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Coronary heart diseases

- *Guus van der Bie, Christoph Rubens*
On the development of the heart and the embryology of the coronary vessels
- *Christoph Rubens*
Coronary Circulation within the human circulatory system
- *Christoph Rubens*
Pathology of coronary heart disease—the endothelial organ and endothelial dysfunction
- *Uwe Schulze*
Pathophysiology of coronary artery disease
- *Uwe Schulze*
Pathogenesis and salutogenesis of coronary artery disease
- *Andreas Fried*
Psychosocial factors with coronary artery disease
- *Andreas Fried*
Conventional medical treatment of and intervention in coronary artery disease
- *Matthias Girke*
Anthroposophical treatment of coronary artery disease
- *Sonja von Lorentz*
Medication for arteriosclerosis—Plumbum mellitum Sclerotic process and finding the indicated medicine
- *Uwe Schulze*
Medicinal action of Cactus comp. II®. Case report
- *Andreas Fried*
Havelhoehe School of Heart-Care
- *Christoph Rubens*
The middle human being Coronary artery disease as a task—summary
- *Christoph Rubens, Matthias Girke*
Epilogue
Insight into and treatment of coronary disease in anthroposophical medicine—questions concerning internal and external evaluation

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English Issue

Content

- 2 | *Guus van der Bie, Christoph Rubens*
On the development of the heart
and the embryology of the coronary
vessels
- 6 | *Christoph Rubens*
Coronary Circulation within the
human circulatory system
- 10 | *Christoph Rubens*
Pathology of coronary heart
disease—the endothelial organ
and endothelial dysfunction
- 13 | *Uwe Schulze*
Pathophysiology of coronary
artery disease
- 18 | *Uwe Schulze*
Pathogenesis and salutogenesis
of coronary artery disease
- 23 | *Andreas Fried*
Psychosocial factors with coronary
artery disease
- 25 | *Andreas Fried*
Conventional medical treatment of
and intervention in coronary artery
disease
- 29 | *Matthias Girke*
Anthroposophical treatment of
coronary artery disease
- 38 | *Sonja von Lorentz*
Medication for arteriosclerosis—
Plumbum mellitum Sclerotic process
and finding the indicated medicine
- 43 | *Uwe Schulze*
Medicinal action of Cactus comp. II®
Case report
- 46 | *Andreas Fried*
Havelhoehe School of Heart-Care
- 49 | *Christoph Rubens*
The middle human being Coronary
artery disease as a task—summary
- 51 | *Christoph Rubens, Matthias Girke*
Epilogue
Insight into and treatment of
coronary disease in anthroposophi-
cal medicine—questions concerning
internal and external evaluation

On the development of the heart and the embryology of the coronary vessels

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■ Abstract

The organogenesis of the heart begins at the end of the third week and takes c. 35 days, with functional maturity achieved only with the separation of venous and arterial circulation at birth. Coronary development starts at the angiogenic vascular plexus in the region of the interventricular and atrioventricular grooves. Nutrition for the heart is initially by diffusion, with a coronary circulation established at about the 44th day. The involvement of the four levels of existence can be seen in the way the coronary circulation develops. Special aspects of cardiac embryology are: first primitive organ; only extraembryonic primordium; primary cavity development instead of invagination. The development of the heart relates to that of the placenta. The latter may be considered a prenatal heart (mediation between maternal and fetal blood) which leaves behind the process organization for the postnatal heart (mediation between upper and lower human being, internal and external world). The gesture of the coronary blood in embryonic development is one of enveloping intracavitary blood in terms of the blood meeting itself—looking around you as you look within yourself.

■ Keywords

Cardiac embryology
Embryology of coronary vessels
Angiogenesis
Placental development
Involvement of the four levels of existence

Cardiogenesis

The embryonic development of the heart has three main characteristics that distinguish it from the development of other organs. 1) Cardiogenesis precedes the primordia of other organs. 2) The heart is the only organ which begins its development outside the embryo, i.e. outside the germ layers. 3) Development of the cardiac cavity is directly from the heart itself and not through endodermal or ectodermal invagination.

By the end of the 3rd week of pregnancy, the primordium of the heart consisting of mesodermal cells develops on the boundary between intra and extraembryonic mesoderm, between amnion and yolk sac and on the cranial aspect of the germ disc, and. The period of development is c. 35 days (to the end of the embryonic period), with the organ becoming internalized (intraembryonic displacement) and descending (descensus cordis) (*Figs 1 and 2*). The coronary circulation develops during this period, with diffusion followed by the heart's own circulation as the basis for cardiac exchange processes (1, 2). Functional "maturity" will only come when breathing starts at birth (final separation of circulations in the arterial and venous branches, obliteration of the ductus arteriosus and closure of the foramen ovale).

From its very beginning, the heart, "organ of the middle", shows the gesture of mediation and repolarization, being the only organ positioned between the prenatal membranes (amnion, yolk sac, connection to maternal organism) and the germ primordium of the future physical body. This reflects its functional role in the fetal period (from the beginning of the 3rd month or 9th week) when the heart mediates via the vessels of the umbilical cord between placental and thus the maternal blood on the one hand and the fetal blood or intraembryonic haematopoietic tissue on the other. An evident connection exists between cardiogenesis and placental development. The primordium of the heart develops in the 3rd/4th week, when the trophoblast has developed into an all-round chorion rich in villi and maximally open to the periphery where only a layer of chorion cells separates maternal from embryonic blood. The tiny embryonic heart clearly shows that there is no question of it physically maintaining the comparatively vast placental

Fig. 1

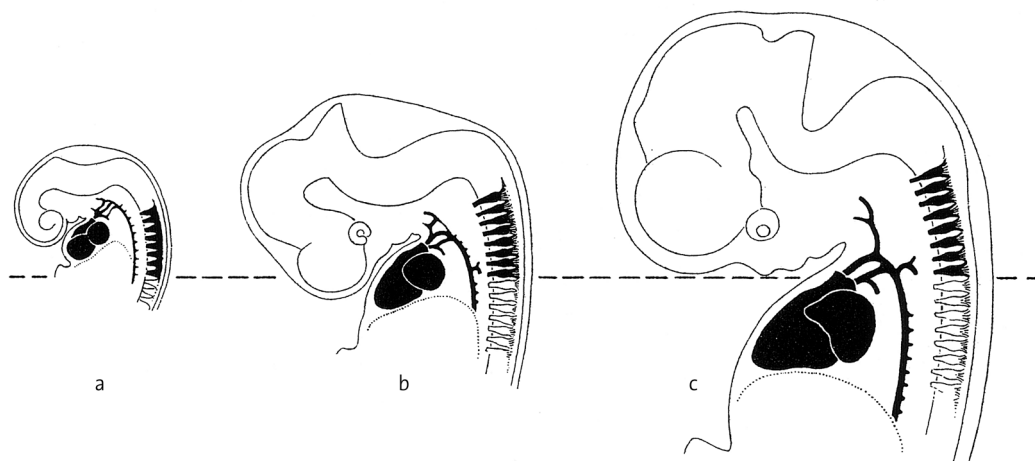
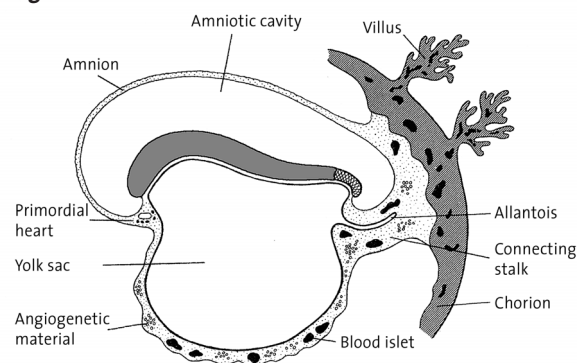


Fig. 1
Descensus cordis.
Days 29, 42 and 48.
From Hinrichsen
KV. Humanem-
bryologie, 1991,
quoted from Schad
W. Merkurstab
2003, Heft 4.

Fig. 2
Germ disc in me-
dian section, c.
19 days old. From
Langmann J. Medi-
zinische Embryo-
logie, quoted from
Schad W. Merkur-
stab 2003, Heft 4.

Fig. 2



circulation. Instead, the placenta moves the blood back to the embryonic heart in the germ disc (3). The further cardiogenesis progresses and the cardiovascular system of the embryo develops a circulation that takes the place of diffusion of substance streams, the more does the chorion abandon its all-round peripherality to condense one-sidedly in the disc-shaped placenta (Fig. 3) (4). When the placenta has matured, the heart has developed its septa and concluded development as an organ (9th week). The functions of the heart which persist after birth (complete separation of circulations) only develop fully when the placenta dies at birth.

Angiogenesis

In the human embryo the development of blood vessels begins around the 7th day in the region of the body stalk outside the embryo, i.e. more or less opposite to the cardiac primordium at the caudal pole of the germ disc in the chorion and on the yolk sac. Initially nests of primordial tissue (haemangioblasts) are observed which later form continuous strands of tissue, with blood cells (haemocytoblasts) and vasculogenic cells (angioblasts) differentiating out from these in due course. The vascular wall develops in a process of densification, whilst primitive blood cells arise as cell complexes loosen. In Goethean terms this would be contraction and expansion. Intraembryonic blood vessels begin to form in the lateral mesodermal regions of the embryo even before the 20th day. The aorta and arteries of the pharyngeal arch are initially paired; later, around the 44th day, asymmetry develops through obliteration of the right aortic arch and the circulatory system is then essentially in its final form. The ability to develop new vessels is under certain circumstances retained for life (1).

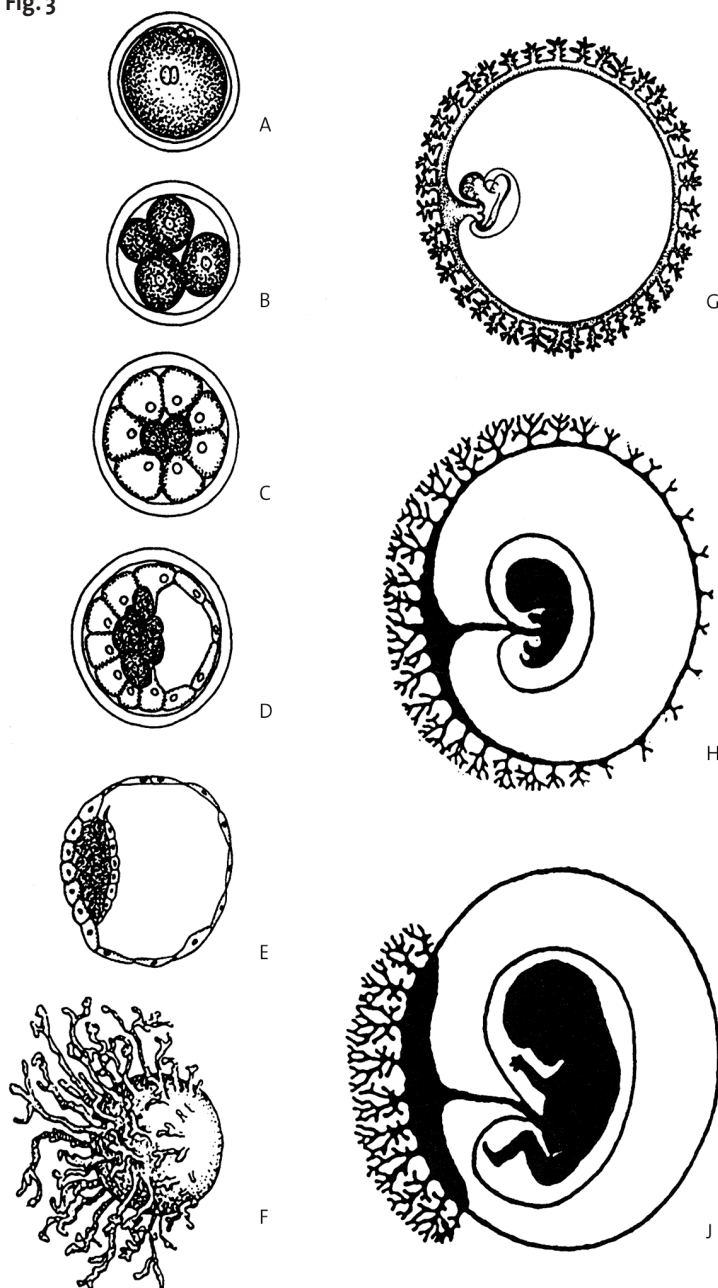
Embryology of coronary vessels

In the 35 days of the heart's complex organogenesis—incipient primordium at the end of the 3rd week, development of internal space, onset of contractions as early as the 22nd day, myocardial differentiation and finally completion of the ventricular septum on about the 56th day—it seems that the development of this central circulatory organ's own vessels (coronary vessels) cannot be followed entirely. An attempt will, however, be made

to present what is known about this and consider the developmental gestures involved.

Important studies on the embryological development of the coronary system have been done on quail. It was found that the first beginnings of blood vessels developed in the subepicardial mesenchyme (5). Early vascular structures were located near the interventricular and atrioventricular sulci. These were angiogenic vascular plexuses of the kind also observed in other sites. In due course an arterial and a venous system differentiate out (6). They develop from endothelial cells and begin to produce numerous arteriovenous anastomoses. These migrate towards the apex and are precursors of the myocardial capillary net. At the other end the primitive subepicardial coronary vessels grow towards the sinus venosus and truncus aorticus. When the growing subepicardial coronary arteries and veins touch the truncus aorticus and sinus venosus, apoptotic processes cause the aortic wall to open and a connection is made with the lumina of the embryonic coronary vessels (7). It is a mere 12 days from the first beginning of the coronary vascular bed on about day 32 to the first beginning of coronary circulation on day 44, but it appears that development of all coronary trunks does not conclude until day 56 (1,8). The developing heart is presumably largely supplied by diffusion for a minimum of 24 days, with coronary circulation fully established only towards the end of cardiac development.⁸ Whereas development of the subepicardial coronary vessels is well advanced, that of

Fig. 3

**Fig. 3**

From trophoblast (D – F, Days 3 – 16) to chorion (G & H, 4th & 9th weeks).

From Schad W. Merkurstab 2001, Heft 3.

myocardial capillaries, the precondition for definitive circulation, only comes to completion at the moment when in the 7th week (c. day 44) the embryo has become astralized and further development involves the movement of coming upright (I-nature) (9, 10).

Considering the phenomenology of coronary development gestures from the point of view of the different levels of existence being involved in building up the human body, a law of human development is seen to come into play here:

1. Cell nests of haemangioblasts—starting point for the physical organization.
2. Flowing movement of primordial blood vessels in what is still a fluid state (migration, sprouting),

beginning from the periphery—etheric organization coming into play.

3. Differentiation into blood and vascular wall, artery and vein—astral organization coming into play.
4. Apoptotic processes on the truncus aorticus and sinus venosus establish connection with the major circulation—I-organization coming into play.

Further aspects to the phenomenon of embryonic cardiovascular development

1. Topography of embryonic cardiovascular organization reflecting and determining human individualization

As stated earlier, cardiogenesis begins cranial to the buccopharyngeal membrane where polarization is at a maximum in humans through contact between the floor of the amnion (pre-ectoderm) and the roof of the yolk sac (pre-endoderm). At this point, the intraembryonic mesoderm touches the geometric centre of the chorionic cavity which is orientated to the periphery represented by the maternal organism.

Cardiogenesis and placental circulation relate like centre and periphery in the embryonic vascular organization. On the one hand we have the primordium of the “central” heart which will remain after birth. On the other hand the organization of the chorion and later the placenta presents as a “peripheral, prenatal heart”. R. Steiner called the embryonic membranes the “outwardly visible” aspect of the spiritual organization of the human being as it prepares the “visible human being”. These membranes are cast off at birth. But the spiritual organization, i. e. the “invisible human being”, continues to act as a power in the processes of the “visible human being” who remains. On this basis, we may consider the placental circulation to be the visible cardiac organization of the “invisible human being” before birth (11). The heart organ reaches functional perfection at birth with complete separation between venous and arterial circulation and with the first breath as a reflection of the human I-organization taking full effect. The placenta’s role as “prenatal heart” has been achieved. It dies off after birth, leaving an effective “process organization” which is the full functional capacity of the postpartum heart. This then also takes up a mechanical aspect to its function—modulation of the blood stream through blood pressure. In the heart which “remains” postpartum, we have an original central cavity that focuses inwards and differs completely from other body cavities in that it did not develop through invagination of some other cavity. This soul gesture after birth says: look inward! In the prenatal chorion and placenta, on the other hand, the vascularized villi floated in a cavity originally developed from trophoblasts where the orientation was to the outside. There the gesture of soul was: Look around you!

2. Morphogenesis of heart and coronary circulation

Cardiogenesis may be characterized as a process of reversal and evagination of an originally tubular and then temporarily loop-shaped organ, a process which

repeats itself as it goes into all dimensions of space. As the embryo develops craniocaudal and ventrolateral curvature and the heart descends, reversals result which lead to the 4-chambered, septate configuration of the heart by the end of organogenesis:

- *Dorsally and ventrally*: visible in the topography of pericardial cavity and heart tube.
- *Caudally and cranially*: visible in the change of position of the primitive arterial trunk and the sinus venosus.
- *Left and right*: visible in the development of the primitive ventricle, displacement of aorta and pulmonary artery to the left side, and of the sinus venosus to the right side of the heart (1, 12).

The coronary circulation evolves concurrently with this highly complex spatial development. It can only become functional once the spatial order of the chambers has gained its basic form and its topographical position in reference to the bulbus aortae, the vena cava and the right atrium (from day 41 at the earliest) (1).

3. Polarization in the human organization

With the first inhalation at birth, polarization is brought to complete realization anatomically and functionally in the heart. It had long since been morphologically prepared for, but could not be functional prenatally because of the oval foramen and ductus arteriosus.

The physical separation, appropriate to postpartum life, between “visible” and “invisible human being” (in form of the embryonic membranes) is the ultimate gesture of polarization. From then on the human being is incomplete. He has lost the prenatal membranes. The physically visible membrane organ was cast off, but the organization active in it before birth lives on at functional level as an organization of powers. It is now the heart’s physiological task to mediate and establish balance between the poles of the visible human being, so that human individualization and destiny development can be achieved on this physiological and anatomical basis. From now on the endeavour is to seek wholeness in the individual progress through life (4, 11).

Like no other organ, the heart is able to balance out morphological and functional polarities. The tension between life and death is organically overcome in every systole and diastole of cardiac function, making it bear fruit for the human being.

Concluding remarks

It needs extraordinary powers of thought and imagination to unravel the morphology of cardiogenesis. To gain insight into the soul and spirit dimensions of the heart’s development and function calls for higher powers of insight—Inspiration and Intuition.¹³ The attempt must therefore remain incomplete. As there is no complete scientific description of coronary artery development, insight into the function and later pathological tendencies must needs remain incomplete. With the help of the continually enlarging surface in the myocardial trabecular system, coronary blood envelops the in-

tracavitary blood in the heart without entering into physiological exchange with it. A kind of self-encounter for the blood, a gesture saying “look around you by looking into yourself”.

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Coronary Circulation within the human circulatory system

CHRISTOPH RUBENS

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■ Abstract

In terms of functional threefoldness, the human circulatory system goes in three directions—towards the upper human being (neurosensory system), towards the lower human being (metabolism and limbs) and the middle human being (rhythmical system). In the middle human being we have a duality—the pulmonary as against the coronary circulation. This provides insight into the way the four levels of existence are involved in the human circulatory system. In the sphere of the neurosensory system, the blood is influenced by the I-organization, in the system of metabolism and limbs it is connected to an equally significant degree with the movement of material substance in the physical organization. In the middle, the astral organization leaves its mark on the air-related processes in the pulmonary circulation, and the etheric organization does so on the processes of the coronary circulation which belong to the fluid organism. The significance of the coronary circulation in linking etheric and physical organization is particularly evident in the direct threat to life offered by coronary syndrome—the etheric organization, maintainer of life, can separate directly from the physical organization.

■ Keywords

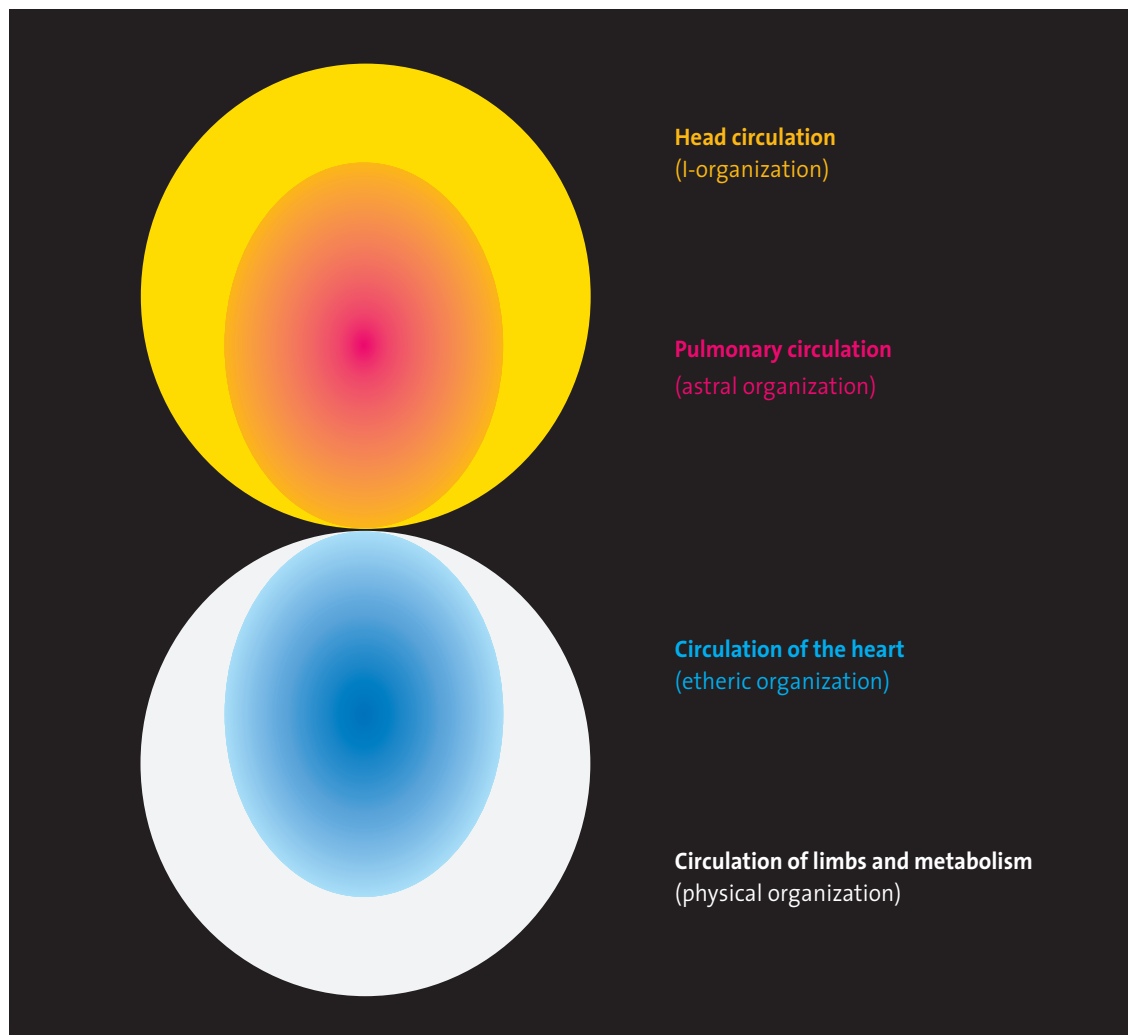
Head circulation
Lung circulation
Coronary circulation
Circulation in limbs and metabolism
I-organization
Astral organization
Etheric organization
Physical organization

In the modern physiology and anatomy of the blood circulation which in essence goes back to W. Harvey (1578–1657), we distinguish between the lesser pulmonary circulation (part of the low-pressure system) and the greater circulation of the whole body (high-pressure system). It is also possible to establish another distinction if we consider the morphological and physiological characteristics of individual regions. The circulation of the head, which is part of the neurosensory system, has very different characteristics from the “lower” circulation in the system of limbs and metabolism. Beside the low-pressure pulmonary circulatory system in the rhythmical system, the coronary circulation represents a fourth element. Its characteristics will be considered below.

The view held in modern anatomy and physiology is that the circulation ensures the transport of matter, and homoeostasis to maintain organ functions. The cause-and-effect aspect has been elucidated step by step, with the determining spiritual organization behind it all has gradually lost sight of (1). To understand the differences between the circulatory regions we must turn our attention to the spiritual configuration that lies behind.

The differentiation of human functions into neurosensory system, rhythmical system and system of metabolism and limbs given by Rudolf Steiner (2) is also reflected in the organization of the circulatory system which may be seen as an organ in its own right. The relationship of the four bodies is different, however, in the neurosensory system, the rhythmical system and in metabolism and limbs (3).

It must also be taken into account that the blood, “all-mediator” in the human organism, bears the imprint of everything that lives in the different organ functions. Rudolf Steiner spoke of the blood as the organ of human I-nature or selfhood that “is present in all organs, to be an instrument for I-nature” (4). From such a point of view, the blood is the organ which helps the I-organization to take hold of the whole living human body, building it up and maintaining it. To receive these constructive powers, the I must flow in such a way in the blood “that it first has its powers filled with soul quality by the astral organization, the etheric and the physical organization” (5). Contact between the circulatory organ as a



The involvement of the four levels of existence in the blood circulation

whole and the four bodies shows different characteristics for the different functional spheres. With the imprint of the different powers and the balancing mediation of the heart, the blood makes continuous incarnation of the human being possible.

Circulation of the head organization

Here the blood, starting from the aortic arch, moves via the carotid and vertebral arteries to the central nervous system and the sense organs in the head. Having flowed through sense organs and brain it collects in the sinus before returning to the heart via the jugular veins and superior vena cava. The special signature of this circulation shows itself even in the oxygenation of blood during embryonic development, with the highest O_2 level found proximal to the ductus arteriosus; distal to this, "mixed blood" with lower levels of oxygenation is adequate for further development (6). Another characteristic of this circulation is that the vessels supplying the brain are largely subject to autoregulation (no resistance vessels, constant flow), which provides for maximum independence of conditions in the rest of the circulation. The physiological functions of this upper circulation are oxygenation and nourishment of brain and sense organs but also the mediation of perceptions and impulses in the hormonal systems.

In this part of the circulatory system, sensory impressions and thoughts are imprinted on the blood. Filled with these, the blood returns to the heart.

Pulmonary circulation

The venous blood flowing from the periphery of the organism and from the heart's coronary sinus itself is low in oxygen and thoroughly configured by all organ activities. It enters into the right atrium and right ventricle and then passes at low pressure into the pulmonary circulation (lesser circulation). It enters into the lungs via the branching pulmonary artery. There it reaches the alveolar capillaries where gas exchange takes place. The postalveolar arterialized blood moves via four pulmonary veins to the left atrium. From the left ventricle it can be made available to the whole organism. There can be no doubt but that the pulmonary circulation is a distinct and specific part of the circulation as a whole with its own physiological characteristics. The blood stream goes from the right to the left heart, blood gases are in reverse proportion compared to the high-pressure system. It is a low-pressure system, with resistance to flow at 10 % of that in the rest of the circulation. Dependence on hydrostatic forces is marked. Apart from the pulmonary circulation described, with its vasa publica serving gas exchange, the lung is also provided for through the

vasa privata, which is part of the high-pressure system, to supply nourishment for the pulmonary parenchyma.

Inhalation and exhalation express ensouled nature. Independent life after birth begins with an inhalation. Life ends in an exhalation as we die. Beginning and end of life, development and involution here relate directly to the environment from which life has arisen (airy atmosphere of the earth, light space of the cosmos). Pulmonary function also relates directly to the world of feelings which is part of the astral organization. It is unthinkable that soul life be possible without air and the lung (pleasure, pain, laughter, weeping, speech, art). Pulmonary respiration thus is also the process in which sentient life imprints itself on the blood as the signature of ensouled organisms.

Coronary circulation

Taken to high pressure in systolic contraction of the left ventricle, the arterialized blood flows through the open aortic valve. The first supra-avalvular vessel reached in systole is the right coronary artery, where blood flow is both systolic and diastolic. This artery supplies the right ventricle (part of the low-pressure system) and its atrium as well as parts of the posterior wall of the left ventricle (anterior and posterior parts). Diastolic flow only increases rapidly after the arterial pulse wave of the body's circulation in the left coronary artery which also branches off immediately above the aortic valve. The interventricular anterior and circumflex rami branch off from the main trunk of the left coronary artery. Postcapillary coronary blood collects in the venae cordis and reaches the right atrium above the tricuspid valve via the coronary sinus especially during systole. It is therefore the "last blood" to be added to the blood collecting from the whole organism. Physiologically the coronary circulation is seen to have significance in supplying the myocardium with oxygenated blood rich in substrates to ensure that cardiac function can meet demand. The coronary circulation has a 5 % share in cardiac output and can be increased to four times as much (7, 8).

Systolic and diastolic flow in the right coronary artery and particularly diastolic flow in the left coronary artery give the coronary circulation its typical signature, with reversal of conditions indicating its special character. The creative gesture lies in the reversal. Compared to organs such as lung, liver, spleen and kidneys, the heart's blood supply comes in from the periphery, thus reversing the "hilus principle". Arterial coronary blood flows from the large epicardial vessels towards inner myocardial layer, and—separated by the single-layer endocardium and basal membrane—forms a fine capillary net around the intracavitary blood. Trabecularization of the myocardium causes the area of encounter between intracavitary and coronary blood to be increased. In conventional science, the physiological significance of this can at best be a matter of speculation. From the phenomenological point of view, surface enlargement is, however, a morphological precondition for exchange processes and the uptake of energies from the periphery. The arche-

type for this is the leaf of a plant. Coronary blood appears to surround the intracavitary blood in diastole, and myocardial trabecularization gives it a surface configuration which enables it to perceive and take in the peripheral energies contained in the intracavitary blood. Blood as the vehicle for the I-organization takes these energies into itself with the help of the coronary circulation, with a kind of self-encounter of the blood happening between coronary and intracavitary blood (9). If we also take note of Rudolf Steiner's view that the energies and powers brought together from the cosmos concentrate in the heart (10), the coronary circulation becomes the circulatory element where the human I-organization meets the etheric world in a very special way through the blood. This is confirmed by the typical fear of death experienced with acute coronary syndrome. Fear of death arises when the etheric organization threatens to separate from the physical organization (11). The unenlivened bodily organization, i.e. the corpse, would remain behind. The severe inhibition of coronary flow creates this very danger for the organism as a whole (ventricular fibrillation, cardiogenic shock with left heart failure). The close connection between coronary blood and etheric world and the interpenetration of the two can explain the heart's power to regulate itself in every cycle. Beyond this, it seems that it was profoundly right for W. Harvey, for instance, to speak of the heart as the source and origin of life and the sun of the microcosm (*principium vitae et sol microcosmi*) (11, 12).

Circulation of the body

The vessels for the human being of limbs (subclavian, iliac and femoral arteries) and the metabolic human being (coeliac trunk, superior and inferior mesenteric and renal arteries) arise from the aorta. From the capillary bed, the blood flows to collect in the inferior vena cava and back to the heart. Special importance attaches to the second capillary bed in the liver which leads to the portal vein. This "lower circulation" is distinct from the "upper circulation" of the head even at the embryonic stage in that oxygenation is lower distal to the ductus arteriosus. It is also widely regulated by the autonomous nervous system, with variable degrees of flow. Physiologically it serves food intake and digestion and eliminatory processes, provides nourishment and oxygen for the muscles of the locomotor system.

In this circulation, the emphasis is on letting the world of matter and will impulses enter into the blood. Consider that the blood follows every intentional and unintentional movement of the limbs, apart from anything else just because of the given spatial relationship.

Final considerations

In his lecture on the invisible human being (5), Rudolf Steiner spoke of the way in which the spiritual organization, starting from the human I, intervenes constructively in the physical body of the "lower human being". The opposite process is direct destructive intervention of the I-organization in the "upper human being". Destructive forces thus dominate in the region of the head circula-

tion, and this is due to a direct connection with the I-organization which here intervenes directly. Where thoughts arise, catabolism dominates over anabolism (physiology of neural tissue, process of destruction or death). At the other pole, in the "greater circulation", I-activity initially enters into the astral and etheric organization in the organs that serve the synthesis of matter, to work in the constructive processes at the physical level (physiology of liver, anabolism). In the pulmonary circulation which lies in between and is orientated towards breathing air, the astral body fills the I-organization, and destructive powers may be considered to be reduced in their action compared to those in the neurosensory system (reduced death process). The coronary circulation, also lying in between, supplies the myocardium and is therefore more orientated towards the sphere of metabolism and limbs. It is a fourth circulation element. A sphere of the circulatory organization which mainly serves metabolism having shifted to the middle human being, we have a reduced anabolic process there. The I-organization intervenes via the astral body (contractions of the heart). The pulse is an outward reflection of the process.

We thus have an image of the human circulatory organization where we again have functional threefoldness, with a duality in the middle (rhythmical) system which allows us to see the relationship between functional threefoldness and the four bodies that constitute the human being.

The blood is thus continually on the move, all-mediating, in the currents of the invisible human being's I-organization that influence the visible human being. Mediated by the heart, constructive powers are taken to regions where destruction takes place and vice versa. The incarnation of the I in the blood and therefore in the living body of the human being is maintained in these processes, with coronary blood assuming a profoundly significant task for the vital energies, one that is not fully understood to this day.

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Pathology of coronary heart disease— the endothelial organ and endothelial dysfunction

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Das endotheliale Organ und die endotheliale Dysfunction.
Der Merkurstab 2006; 59: 213–12. English by A. R. Meuss, FCIL, MTA.

■ Abstract

The endothelial layer at the boundary of blood and vascular wall is highly differentiated and vital throughout; this is the endothelial organ. It is a site of functional adaptation for blood and organ process, situated in the polarity of energy currents also reflected in the biological functions of the mediators which regulate endothelial function—vasodilation and vasoconstriction, anti-aggregation and aggregation, anticoagulation and coagulation, diastole and systoles, exhalation and inhalation, sleep and waking, night and day, anabolism and catabolism. Imbalance is possible in the interplay of these opposites and may present as endothelial dysfunction, an early stage of arteriosclerosis that is still wholly functional. With manifest arteriosclerosis, the endothelial organ is no longer adequately available as middle and mediator. Inflammatory and sclerotic processes may be in direct opposition.

■ Keywords

Endothelium
Endothelial function
Endothelial dysfunction
Arteriosclerosis
Polar opposites
Blood stream
Neural stream
The four levels of existence

Significance of the endothelial organ for the circulation

The vascular wall is typically made up of three coats, with variations depending on the functional role in the given sector of the circulatory system. On the outside, the vessel connects with the surrounding tissues via the largely connective tissue coat of the tunica adventitia (externa). The tunica media in the middle is rich in muscle fibre and modulates vascular tone. The boundary to the blood stream is represented by the tunica intima with its layer of endothelial cells on the blood side. This layer lines arteries, arterioles, venules and veins. In the heart it is the endocardium. In the capillary part of the circulation, where blood and organ activity are inseparably bound up functionally, endothelial cells and basal membrane make up the wall structures, with no tunica adventitia or media.

Because of its multiple functions at a boundary to the flowing blood that is very much alive, increasing efforts have been made in recent times to see the endothelium as a uniform organ. Its physiological role as mediator between blood and vascular or organ processes increases from heart to periphery. As tunica intima of resistance and precapillary vessels it plays a subtle role in regulating tone. Contraction and relaxation appear like pulse qualities (systole – diastole) placed in the periphery, where they modulate blood flow to a marked degree. In the capillary bed, the heart's pulse beat gives way to flow determined by the activity of the organ concerned (metabolism). The vascular surface increases considerably in the capillary region, capillary forces are taking effect. Phenomenologically, "capillarity" and surface area are characteristic of plant nature and hence of etheric activity.¹ The capillary bed in the circulation is on the one hand a site of maximum processuality and vitality, with fluid turnover, exchange of matter, and cell migration. On the other hand this is where we find receptor-mediated interaction with mediators and messenger compounds as sensory processes. The blood is perceived and "tasted" by the endothelium. In the early days of endothelium research, scientists focused entirely on selective transport processes. Since then, the significance of the endothelial organ for vascular tone, coagulation status of the blood (haemo-

stasis) and growth processes has become apparent. The endothelium also has functions in cases of inflammatory and immune processes, angiogenesis and the growth of tumours and metastases (2). Relatively little research has been done on the functional significance of the endothelium on the venous side of the circulation and in the heart.

Historical aspects of endothelium research

Reference should first be made to Howard Florey (1898–1968). He is considered the originator of research on the vascular endothelium. It is worth noting that initially he was concerned with the treatment of bacterial infections which had a high mortality rate until the mid-20th century. In 1940 he introduced experimental exposition of penicillin, discovered by A. Fleming in 1929, in mice infected with streptococci, demonstrating its life-saving properties in the animal experiment. This was the beginning of the “age of antibiotics”. Together with A. Fleming and E. Chain he was awarded the Nobel Prize in Medicine in 1945. Soon after this, in the 1950s, he started work on the role of cholesterol and investigations on arteriosclerosis and also the endothelium. He thus turned to the sclerotic vascular diseases which came to play such a role in the industrialized countries of the West during the second half of the 20th century. “Endothelial cells ... [are] ... more than a sheet of nucleated cellophane” he said in 1966, indicating even then that the vascular endothelium is a highly differentiated and vital tissue of organ quality. Milestones on the road to understanding the epithelium have been the discovery of endothelium-derived dilatation by R. F. Furchgott in 1980 (Nobel Prize in medicine in 1998), and growing awareness of nitric oxide being an endothelium-derived relaxation factor (EDRF) in the 1990s. The counterpart to the NO system is considered to be the endothelin system. Exploration of this started in 1988, when M. Yanagisawa identified endothelins 1–3 as endothelium-derived constrictors (2, 3).

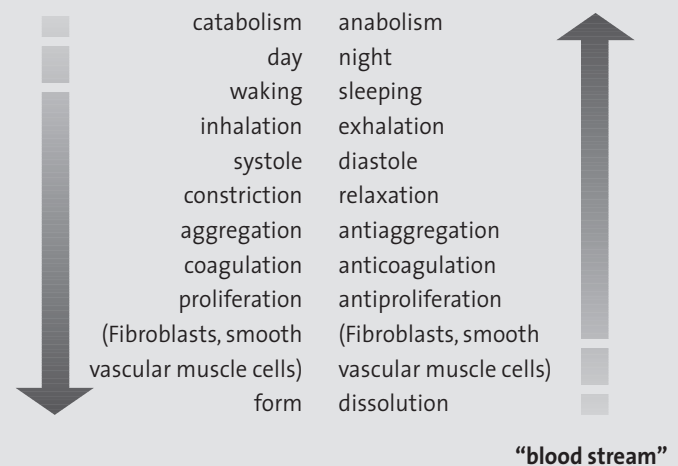
Endothelium-derived endothelial function

As already mentioned, increasing attention was given to the “endothelium-derived endothelial functions” (dilatation and constriction) in the 1980s. Ultimately this led to endothelial mediators being described, above all NO (nitric oxide, EDRF) which acts as a dilatant, and endothelins 1–3 with their constrictive actions.) (4, 5, 6). Highly effective regulatory processes in the peripheral circulation, including their mediators, were identified. Peripheral and local regulatory processes modify vascular tone, blood coagulation status and cell growth in particular. The effectiveness of powers beyond the ordinary is evident, among other things, from the fact that endothelin 1 has ten to 100 times greater constrictive activity in equimolar concentrations than noradrenalin, vasopressin or angiotensin II.

Powers and mediators in epithelial functions

One methodological approach to the phenomenology of the natural world is to look for polar opposites, for

Fig. 1. Polarity between powers active in the human organism
“nerve stream”



they can help to make the whole comprehensible. In a lecture given on 11 February 1923 (7). R. Steiner spoke of how destructive “nerve stream” and constructive “blood stream” represent polar opposite powers of the I-organization in the “invisible human being”. In the middle human being, one then has a less destructive and a less constructive stream of powers from the I-organization of the invisible human being as polar opposites (“stream of breathing” and “stream of pulse”). On closer consideration one can hardly fail to see that “nerve stream” and “blood stream” are opposite manifestations of general (world) laws to which man is also subject (Fig. 1).

If we arrange the mediators according to their biological functions, they relate to the polar qualities reflected in “nerve stream” and “blood stream” (Fig. 2, Table 1).

Endothelial dysfunction and the pathology of coronary disease

With healthy endothelial function and one that is regaining health, constriction and dilatation, coagulation and anticoagulation, aggregation and antiaggregation, proliferation of sclerosis-related cell groups (fibroblasts, smooth vascular muscle cells) and antiproliferation, etc. are always in balance. Endothelial dysfunction means that they are out of balance. Constrictive, aggregating, coagulating and proliferative tendencies predominate and bring about pathological changes. By definition, the paradoxical constriction of a vessel in response to acetylcholine is considered to demonstrate endothelial dysfunction. Dilatation (“blood stream”) therefore becomes constriction (“nerve stream”). The transmitter of the parasympathetic system has adopted a sympathetic form of action. A change occurs in the reaction of the endothelium to an unchanged stimulus. Causes under consideration are response to injury, primary damage to the endothelium, oxydative stress or reduced availability of NO. From the point of view of spiritual science, the question arises as to whether this is not primarily a change in the relationship between the streams of I-organization powers, or excessive intervention of the astral organi-

Fig. 2. Physiological mediators in the polarity between powers active in the human organism

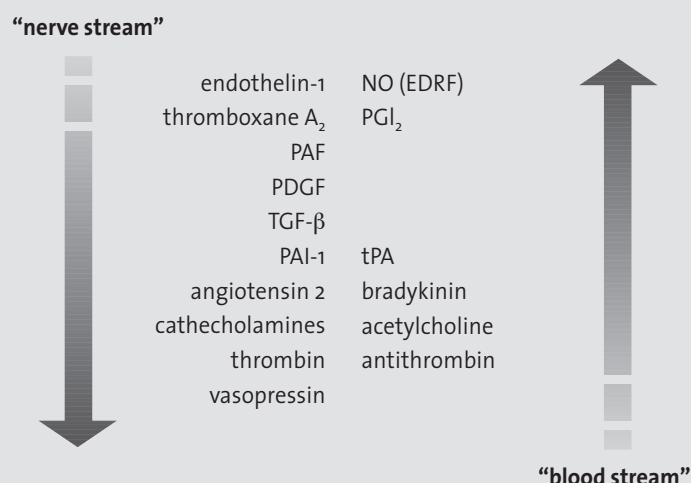


Table 1: Physiological mediators in the polarity between powers active in the human organism

“nerve stream”		“blood stream”	
Endothelium-derived factors:			
endothelin-1	constriction	NO (EDRF)	relaxation
	aggregation		antiaggregation
	proliferation		antiproliferation
Thromboxan A ₂	constriction	PGI ₂	relaxation
	aggregation		antiaggregation
	proliferation		antiproliferation
PAF	aggregation		
PDGF	proliferation		
	aggregation		
TGF-β	proliferation		
	coagulation		
PAI-1	coagulation	tPA	anticoagulation
Endothelium-independent factors:			
angiotensin II	constriction	bradykinin	dilatation
	proliferation		
catecholamines	constriction	acetylcholine	dilatation
	proliferation		
thrombin	coagulation	antithrombin	anticoagulation
vasopressin	constriction		
	proliferation		

Abbreviations:

NO = nitric oxide

EDRF = endothelial derived relaxing factor

PGI₂ = prostaglandin 2

PAF = platelet-activating factor

TGF-β = tumor growth factor

PAI 1 = plasminogen activating inhibitor 1

tPA = tissue plasminogen activator

Note: Proliferation and antiproliferation here relate to promotion and inhibition of growth of fibroblasts and smooth vascular muscle cells which play a role in sclerosis.

zation. The beginning of arteriosclerotic pathology seems to show itself as a gesture at least in endothelial dysfunction. Constriction, aggregation, coagulation, adhesion, proliferation, etc. finally lead to arteriosclerosis. The organism attempts to balance these tendencies to form deposits with inflammatory changes (macrophages and lymphocytes infiltrating), but the etheric organization is progressively withdrawing from the endothelial organ, and the astral organization ultimately continues to get “caught up”. Inflammation grows chronic. The endothelial organ loses functional significance and is then no longer available as mediator between “nerve stream” (sclerosis) and “blood stream” (inflammation). Inflammation and sclerosis meet head-on. Plaque rupture may occur, for instance. The processes described apply to large areas of the arterial vascular bed. Manifesting in the middle human being, i.e. in the coronary circulation, they may prove life-threatening (8, 9).

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Pathophysiology of coronary artery disease

UWE SCHULZE

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English by A. R. Meuss, FCIL, MTA.

■ Abstract

Today, the pathophysiology of coronary artery disease is based on the “response to injury” hypothesis. Damage to the endothelium results in the accumulation of substances (mainly lipids) and cells (mainly monocytes) in the vascular tunica intima causing inflammation and the development of plaques. Rupture of unstable plaque leads to thrombotic reactions (acute coronary syndromes). Fibrosis leads to sclerotic, stable plaque and thus arteriosclerosis as the final stage of this chronic process. The inflammatory process can be understood in terms of the polarity between blood and nerve stream. Continuous involution in the upper human being uses up the regenerative powers of the etheric. The weakened I-organization is not able to control destructive astral activity nor to strengthen the etheric powers in the flowing blood.

■ Keywords

Atherosclerosis
Endothelial dysfunction
Inflammation
Acute coronary syndromes
Trigger factors
Four levels of existences

The term arteriosclerosis, introduced by Marchand in 1904, signifies the accumulation of lipids (athere, atheroma, “groats”) in the arterial tunica intima which causes vessels to harden (sclerosis). The term arteriosclerosis, introduced by Lobstein in 1829, is considered to be a synonym (1).

The phenomenon of arteriosclerosis was known and described in ancient Egypt. Hippocrates described the symptoms of myocardial infarction in the 4th century BC, and Antyllus the importance of diet to combat arteriosclerosis in the 2nd century BC (1).

On the one hand arteriosclerosis is a generalized systemic phenomenon affecting the large and medium-sized muscular arteries of various vascular provenances. Coronary arteries, cerebral vessels and peripheral pelvic and leg arteries are mainly affected. On the other hand it is a focal process occurring mainly in the region of the tunica intima and in contact with the circulating blood.

Ultimately the terms atherosclerosis and arteriosclerosis describe the final stage in a chronic deposit-forming process which may be observed even in young people. Intravascular ultrasound studies found atherosclerotic changes with thickening of the t. intima in every sixth 20-year-old (2).

The current view is that atherosclerosis is a highly complex, active process characterized by inflammatory reaction to a localized disorder or injury to the inner vascular wall (3). The pathophysiology still considered valid today is Russell Ross’ “response-to-injury” hypothesis (4).

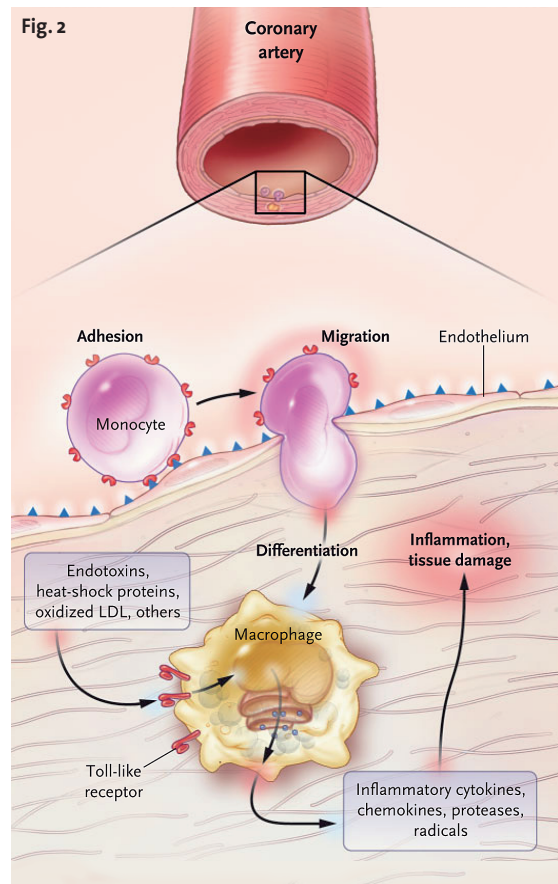
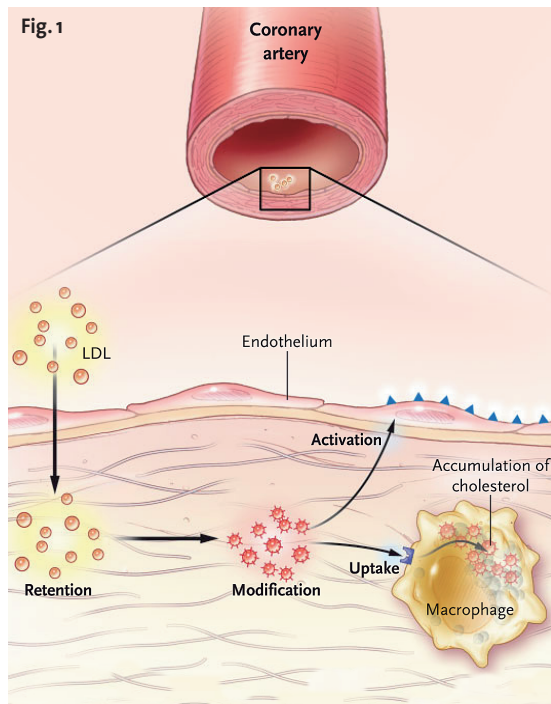
1. The “response-to-injury” hypothesis

Originally the hypothesis was that the first step in atherosclerosis was an injury to the epithelium. Later it became evident that in the early stage of atherosclerosis there is initial endothelial dysfunction, followed by endothelium activation, and these play a major role in inducing the atherosclerotic lesion known as “plaque” (5). An inflammatory process starts in the t. intima in response to injury to endothelial cells and endothelial dysfunction. With the barrier function of the endothelium disrupted, macromolecules (e. g. lipoproteins) and inflammation cells (mainly monocytes/macrophages) migrate to subendothelial space. Oxidatively or enzymatically modified lipoproteins (mainly LDL) play a

Fig. 1
LDL infiltration in tunica intima (7).

Fig. 2
Macrophage activation (7).

Fig. 3
T-cell activation (7).



particular role in inducing atherosclerosis (Fig. 1) (6). Lipids cause foam cells to develop from macrophages and accumulate, histologically these appear as fatty streaks (Fig. 2). Activation of the endothelium will parallel to this lead to the expression of adhesion molecules and inflammatory mediators. These in turn cause increased adhesion of thrombocytes and leucocytes to the endothelium and these can migrate to the subendothelial space (Fig. 3).

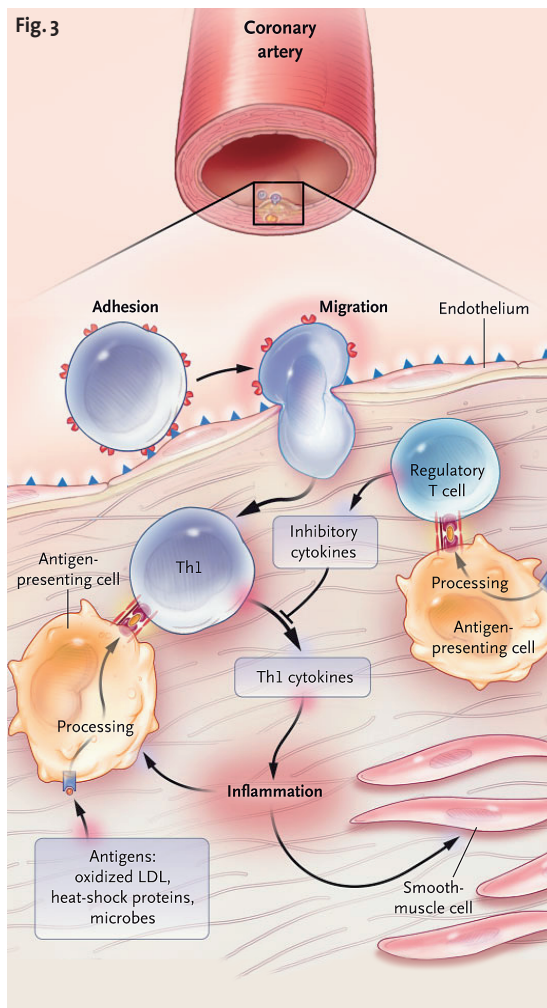
Activated monocytes produce inflammatory mediators (e.g. cytokines and radicals) which leads to T-cell activation. Apart from the release of inflammatory mediators, growth factors are produced which lead to the migration and proliferation of smooth muscle cells to subendothelial space. The vascular wall compensates for plaque development by thickening, with no reduction in lumen to begin with. As the chronic inflammation continues, however, atheromatous plaque increases, the fibromuscular cells which have invaded the wall proliferate under the influence of growth factors, and an extracellular fibrous matrix develops, further accumulation of inflammatory cells leads to focal necroses, and a fibrous cap develops over a necrotic plaque nucleus rich in lipids (4). The lesion then expands into the vascular lumen. At this stage the process is still asymptomatic, plaques merely inducing medium-degree vascular stenoses. After this, evolution may go in either of two directions.

Scar tissue leads to consolidation of the fibrous lesion, or a soft, central lipid core may develop due to extracellular accumulation of lipids and cell detritus. Projecting into the lumen, the lesion is exposed to increasing mechanical forces from blood stream and vascular wall tone. Proteolytic substances may cause the fibrous cap to thin especially in the marginal areas of the plaque. The complex, vulnerable plaque which develops at this stage may rupture (v. i.) (6).

On the other hand, fibromuscular smooth muscle cells from the t. media can form an extracellular matrix rich in collagen and this contributes to progressive fibrosis of the lesion. These muscle cells are probably also genetically reprogrammed to osteoblast-like calcifying vascular cells and initiate calcification of the vessel. Bone matrix proteins such as osteopontin and acid phosphates are demonstrable in atheromatous lesions. This supports the thesis that the mineralization process is not specific to bone tissue but general to all tissues (8). If inhibition of this process is lifted, normal vascular tissue becomes bone-like. Calcification will then, however, be at the cost of the vascular lumen and elasticity, though on the other hand it also serves to stabilize a vulnerable soft plaque (Fig. 4).

2. Endothelial function

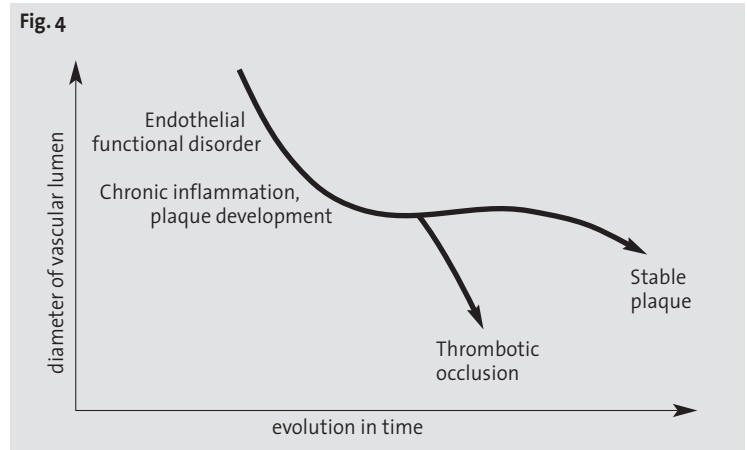
The endothelium forms a barrier between vessel and bloodstream. Apart from this purely mechanical function, the endothelium is also a highly active organ mediating between bloodstream and vascular function (5). Dysfunction plays a key role in the pathophysiology of arteriosclerosis. A number of cardiovascular risk factors cause disruption of endothelial function. This takes the form of increased permeability to plasma constituents, pathological, i.e. vasoconstrictive reaction to flow phenomena, and pro- rather than anticoagulant activity. The inflammatory process thus initiated will in turn cause endothelial dysfunction to increase. For endothelial organ and dysfunction see the other paper by C. Rubens in this issue.



3. Plaque rupture—acute coronary syndrome

Uncomplicated plaque lesions do not yet impede blood flow and are therefore asymptomatic. Activated macrophages, T-lymphocytes and mast cells produce a number of molecules (cytokines, radicals, proteases, coagulation factors) which can destabilize the lesions. Metalloproteinases cause thinning of the fibrous cap, and the shear effects of the bloodstream can lead to plaque rupture (7). The thrombogenic material released in the process induces plasmatic coagulation activity and the activation of thrombocytes in the blood. This causes a thrombus to form on the ruptured plaque. Partial or complete occlusion of the coronary vessel results, with symptoms ranging from unstable angina to myocardial infarction.

To date, it cannot be foreseen when a plaque lesion will rupture. Key factors are not the size and degree of stenosis but rather the composition and vulnerability of the lesion (6). Intravascular ultrasound (IVUS) and intracoronary thermography permit assessment of the morphology and temperature of the lesions. Distinct differences in temperature have been found between stable and unstable plaque lesions. The local rise in temperature indicating the degree of inflammation also extends to non-significant plaques in the vessel concerned, so that the inflammatory process is not focal but involves the



whole vessel. Temperature differences are greater with acute coronary syndrome than with stable angina (11). It is generally agreed that acute coronary syndrome, and especially acute myocardial infarction arise from medium-degree soft plaques and not from high-degree, calcified stenoses. The latter lead to typical stable, stress-dependent angina. Stenosis only develops when additional thrombi become lodged in a highly calcified, fissured plaque. It may still be asymptomatic, as adaptation to chronically progressive stenosis leads to conditioning and the development of collaterals (9).

4. Triggering factors

The most widely known hypothesis as to the factors which trigger inflammatory processes in the t. intima is the cholesterol hypothesis, according to which lipoproteins (LDL) which have undergone oxidative changes in the t. intima cause the release of adhesion molecules, proinflammatory cytokines and other inflammation mediators of macrophages. The oxidation process is ascribed to reactive oxygen metabolites (oxygen radicals). The hypothesis makes theoretical sense and is supported by a number of experimental data, but has not so far been substantiated in vivo. The modified lipids and proteins found in vivo do not necessarily correspond to the oxidized lipoproteins found in vitro that yielded the experimental data (10).

Hypertension is considered another factor triggering an inflammatory reaction. Angiotensin II has pro-inflammatory as well as vasoconstrictor properties and these stimulate the expression of cytokines and adhesion molecules.

Hyperglycaemia leads to the production of AGE (advanced glycation end products) which bind to receptors that stimulate the production of proinflammatory cytokines. Hyperglycaemia also causes oxidized products to be produced which activate inflammation mediators.

Adiposity is another triggering factor as well as the dyslipidaemia frequently connected with it.

Infectious factors have also been considered, above all chlamydia infection. These organisms were found in many atheromatous lesions. Such an intravascular infection might well induce a local inflammatory reaction. All trials of antibiotic treatment for acute coronary syn-

dromes have failed, however, so that we may be dealing with an epiphenomenon.

5. Systemic inflammation

The inflammatory process of arteriosclerosis does not remain limited to the local lesion in the vessel. The endothelium releases adhesion molecules, mediators and proteins and these are demonstrable in systemic blood. Messenger cytokines induce the production of acute-phase-proteins in the liver. In the blood, C-reactive protein (CRP) is demonstrable, for instance, which correlates with the risk and prognosis of acute coronary syndromes (3). As mentioned above, fatty tissue as well as the liver is involved in systemic inflammation due to cytokine release (7).

6. Review

Consideration of the pathophysiological processes in arteriosclerosis allows us to identify a number of processes.

- The evolution of the disease in time takes years or decades, going through a number of phases, some of them running parallel.
 - Initial phase of endothelial dysfunction (see also the paper on the endothelial organ by C. Rubens in this issue).
 - Plaque formation in the inner vascular wall (v. s.)
 - Instability of plaque with rupture and activation of coagulation leading to acute occlusion (coronary syndromes).
 - Sclerosis and fibrosis of the plaque, with actual arteriosclerosis the final stage in the process.
- No causality is known to date. A large number of external stimuli have been said to damage the vascular system, esp. if exposure is repeated (see also the paper on the pathogenesis and salutogenesis of coronary disease in this issue).
- The vascular system reacts to the different external stimuli with a chronic inflammatory process in the tunica intima. Interaction develops between blood processes (called "blood stream" here) on the one hand and processes in the vascular wall on the other which are under the influence of vascular innervation (here called "nerve stream"). Both processes occur at the functional and the morphological levels
 - at the functional level for the blood organ, laminar or turbulent blood flow influences the reaction of lumen size due to shear mediated by the endothelial function;
 - at the functional level for the nerve stream, the autonomous nervous system regulates vascular tone, excessive sympathetic activation leads to vasoconstriction;
 - at the morphological level for the blood organ, substances (e. g. lipids) and cells (e. g. monocytes) circulating in the blood pass through a damaged endothelium and cause deposition processes in the wrong site in the tunica intima"
 - at the morphological level for the vascular wall, deposits in the t. intima cause proliferation and

migration of vascular muscle cells which differentiate into bone-building cells.

Taking these processes together, one sees how the upper human being intervenes destructively in two ways—on the part of the blood stream via endothelial dysfunction, on the part of the nerve stream via sympathetic activation. Both lead to hardening vasoconstriction and damage the inner wall of the vessel. Furthermore, processes physiological to blood are displaced into vascular tissue, with deposits in the wrong site and an inflammatory reaction. The complex interaction between blood processes and nerve stream was described by R. Steiner in 1923 (12). On the one hand, processes occur in the blood "... which lead to inflammation if they take hold of what surrounds the blood or lies next to it". On the other hand, a predominant nerve process pushing into the blood leads to tumour development. "The development of a tumour is a metamorphosed nerve process in the wrong place in the human organism." Repeated damage due to the destructive nature of the nerve stream means that this cannot be overcome by the inflammatory process in the t. intima in terms of acute inflammatory activity. The inflammatory process becomes chronic, triggering fibrosis and sclerosis as controlling form principles in the wrong site ("tumour development"). The restorative power of the etheric exhausts itself in the chronic process. A destructive astral principle dominates the situation, acting directly on the physical organism. The higher organization of the I fails to control astral activity with regard to both governing the nerve stream and working the blood processes through. With etheric powers of regeneration exhausted, the I-organization lacks the point of attack for its constructive actions. R. Steiner and I. Wegman therefore wrote as follows about arteriosclerosis: The I-organization is driven out, as it were, from these organ systems" (13). R. Steiner described the actions of the I-organization in his lecture on the invisible human being (14). In the arteriosclerosis process the destructive nerve stream of the upper human being predominates, and at the same time the blood stream is not given enough constructive help from the lower human being. The two streams meet in the heart where rhythmical activity establishes balance between them. It is exactly at this point that the damaging effects of streams that have become one-sided show themselves and lead to coronary artery disease, a particular threat today, with myocardial infarction and sudden heart death.

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Pathogenesis and salutogenesis of coronary artery disease

UWE SCHULZE

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English by A. R. Meuss, FCIL, MTA.

■ Abstract

Cardiovascular risk factors play a major role in the pathogenetic view of coronary artery disease. Many are described, but with causality not established they must rather be considered to be risk indicators. Their effect on the organism can be described if we take a wider risk-indicator view based on the fourfold principle. In their totality they then give a picture of coronary artery disease. Of equal significance, thought given little attention to date, is the salutogenetic approach to the prevention and treatment of coronary artery disease. Numerous observations substantiate the positive significance of these factors. Finally the heart itself can be exemplary for a health-giving life style.

■ Keywords

Risk factors
Risk indicators
Pathogenesis
Salutogenesis
Coronary artery disease
The four levels of existence

1. Risk factor concept

Cardiovascular risk factors play a key role in today's pathophysiological concepts relating to coronary artery disease (CAD). As no single cause has been identified for the development and evolution of CAD, factors connected with increased incidence of CAD collected in extensive epidemiological studies over the last 50 years are generally known as "risk factors" today. Clinical and epidemiological investigations have led to the identification of more than 200 such factors. Their significance for the development of CAD is presented in "risk factor concepts" (1). The detailed strategies for primary and secondary prevention of CAD are based on those concepts.

A recent worldwide study has impressively demonstrated the significance of the most important risk factors for the development of myocardial infarction (2,3). The investigation covered the generally known risk factors of cigarette smoking, hyperlipoproteinaemia, diabetes mellitus, arterial hypertension, obesity and psychosocial factors. The degree of correlation was given as the "odds ratio" which reflects the relative risk of developing a disease (*Table 1*). It was found that these factors carry c. 2–4 times the risk of myocardial infarction. It is interesting to note that these findings apply to all populations studied, irrespective of age, sex, nationality or ethnic grouping.

The two leading factors—smoking and disorder of fat metabolism—also showed a linear relationship between extent of risk factor (no. of cigarettes/day or severity of hyperlipoproteinaemia) and probability of developing myocardial infarction.

The significance of psychosocial factors was also clearly evident in the study (*Table 2*), again irrespective of age, sex, nationality or ethnic grouping.

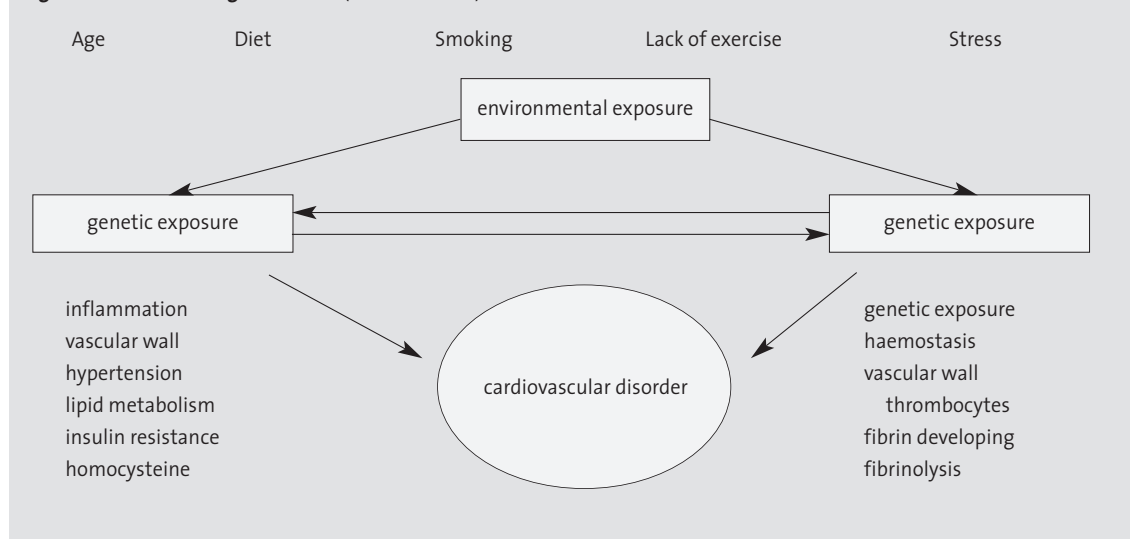
The data obtained in this important study also reveal a weakness in the "risk factor" concept. "Factor" signifies an "important part, co-determining cause". However, all the factors investigated so far have relatively minor effects, far removed from the intended causality. Risk "factors" should therefore rather be considered to be risk "indicators" (5). The risk factor concept has, however, become firmly established, and attempts are made to combine them in "risk factor models" to arrive at defini-

Table 1:
Odds ratio (adapted for age, sex, smoking)

persistent smoker	2.95
persistent and earlier smoker	2.27
ApoB/ApoA1 ratio (max. quintile)	3.87
diabetes	3.08
hypertension	2.48
obesity	2.24
psychosocial factors (total)	2.51
exercise	0.72
eating fruit and vegetables	0.70
alcohol consumption	0.79
total "risk factors"	129.2

Table 2:
Odds ration for psychosocial factors

permanent stress at work	2.14
permanent stress at home	2.12
permanent stress in general	2.17
serious financial stress	1.33
life events – one	1.23
life events – two or more	1.48
feeling low	1.55
depression	1.44

Fig. 1: Interaction among risk factors (based on ref. 6)

te concepts (Fig. 1). The above-mentioned INTERHEART study does in fact show that the presence of several factors leads to an exponential increase in total risk. Smoking, hypertension and diabetes mellitus combined carried 13 times the relative risk; an additional fat metabolism disorder increases the risk to 42 times that for people who do not have these factors (2). We all know the “escape phenomenon”, however, where someone with many risk factors does not develop the disease, or conversely those who have the disease do not show demonstrable risk factors.

If we take the term “risk” literally, it means “hazard, danger”, derived from *riscare*, “to run into danger”. Someone with risk factors would thus be like a seafarer steering for a reef.

A similar image may present in the symptomatology of CAD. The typical symptoms of functionally relevant coronary occlusion are those of angina. This only manifests at the end of a cascade of pathophysiological changes which starts with metabolic changes, limitation of diastolic function, then of systolic function, ECG changes and finally the angina (7). The latter is like the tip of an iceberg.

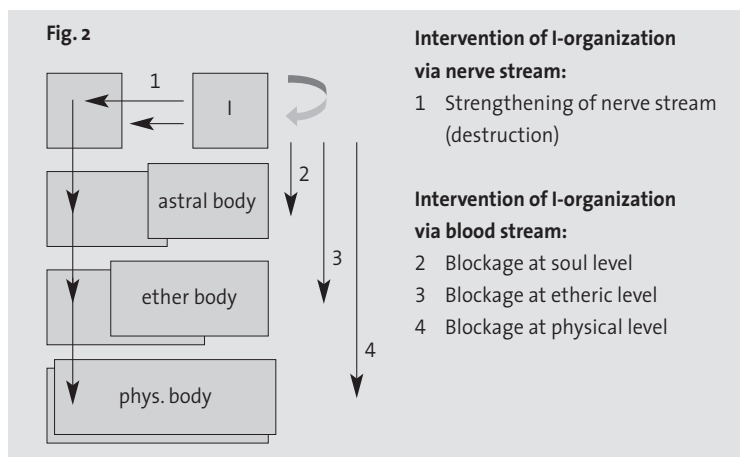
Would it be possible to develop an image of CAD also with regard to the totality of risk indicators?

2. Broadening the risk factor concept

All the risk indicators can be seen as internal or external influences on the body's physiology. These act at different levels, including the physiology.

- Numerous genetic factors and also metabolic factors (e.g. hyperlipoproteinaemia, diabetes, etc.) at the level of the physical body,
- haemodynamic changes (e.g. hypertension) and disorders of the locomotor system at the etheric, functional level,
- numerous psychosocial factors at the astral, psychic level,
- biographical factors at the spiritual level which goes beyond the individual.

Individual risk indicators may certainly take effect at different levels. If we include the powers of the I-organization in the invisible human being, as Rudolf Steiner spoke of them,⁸ the numerous risk indicators can be given a system. From the point of view of his lecture, an imbalance harmful to the visible human being develops between destructive and constructive powers of the invisible human being's I-organization. The powers acting from the I-organization or the astral organization in the invisible human being may take a relatively too powerful direct influence on the visible human being



and thus prove destructive, or the powers of the I-organization which with the help of the astral, etheric and physical organizations act in a more constructive way are impeded and weakened. It seems possible to characterize the different risk indicators in relationship to the different power streams in the I-organization of the invisible human being.

2.1 Level of the human I-organization ("nerve stream")

Our Western civilization relies greatly on the advances in modern science. Its spiritual and cultural orientation has developed a comparatively one-sided dependence on sensory impressions and analytical thinking. Especially in the 20th century, humanity has on the one hand emancipated from the natural environment at breathtaking speed and in this way—speaking phenomenologically—made night into day. The degrees of freedom gained were on the other hand “paid for” by lack of freedom in thinking and the setting of values. The civilizatory conditions of our “Western” life style tend to impose themselves and make excessive demands on our inner life. We are awake without sleeping and therefore sicken from the flood of sensory impressions. It means that the destructive activities of powers flowing from the I-organization into the visible human being “along the nerve strands” may be increased. Those powers can also reduce the degree to which the I-organization enters into the bodies of the invisible human being to develop constructive processes (Fig. 2).

As a whole, today’s social structure limits individual freedom and possibilities of being creative. Being reduced to a structure of thinking and values that is not truly human (but in accord with the nature of machines and with economic aspects) leads to lack of freedom, and thinking geared to maximum profit to antisocial attitudes. The problem shows itself to be a “disease of our time and society” (9).

2.2 Level of the astral organization ("stream of breathing")

Our sentient life with all its susceptibilities is also directly connected with spiritual and civilizatory orientations. Biographical questions, anxiety, aggressiveness,

depression, excessive or insufficient demands can become life-threatening factors in the part of humanity which is subject to Western values. Efforts made by scientists to clarify these connections between soul and body have resulted in “psychocardiology”, for instance (see the paper by Andreas Fried in this issue).

In the meantime it seems to be evident that the tenor of our soul can cause us to be ill. A life of feeling (astral organization) emancipating in the way described prevents the I-organization of the invisible human being from entering into the etheric and physical organization in a way that would lead to health (Fig. 2). The destructive tendencies intervening directly in the visible human being cannot be adequately met.

2.3 Level of the etheric organization ("pulse stream")

The whole sphere of biorhythms and habits in life is also largely dependent on our civilization. Here we come face to face with processes that maintain life. It is particularly at this level that major obstacles may be found to the healthy intervention of the invisible human being’s I-organization in the physical organization.

The “force of habit” leads to modes of behaviour that are automatic and no longer done in full conscious awareness. These inhibit and damage the rhythmical system in many different ways. More than 85 % of cardiovascular events are due to habitual behaviour.¹⁰ Reference may be made especially to smoking, but also lack of exercise and eating habits as representative of a number of life style factors. Less evident everyday habits point in the same direction, watching television, for instance, which means lack of movement in body, soul and spirit. In our civilization, lack of exercise and dietary errors have taken root not only in terms of the body but also of soul and spirit.

Rudolf Steiner referred to this in 1920: “... that you thoroughly try to see all damage to the heart as arising from inappropriate human activity ... The way people give themselves passively to movement is something which deforms all processes that come together in the heart, as it were” (11).

2.4 Level of the physical organization ("blood stream")

The invisible human being’s stream of I-organization powers is always impeded in developing its health-giving, constructive activity in the physical organization if there are hereditary or acquired biochemical abnormalities. Coagulation disorders (PAI-1, fibrinogen), disorders of fat metabolism (cholesterol, LDL, HDL, lipoprotein (a), triglycerides), metabolic disorders (glucose, homocysteine), etc.

To sum up, therefore, a look at the cardiovascular risk indicators gives the following picture for the conditions under which coronary artery disease develops.

The life style in today’s “modern” societies causes the invisible human being’s I-organization and astral organization to intervene strongly in the visible human being. The constructive powers need to make greater efforts to

counteract this destructive activity if health is to be maintained. If the constructive powers are impeded even as they arise (v.s.) arteriosclerotic deposits may form, depending on individual conditions, and this is met with a chronic inflammatory reaction (See also U. Schulze on the pathophysiology of CAD in this issue).

3. Salutogenic concept of CAD

Modern medicine is essentially concerned with pathogenesis, with attention largely focusing on pathogenic factors. Far less attention has so far been paid to the factors which have a protective and healing influence on the organism. The concept of salutogenesis has been developed for the investigation of such influences. The works of American medical sociologist Aaron Antonovsky have proved a major influence in this field. He studied women living in Israel to look for pathogenic factors. To his surprise he found that some of these women stayed healthy in spite of horrific past experiences in concentration camps, during flight and displacement and in wars, and this not only physically but also mentally. He realized that his investigations had gone in the wrong direction. The key question was rather: What makes people stay healthy in spite of extraordinarily severe traumatic experiences?

The salutogenic model can be described at different levels (13)

- at the physical level according to the principle of heterostasis, which is the ability to balance ever-present stress factors and calls for a high degree of adaptability in the organism;
- at the mental level by using the concept of "sense of coherence". This defines the "will to have meaning", a conviction that one's own life and activities have meaning.
This involves a number of abilities:
 - to be able to understand demands and stresses (comprehensibility)
 - to be able to mobilize resources to cope with them (feasibility)
 - to see meaning in coping with difficulties (meaningfulness);
- at the level of mind and spirit by using the concept of resilience, powers of resistance that allow one to maintain health in the face of all physical, psychic and spiritual influences. Such resources may be a relationship to God or the spiritual world, stable human relationships, or existence being materially secure.

The question now arises as to the factors which help to keep the heart healthy. Those relating to CAD have not so far been adequately investigated.

At the level of the physical body, the influence of different life style factors has been widely explored, especially diet and mobility.

The positive effect of regular physical exercise for both primary and secondary prevention is well known (14). Continuity matters more than intensity in this case. It has been shown that sprightly old men who walk for more than two hours a day fall ill only half as often as

their contemporaries who do little walking (15). The effects of regular exercise have also been considered at the physiological level. Apart from many positive effects on the cardiovascular system it was also found that exercise leads to increased production of endothelial progenitor cells (EPC) from bone marrow and thus contributes to the regeneration of injured epithelium. Regular physical exercise is therefore a regular rejuvenation process (16).

It is also generally accepted that diet has an influence on the development of arteriosclerosis. A number of studies have shown a balanced diet with plenty of vegetables, fruit, carbohydrates and roughage, like the Mediterranean or a traditional Asian diet to offer protection (17). The type of food also plays a role. Healthy foods demand more digestive effort from the organism than do preserved prepared foods that contain additives. They also contain considerably more minerals and trace elements.

Protective factors were also considered in the above-mentioned INTERHEART study. General factors were consumption of fruit and vegetables, regular physical training and moderate alcohol consumption. All three together reduce the risk of myocardial infarction by c. 80 % (2). Risk reduction at this level is not known for any modern and usually expensive preventive medication (18).

Far fewer investigations have been done at the level of the psyche. Stress research did soon show, however, that stress does not always equal distress. "Eustress" with its positive effect is distinguished from "distress" which is characterized by negative emotions and great inner effort for low reward (19). Stress can thus be positive under certain circumstances: "The need to use psychic and organic powers of heart to bring plans to realization and shape one's life has a beneficial effect on heart function" (20). Apart from psychosocial stress, much work has been done on enmity and depressive states, but little on positive mental factors (21). Indirect parameters have shown that 15 minutes' laughter can have positive effects on the circulation. The influence of faith and prayer has also been studied, and it was shown that patients who have a faith have a better prognosis following bypass surgery (22).

Numerous studies have been done on resistance factors in mind and spirit, evaluating the significance which a secure social basis in a network of family, friends, group activities and organizations held for CAD development. The significance of these social factors has also been studied with reference to the prognosis for patients after myocardial infarction. In every case it was evident that a functioning social network led to a reduced incidence of CAD as well as a better prognosis if the disease had developed (23). It has also been shown that human support is a mighty protective factor, with socially integrated and secure individuals suffering myocardial infarction up to five times less often than those living in isolation (24).

The cultural background also plays a role in the development of cardiovascular disease. Japanese living in the USA who had integrated most into American culture

showed 3 – 5 times the risk of developing such diseases than immigrants adhering to the traditional Japanese lifestyle. The latter had as low an incidence as did Japanese living in Japan, independent of the remaining “classic risk factors” (23).

The socio-economic status equally plays a role. A low educational level and low income predispose to CAD. This points to the significance of the right kind of education starting in childhood, which includes the availability of role models so that a child may learn to deal with demands and problems (13).

4. Heart qualities showing us what to do

Healthy cardiac function has the elements of movement and rhythm. The blood moves the heart, the heart in turn gives impulses to the flowing blood and mediates perceptively between blood movements in the lower and upper human being. The movement is governed by rhythm. “The rhythmical action of the heart brings the element of time into a vascular system occupying space” (25). This “etheric” time is not linear but characterized by integration of time, i. e. synchronicity of past, present and future. At any moment, past (venous blood) meets the potential of the future (blood rich in oxygen) and is moved in rhythm. The rhythm, being repetition of something similar (but not the same) retains the past interval, with the variability of the interval leaving room for potential future development. In the present, memory made present meets with expectation also made present.

This tension creates the potential for the ensouled movement filled with warmth which is characteristically human. “With people suffering from heart disease one would therefore always have to see to it that one gets them to move of their own accord in a way which they truly live through” (11). Such mobility is needed not only at the physical level but also in mind and spirit.

The comprehensive physiological function of the heart can be a model for us of hygienetic processes to guide cardiovascular disease to health. There is need to rediscover and cultivate in everyday life the qualities of the heart as an organ of perception, of movement and of rhythm.

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Psychosocial factors with coronary artery disease

ANDREAS FRIED

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English by A. R. Meuss, FCIL, MTA.

■ Abstract

The paper sums up recent findings in studies on the connection between coronary artery disease (CAD) and psychosocial causes. Depression, anxiety, chronic stress and personality factors such as distrust and a liability to grow angry were found to be risk factors. A pathophysiological model of chronically elevated catecholamine release is shown to be a physiological link between experiences in the psyche and effects in the vascular system.

■ Keywords

CAD
Risk factors
Depression
Anxiety
Stress
Personality factors

For some years now, a connection between specific psychosocial factors and the onset and evolution of cardiovascular disorders and especially coronary artery disease (CAD) has become increasingly apparent. Psychosocial symptoms that may carry cardiac risks have not been given sufficient attention in practice. Their listing as pathogenetic factors is made more difficult because symptoms of mentally or organically determined disorders, such as exhaustion, tiredness, sleeplessness and low performance, overlap, with the benefit of specific intervention far from evident. Review papers on the subject have appeared in the journals *Circulation*, *Psychosomatic Medicine* and *Archives of Internal Medicine* (1–3) with the most important risk factors placed in the main categories of depression, anxiety, chronic stress and personality traits. From the point of view taken in the medical approach we represent, psychosocial risk factors are indeed typically part of processes which

make excessive demands on the neurosensory system and can therefore intervene in the physical organization to impose form, harden and destroy, thus being pathogenetic if the counter forces called upon to bring balance and healing, powers to dissolve and remove, cannot take adequate effect.

Depression

Depression affects about 5 % of the general population, but 15 % of CAD patients. This is important for the prognosis; different studies have established the relative risk of MI or cardiovascular death to be 2.4 – 4 times as high (4). The negative influence of depression on the heart was in most studies not dependent on the severity of the CAD, established by coronary angiography, the size of the infarction or the ejection fraction (4). The importance of depression as a risk marker was substantiated in the recently published INTERHEART study¹⁰ where association between psychosocial risk factors and myocardial infarction (MI) was established by testing more than 12,000 people. Depression was diagnosed in 24 % of subjects (controls 17.6 %, equivalent to odds ratio of 1.55). The differences were consistent in all the different ethnic groups and for men as well as women. (It is interesting to note that an exercise programme of 3 times 30 minutes/week proves as effective after 4 months in treating depression as does exhibition of tricyclic antidepressants or serotonin reuptake inhibitors (SSRI)).

Anxiety

People with anxiety syndromes also show increased cardiac risk, similar to depression (5). Patients were found to have great fear or phobic anxiety after MI, which in turn are associated with a poorer prognosis. Increased cardiac lethality in cases of anxiety syndrome is mainly caused by sudden heart death and not MI. There are additional explanatory models postulating increased catecholamine secretion, limitation of autonomic cardiac regulation (baroreflex sensitivity and heart rate variability) and lengthening of the QT interval in the ECG as possible pathophysiological mechanisms. Anxiety also increases susceptibility to stress. It has a negative effect on attitudes to health. Above all, many anxious individuals tend to smoke too much.

Personality traits

In the late 1950s, Friedmann and Rosenman described the type A personality with cardiac risk, main traits being ambition, hostility and excessive dedication to work (6). Subsequent studies on the cardiac risk of type-A behaviour did not give consistent results, however. More recent studies suggest that it is above all hostility, distrust, anger and cynicism which have a poor cardiac prognosis and are considered to be “toxic” components in a type-A personality (1). Different pathophysiological scenarios have also been postulated for personality traits. Patients with the above traits particularly show elevation of catecholamine levels, heart rate and arterial blood pressure.

Acute and chronic stress

Work-related stress has been studied most. On the basis of Karasek's (7) work, it was established that the risk is particularly high (work strain) in work situations making many demands and offering limited opportunity for decision-making or being in control. Equally unfavourable are combinations of many demands and little recognition. Subacute and acute events in life are of greater importance for the incidence of acute ischaemic coronary syndrome. The incidence of MI and sudden heart death rose during the 1994 earthquake in Los Angeles and during the Gulf War in Israel in 1991. Numerous epidemiological studies showed that “life events” were frequent trigger factors preceding MI, e.g. the death of a life partner, divorce or losing one's job. Acute and chronic stress can have a negative effect on one another via very different mechanisms in the cardiovascular system. Acute Stress was found to involve a tendency to ventricular arrhythmia, elevated blood pressure and increased peripheral vascular resistance. Chronic stress can lead to raised catecholamine levels, thrombocyte aggregation and inhibition of fibrinolysis. Whilst most life events and the psychosocial form of stress can scarcely be influenced, the individual ability to cope with situations that cause stress can be trained (8). Jacobson's muscle relaxation, autogenic training and similar methods are usually offered and have by now become a firm part of cardiological rehabilitation. To sum up, psychological factors are nowadays also accepted in the wider sense as promoting and aggravating organic disease.

Taking biography and biology together

The psychosocial phenomena seen with CAD initially relate to the waking state—depression, anxiety, personality factors and stress affect the organism. All measurable changes in hormonal factors and mediators, including limitation of heart rate variability and baroreceptor sensitivity are from the spiritual-scientific point of view due to such experiences. The visible human being's physical organization is taken hold of by psychosocial conditions via the “upper” streams of powers from the invisible human being's I-organization (9). Powers of the invisible human being's I-organization and astral organization acting on the visible human being have

full or limited destructive quality. Too much of what goes on in the outer surroundings is “stuffed” into people, and pathophysiologically this may end in endothelial dysfunction and destruction as well as deposits causing arteriosclerosis. This “hardening tendency” on its part makes the blood “rebellious” as it seeks to “bring healing”. The attempt can be evident in the inflammatory aspects of CAD pathology (chronic inflammation). From the spiritual-scientific point of view it is certainly possible for the inflammatory tendency developing in an attempt to heal to bring excessive powers of dissolution into the process and cause acute conditions (plaque rupture and acute CAD). The degree to which such an attempt at healing by turning the power streams around results in dissolving, inflammatory quality, may depend on the severity of the destructive pathological influence. This helps us to understand the observation that changes in inner life or acute threats (e.g. natural disasters, unemployment) go hand in hand with coronary syndrome.

With a comprehensive approach to treatment, one will not make the error of limiting oneself to reducing harmful psychosocial factors but rather seek to give people the strength to meet such common outside influences. This can be achieved by gaining a degree of balance between the “subtle death processes” coming from the upper human being and the constructive processes coming from the lower human being. These will no longer impinge directly on one another if the etheric organization has been strengthened. Once the middle has been found again, the higher bodies of the essential human being can be bound up again with the processes of the lower human being. The healing of sclerotic conditions in particular becomes possible. Restoring the middle calls not only for medical treatment but also the differentiated use of the art therapies used in anthroposophical medicine (see also the paper on the Havelhoehe cardiac training course).

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Conventional medical treatment of and intervention in coronary artery disease

ANDREAS FRIED

Original title: Konventionell-medikamentöse und interventionelle Therapie der koronaren Herzkrankheit. Der Merkurstab 2006; 59: 231–5. English by A. R. Meuss, FCIL, MTA.

■ Abstract

The paper sums up medical cardiological treatment against the background of historical developments in drugs research. The different groups of medicaments are briefly characterized and their efficacy in reducing risk is evaluated (RRR; ARR; NNT). The most recent definition of acute coronary syndrome (ACS) is also presented, with different options for treatment.

■ Keywords

CAD
Medical treatment
ACS
Risk reduction
NNT

The history of treatment for coronary artery disease (CAD) did not begin with the introduction of nitrates in the 19th century but much earlier, when people were for the first time consciously aware of the symptoms of coronary flow disorder and looked for the cause, so that the condition might be ameliorated. History has shown that the state of knowledge was at the same time also the basis for treatment. Knowing this, today's methods of treatment reflect our present level of knowledge and may well be considered history in later years.

The first exact and complete description of angina was given by London physician W. Heberden in a lecture to the College of Physicians in 1768. He not only gave a detailed description of the typical symptoms of angina but also brought them together in one syndrome (1). A characteristic of the condition was to him improvement

by wine, spirits and opium. These “medicines” dominated CAD treatment for the centuries that followed.

The important breakthrough in modern medical treatment of angina came in recent decades. The first nitrate was synthesized in 1943 (1). Isosorbite followed in 1960, and in 1972 the action of the metabolites isosorbide II mononitrate and isonite V mononitrate. A completely new era of CAD treatment started in 1962 when the first betablocker (propanolol) was introduced. This based on the receptor hypothesis developed by Ahlquist in 1948 who studied it on the alpha and beta receptors in the heart. Further differentiation into beta 1 and beta 2 subtypes came in 1967.

At about the same time, the completely new group of substances known as calcium antagonists was developed. Nifedipine was available from 1966. Has et al. had discovered verapamil in 1962, but the mechanism of action was unclear at the time. Both drugs were therefore first included in the inhomogeneous group of coronary dilators, with dipyridamol holding the dominant position at the time. In 1967, Freiburg physiologist A. Fleckenstein then identified the mechanism of action for calcium antagonists (1).

Today, medical treatment for patients with stable angina is intended to

1. reduce cardiovascular morbidity,
2. maintain and improve quality of life, and
3. reduce mortality.

The modern view is that the principle of plaque stabilization plays a key role not only with acute coronary syndrome but also in the treatment of stable angina. Different clinical goals are thus still considered, on the one hand anti-angina treatment, and on the other plaque stabilization.

Blocking beta receptors reduces myocardial oxygen demand, extends diastolic perfusion and hence improves myocardial circulation. Beta blockers are particularly effective in post-infarction patients. They are contraindicated with Prinzmetal's angina, severe bradycardia, higher degrees of AV block, SA node problems and severe or acute heart failure as well as with asthma.

Calcium antagonists reduce transmembranous influx of calcium ions into the cell, cytosol calcium concen-

tration decreases, leading to relaxation of smooth vascular muscles and a negative inotropic effect on the myocardium. The anti-anginal action of calcium antagonists essentially corresponds to that of beta blockers as regards symptomatic improvement and increased exercise tolerance with stable angina. This group of substances (except for vasoselective substances) is considered contraindicated in decompensated heart failure especially because of their negative inotropic action.

Nitrates liberate nitric oxide (NO) which effects endothelium-independent vasodilation above all of the coronaries and venous capacitance vessels. They are even more powerfully anti-anginal if combined with beta blockers or calcium antagonists. Nitrates should not be used with hypertrophic obstructive cardiomyopathy, severe aortic valve stenosis or concurrently with the phosphodiesterase inhibitor sildenafil. Attention must be paid to developing tolerance and nitrate-induced endothelial dysfunction.

Recommendations for clinical treatment with plaque-stabilizing measures

Aspirin and clopidogrel both reduce cardiovascular events and improve the prognosis for post-infarction patients. Aspirin should be considered first choice.

CSE inhibitors (statins) improve the prognosis in general, drastically reducing the number of cardiovascular events. Statins (e.g. simvastatin) benefit above all older patients and diabetics. LDL/cholesterol levels should be below 100 mg/dL. The prognostic value of effective cholesterol reduction with ezetimibe + statin is not yet clearly established.

Nicotinic acid increases HDL by 1 mg/dL, with cardiovascular events reduced by 2 – 4 per cent.

ACE inhibitors reduce vascular tone, trophic stimuli and particularly oxidative stress in the vascular wall. They can also reduce or completely prevent the development of nitrate tolerance. CAD patients benefit from concurrent treatment with ACE inhibitors.

Antioxidants like vitamin E shorten rather than prolong life in many cases. The usefulness of vitamin C supplements is equally uncertain. Oestrogen is also more likely to have a negative effect on the prognosis of CAD patients.

The significance of new types of antianginal drugs such as nicorandel, L-arginine and ivabradin is not yet clear.

The efficacy of medical treatment is similar to that of consistent life style modification (2). Numerous studies have shown various medical strategies to be effective. In most of them, efficacy is rated as relative risk reduction (RRR). Percentages are mostly in two-figure range. There is consensus, however, that absolute risk reduction (ARR) is the appropriate parameter for assessing efficacy quantitatively. Its reciprocal, "number needed to treat" (NNT) provides a good indication for efficacy.

Comparing the results of studies is difficult when the duration differs. It is necessary to recalculate NNT for the same duration, i.e. a year's treatment.

1. CSE inhibitors (statins)

Both the 4-S study of 1994, with simvastatin medication in doses of 20 – 40 mg/day, and the 1998 lipid study with pravastatin showed similar results, with absolute risk reduction of all fatalities at 3.3 %, equivalent to an NNT of 164. The most recent and also biggest study with simvastatin is the Heart Protection Study (3). Criteria for inclusion in the study involving more than 20,000 patients were: patients with CAD, peripheral arterial occlusion, diabetes mellitus and/or hypertension. The ARR for all fatalities was 1.8 %, equivalent to an NNT of 278, relating to one year. If one considers that c. 2/3 of patients had definite or probable CAD, the results are in the range expected in the 4-S study.

2. Thrombocyte aggregation inhibitors (aspirin)

This substance has been used for secondary prevention in the treatment of CAD from the mid-1980s. A study was done with again over 20,000 patients with documented CAD given aspirin long-term (4). Dosage was between 75 and 375 mg. The period of observation was 3 years, ARR for all fatalities 1.2 %, equivalent to an NNT of 167.

3. Beta receptor blockers

Another important group of medicines with positive effects in secondary prevention are the β -blockers. Yusuf et al (5) give the results of a meta-analysis of more than 25 randomized and controlled intervention trials involving more than 23,000 MI patients treated with β -blockers immediately or a few days after the event. Duration of treatment was 1.5 years on average. The ARR for all fatal outcomes was 1.8 %, corresponding to an NNT of 83.

4. ACE inhibitors/AT1 receptor antagonists

A number of randomized, controlled intervention trials done in the 1990s have shown positive effects of ACE inhibitors as part of secondary prevention for patients with relatively low left ventricular ejection fractions. Thus a paper by Pfeffer et al. (6) concerns a multicentre, randomized, controlled trial with more than 2,200 patients given captopril in increasing doses up to 3 times 25 mg/day or placebo 3 – 16 days after MI with reduced left ventricular ejection fraction (< 30 %). Duration was 3.5 years. ARR for all fatal outcomes was 5 %, corresponding to an NNT of 70.

To sum up, the results of medical treatment of stable angina with limited or non-limited left ventricular ejection fraction, though highly differentiated today, are relatively unsatisfactory concerning absolute risk reduction rates in the prognosis. This is worth noting especially as good scientific data show that changes in life style (giving up smoking, regular physical activity, reducing chronic stress factors) are more effective in secondary prevention of CAD.

5. Giving up smoking

In 2000, Wilson et al. (7) presented 12 cohort studies on the effect of giving up smoking on mortality after MI. Follow-up was 4.8 years on average, with c. 5,800 patients included. Absolute risk reduction was not less

than 7.7 %, which is an NNT of 62, relating to one year. Careful attention was paid to possible confounding parameters.

6. Diet to protect coronaries

The Lifestyle Heart Trial by Ornish et al. (8) was a pioneering effort. A randomized, controlled intervention trial with c. 30 patients showed that major intervention such as a strict, low-fat diet, no smoking, measures to cope with stress, and regular physical activity can lead to regression of coronary stenosis within a year. The results were checked and published in 1988, after 5 years of follow-up. Stenosis was reduced by 3 % in the intervention and increased by 12 % in the control group.

In the 1990s, a different approach was tried in France—the Mediterranean diet. This is relatively high in unsaturated and multiple unsaturated fatty acids and omega-3 fatty acids. In the Lyon Diet Heart Study, the efficacy of the diet was tested on CAD patients (9). This was a randomized, controlled intervention group of 605 patients with post MI status. Four years' observation gave an ARR of 12 %, equivalent to an NNT of 33, for the combined end point death and reinfarction. The ARR for the sum of total mortality and coronary events in the 4 S trial was c. 10 %, equivalent to an NNT of 55, relating to one year.

7. Regular physical activity

Epidemiological studies have shown for many years that regular physical activity of medium intensity (e.g. walking briskly, cycling, slow jogging and also light gardening and housework) have a favourable primary prevention effect on CAD. Regularity (daily if possible, or at least 3 or 4 times a week) and the duration (30–60 minutes a day) are more important than the intensity of effort. O'Connor et al. have shown in a meta-analysis of 22 randomized, controlled intervention studies including more than 4,500 post MI patients that total mortality was reduced by 2.2 % in the intervention group, an NNT of 136 (10).

8. Reducing stress

Numerous epidemiological studies have shown a connection between psychological risk factors such as chronic stress and CAD. The Interheart study of 2004 merits particular attention (11, 12).

The investigation done by Blumenthal et al. (13) also has special significance. This was a randomized, controlled intervention study including 107 patients with mentally inducible myocardial ischaemia. They were divided into three groups. One group had 4 months of stress management, the second physical training only, and the third (controls) merely the standard treatment. Follow-up was for five years. For the cardiac episode end point (cardiac and non-cardiac death, non-fatal MI, bypass operation, balloon dilatation), the stress management group had an ARR of just under 21 % compared to the controls, i. e. NNT 24. In the 4-S study, the ARR was 16, for the correspondingly combined end point, which is an NNT of 34, for one year.

Conclusion

Relevant randomized, controlled intervention trials were studied to assess the efficacy of medical treatment and changes in lifestyle. Efficacy was evaluated in terms of ARR and on the basis of this the NNT. NNT ranges from 50 to 200 for medical treatment for secondary prevention (relating to one year). It has to be expected, however, that the combined actions of the medical treatments described and non-medical interventions may achieve a better overall effect than individual measures on their own. This is merely a hypothesis, however, as there is no scientific proof based on randomized, controlled intervention trials. On the basis of clinical experience, secondary prevention continues to rely on combinations of antithrombotic drugs, β -blockers and CSE inhibitors plus ACE inhibitors if there is concomitant heart failure.

An NNT of c. 40, for one year, may be expected with the combination of simvastatin, acetylsalicylic acid and β -blockers for secondary prevention of CAD, assuming that the actions of the individual drugs have an additive total effect (2).

Compared to this, stopping smoking is a lifestyle change which on its own roughly equals the effect of the above combination of drugs. A diet which protects the coronaries also shows efficacy of this order of magnitude. The effects of regular physical exercise and reduction in stress are in the range of efficacy of simvastatin treatment or slightly above. It may be said that the efficacy of the above-mentioned changes in lifestyle in sum is likely to be several times above that of combined drug treatments (2).

All the above is according to the present state of knowledge as regards a stable phase in CAD.

Interventional treatments

New diagnostic and clinical methods have changed the diagnosis and treatment of acute coronary syndrome (ACS) in recent years. The syndrome is differentiated into

1. ACS with ST-segment elevation (STEMI) or LBBB, requiring immediate recanalization, and
2. ACS with non-ST-segment elevation, subdivided into non-ST elevation infarction (with positive troponin non-STEMI) and unstable angina.

Ad 1)

Treatment of acute STEMI

consists in reperfusion treatment/catheterization (primary percutaneous coronary intervention – PCI) or thrombolysis with as little time lost as possible within 12 hours (14, 15, 16).

Primary catheterization is now considered the preferred method for treating STEMI in the German guidelines. The time lost by changing to primary PCI as against thrombolysis should not exceed 90 minutes, however, or primary PCI be done within two hours of first physician contact.

A number of randomized trials have shown this early invasive strategy to be superior in the long term,

with a significantly lower rate of events for the death/re-MI/stroke end point.

Further randomized trials, e.g. the Clarity-TIMI-28-trial, show that clopidogrel given in addition to aspirin, thrombolysis and/or PCI reduce cardiovascular events in STEMI patients (under 75 years of age).

According to German guidelines, standard concomitant treatment of acute STEMI and non-STEMI consists in aspirin, heparin i. v., beta blockers and in addition prior to PCI clopidogrel (300 – 600 mg saturation dose) and glycoprotein II B/III A inhibitors (above all for high-risk patients).

Ad 2)

Acute ACS without ST-segment elevation

Acute chest pain without ST-segment elevation or LBBB in the ECG come under this heading. Clinical parameters have been established to identify risk-patients with the condition, so that according to the German/European guidelines there will be rapid invasive differential diagnosis (at least without 48 hours) (14, 17).

- troponin or I elevation—indicating non-ST elevation infarction (NSTEMI)
- ST-segment depression (> 0.1 mV) in the ECG
- haemodynamic instability
- instability of rhythm
- diabetes mellitus

Aspects of treatment

The recommendation of rapid invasive differential diagnosis and coronary revascularization (PCI or bypass surgery) for patients with the above risk factors derives from the data of trials (e.g. Frisc II, Tactics) where the results of invasive strategy were better compared to a conservative approach. Peri-interventional treatment also includes the use of intravenous glucoprotein II B/III A antagonists. Since the Cure trial, the benefit of clopidogrel in addition to aspirin is established for patients with ACS with non-ST segment elevation (absolute risk reduction is, however, marginal, though statistically significant).

According to the German guidelines, further medical treatment of ACS without ST segment elevation consists in aspirin (250 – 500 mg as i. v. saturation dose, then orally 100 mg/d for life) and intravenous fractionated or low-molecular heparin.

With this invasive strategy, hospital mortality of acute MI (STEMI and non-STEMI) was reduced from 10 – 15 to 5 – 8 %. Patients with non-STEMI profit most by this, especially older, multimorbid individuals, frequently with diabetes.

With invasive coronary angiography the physician must decide if apart from interventional treatment using coronary dilatation and setting a stent one should also consider bypass. This is determined above all by the distribution pattern of stenoses, the morphology and localization of individual stenoses.

The use of new drug-eluting stents (DES) in addition to non-drug-eluting stents (BMS) also calls for a differentiated approach. Extended small-calibre sections of

vessels of diabetics benefit especially from the new stent technology. Main-stem relevant stenosis in highly proximal situations should preferably also be treated using the new technology. Short stenoses in large-calibre vessels can continue to be treated using conventional stents. For this Achilles' heel of interventional treatment, stent implant technology can thus mean a further reduction in restenosis rate from 20 % to c. 8 – 10 %.

With DES, careful continued medication with aspirin and clopidogrel should continue for at least six months.

The most recent publications do, however, show a new problem situation with DES, with late thromboses possible even after a year, with fatal outcome. This is due to delayed re-endothelization because of the mitosis-inhibiting drugs coating the stent. Work is in progress to improve the situation, but efficacy studies will be required in future.

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Anthroposophical treatment of coronary artery disease

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■ Abstract

Sclerosis in the vascular system is characterized by astral-body activity causing excessive form processes and ultimately hardening. At the functional level, the process may show itself in reduced vascular relaxation taking the form of endothelial dysfunction, progressing to the organic changes of stenosis, calcified coronary sclerosis. If we consider the four bodies, the physical body shows sclerosis going as far as calcification; vitalizing and anabolic etheric function is limited and taken to the opposite principle of an ischaemic catabolism. The astral organization makes consciousness arise in the wrong place with anginal pain. The I-organization cannot balance out the one-sided deviation to the upper human being of the astral body, which would take it into the dissolving function belonging to the lower human being. Inflammation, connected with the lower human being, develops to counter the sclerotic process which belongs to the upper human being. If it cannot develop its salutogenic activity, it will lead to the chronic evolution which leads to sclerosis. Clinically, it will be necessary to release the astral body from its excessive form-giving activity and support the salutogenic activity of the lower human being. Invasive measures correct coronary morphology but do not change the pathological process. Beta-blockers, ACE inhibitors and aspirin force the astral body away from its pathological activity but do not help it to come to a rhythmic, balancing function by way of the I-organization. This is the aim with the anthroposophical approach to treatment. Medicatin is discussed as well as eurythmy and art therapies. In addition the patient can come to see his illness as an inner task within his biography and take a part in the process which leads to health by doing meditative work.

■ Keywords

CAD, Cactus, Aurum, Arnica, Cardiodoron, Cuprum, six qualities, MI, variant angina

The total population of patients with coronary artery disease (CAD) falls into polar opposites. On the one hand we have the slender patient of rather delicate build. He will often have only few of the classic risk factors. The psyche is characterized by wide-awake conscious awareness, with many, differentiated thoughts and reflections also with regard to genesis of his disease. All decisions concerning future treatment are carefully weighed and analysed.

On the other hand we have the more ample, adipose patient, often with numerous risk factors, who develops CAD in conjunction with a metabolic syndrome, for instance. His conscious mind is a very different world, often dynamic, with much greater emphasis on feelings. Neck and face redden quickly if there is emotional stress (hectic spots), pointing to a psyche that is much affected.

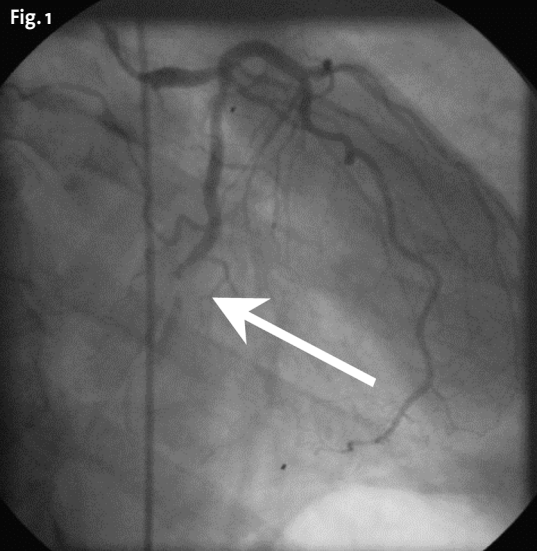
The first type develops the “neurasthenic” constitution in which the neurosensory system is dominant, the second the “hysterical” constitution determined by metabolism and limbs. Both types of the disease lead to a sclerotic quality in the middle human being—coronary artery disease.

Considering this easily seen polarity in the clinical picture of CAD, how can we describe the activities of the four bodies that lie behind it?

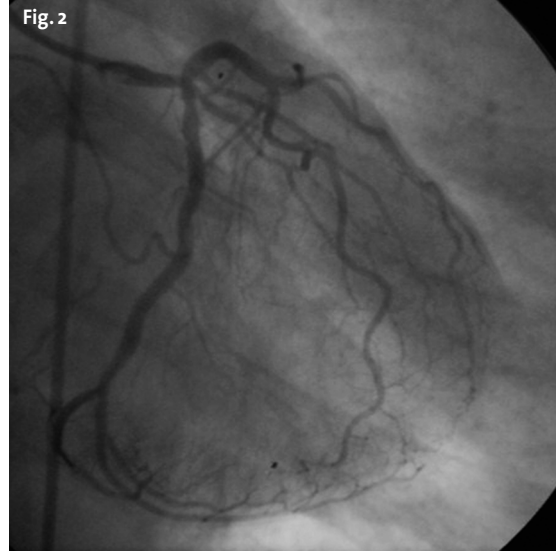
The qualities of inflammation and sclerosis meet in the CAD process. The neurosensory system, the quality of conscious awareness in the upper human being has an excessive influence on the middle human being, and this leads to a balancing, healing inflammatory response from the system of metabolism and limbs, seeking to oppose the coldness of the upper pole with the warmth of inflammation. When this contributes to plaque rupture, we have an acute coronary syndrome (ACS). If the reaction cannot balance out the excessive influence of the upper human being, the transition to sclerosis counteracts the healing inflammatory process. A principle designed to be salutogenic then turns morbid. Hardening sclerosis develops at the physical level, the destructive processes connected with ischaemia at the etheric level, conscious awareness of angina at the astral level and finally inner limitation is set to individual potential for development at the level of the I, going all

Fig. 1

Myocardial infarction, posterior wall (STEMI) with occlusion of ramus circumflexus and dominant left coronary artery prior to recanalization (Cardiac catheter, Haevelhoehe Community Hospital, Berlin)

**Fig. 2**

Myocardial infarction, posterior wall (STEMI) with occlusion of ramus circumflexus and dominant left coronary artery following recanalization (Cardiac catheter, Haevelhoehe Community Hospital, Berlin)



the way to threatening fear of death in connection with ACS or myocardial infarction (MI).

• Unphysiological awakening in the middle human being

With the hysterical constitution, where the emphasis is on metabolism, blood dynamics are easily and excessively excited by mental activity in the upper human being. Minor occasions, sometimes quite trivial, thus lead to such overwhelming emotional reactions that the blood rushes to the upper human being (hectic spots). Feeling, which is normally at a dream or sleep level, is excited and brought “awake”. These awakening emotional dynamics may often show themselves in rapid speech, sometimes even a restless urge to talk. At the same time, the blood pressure rises in connection with the inner excitement. The higher bodies abandon their largely unconscious activities in the system of limbs and metabolism, restlessly seeking to come to conscious awareness. The patient appears hectic, in inner tension, and hardly ever knows moments of inner peace and “breathing out” in soul. At the functional level the process goes hand in hand with hardening and sclerosis. The vascular system of the heart is also affected, with abnormal endothelial relaxation arising in an as yet fleeting sclerotic gesture. These dynamics of the astral body may often be observed in conjunction with a metabolic syndrome.

It is also possible to establish the significance of experimentally produced stress on endothelial function in healthy subjects. Even brief exposure to stress led to endothelial dysfunction persisting for several hours (1). On the other hand the conscious pole in the upper can have too great an influence on the middle human being. An example would be an overwhelming shock, almost paralysing the individual, which may cause twitching in the extremities. Here the individual does not live in restless, dynamic feelings, but experiences a quality that causes people to freeze up both inwardly and outwardly. A thought-quality forces its way into the middle

human being in the sentient configuration, i.e. at the level of the astral body. A confrontation arises between the restless awakening which is dominated by the lower, and the shock-like conscious awareness which is also entering into the middle human being. The first of these qualities causes blushing, the second pallor. Again we have the polar opposite qualities of limbs and metabolism as against the neurosensory system.

These opposites, continually present in the medical history of patients with CAD, will not be seen in everyday life, but the minor “preliminary stages” will—inner excitation not adequately guided by the I, or else the sudden, excessive awakening with thought-quality, which enter into the middle human being. It seems that the two may also happen together. A life full of stress often involves the shock of realizing how much still needs to be done and at the same time and afterwards an inner life of stirred-up and restless feelings.

• Healing and morbid processes with different types of inflammation—chronic inflammation and sclerosis

When the astral body awakens pathologically in the middle human being and therefore in the wrong place, a process going hand in hand with constrictive, hardening physiological changes, inflammation arises to oppose and balance this out in an attempt to heal. This process runs mainly in the darkness of the unconscious, though there may be a dim awakening, for instance with the pain of the inflammation. With angina it may go as far as the burning pain connected with inflammation, which is the opposite of the spasmodic, constrictive pain belonging to the upper human being. The “close-to-organ” awakening of the astral body in connection with manifest disease thus also involves the two opposite ways in which upper and lower human being come to expression which we have also described for the world of feeling. A quality in the inner life, which initially seems transitory, develops into the sentient and conscious quality experienced close to the organ as the disease progresses.

The chronic inflammation which leads to atherosclerosis is a process of progressive paralysis which can no longer be salutogenic and healing and will in due course lead to sclerosis. Compared to the acute form, chronic inflammation evolves into a disease process terminating in sclerosis. The phenomena of sclerosis reveal the actions of the neurosensory system at the level of the living body, initially entering into the middle human being in a more functional and rather transient manner. Chronic inflammation thus visibly shows at organic level what existed functionally in the early stages. Again we can see that this disease, too, starts at the functional level in which the bodies work together, only coming to organic manifestation at a much later time. With regard to diagnosis, angiography to demonstrate stenosis, the "gold standard", is from this point of view merely showing that the disease has reached the organic stage. Treatment goals must be based not only on this but also on the essential preliminary stages in order to utilize the salutogenic potential of those early stages, ranging from the setting of inner development tasks and art therapies to medical treatment (*Figs 1, 2*).

• **Atherosclerosis—process between nerve and blood**

If we consider CAD from this point of view, light is thrown on the underlying morbid process and we also gain indications for healing processes we may call upon. Initially these are the capacity for inflammation. Inflammation will only serve its purpose, however, if its activity in overcoming sclerosis is followed by a constructive healing phase. What phenomena can we establish for this comparatively "quiet" period of regeneration? An important observation is that bone-marrow-derived endothelial progenitor cells which are demonstrable in the blood may in fact serve to regenerate and heal the vascular system (2, 3). Haemopoietic bone marrow, surrounded by bone, does not belong to the spheres of the blood system which are open to the daytime actions of the bodies and go along with these e.g. when the haemodynamics change. It is rather the constructive night-time activities of the bodies—wrapt in the sleep level of consciousness—and in many respects related to the embryonic state, which are active in haemopoiesis. The vitality of bone marrow evidently yields healing and regenerative qualities which remind us of the common embryonic origin of vascular and blood cells, and take the constructive night-time activity of the bodies also to the vascular organization. We may assume that the disease, initially functional and consisting in dominance of daytime activity of the bodies, can go hand in hand with a limitation of this night-side with its etheric quality. It thus appears that atherosclerotic vascular disease shows itself in advance in the reduced availability of progenitor cells, a clear indication that it needs to be seen as a disease which affects not just one organ but the whole human being.

The cells deriving from bone marrow vitality are evidently able not only to regenerate peripheral, circulating endothelial progenitor cells but also to have part in the

process of regenerating muscle, brain, heart, hepatobiliary system, pancreas and vascular endothelium. When a female heart has been transplanted into a male person, the donor organ is found to contain cardiomyocytes with a set of XY chromosomes which points to cells derived from bone marrow and not the transplanted heart migrating to the donated organ and differentiating further into cardiomyocytes. A steady regenerative stream of cells still in the fluid sphere are clearly ready to differentiate on entering into the constructive regenerative organ processes. It appears that the environment of the organ has the properties that lead to differentiation of stem and progenitor cells. Thus the injection of neuronal-type stem cells into skeletal muscle led to transdifferentiation into skeletal muscle cells (v. s.). It appears that increasing form and differentiation relates to decreasing proliferative vitality in these cells. In the vascular system, for instance, ischaemic tissue damage following MI led to an increase in circulating endothelial progenitor cells. Meanwhile additional factors have been identified that may contribute to a mobilizing effect. In our particular context, the effect of mobilizing endothelial progenitor cells with physical exercise and hence the coming into play of the human will is of particular interest. The process of sclerosis, as a quality of the nervous system which gains dominance in the wrong place, is met with a constructive, regenerative process, the origin of which points to haemopoiesis in bone marrow; from the fluid sphere—distributed by the blood (circulating endothelial progenitor cells being demonstrable)—it goes into the creation of organs, condensing into the solid state. In this sense sclerosis and the concomitant healing processes fit into the polarity between nerve and blood. Limits of endothelial regeneration also play a role in the development of atherosclerosis, as they lead to a relative predominance of the upper human being. The proliferation, adhesion and incorporation of endothelial progenitor cells are said to be limited with type 2 diabetes (4).

Aspects of treatment

CAD means that sclerotic processes develop in the middle human being. At the physical level, ischaemic disease of the heart involves hardening processes both in atherosclerosis of the coronaries and in cicatrizing fibrosis of the myocardial movement organization. Constructive vitality regresses, giving way to a destructive metabolic process that ultimately leads to necrosis. Ischaemia causes not only functional metabolism to be limited in connection with the "stunned and hibernating myocardium", but also regression of constructive maintenance metabolism, which is an etheric function. Instead an astral quality of consciousness arises which goes hand in hand with the destructive metabolism and the hardening gesture of the disease, coming to expression in angina or dyspnoea as its equivalent. This typical configuration of sentience may in the psyche lead to anxiety and, with acute MI, fear of death. This experience of I-activity under immediate threat is characteristic

Tab. 1

Medication	ARR (abs. risk red.)	Length of trial (years)	NNT (rel. to 1 year)
ASS	1.2	2	167
CSE	3.3	5.4	164
beta blocker	1.8	1.5	8.3
captopril	5	3.5	70
stop smoking	7.7	4.8	62
low-fat diet	38	12	32
reducing chronic stress*	20.9	5	24

* Caution, different end point. No longer all fatalities but only combined "cardiac episode" end point. Corresp. NNT from 4S study (simvastin) for this end point is 34 (6).

of acute coronary syndrome and infarction. The above characterization of the four bodies provides the treatment goals. At the physical level these may, if indicated, consist in intervention (PTCA, stent, bypass surgery). In addition, the weakened etheric organization of the heart needs treatment to support it. Finally the unphysiological activity of the astral body needs to be treated and the I-organization must be supported in its mediation between the polarities in the threefold organism.

• Medical treatment

Currently CAD is treated symptomatically and by addressing risk factors that will respond to medication. The characteristic principles are adjustment and suppression according to the accepted image of CAD, with the need for treatment and action based on this. Beta blocking represses the sympathetic activation associated with the astral body's awakening. ACE inhibitors correspondingly intervene in a neuroendocrine profile subject to changes in the same direction. This corrects the above-mentioned imbalances superficially, turning a sad face into a happy one, as it were, but not doing anything for a soul in travail. Corrections like these change the activities of the four bodies outwardly, but inwardly do nothing to effect therapeutic change. When medication is stopped, the situation will be as it was before. The various anticoagulant principles act against the hardening and excessively form-giving actions of the astral body. Aspirin pushes astral nature out of the living organism, as evident from the change in conscious awareness (analgesic) and in connection with this, the quality of dissolving indurations. Heparinization and other anticoagulant measures for ACS and MI go in the same direction. Lysis directly intervenes in the polar qualities of the upper and lower human being which establish blood rhythms in the field of tension between coagulation and fibrinolysis. Nitrates take human beings from the daytime to the night-time constellation (5). These medical treatments have brought significant progress in enabling one to handle the morbid spectrum, but their quality is anything but therapeutic, even though they are justified and clearly effective. One must also consider how such long-term interference with the functions of the bodies—and with regard to the differentiated relationship between soul and spirit on the

one hand and the organism on the other, it does appear rather crude—affects the human being, who is meant to be in a process of development. For the proper evaluation of these treatments it is important to know both their potential and their limits. In the literature, relative risk reductions are often given with reference to a specific end point. Largely in two figures, the values given suggest an action which in view of the achievable absolute risk reduction (ARR)—demonstrable in a way relevant to practice in its reciprocal, the NNT (number needed to treat)—is reduced to a rather modest effect. *Table 1* shows the NNTs for the current medical approaches to CAD (secondary prevention).

Kolenda summed up his review by saying: "Changes in lifestyle result in ARR and NNT values equivalent to those achieved with medical treatment, or even distinctly better, as is probable with stopping smoking and a suitable diet. Even a conservative assessment gives a potential benefit for the totality of life-changes considered that is absolutely comparable to the positive effects of medical and surgical treatment."

As to the work that needs to be done on inner development which arises in conjunction with the frequently-mentioned stress management as an umbrella term for differentiated tasks required, reference should be made to the work of Dean Ornish, who pioneered this research, and the investigation made by Blumenthal et al. (7). This was an RCT including 107 patients with mentally-inducible myocardial ischaemia who were divided into three groups: 4 months of stress management (Group 1), physical training (Group 2), standard treatment (Group 3). Follow-up was 5 years. For the end point "cardiac episode" (death due to cardiac and non-cardiac causes, non-fatal MI, bypass surgery, balloon dilatation), ARR for the stress management group compared to the control group was 20.9 %, which is an NNT of 24 (in the 4S study, the NNT for the corresponding combined end point was 34 (6)).

In a field of medicine where large and good-quality outcome studies are available, we thus have data for NNT where the patient's inner development in terms of comprehensive lifestyle change is shown to have equal if not superior efficacy than is known for medical and surgical treatments. Little attention has been paid to this in mainstream medicine, and there are probably many (not evidence-based) reasons for this, which reflects a view where the sick individual is seen as in need of repair and not as capable of development.

• Medicines developed in anthroposophical medicine¹

One goal of treatment for CAD is to guide an astral body which is seeking to wake up in the wrong place towards its normal activity and strengthen the I-organization's powers to guide it.

An important medicament which also has significance in the treatment of CAD is Cardiodoron®, a composition which takes up and mediates the polar opposite activities of the four bodies in the threefold organism. Providing an archetype, it supports the harmonizing

Note

1) The German notation for decimal potencies is D (e.g. D6) rather than x (6 x).
Translator.

function of the rhythmical system. Phenomena such as the endothelial dysfunction which reduces the dissolving gesture in the vascular organization, or limitations in heart rate variability—which point to tendencies to grow rigid in the rhythmical action of the heart, are evidence that the higher bodies are one-sidedly imposing too much form. Use *Cardiodoron* (20 drops t.d.s.), *Aurum/Cardiodoron* (20 drops t.d.s.) or—especially if thoracic symptoms are spasmodic—*Cardiodoron 1%/Magnesium phosphoricum acidum D6 s.c.*

Where the astral body acts in a constrictively spasmodic way, copper may be used, e.g. as *Cuprum aceticum comp.* This can undo excessive, destructive day-time astral body activity, sometimes concomitant with peripheral coldness, and restore it to the organism to vitalize it. The preparation contains *Nicotiana* in addition, which also addresses and balances out unphysiological astral-body activity, meeting the “toxic” activity of the astral body with its etheric powers. With the form of CAD which involves a tendency to vasospastic reactions, the improvement seen with the medicament is occasionally impressive.

A woman aged about 60 was admitted with epigastric and retrosternal symptoms occurring at night and with emotional tension. The symptoms had persisted for 15 years and responded to nitrates. The medication was, however, followed by serious headaches, which is why the patient was looking for help elsewhere. For some years now she had been taking a strong espresso when the pain started at night, which relieved the pain but also resulted in persistent sleeplessness. Detailed cardiological diagnosis including cardiac catheterization had been done elsewhere, the diagnosis being variant angina. After the first injection of *Cuprum aceticum comp.* her symptoms improved immediately and the patient was discharged on the third day of her stay in hospital. Additional medication was not asked for, not did we consider it necessary.

Magnesium phosphoricum can balance out astral-body dynamics going towards the neurosensory system (*Cardiodoron 1%/Magnesium phosphoricum acidum D6 aa amp. Weleda*). *Magnesium* altogether plays a special role in treating malignant arrhythmias (torsade de pointes). It brings light qualities, which in humans belong to the sphere of consciousness, into the vital processes; it is akin at mineral level to *Bryophyllum* at plant level.

If there is concomitant restlessness (especially with a hysterical constitution), *Bryophyllum* may prove effective. For long-term medication, give it orally in low potency or in material doses as a 50 % trituration (a pinch t.d.s.), in acute situations i.v., using a perfuser if necessary (e.g. 5 amp. of *Bryophyllum 5 %/24 h*).

Cactus grandiflorus addresses the sentient configuration of CAD and plays a role in treating constrictive, oppressive feelings in the chest with angina. This medicinal plant from the *Cactaceae* family develops a congestive vitality where the leaf organization hardens into spines. The nature of this plant shows its etheric congestion, developing into hardening processes. Flowering

then erupts, taking the whole into an impressive sulphurous quality. *Cactus grandiflorus* can free congested astral activity in that way, taking into a sulphurous quality, i.e. orientation towards the metabolic system. Use *Cactus comp. II amp., pilules (Wala)*.

The suggestions which follow relate to the etheric rather than the astral level. It is especially after an acute event, requiring intensive care, that patients appear weak and in need of support at this particular level. *Prunus spinosa* in low potencies or material doses can prove most helpful here. It may be supported further with *Primula Auro culta* (e.g. *Rh D3*, 20 drops t.d.s.). The organ preparations (e.g. *Aurum/Cor*) take the archetypal laws to the etheric growth and development processes.

At this point, the use of *Arnica* should be mentioned. This medicinal plant brings the higher bodies back to the lower ones again when “trauma-type” processes have caused them to move away from body-orientated activity. When “physical traumas”, e.g. as part of ischaemic and destructive metabolism going as far as MI, or also due to external influences (trauma), push the higher bodies out of their physiological body-orientated activity, *Arnica* in low potency may be indicated for MI (*Arnica planta tota D10/Cor D10 amp. Weleda*).

Reference should also be made to external application of *Arnica* as a compress over the heart (v.i.).

The activity of the I-organization which in the middle human being includes the mediating element, actively connecting the polar qualities in the threefold organism when these have fallen into imbalance due to illness, is addressed by *Aurum* medication.

• Gold as a medicinal agent and the human heart—summary clinical aspects of its use

By nature, the heart holds a position between buoyancy and gravity (8). These polar opposites are related and mediated by its rhythmical activity. This shows a relationship between the nature of the heart and that of gold which can cast light on the medicinal actions of the latter. As the central organ, the heart is an integral part of the metamorphosis of vital energies into the light of the conscious awareness which unfolds towards the upper human being. Gold, having an inner relationship to it, may be seen to be a medicinal agent that can heal irregularities in that metamorphosis.

In relatively low potencies gold helps the transformation of light into constructive life. There is a fundamental difference between qualities of light. The light of consciousness in the world of thought has a quality of coldness, being comparatively dead. With a destructive metabolism it can take the organism into hardening processes. On the other hand there is enlivening light which can be developed as living thought, for instance, radiant with I-nature. The restlessness of conscious life in our fast-moving present age leads to sclerosis in the middle human being. Living thought, which to a degree leaves the head and in a “reality that is filled with light, warmly entering into the phenomena of the world” (9), gains warmth as well as light, becoming the “thinking

of the heart” and can have a vitalizing effect on this organization. This describes the inner development work referred to above. With CAD it does, however, also need healing in the body, and gold, which enlivens a body that is growing rigid and hardened, can contribute to this.

Light is now also cast on the use of gold in specific cases on Rudolf Steiner's advice. The brief notes still extant above all refer to Aurum, often in the D6, being prescribed for reduced vitality, tiredness and states of exhaustion. The brief characterizations show that the patients had delicate constitutions, often said to be pale and thin, which does not agree with the homoeopathic constitutional type. The reduced vitality which may follow prolonged illness or also shock and excessive mental stress, entering into the sphere of life and its metamorphosis into powers of thinking and conscious awareness, clearly can respond to gold in a therapeutic approach where light is transformed into life, as it were. Cardiac patients with that kind of constitution may be started on Aurum in low potencies (e. g. Aurum met. prep. D6 trit., a pinch t.d.s., Aurum Cardiodoron comp., 20 drops t.d.s., Aurum/Cor amp.). If the constitution is congestive, plethoric, forcing the organism into gravity, a medium potency may be used. The following words by Rudolf Steiner may be considered in relation to the transformation of light into life: “Introduced into the human organism in the right dosage, gold will bring the power of thought back again. It restores to thinking the power which enables thinking to act back on the astral body and indeed the ether body. *It is from their thinking that human beings are given new life by gold* (italics by MG) ... with gold, the I-organization is able to act right down into the ether body. The ether body can then act on the physical body. But gold makes it possible to keep thoughts powerful right down to the ether body” (10).

Powers of thought and of life here show themselves to be related when it comes to the actions of gold, and this leads to another aspect in the use of gold to treat heart conditions. Rudolf Steiner had early on spoken of the way CAD depends on the human psyche, and this is getting more and more apparent today, being taken into account in clinical approaches such as the Lifestyle Heart Study (11). Speaking of diseases of the rhythmical system, he said: “Above it is also the case, however improbable it may seem from the materialistic point of view, that hasty thinking, a thinking where one does not consider the justification for the reasons why one is thinking, hasty thinking one thought leapfrogs over the other—one of the fundamental problems in our time—a situation where one thought treads on the heels of the next, is something which will definitely have consequences in the human organism after a time, and this specifically in the rhythmical organism” (12). On the one hand this means that developing human beings are asked to bring the I's powers of guidance to realization in their thinking. On the other hand, medication can pave the way for this goal in connection with the disease. And it is gold which can support this guiding power in a living way of thinking, and “make it possible

to keep thoughts powerful right down to the ether body”. Inner development done consciously is supported by the unconscious activity of gold as a medicinal agent in case of sickness.

To sum up, the clinical significance of gold is evident from its quality as mediator between light and life. Reduced energy and nutritional levels in the organization of metabolism and limbs caused by excessive powers of consciousness developing or by shock, can be vitalized by giving gold in low potency (e. g. Aurum met. prep. D6).

Conversely, cardiac patients with a pyknic, congestive constitution may need a medium or even a relatively high potency of it (e. g. Aurum met. prep. D10 – 20).

Low potencies support vital energies, connecting the human soul and spirit with the body; higher potencies free soul and spirit when they are too much bound up with the organism, which leads to heaviness.

Medical treatment relating to the time form of CAD

The above medicines may relate to the time form of CAD in a differentiated approach. At the level of endothelial dysfunction, clinically sometimes taking the form of variant angina with no changes in the coronaries, Nicotiana and Cuprum aceticum, if indicated together with Renes (Cuprum aceticum comp., Nicotiana D10 amp.), will address the hardening actions of the astral organization. The Renes organ preparation serves to guide an astral body which is acting too much at the level of the neurosensory system towards its functions relating to metabolism and limbs. The action of Magnesium phosphoricum (e. g. in the D3; Cardiodoron/Magnesium phosphoricum acidum dil., amp.) goes in the same direction. If there are spasms, including those occurring at low temperatures, this frees the astral body from the nonphysiological activities that belong to the upper human being. One may also think of Cactus comp. II amp. here.

“Soft” plaques on the other hand point to inflammatory processes and on rupture can lead to ACS and MI (with or without ST-segment elevation—STEMI or NSTEMI). Apart from interventions, the acute condition, the event having the nature of physical trauma, also calls for Arnica medication (by injection (e. g. the D3, and also a warm Arnica compress over the heart)). Cactus (Cactus comp. II amp. Wala) can be used to counter the non-physiological activity of the astral body in anginal pain. If symptoms involve spasms, Magnesium phosphoricum D3 – D6, also in form of Cardiodoron/Magnesium phosphoricum acidum D3 – 6 is indicated. If there is also restlessness, Aurum-Lavandula ointment on a piece of cloth over the heart can give relief. Bryophyllum can complement this. Cardiodoron® is a basic medicament. With hypotension, Veratrum album in low potency (e. g. D4) is important (10 drops several times daily). Carbo betulae in high potency (D30, amp., dil.) has been used for years in this context.

In the phase which follows ischaemic degradation processes, Primula Auro culta (in low potency, e. g. Rh D3)

and Arnica/Cor D10 amp. may be used to stimulate the etheric organization.

Finally calcified stenosis, with the inflammatory quality largely gone, which clinically often occurs together with angina of effort (stable CAD), calls for therapeutic principles that reduce the sclerotic process in the middle human being and support the salutogenic processes of inflammation to oppose sclerosis. The latter can be done with *Viscum*. *Viscum/Crataegus* (Wala) has often been used. This also brings us to hawthorn with its sulphurous and therefore “inflammation-related” qualities. The sclerosing process can be “taken up” with the help of *Plumbum mellitum*, e. g. in the form of *Scleron*®.

Again it is important to take note of circadian temperature rhythms which may have become “frozen”. *Aurum* and the above-mentioned *Cardiodoron*® can go along with all the stages of sclerosis we have mentioned. *Aurum/Cardiodoron comp.* which apart from gold and arnica also contains *Formica*, would be appropriate from these points of view.

Exercise

Exercise is a major element in treating coronary disease. Rudolf Steiner referred to “movement with soul” when speaking of heart disease. Exercise should not be the reductionist use of the muscles to burn up calories. The individual’s will can also shine into it. Every movement then becomes a spiritual process where the spiritual aspect of human nature is put in connection with the living body to warm it. It is essential that the movement should involve the whole human being and not be a process of disassociation where the legs, for instance, move on a treadmill ergometer and the senses—possibly distracted by some other stimuli—perceive no change in the environment brought about by locomotion. By nature every movement is related to inflammation. Exercise therefore supports the healing quality of inflammation with diseases that lead to sclerosis. Numerous studies have now demonstrated the positive effect of exercise. Loellgen has published a good review on primary prevention of cardiac disease (13). Reference may be made at this point to eurythmy therapy and its importance in treating coronary disease.

• The challenge presented by coronary disease. Reference to a psychocardiology broadened by anthroposophy

The role of psychosocial factors in the development of coronary disease is emerging more and more clearly. In Rozanski’s review (14), reference is made to dimensions such as fear and anxiety, depression and lack of perspective in the biography. The Interheart Study also confirms that depression, serious incidents in life, stress at work and at home and relating to money play a considerable role which has so far been underestimated (15, 16). The disease may thus present a challenge which patients need to take up, making them take an active role in shaping the healing process.

Medical treatment can support activities at different levels of existence, as described. These healing processes

occur far below the threshold of consciousness. At the same time, inner development work with the same aim may be done by the patients themselves as a form of salutogenesis. These efforts are, however, at conscious level and made in a reflective mood. Comprehensive treatment of heart disease will thus involve medical treatment, lifestyle measures, attention to changes in the inner life as a “hygiene of the soul”, and finally also connect the healing processes with meditative spiritual work.

What changes are seen in human thinking, feeling and will in the case of coronary disease?

“Hearts begin to have thoughts” (17)

Rudolf Steiner referred to a “hasty” form of thinking where thought follows close on the heels of thought. This, he said, caused negative changes in the rhythmic system. Observations that go in this direction can be made with many patients. Some who are suffering from coronary disease are very clear, sometimes even abstract, thinkers who may also tend to be pedantic. Here the task is to release thinking from abstraction and give it warmth as well as clarity. In his *Michael Letters* (17) Rudolf Steiner used the formulation: “feeling one’s way into the light and darkness of thinking”, asking us to bring warmth into our thinking to join a light-nature which at the present time can quickly change into the cold light of intellectualism. Thinking then becomes an activity of the heart as well as the head.

Conversely, one often sees a quality of thinking that tends to be highly associative, sometimes evident in exceedingly rapid and hasty speech. The rigidifying element in thinking, in too cold a light, is the polar opposite of thinking that is out of control and may dissolve, as it were, in associative processes. In both cases the individual must develop thought control. This gives thinking a quality akin to will and feeling, a quality of love that can enter “warmly into the phenomena of this world” (9).

“Master of, not slave to, one’s thinking”

The pressure felt at work plays a particular role among known psychic risk factors in coronary disease. Terms such as “job strain” point in this direction, describing a situation where human activity can no longer unfold freely but is caught up in compulsions that often seem insoluble. The middle manager finds himself in such a situation who has to meet the firm’s targets yet also deal with staff who cannot do more, making this very clear to him. Set aims and reality are in conflict and the individual concerned does not manage to develop strong enough powers of judgement.

This phenomenon governs our actions in many ways. It is possible to distinguish three qualities in all human activity. One is the idea of what needs to be done. In itself this does not have the power to be implemented. Its importance and significance must be known and felt if they are to become motivation to fire the will. Ideally insight into the justification and necessity of what initially was an idea lets love for doing it develop (18), leading to will-based activity. The third quality lies the actu-

al action done out of the will. This comes to realization in outwardly perceptible action, though the process which leads to it is beyond everyday conscious perception. It is easy to see how these three relate to the threefold nature of the human organism. The idea develops in the sphere of the neurosensory system, the love for doing in that of the rhythmic system, with will-based action finally based on metabolism and limbs. The middle quality is at risk today and thus also the principle by which the individual connects with his doing in a real sense, making a general idea of action into a personal one, into motivation. This is also where mysterious powers such as conscience, or “healthy intuition” (*Occult Science* (23)) may come in as qualities of judgement. We do much from a sense of obligation, imposed at work and also felt to be compulsory in private life, shaping the will directly in by-passing this middle sphere. Conversely, the lower principle may be too powerful, making us act too quickly in affect and not reflect enough beforehand.

“Measure and master of surging sentience”

Reference has already been made to two polar opposite dynamics in feeling in connection with coronary disease—shock and getting upset, readiness to get annoyed or in a rage. Here the individual is set the task of mastering the middle soul quality of sensible feeling that is not overrun by the qualities of the upper and lower human being to either harden or be excessively dynamic. This calls for exercises to develop inner calm (e.g. Rittelmeyer’s letters on self education (19)). One may try, for example, to bring to mind strongly a situation that causes stress and restlessness, and then find the strength to enter into profound inner calm. The eye may let go of restless everyday events and turn to the clear, starry firmament that arches in majestic calm over all the activity on earth. Exercises like these may then taken further into meditative work if patients feel the need for this.

Another important element in connection with coronary disease is the fear and anxiety associated with sudden heart death, for instance (14). Fear is a threefold challenge. Depending on its severity and the degree of oppression for the patient it may initially call for medical treatment. Depending on the inner quality of the experience (restlessness, excitation, or on the other hand paralysing fear), different medicines may be considered:

- Bryophyllum (Bryophyllum/Conchae amp., Bryophyllum 5% amp.) if symptoms are “hysterical”,
- Cuprum (D6 – D20) with fright and also anxiety connected with instances of death, or Pallasite Ointment if there is panic (20)
- Aconitum D30 for fear of death, deep “central” fear, or if the astral body intervenes too deeply in case of shock,
- Arsenicum album for neurasthenic fear syndrome, night-time aggravation,
- Aurum to strengthen the middle when fright-type fear and “hysterical” fear, which belong to the lower

human being enter into the middle human being.

Art therapies can also be a great help. Finally living in fear is a challenge to gain spiritual insight and thus develop an ability which may equally be served by other therapeutic methods (21).

Essentially, different forms of depression are seen with coronary disease. Sometimes there is a perceptible inner “lack of light”. Symptoms of depression are also known to be twice as frequent with other conditions that may lead to coronary disease. Type 2 diabetes is an example, with depressive symptoms evident even before it manifests.

Positivity

Hopelessness and no prospects for the future are also considered to be risk factors for coronary disease. This means another one of the six qualities needs to be practised—positivity. It is not a matter of making the negative “look good”, but to discover the positive aspect even if a situation in life is felt to be hopeless, with no way out. This creates a different mood and attitude to life’s events and can give rise to healing powers.

Lack of bias

Finally lack of bias, being open and alive in one’s interest in the world free from preset ideas, has therapeutic significance with coronary disease. The syndrome is connected with an attitude of mind that has closed in on itself, unable to show warm interest in others, which leads to isolation rather than warmly human encounter in the social sphere (14).

An organ develops

At the embryonic stage, the three embryonic layers give rise to the different organs in the human body. Comparatively speaking, the “embryonic layers” of thinking, feeling and will can become an organ in the astral body with the exercises described above. Rudolf Steiner referred to these, together with a sixth which brings them all together, as the “six qualities” (*Occult Science*). The supersensible organ is located in the heart region and often referred to as the twelve-petalled lotus flower. Its genesis is clearly connected with the healing powers that bring about transformation in coronary disease. It is also an organism of abilities. Its development represents a major step forward in the development of the human spirit and soul, which again points to the fact that in essence, healing means not only freedom from symptoms, but transformation and the development of abilities in essential human nature which does have the potential for development. Something has to be overcome which is not yet human in the actual sense, a “dying and becoming” in the Goethean sense. This transformation into the truly human, with the individual becoming “measure and master” (Morgenstern) of soul capacity, is at the same time a resurrection impulse which transforms what has existed so far. In this sense a medical approach where the constant development potential of human beings is taken into account, making the therapeutic aims serve this, is Christian by its very nature.

In some respects, coronary disease may appear to be a physical expression of incomplete development of the twelve-petalled lotus flower as a higher organ. Healing thus also means making that development more and more complete. One can see this in some patients who have had coronary disease for a long time and made it their task in life. A kind and loving nature may be evident, letting the inner sun of humanity shine out. The heart has sun nature. Heart disease can bring out the sun nature of essential human nature.

Some patients ask for suggestions on meditation. With the term "meditation" used to widely and vaguely today, it will be necessary to clarify this first. It is not a matter of relaxing passively, possibly supported by external media. It is rather inner activity on the part of the individual. The central task is to transform and strengthen thinking. Its abstract nature, divorced from spiritual reality, needs to be transformed. Warmth and intense feeling can arise in our thinking without losing the light-filled clarity of it. This makes thinking an inner activity of will which can be experienced as an activity of the I. The subject of meditation may vary. Against the background of the heart organization's inner quality which develops light quality from our vital energies, we may think of the Rose Cross Meditation, which Rudolf Steiner described in great detail (22, 23). In this meditation, the image of changing and developing essential human nature shines out, with the sign of the cross in the background. The connection is perceived with the deed of the Christ, the Mystery on Golgotha.

To sum up, we have a comprehensive approach to the treatment of patients with coronary disease. The focus is on healing potential, with illness seen as a developmental challenge. Strategies include rather than exclude the pathogenetic approach, depending on the indication. Physicians must, however, reflect again and again that symptomatic medical treatment modulates or "tames" disease processes. What they achieve is a "tamed disease" but not health in the true sense. Health comes if we use the human potential for change and development. Dean Ornish's important trial continues to warn that the approach to coronary disease must change. Changes in life style point the way, rather than the conventional treatment common in 1990. "Dose-dependent", a vegetarian diet low in cholesterol, an exercise programme and meditative work led first to amelioration of the symptoms of angina and finally to incipient regression of coronary stenoses (11). At a time when cardiology has become highly technological, with a differentiated medical "setting", important other approaches open up. We need to develop and deepen these in anthroposophical medicine.

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Medication for arteriosclerosis—Plumbum mellitum

Sclerotic process and finding the indicated medicine

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■ Abstract

The medicament Plumbum mellitum/Scleron® has been developed by gaining insight into the process of sclerosis and the healing which is needed for this. With sclerosis, the I-organization is not adequately involved in anabolism and catabolism, with the result that the astral body takes over in an uncoordinated way. The I-organization must be strengthened to restore the balance between an overweening, destructive nerve stream and an underrepresented constructive blood stream, which will also restore harmony to the warmth organization. The medicinal action of Plumbum mellitum is to strengthen the I-organization in the anabolic sphere. Honey transmits the catabolic process initiated by lead to the anabolic blood stream. The pathologically destructive action of the astral body is taken back into the normal relationship with the I-organization. The latter governs the destructive processes again, at the same time having the dissolving and constructive aspect within it as a balancing-out process. Fundamentally, the principle of the I-organization is such that anabolic and catabolic actions are their own abutment in the effective healing process. Plumbum mellitum is specific for this.

■ Keywords

Medicinal process
Sclerosis
Plumbum mellitum
Scleron®
Warmth organization
Nerve stream
Catabolism
Blood stream
Anabolism
Lead
Sugar
Honey

- I Aims
- II Methodological premise
- III From nature of disease to formulating healing requirement
 - a) How does a foreign body develop?
 - b) Destructive and constructive quality of I-organization
 - c) How the organism deals with the foreign body
 - d) Anabolism and secretion in warmth
 - e) Summary of healing requirement
- IV Characterization of individual medicinal substances
 - a) Lead
 - b) Honey
 - c) Sugar
- V Plumbum mellitum
 - Characterization of medicinal composition
- VI Conclusion and further developments

I. Aims

The question as to the healing requirement is of particular importance when looking for a suitable medicament. For there must be more than just an outer connection between pathology and treatment. Insight into the nature of the disease should make it possible to develop a view as to the healing process. A medicament can then be developed on the basis of this and used in a comprehensible way.

II. Methodological premise

Taking up the spiritual-scientific basis developed in this issue and, among other things, Rudolf Steiner's "The invisible human being in us" (11 Feb. 1923 (2)), and his and Ita Wegman's discussion of sclerosis and arteriosclerosis in "Extending Practical Medicine" (3), an attempt is made to develop a concept of the disease and healing process for arteriosclerosis.

The method chosen is the polar treatment of a process which represents a foreign body in the organism.

III. From nature of disease to formulating healing requirement

III a. How does a foreign body develop?

The human organization is based not on matter but on activities. Knowing this has far-reaching consequences for the way we see the human being and the medicinal agent.

Life consists in secretory activities. The function of different substances is to stir the organism into activity. A substance which no longer has a function in the organism must be eliminated. Otherwise it will be a burden, assuming foreign-body quality.

Foreign bodies are created wherever the astral body exerts secretory functions, for instance. Substances secreted out from the organic sphere are then lifeless. The I-organization also needs this *transition* from organic to lifeless matter as a basis for its activities. It needs only the *process*, however, and not the end product (4).

Such end products which are of no further use become a burden to the organism. They accumulate and sclerosis, or arteriosclerosis, develops.

In the healthy physiological state, the I-organization is involved in the process in so far as it takes matter which has foreign-body nature into immediate dissolution, so that a healthy balance is maintained between constructive and destructive processes.

Seeing the quality of the I-organization to be such, we duly arrive at the therapeutic use of the medicament (v. i.). This merits a closer look at that quality.

III b. Destructive and constructive quality of I-organization

(Why excessive astral-body activity proves pathological, and why a weak I-organization is the cause of pathology)

One important characteristic of the I-organization is that on the one hand it takes the astral body's destructive work as far as the mineral level, for instance in osteogenesis. On the other hand the dissolving and healing effect is always present at the same time, dissolving the incipient pathological process and initiating healing. This is evident in the haemopoietic property of bone marrow. The process of death and hardening is already integrated internally, in spatial terms, in the life-creating process. Both are functions of the I-organization—one in the nerve process, hardening and creating bone, the other in the blood process, dissolving, liquefying, causing inflammation.

The function of the I-organization is similarly evident in the human rhythmical system. Arterial vessels carry pulsating blood, with the arterial wall as a solid container maintaining form for the blood in the vessels, so that it cannot simply flow anywhere, which is what it would do if left to itself. The arterial wall as a structure arises at the embryological stage from blood cells that were previously in the flow. Because of its origin, the structure is subject to reduced hardening and degradation processes. In health it is however constantly given life and kept in balance by the blood flowing through it.

This higher authority, the I-organization, combines the potential for disease with that for healing.

If it is too weak, destruction via the astral body results. This also destroys but does not have the power to deal with the destroyed matter in the same way. It delivers the detritus, matter of foreign-body quality, to the

I-organization, which does not deal with it, however, being engaged elsewhere (cause of pathology).

Products of degradation result which drop out of the live sphere of the organism and form salt-like deposits in areas where a tendency to create deposits and solidify already exists. In the rhythmical system, these are the arterial walls.

III c. How the organism deals with the foreign body

The foreign-body situation is dealt with in two ways in the organism. As described in Rudolf Steiner's lecture on the invisible human being, they are as follows.

1. On the one hand we have a situation where the constructive powers of flowing blood build up around the foreign body. Nerve function is secondary to this and grows so strong that it predominates in the process, with an exudate forming around the foreign body (the blood breaks down under the Sal process) and the foreign body is gradually encapsulated. Hardening results from the blood's constructive powers being initially active and made subject to the destructive dynamics of the astral body.
2. On the other hand a situation arises where destructive nerve function primarily reacts to the foreign body which has been brought in. This initiates secondary blood activity, with the result that the blood does not coagulate but pus develops. The dominant destructive nerve stream pushes this to the outside. Pus is discharged and scars develop.

With arteriosclerosis, the healing process required is that the sclerotic process which is in an encapsulated state (1) must be pushed out by supporting the nerve stream not only via the astral body but above all activity of the I (2).

The foreign body which has thus been pushed out must be taken up and dissolved by the blood so that it can be involved in bodily processes again or eliminated at the right point by the organism. The process is connected with differentiated temperature states in the body.

III d. Anabolism and secretion in warmth

The I-organization normally lives wholly in temperature states. It draws the individual, differentiated organs forth from the general, undifferentiated organic matter in the human being. In the process, the I-organization either increases or decreases the temperature state of an organ preparing to come into existence (or an organ which already exists and needs constant regeneration).

If the I-organization decreases the temperature, inorganic matter enters into a solidifying process as the organ develops. Salts are taken in; in the physiological state this is the precondition for osteogenesis. With pathology, blood vessels grow bone-like, solidifying arteriosclerotically to the point of calcification.

If the I-organization increases the temperature, organs such as the blood develop. In the physiological state, these are able to dissolve organic matter and take it to the fluid or gaseous state. Rickets or arteritis are examples of pathological changes.

Galenite



To sum up, we can say that in a state of *warmth*, the I-organization is active *internally*. In other words, heat is the immersed symptom of neurosensory activity for instance with inflammatory and pyrexia conditions.

In the state of *bone or sclerosis*, the I-organization is no longer active internally. It has been discharged, as it were, from the sphere of growth and organization in the organ and its involvement is then purely *external*. The I-organization has, as it were, been driven out of the organ system.

III e. Summary of healing requirement

The I-organization is too weak in both constructive and destructive functions.

The first step is therefore to strengthen an I-organization which is weak and only acting from outside so that it may on the other side enter into the blood stream and action on the foreign matter to dissolve it.

Restoring the balance between destructive nerve stream and constructive blood stream then also harmonizes the warmth organization. This calls for strengthening warmth in sites where lack of it takes the form of deposits and sclerosis, and taking warmth away in sites where pathological inflammation develops, with the organism attempting to heal in a way which would only cause the condition to deteriorate. The I-organism needs to have properly directed and regulative quality also in the warmth organism.

The destructive effect taken over by the astral body in the pathological state would have to be taken back again by the I-organization. The astral body would then be able to perform its own functions again which it had to neglect before (e.g. emotional lability, feeling one's own state of health/illness).

Requirement: to stimulate the I-organization quality directed towards degradation. At the same time build up and dissolve by taking the foreign-body element which needs to be removed into the warmth process.

IV. Characterization of individual medicinal substances

IV a. Lead

Lead is a grey to greyish black, lustreless heavy metal. It is soft, heavy and has little tensile strength. It occurs only rarely in native form (i.e. as the pure metal). The most common lead ore is lead glance (galenite), a sulphidic mineral crystallizing preferably in cubic form, with grey lustre and highly frangible. Formula: PbS (6).

Lead and lead ores do not, as a rule, contain water. With few exceptions (v. i.) lead salts, even those that are partly soluble in water, crystallize without water of crystallization. Lead is very slow to react chemically, remarkably so even with aqueous solutions. The fact that it does not easily open up to the watery element may already point to its relationship with dead matter. The chemistry of lead is extraordinarily simple. The metal is a poor conductor of heat and electricity, and practically impenetrable even to α -, β - and γ -rays. With its stable structure, lead is the end product of all natural radioactive decay series. The decaying matter comes to rest in it.

Another aspect to be found among lead phenomena is a relationship to heat. Lead melts at 327°C , that is, if just held over a candle flame, and evaporates at 1555°C where other metals merely melt. Finely powdered, pyrophoric lead produced in a vacuum ignites and is combusted spontaneously on contact with air (7).

A number of lead ores (red lead ore, yellow lead ore and others) are in bright colours ranging from yellow to orange and red, indicating their relationship to heat. Lead frequently combines with sulphur, which points in the same direction.

Lead has been known from antiquity. As its properties became more widely known it came to serve many purposes. A first step came in the late middle ages when lead shot was used to kill. Next came the invention of printing, using lead type and lead colours which were appreciated for the quality of their colour. Today lead is widely used in technology, which relates to the growing importance of rational thinking and the factual approach in our culture (8).

Lead toxicology shows hypochromic anaemia due to inhibition of haemopoiesis. The pole of life in bone is taken hold of by death processes. Apart from the erythrocyte system, lead has three more points of attack: smooth muscle, motor nerves and kidneys. The nervous system is particularly sensitive to lead intoxication. This points to a powerful effect on the neurosensory system (9) symptoms of poisoning are peripheral neuropathy, encephalopathy, and mental retardation in children.

With sclerosis, a weak I-organization means that the interrelationship between it and the other bodies is disturbed. A substance is needed to initiate the healing process by taking over the function of that weak I-organization.

To strengthen it, its activity must be directed towards processes aiming towards lifeless minerality. Only medicaments with mineral nature will serve this purpose.

Lead is a substance which supports the I-organization's destructive functions, taking over this function where it is too weak in the nerve stream. Strengthened nerve function of the I will stir up the blood's inflammatory powers, and this opens the way out for sclerotic, salt-forming, foreign-body-like processes which would otherwise remain in the body. Lead sets the direction for the destructive functions of the I-organization. This initiates the healing process, for a foreign body can be ejected with the pus that forms around it.

Too much of this process would, however, be toxic for the organism. This is also why lead should not be used on its own but in a composition with honey and sugar, and why treatment needs to be interrupted at intervals.

IV b. Honey

It is not sufficient to find a medicinal process which will restore the destructive aspect of I-organism function to its proper place in the organism. The constructive side of the I-organization must equally be stimulated as a characteristic of healthy I-activity and take effect as such. Otherwise over dosage of destructive lead powers will cause hypertrophy of the I-organization and physical break-down because of excessive destruction.

Honey is initially gathered as nectar from the floral region of the plant by an individual foraging bee. It is taken to the hive and taken over by worker bees, passing it from one to the other. The drop of nectar thus passes along the food chain, enriched with enzymes and thickened as the honey matures (10). The bee takes the drop of nectar which is changing into honey to and fro many times between the siliceous environment of the waxy hexagons in the comb and the astral stomach of the insect. This brings about the transition from astral to I-organization. Honey production depends on the communal effort of the whole hive. This highly complex social organism takes the honey substance beyond the singularity of the individual animal and into a configuration comparable to that of the I-organization.

The bee thus prepares the transition process between I and astral body in the natural world. Finally the ripe honey is sealed in its cell in the comb in a state moving towards lifelessness, its water content greatly reduced in a kind of "live crystallization". The I, which also relates to the mineral sphere, is given a kind of example of how it may regain the necessary control over the astral body.

The destructive powers of the astral body in the visible human being is redirected towards the invisible part of the human being which serves metabolism. This reintegrates the astral body in the constructive and dissolving aspect of the invisible human being, so that it can perform its function in the etheric powers to give form to matter.¹¹ These special form-giving powers of honey make it possible for the I-organization to capture the destructive action of lead and keep it in limits.

Honey also enables the I-organization to exert the necessary control over the astral body, as described in

Extending Practical Medicine (12) so that the relative independence of the latter is taken away.

IV c. Sugar

In chemical terminology, sugars are crystalline, water-soluble, sweet-tasting carbohydrates from the ranks of mono- and oligo-saccharides. In common parlance the term is used for the disaccharide saccharose which is obtained mainly from sugar beet, sugar cane and to a lesser extent also from maple, sugar millet and palms. D-glucose and D-fructose are important monosaccharides. Starch is a polysaccharide stored in all plants which consists of D-glucose unites.

Let us consider sugar in its relationship to the activities of the different bodies. This is where it has significance for the organism. Of all the carbohydrates taken with our food, only sugars and starches can be further utilized for the human organism (13).

Food starch, i. e. D-glucose polysaccharide with longer chains, must be changed and transformed once taken in with the food before it can be absorbed from the digestive tract. Otherwise starches will be foreign bodies. Enzymes break them down in the oral cavity and convert them into sugars as they progress through stomach and duodenum. This activity continues throughout the digestive tract. As simple sugars (e.g. glucose), carbohydrates can be taken directly into the activities of the organism.

Astral body and I-organization are working together to convert starch into sugar with ptyalin in the mouth or amylase in the stomach, for instance. In the stomach the astral body predominates over the I-organization, the activity of which is subdued. Sugar and glucose are active in the sphere of the I-organization. The activity of the latter in the human organism can be followed via these sugars. The sweet taste may only be consciously perceived on the tongue, but it continues to be active wherever the sugars go in the organism (14).

"Where sugar is produced, the I-organization comes on the scene and gives subhuman (vegetative, animalic) bodily nature an orientation towards humanity" (14).

In this sense, sugar enables the I-organization to take up its special task in the organism and be ruler and guide also of animalic and vegetative processes. Without such guidance they grow independent in sclerosis and cause pathological changes.

Sugar strengthens the I-organization directly, not like lead only via the conscious neurosensory human being with catabolic quality but also in the anabolic sphere, serving human metabolism.

Sugar circulates through the whole organism in the blood. A healthy balance is maintained for as long as the I-organization connected with it is taken up by astral body, ether body and physical body. Sugar enhances the powers of the I which are active in the blood. When repeated upsets, intellectual overwork or hereditary factors make excessive demands, however, the I-organization's integration into the other bodies is impeded and the pathological changes of metabolic syndrome and

diabetes develop (14). Here we have the connection between the risk factors in metabolic syndrome and coronary disease as it arises through the four bodies, and the relevant need for healing.

V. Plumbum mellitum

Characterization of medicinal composition

Anthroposophical medicine and a significant number of its medicaments cannot be understood simply on the basis of the individual substances used, as is the case with homoeopathy and conventional medicine. Understanding depends on insight into pathological processes. A medicament is then composed with reference to those processes. The medicinal process inherent in the medicine helps to restore order when the powers and activities of the individual bodies have become unbalanced in case of illness.

In this sense, the developmental history of the natural substance and the pharmaceutical process used have special importance. Paracelsus asked that the physician go through nature's examination in order to perceive and study the pathological processes to be found there. Natural products were not to be used as they were. Instead, pharmaceutical processes should make the actual medicine a new creation that goes beyond the natural state (1). In the end this results in a new medicinal substance, as shown here in the composition of Plumbum mellitum. To make a comparison: composing a melody is to create something new which is more than a sequence of notes and does not live and take effect in the mere sequence. The melody with its harmony and rhythm has its unique signature¹.

The principle of the medicinal action of Plumbum mellitum is that it strengthens the I-organization so that it takes up its degradation functions again. The pathological situation is initially taken over by lead (11). This means that the degradation products do not remain in the body as salt-like elements but find their way out. This principle corresponds to the path of the foreign body in the second principle of the "invisible human being" (2) (v.s., III c. 2). Lead gives the direction for the process of expelling the foreign body/splinter with the pus.

To avoid moving from one pathological situation to the other, honey is brought to bear at this point in the process and in the whole method of production. It prevents excessive suppuration and expulsion, taking the now ongoing process into the blood current of constructive function. Honey takes the pathologically destructive action of the astral body back into the total relationship with the I-organization and transfers it to the latter. The I-organization regains control over degradation and at the same time also has the dissolving aspect of constructive function.

Destructive and constructive activities always represent their own abutment for a successful healing process. This is the basic principle of the I-organization and the medicament makes it available for clinical use in its own particular way.

Plumbum mellitum D12 in tablet form is marketed as Scleron®. It is available from Weleda, also in liquid form, as a trituration and in ampoules.

VI. Conclusion and further developments

Rudolf Steiner's original idea to create a composition of lead, honey and sugar, as described in this paper for Plumbum mellitum/Scleron®, has provided a medicine for sclerosis. The syndrome being highly differentiated, we must ask if there are other medicines for specific situations connected with sclerosis, based on the example of Scleron®.

Physicians and pharmacists at Weleda Schwaebisch Gmuend, Germany, and the Medical Section at the Goetheanum have developed Plumbum aceticum/Mel comp. According to the above, the developmental history of the raw materials is of particular significance in the pharmaceutical process. Scleron® is based on metallic lead obtained from galenite (PbS) by roasting and reduction, which is made into a new composition with honey and sugar. Lead acetate is the lead salt used for Plumbum aceticum/Mel comp. Unlike other forms of lead this is easily soluble in water. Plumbum aceticum has a sweetish, metallic taste (sugar of lead), crystallizes with 3 mol of water of crystallization, and melts at c. 75 °C. This "lead" is therefore much close to honey and sugar at substance level and in the pharmaceutical process. It may thus be possible to take hold of the sclerotic process, which takes much more time to evolve, in the fluid sphere, including the special sclerotic processes where the I would need to be strengthened especially in the fluid sphere, in the ether body, as for instance with autoimmune processes that lead to sclerosis.

Plumbum aceticum/Mel comp. is available from Weleda in form of D12 tablets (magistral formulation).

I am especially indebted to Drs L. Simon and W. Engel for their suggestions and a helpful sharing of ideas.

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Note:

¹)Information on the whole manufacturing process is available to physicians from Weleda.

Medicinal action of Cactus comp. II®

Case report

UWE SCHULZE

Original title: Pathogenese und Salutogenese der koronaren Herzerkrankung. Der Merkurstab 2006; 59: 222–27.
English by A. R. Meuss, FCIL, MTA.

■ Abstract

Cactus comp. II proved effective in treating a patient with metabolic syndrome and advanced, known coronary artery disease with angina. The patient's four bodies are described and the medicament Cactus for the treatment of angina.

■ Keywords

Coronary heart disease

Angina

Cactus

The four bodies

1. Case record

A male patient aged 71 was admitted on 30 Jan. 2006 as his general condition had worsened, with dizziness, weakness, tiredness and spasmodic muscle twitches, predominantly on the left side, and in decompensated renal failure. Diabetic nephropathy was long established. High doses of diuretics had led to marked deterioration of renal retention (creatinine 4 mg/dl). The patient had an extensive cardiological history—known ischaemic cardiomyopathy with clearly limited systolic LV function (EF < 40 %) with trivascular CAD w. status post MI 1997, status post coronary bypass 1997 (LIMA to RIVA, ACVB to RCX), status post PTCA/stenting of RIVA 2005, status post DDD SM implantation, now DDI with permanent atrial fibrillation. CV risk factors currently nicotine abuse at 100 py, type 2 diabetes, adiposity and hypercholesterinaemia. Stage II B PAD bilat. as part of generalized arteriosclerosis, status post PTA of left AFS. Finally COPD Gold Stage II had been diagnosed.

About six weeks earlier patient had been admitted for biventricular decompensated cardiac failure requiring high doses of diuretics (torasemide 100 mg, hydrochlorothiazide 25 mg) for recompensation. With pre-existing renal failure this medication led to a distinct rise in retention with the above-mentioned clinical symptoms indicating acute aggravation of chronic RF. Discontinuing the diuretics, short-term treatment to control volume and exhibition of Bryophyllum ampoules per os, the symptoms improved within a week. Creatinine levels went down to 1.3 ml/dl. The spasmodic muscle twitching responded particularly well to Bryophyllum. In spite of cautiously starting diuretics again, signs of cardiac decompensation with oedema of the legs and increased dyspnoea on effort. Diuretic treatment with 30 mg of torasemide and 12.5 mg of HCT finally established a stable balance between cardiac and renal compensation. Anginal symptoms had recurred when the cardiac condition worsened. Nitrates (pentalong 50 mg b.d.) were started for the heart failure and angina. With the cardiac situation stable, anginal attacks nevertheless occurred in spite of the treatment. They were now treated with Cactus comp. II injected s.c. in the left upper arm. The patient was always completely symptomfree in

Fig. 1

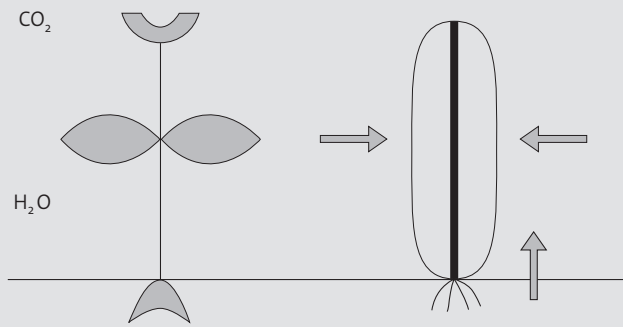


Fig. 1 5 – 10 minutes and could be discharged. No further anginal attacks occurred in the next four weeks.
Fig. 2 and 3 Diagrammatic representation of flowering plants and cactus.

Fig. 2 and 3
Cactus grandiflorus. From
 Thornton RJ,
Temple of Flora
 1812.

2. Description of the four bodies

The patient had had metabolic syndrome for years with all its sequels in form of generalized arteriosclerosis with advanced CAD and PAD, plus renal failure due to diabetes and vascular disease. He was little aware of his movements being limited as a result, as his former lifestyle also involved little exercise and led to obesity. Physically he had a broad chest, bloated adipose abdomen, with extremities appearing rather slender (at least when CD-compensated). Skin pale and doughy, blood supply seems poor. Fluid metabolism highly unstable, with tendency to develop peripheral oedema rapidly. The air organism seems impeded in the thoracic region and partly displaced to the abdomen (flatus, constipation). Mentally the patient appears friendly and open but subdued, with signs of depression, in part also easily upset, with a tendency to quick anger. Interests, hobbies, other things or goals in life not in evidence. The patient is well informed on his diseases, but his questions always concern the functional state of his organism, nothing relating to meaning or significance of this condition for his own life. Compliance regarding medication, visits to his physician, weight, blood pressure and blood sugar determination is very good, but there is hardly any preparedness to go beyond this in changing his lifestyle.

All in all, astral activities of the upper human being predominated, with the I-organization not strong enough to guide them, so that they were proving too destructive in the middle and lower human being. This forces the ether body into gravity (adiposity, oedema). The physical body hardens, and deposits are formed (arteriosclerosis). The organs which have a specific mediating function in the astral and etheric interplay—heart and kidneys—are especially affected.

3. Cactus comp. II

The Wala product consists of Cactus D3, Crataegus D2, Arnica D14 and Cinis Avenae cum Magnesio phosphorico D5.

The Cactus constituent is obtained from *Cactus grandiflorus* (queen of the night).

Cactus plants thrive in an atmosphere which is inimical to life, with high-level solar irradiation and great heat. Water and nutrients are scarce, with a high salt content in the air in some regions. In this environment the cacti have withdrawn the leaf sphere completely into the stem, with only spines remaining. The stem grows hypertrophic, swelling up as water is stored in its vacuoles. The leaf surface turns into a tough epidermis delimiting the stem against the outside. Photosynthesis takes place in it. The pores in the epidermis are closed in the daytime to prevent drying out, opening only at night so that CO₂ and water may be taken in. This means that night and day are reversed, with photosynthesis mainly happening at night. Cacti will again and again produce remarkably expressive flowers from such a body. The *Cactus grandiflorus* flower is something special, 20 – 30 cm in diameter, vanilla-colour, with a strong scent. It opens only for one night, withering by morning. The flowering impulse thus also shows night being turned into day. The plant is native to the rocky shores of Central America, producing an extensive network of stems anchored to the ground by numerous aerial roots. The plant thus shows congestion in the stem region, with the leaf and partly also the root sphere withdrawn into this and vital processes occurring within it (Fig. 1). Flowering is powerfully held back initially, then to explode, as it were, in one night.

R. Steiner spoke of cactus in a lecture on 10 April 1924 as a plant which in contrast to other plants expands its stem. “The contraction which stems usually show reveals Moon powers; when the stem itself wants to expand, we see the battle between Sun and Moon influences” (1). Sun powers let the plant’s flowering and leaf spheres grow out into surrounding space; Moon powers keep the plant in the earthly domain in its stem and root regions. In the cacti, tension arises between the two powers in the stem region. We thus see the kind of “pathology” which in human beings takes the form of arteriosclerosis, especially when it affects the middle human being in CAD. (See description of CAD in this issue)

Rubini referred to *Cactus grandiflorus* in 1864 as medicinal for heart conditions involving “sensation of constriction around the heart and chest” (2).

Crataegus, hawthorn, belongs to the rose family. The wood is hard and strong. A powerful flowering impulse arises in spring, yielding flowers with a heavy scent. Flavones and procyanides are produced with ACE-inhibitor-type effect on the circulatory system. This powerful, sulphurous flowering impulse on the one hand, and the woodiness on the other indicate warmth-etheric activity in the circulation, with the astral taken into the etheric.

Arnica thrives on siliceous soil, firmly anchored in the ground with a strong root and rosette of leaves, and producing a radiant yellow flower. It stimulates the structural and form-giving powers needed for traumatized tissues.

Cinis Avenae cum Magnesio phosphorico is an ash which mediates in the interplay between the higher and lower bodies.



Experience has shown that Cactus comp. II® acts reliably on acute anginal symptoms when given by s.c. injection in the left upper arm. A small study of our own with 12 patients showed positive results in practically every instance. To give this observation a broader basis we have started documentation of observations made with application to run at a number of different centres from April 2006.

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Havelhoehe School of Heart-Care

ANDREAS FRIED

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Der Merkurstab 2006; 59: 258-61.
English by A. R. Meuss, FCIL, MTA.

■ Abstract

The paper describes the preconditions and principles of the Havelhoehe School of Heart-Care. Apart from the five steps (stop smoking, change eating habits, moderate physical training, stress management and individual support), the special aspects/problems of modifying one's lifestyle are considered. Special attention is given to group therapy with regard to the development potential in working through the disease and possible resistance.

■ Keywords

School of Heart-Care
Self-help project
Ornish
Coronary artery disease
Lifestyle

In principle, the treatment of coronary disease, the ultrachronic inflammatory condition described in preceding papers, rests on three pillars.

The *first* is interventional treatment (balloon angioplasty and stenting) or bypass graft surgery. This has its justification in acute stages.

The *second* is medical treatment, with a range of possibilities. The main point is to help patients with ACS who are in a life-threatening crisis situation and ensure survival. Mortality continues to be almost 50 % with ACS. Two thirds of the 50 % die immediately of cardiac arrest, among other things also because prodromal symptoms were not given the right attention. About 10 – 15 % of MI patients die following admission to hospital, though increasingly aggressive interventional treatment in recent years has halved this mortality rate.

The *third* pillar, equally effective as the other two, is prevention by reducing risk factors once the acute stage has passed. It involves identification of and changes in known CAD risk factors. We distinguish between risk factors such as age, sex and also heredity which cannot be changed, and others that can be changed, among them the following:

a) *Somatic* risk factors are smoking, diet-dependent factors such as elevated cholesterol and triglyceride levels, overweight, type 2 diabetes, high blood pressure and lack of exercise.

b) *Psychosocial* risk factors such as chronic stress (e.g. at work), social isolation, hostile attitudes/being quick to anger, depression, anxiety and socioeconomic disadvantage ("poverty causes illness") (1).

Here lies a special challenge in anthroposophical medicine, as it addresses the *whole human being* and not *only* the disease, seeing the pathological process in the context of the whole biography as a "developing life form" (see Matthias Girke's paper in this issue, for example). The paper by Dean Ornish² has shown for the first time that consistent changes in lifestyle and his treatment regimen can cause regression of coronary stenosis in patients at risk of developing MI within a short time, without using lipid-reducing drugs or surgical intervention/balloon dilatation. The five main steps in the original programme are:

- stop smoking
- change eating habits
- regular, meaningful physical training
- regular training to reduce stress
- support from medical staff and other patients.

A specific programme was therefore developed at Havelhoehe Community Hospital which includes anthroposophical medicine, an approach where the human being is addressed as a whole in body, soul and spirit. It follows the five steps of the original programme in a modification to meet our particular approach. The Havelhoehe School of Heart-Care was established in 1998. Apart from acute clinical cardiology (v. s.) it includes a project of equal weight for the *long-term* recovery of CAD patients.

The programme starts with an intensive lifestyle change week, with changes in diet and cooking methods, personal stress management, individual exercise training, meditative relaxation and talks. The course takes place in a quiet hotel nearby (Schloss Reichenow near Berlin) so that people will have an opportunity to concentrate on their health and the change in lifestyle without disruption from outside. Partners are more than welcome. Two physicians, a eurythmy therapist, a nutri-

tionist/ocotrophologist and qualified psychologist/psychotherapist run the course.

After the intensive week we offer an ongoing group (4 h a week for a year) to deepen what has been learned and integrate it in work and everyday life.

We also advise our patients to attend a coronary sports group/outpatient heart group where the usual methods are used plus Bothmer gymnastics and eurythmy therapy.

To achieve the results reported by Dr Ornish, we advise patients to attend the intensive week and then the ongoing group, including coronary sport. Over the last 8 years c. 150 patients have been attending. The School now has people in 8 different years, with the first seven year-groups divided among two classes. The majority of patients wanted to continue after their first year, and currently we have c. 60 patients in regular attendance for 4 hours a week.

The outpatient work is as follows. The first 60 minutes are devoted to exercise, with eurythmy therapy and Bothmer gymnastics in addition. "Settling down" at the School is important not only in physical terms. A part of the whole group is at the same time working with our nutritionist in the kitchen to prepare the evening meal for all. We do not advocate any specific diet and differ especially from Ornish's recommendations of an extremely low-fat diet. More recent insights, especially in the Lion Heart Study (3), have shown a classic Mediterranean diet to be just as effective. This means a high proportion of salads, fruit and vegetables, with relatively little animal fat in meat and milk products. What matters is not the measuring of protein, fats and carbohydrates but training patients' judgement in the choice of suitable foods as well as conscious and relaxed eating. Again the "less is more" principle applies, consciously treating food as something to be enjoyed.

The last third of the four-hour evening programme is devoted to group discussion. This often seems the most important part to our patients and their families. I would therefore like to look at this in more detail.

Lifestyle relates closely to the biography. This means that lifestyle changes will always be difficult. Inertia plays a great role in blocking the wish for change. As a team we had to learn at great deal about this so that we could understand this inertia and assess it individually. This is the power of the ether body which needs a long time to allow habits to change and make the changes part of everyday life. Resistance occurs at many different levels both socially, at work and with physicians and therapists. Our recommendations mean a major intrusion in our patients' everyday activities. The very degree of "strangeness" in the new lifestyle is asking a lot, a continual challenge to our patients. Almost every aspect of life is affected, and every meal may suddenly be a "problem", for example. There is the fear that it will no longer be possible to enjoy eating with friends. Should every meal be celebrated as a kind of "credo" in future? Here it seems important to see every change in eating habits

as a process, with implementation calling for varying degrees of help.

The ongoing group work with those who are directly and indirectly affected is designed to help people to be open-minded, our motto being "Open your heart!", and communication among partners. We also hope to achieve a finer psychophysiological perceptiveness and influence, so that signs of stress or the effect of stress can be noted early and suitably dealt with. One important aim is to help people work through their illness, so that they can marshal the best possible creative resources for this. Another important reason for this is to include the partner, who is not directly affected, more fully in the whole process. We also encourage trust in others and bring social support to experience. This reduces tension and allows them to work through stress more easily. Tendency to isolate oneself can be reduced to a minimum.

Cognitive restructuring changes extreme views and values, creating the inner conditions for an attitude that can deal with stress. Ultimately we aim for "psycho-social" reorientation, so that approachability and understanding offer potential for finding a balance in everyday attitudes. The ability to apply these things to everyday life seems important to us, so that responsibility for and planning of implementation does not seem unreal, with new resistance developing and again showing the familiar inertia.

To let trust grow it is important for CAD patients to find "reliable reference people with open hearts", little resistance and great transparency. The whole team see themselves as co-therapists of the psychologist in charge. Follow-up discussions and analysis of developing group processes after every group therapy are therefore important in giving the whole team an overview.

Initially, patients expect the psychologist to provide information on the subject matter of the course, personal introduction, structure and guidance. We meet these wishes. Every member of the group is invited to introduce himself or herself even in the intensive week in Reichenow, speak of their expectations and suggest topics, so that the programme is alive from inside and all share in developing it. Individual activity, readiness and the ability to be open to essential health-related subjects are above all encouraged. The "defences" of patients, seeming necessary protection at first, vary in degree but all have "a heart" which can be addressed, with mutual acceptance, growing familiarity and increasing insight, which is especially helped by the intensive week.

So one finds again and again that weaknesses and anxieties are openly addressed. Accepting well-founded anxieties as a warning signal and a protection on the one hand, and the positive result by gaining distance, the help with relaxation, and new ways of thinking on the other lead to possible solutions. To begin with we often meet with distrust due to disappointments and doubts which we can understand when a patient opens and describes an important chapter in his or her life.

Active listening and entering into the situation of group members gradually makes it possible to have more trust in oneself and in others. This paves the way for looking back and resolving to cultivate good relationships with people one can trust as one returns to everyday life.

Needs, interests and opinions vary and it is possible to arrive at "discussions that bring people together" as one sits together in an atmosphere of open-mindedness, people try to understand one another, being prepared to compromise, so that in the end compromise leads to consensus in a "healthy" way.

Sometimes just a little "too much of a good thing" distinguishes dys-stress from eu-stress. Many CAD patients admit that they belong to the category of super-people who go to excess in representing sentiments, attitudes and behaviour which in themselves are perfectly good. They may, for instance, be

- hypersensitive rather than sensitive
- too quick rather than deliberate
- excessively rather than normally punctual
- over-excitable rather than stimulated
- excessively demanding
- over tense rather than elastic
- excessively aware of responsibilities rather than personally responsible
- excessively concerned rather than caring, etc.

The aim is not to influence our patients and "turn them inside out", but to reduce and blunt existing "risk peaks".

Combining training in stress management with suitable versions of relaxation therapy is highly beneficial, for it makes patients feel well in mind and body, provides solutions that calm, and allows them to cope better individually. One meditation technique we use is "focusing". This uses concentration and deepening to develop solutions for common problems or topics for discussion on an individual basis which will make group discussions more to the point and genuine discussion.

A holistic movement therapy such as eurythmy therapy also helps to change attitudes in due course of time. Here it is vital that the members of our therapeutic team work effectively together. Again and again it is amazing to see patients who have been excessively performance-orientated and full of tension turn into relaxed individuals happy to communicate and taking pleasure in playful and harmonious movement shared with others. Changes in attitude and behaviour in the group are reflected and strengthened afterwards to support this approach.

An ideal complement to this way of coping with stress are music, painting and artistic speech therapy.

The comprehensive and syntonetic approach used by the team of therapists from different disciplines helps individuals among them to assess and improve their own therapeutic skills. This happens in the above-mentioned team meetings.

Our patients are immediately aware of physicians and therapists, i.e. the team, being well informed and working together in harmony. They find that the holistic

approach is supported by all of them, which not only means that less information and communication goes astray, but also that there is a very special quality of togetherness both in the interdisciplinary team and in the group.

A kind of "fire services mentality" prevails in the acute cardiac unit of a hospital with the usual proportion of acute MIs. This means that diagnosis and treatment are essentially based on pathological findings, with bed occupancy limited to the short period of 6–8 days. This means there is no time to consider the processes underlying the pathology. It is therefore important to metamorphose into a caring "gardener mentality" where the focus is also on the subjective condition, with physician and therapist thinking, feeling and acting holistically and as fellow human beings. To unite "two souls" in one breast is essentially possible thanks to the interdisciplinary approach of the team. This helps to strengthen the "gardener mentality". As it is a major element in anthroposophical medicine, it also goes towards bring this mentality to bear also in acute cardiology.

The state of our patients' coronary vessels often reflects the whole of their individual nature. They usually feel constricted, set, frozen and shut in. Negative psychophysiological and psychosocial elements lie behind positive physical and physiological findings. We want to reach these patients and help them be their own "gardener" so that with careful follow-up and comprehensive preventive and general care the disease may be seen and made use of as an opportunity for reflection and change, with a heart for oneself and for others.

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The middle human being

Coronary artery disease as a task—summary

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■ Abstract

Review of aspects of coronary artery disease—embryology; arteriosclerosis in the middle human being; risk factors vs. protective factors; function of the bodies; angina; acute coronary syndrome; cardiogenic shock; sudden cardiac death; need for treatment; conventional methods; anthroposophical medicine; change and self-enablement; network of clinical centres

■ Keywords

Embryology
Arteriosclerosis
Risk factors
Protective factors
Function of the bodies
Angina
Acute coronary syndrome
Cardiogenic shock
Sudden cardiac death
Need for treatment
Conventional methods
Anthroposophical medicine
Network of clinical centres

The preceding papers presented aspects of the genesis, phenomenology, need for treatment and methods of treatment for coronary artery disease (CAD).

In the embryo, form and function of the heart develop as a consequence and not the cause of forces being at work. The human organism arises in the polarity between inner and outer world, creating the heart as an organ which mediates between these opposite poles. The function of mediation between outside (maternal blood) and inner world (fetal blood) is performed by the placenta before and by the heart after birth. The heart establishes balance between nutritional and air processes, the lower human being dominated by metabolism and limbs and the upper human being dominated by the neuro-sensory system. This mediating function is the precondition for human development in body, soul and spirit.

In the middle human being, represented by the rhythmical organization, the pulmonary circulation, which relates to the air, and the coronary circulation relating to the fluid organization, to intracavitary blood, are opposites. Arteriosclerosis as a chronic process between sclerosis (excessive demands, deposits) and inflammation (dissolution) which is no longer balancing out and maintaining health, typically manifests in the middle human being as CAD and can seriously limit people (angina, dyspnoea), or cause vital processes to separate directly from the physical organization (cardiogenic shock, sudden cardiac death). Hypertension of varied genesis (pulmonary) may manifest in the pulmonary circulation, but one never sees arteriosclerotic changes there.

Considering the genesis of CAD from the risk-factor point of view, clearly shows that the form and function of the heart are not the only outcome of forces at work. Pathological tendencies and manifest disease must be seen as arising from demands made on the whole human organization. Congenital irregularities of metabolism (e.g. disorders of fat metabolism) play a role here as do a one-sided diet, lack of exercise, toxic habits (smoking), negative moods (anxiety, aggressiveness, lack of perspective, etc.), lack of meaning and outside determination of mind and biography. It is therefore easy to see that implementation of a protective-factor concept has special significance in both primary and secondary

prevention. Education for the whole of life, followed by inner development and spirituality are the precondition for autonomy in the conduct of life, experience of the sense of life, meaningful work, social integration, movement (work, sport) as the basic elements.

If in considering human sickness and health we take account of the way in which the four bodies work, we can say that sickness develops when the “higher bodies” (I and astral body) act on the “lower bodies” (ether and physical body) without mediation to maintain balance. One-sidedly constructive or destructive tendencies can lead to the kind of pathological change we see with CAD as a manifestation of arteriosclerosis in the middle human being. Hardening processes appear at the physical and etheric level (e. g. myocardial cicatrization), whereas at the level of soul and spirit we see a pathological awakening of astral life, normally in a dream state in the middle human being, with angina and the fear of death which affects the whole individual. The fear of death with acute CAD (unstable angina, MI) is real, for with the I and astral organizations coming in too powerfully, the etheric organization can separate completely from the physical body (cardiogenic shock, sudden cardiac death).

When we look for the need for healing with CAD, it is ultimately a question of finding the middle again by strengthening the I. The higher bodies (I, astral body) will then intervene in and serve the lower ones (ether body, physical body) to bring health and not cause damage. The heart and its functions are the ideal of rhythm maintaining the middle and giving life, with past, present and future integrated in synchronicity. In case of illness, the healthy-giving intervention of the higher bodies needs therapy to support it at the level of body, soul and spirit.

At the physical level this may take the form of re-canalizing an occluded or stenotic coronary vessel (catheterization, bypass surgery). If the patient's regulatory functions are inadequate, pharmacological methods effecting passive adjustment or suppression can prove effective (thrombocyte aggregation inhibition, neuromodulating β -blockage, ACE inhibition and lipid reduction). Anthroposophical medicines will in addition take account of human regulatory potential as an active healing principle, supporting physical and etheric processuality under the guidance of the higher bodies. Pathological processes (sclerosis) can be taken away, and healing processes (capacity for inflammation) supported. This can be further supported by bringing “soul” into movement with eurythmy therapy and by art therapy, modification of lifestyle and an appeal to the need for individual biographical development. CAD can bring about inner change for the individual who is faced with the task of shaping given situations from the past into self-determined powers for the future by entering into inner (spiritual) development.

Relevant medical answers in our present human culture to the tasks set by CAD as a disease of our time consist on the one hand in preventive perception of

how childhood and youth create the conditions for morbid dispositions in the second half of life, and on the other hand in creating an integral network of clinical centres where sick individuals are accompanied all the way from possibly life-saving first measures (acute clinics) to a process of change (outpatient care, rehabilitation) which will enable them to gain an orientation towards the future and powers of self-enablement (schools of heart care).

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Epilogue

Insight into and treatment of coronary disease in anthroposophical medicine—questions concerning internal and external evaluation

The anthroposophical medical aspects of CAD developed in the preceding papers are intended to meet the needs of our time for individual therapeutic ideas. Cardiovascular diseases and especially CAD are known to rank high for morbidity and mortality. The connection with our conditions of life in spirit, soul and body are clearly apparent in individual patients and also well documented (1, 2). In spite of this treatment of CAD patients is often not really individual, taking account of the soul and spirit dimension. The aim of this issue of the journal has been to offer comprehensive insight into the disease, taking account of the whole human being, to allow for a genuine and not only symptomatic healing process—i. e. including pathogenesis and salutogenesis. In future a medical discipline will have value if it can be understood, assessed, applied, evaluated and taught. This means that treatment approaches must be such that they can be conveyed to others and assessment of efficacy allows one to judge their clinical value (3). It has to be considered, however, that comprehensibility and communicability also always depend on the prior knowledge or training of the other person. Thus one must know anatomy to understand coronary angiography, and be familiar with the four bodies of a human being to understand the power of the etheric organization to maintain life, growth and development. The view taken of the human being in anthroposophical medicine integrates the dimensions of body, soul and spirit. The approach also has epistemological potential and therefore allows the critical assessment of methods. Anthroposophical medicine thus has far-reaching potential for being understood, assessed, applied, evaluated and taught (3, 4).

The results of work done by the Cardiology in Anthroposophical Medicine Group presented in this issue should be considered against this background. The authors are aware that the presented material is incomplete. It is now up to the readers who work in anthroposophical medicine and science to bring in any missing aspects by actively collaborating in an ongoing process. The future survival and progress of anthroposophical medicine will greatly depend on such scientific collaboration. The Group considers itself to be a contact point for the field represented in this issues.

For a further step we must ask if developing insight into a disease and its treatment leads to anthroposophical treatment which on the one hand finds general acceptance (internal evidence) and is genuinely put into practice, and on the other is clearly recognizable for its typical characteristics. Such a clinical approach must then be evaluated (external evidence) as a whole or in specific aspects for testing efficacy. Apart from top-quality efficacy assessment in the case of individual patients (cognition-based medicine) (4), it will then need adequate use of the statistical methods of evidence-based medicine. This will, for instance, involve comparing patients receiving purely conventional treatment with others who have anthroposophical treatment to complement it or as an alternative approach. It is easy to see that the choice of treatment option must be solely left to the patient, which means that randomization and blinding, preferred methods in evidence-based medicine, can only be used if relevant issues cannot be clarified by any other method. Prospective cohort studies may be considered here for statistical evaluation of efficacy and benefit. “Hard” end points in planning studies like these may in terms of

anthroposophical medicine be aspects of benefit to the patient: subjective improvement, better prognosis, the patient's discovery and experience of meaning. Some basic and reliable elements needed for such evaluation include

1. recognized expert groups to develop and communicate insight into pathology and methods of treatment that gain high-level acceptance
2. in-patient and out-patient facilities for the provision of care that work together in a structured way
3. scientific institutes to manage the execution and evaluation of studies
4. publications to examine and present the results of scientific investigations.

Anthroposophical medicine has the capacity to be outstanding with innovative concepts that also take us into the future. To do so it must set itself its own targets.

"Man is what is he through physical body, ether body, soul (astral body) and (spirit). In health human beings must be considered in terms of these aspects, in sickness perceived in terms of the balance between them being upset; for health, it is necessary to find medicines that will restore the upset balance" (5).

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