

Strokes and Their Effects

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Imagine the following:

You wake up in a strange bed in a strange room, surrounded by people you do not know. You want to get up but realize that you cannot move your right arm or right leg. You notice that people would like to talk to you but you cannot understand the language they are speaking at all, they are speaking in a foreign language. You are thirsty and ask them for something to drink, but it appears that no one seems to understand you, they look at you with puzzled expressions. You would like to know where you are. There's a sign on the wall, you might be able to see it. But what sort of strange letters are on it? These figures and characters are unfamiliar and strange to you. Everything seems like a nightmare, you feel absolutely helpless and start to panic.

If the place in your dream is a hospital bed, then this nightmare could have become a bitter reality. You had a stroke and are now paralyzed on the right side of your body and suffer from a speech impairment. This nightmare comes true every day for more than thirty people in Germany: a bad dream from which there is no waking.

The Stroke

Quite frequent, strokes are the third-most frequent illness that can lead to death, after cardiac infarction and cancer. It is caused by damage to the body's blood vessel system and is similar to a cardiac infarction (heart attack), except that with a stroke the brain is affected.

What is a stroke?

"Stroke" is colloquial for an abrupt event in the brain, during which the blood flow is interrupted for one reason or another at a certain spot in the brain and as a result certain areas are no longer supplied with blood (ischemia). The immediate result is nerve cell death (infarction).

Forms:

There are two types of strokes: In about 80-85% of the cases there is a disturbance or interruption in the circulation of blood that is caused by occlusions in the blood vessels. In 15-20% of the cases there is bleeding in the brain that is caused by bursting blood vessels.

Causes:

The core causes of strokes are the same as with heart attacks: high blood pressure, cardiac arrhythmia (which can cause blood clots to occur), smoking, diabetes

mellitus, changes in fat metabolism (cholesterol level), lack of exercise, being overweight, and the consumption of too much alcohol.

How many people are affected?

Frequency: Approximately 200,000 people per year suffer strokes in Germany. Between 500,000 and 1,000,000 people suffer from the effects, approximately 75,000 die due as a result of strokes, mostly due to the long-term damages. (Germany has 82.000.000 inhabitants)

Although the stroke is an illness that typically occurs among the elderly, it can happen at any age and there is an increasing trend of a considerable percentage of strokes taking place between the ages of 45 and 65 years old.

Our brain

The brain is the most important organ in our bodies and the one with the highest level of complexity. It processes all of the detailed information from our senses, controls all actions and reactions, and regulates all vital body functions. It consists of three major parts: the cerebrum, the cerebellum, and the brain stem.

The cerebrum consists of two independent and symmetrically arranged halves (hemispheres) that are connected by nerve fibers, the so-called "corpus callosum." It is via the corpus callosum that information is exchanged between the hemispheres. On the surface, the hemispheres look very similar but their functions are very different, each hemisphere is specialized to perform certain functions. There are many different centers within the brain for specific tasks.

Task sharing/distribution in the brain

It can be roughly said that the left half of the cerebrum is attributed with functions like logical and analytical thinking and with language. It is also responsible for the planning, controlling, and implementation of deliberate, arbitrary motor actions. The right hemisphere works more holistically, it represents musicality, creativity, and spatial orientation. (This is generally true for right-handed people; with regards to those who are left-handed the task sharing of the left and right hemispheres cannot be determined with any certainty.)

More recent results from cerebral research show that entire networks are involved in most processes performed by the brain. That is to say, different parts of the brain – sometimes in regions of both hemispheres that are far apart from each other – are simultaneously working together to perform complex tasks like speech, reading, or listening to music.

Additionally, each hemisphere controls the movements of the opposite side of the body, i.e. the left hemisphere controls the entire right side, and conversely the right hemisphere controls the left side. Which of the two hemispheres is hit by the stroke

plays a big role and the effects can accordingly be very different. If a right-handed person suffers from a stroke in the left hemisphere of the brain, which is ordinarily the brain's linguistic center, there is a high risk for speech impairment in addition to paralysis of the right side of the body.

The cerebellum is mainly responsible for motor control including balance. Every movement, from **the awkward movement** of an arm or leg, through to the finest, most complex movements – for example, playing piano or speaking – are controlled and learned there as saved automated movements.

The brain stem controls all fundamental, life preserving functions like breathing, metabolism, blood pressure, and heartbeat. The nerve fibers that connect the cerebrum with the entire motor apparatus run through the brain stem.

What keeps the brain alive?

Most of us are not aware that many of the activities performed by our brain are rather "heavy duty," because a lot of the processes are completely automated. In order to accomplish these tasks, the brain needs large amounts of oxygen and other nutrients (e.g., glucose) to be able to live and function. The brain is supplied by six large blood vessels (arteries) that travel from the heart to the brain where three vessels supply each half of the brain respectively.

Every blood vessel can be imagined as structured like a tree that branches out further and further into the brain. The main blood vessel represents the trunk from which more and more branches reach out in ever more fine twigs. It is through this "tree" that the blood transports oxygen and other nutrients that are vitally important for cerebral cells.

If this constant flow of blood is disturbed or interrupted for any reason and not enough oxygen reaches the cerebral cells, a stroke occurs. The nerve cells in the brain can survive only a few minutes without the vitally important oxygen before they die. The damages are limited to the exact area that is supplied by the affected blood vessel.

There is however a bigger area around this core area hit in which the cerebral cells do not die but which transfer into a sort of "long sleep": they are no longer active, but are supplied from the surrounding area however with small quantities of blood, so that they can **survive for some hours**. If the flow of blood begins to circulate again during this period, these cerebral cells can become active. If not, they also die.

Therefore:

Act immediately! An acute stroke is an EMERGENCY like a heart attack.

The emergency doctor must be informed immediately upon the appearance of typical stroke symptoms (In Germany call: **112**). Please be informed about the emergency

number in your country! The faster a treatment begins, the greater the chances are to keep possible damages to a minimum.

How to identify a stroke

The **first** symptoms could be:

weakness or inability to move the limbs and/or the facial musculature on mostly one side of the body

numbness or tingling on one side of the body

difficulties with language and speech

impaired vision, double vision

vertigo, disturbance of equilibrium, extremely severe headaches

The first medical measures that should be taken in the case of a stroke

If possible, it is especially important with the occurrence of a stroke that the necessary actions are initiated immediately. There is a procedure (Lyse therapy) that can potentially dissolve a vascular occlusion. This procedure is not applicable with all stroke victims, as there is a high risk of bleeding and it is only effective within a few hours (3-4 hrs) after the stroke takes place and in the event of a vascular occlusion. Hence, you have to be certain before the treatment that it is a matter of occlusion and not of bleeding.

This treatment and other actions are best carried out in hospital departments that specialize in the timely and specific treatment of strokes. These "stroke units" have been set up in an increasing number of hospitals in Berlin and Brandenburg.

The effects of a stroke

In recent years the mortality rate due to strokes has clearly decreased. Today approximately 15,000 people die immediately or within the first four weeks of having a stroke. The earlier number was close to twice as high as this. Medical progress is primarily responsible for this reduction, due to improved research and treatment methods and the equipment available in special stroke units.

Approximately forty percent of those who survive a stroke return to their previous everyday lives again after a recovery phase. Thirty percent are so affected by the consequences that the symptoms prevent the continuation of their previous life, e.g. returning to work. For the other thirty percent the effects are so severe that normal life can no longer be carried out independently. Long-term care is necessary and they are bound to a wheel chair or to bed.

The results of the stroke can vary significantly in sort and severity. Up to sixty percent of those affected live with after-effects, when a stroke irreparably damages the brain, or parts of the brain. Cerebral cells die and can only regenerate to a certain extent. This illness is quite different from, for example, infectious illnesses whose symptoms disappear after a certain amount of time. Even a heart attack, if it

doesn't cause a stroke and is treated promptly, usually allows the resumption of everyday life, though perhaps with certain lifestyle restrictions. Strokes, however, damage the brain long-term, restricting carrying out everyday tasks.

Types of Damages Resulting from a Stroke

Damages to the Cerebrum:

Motor function:

Paralysis and sensory disturbances (numbness or tingling) mostly on **one side of the body** (hemiplegia, or paralysis of one half of the body)

Difficulty in absorbing nutrients and swallowing

Visual perception: Visual field loss (a loss of peripheral vision)

Data processing and action control:

Impairment to

language and speaking

attention and concentration

data retentiveness and memory

sight and hearing

planning and programming of movements

counting

spatial orientation

complicated data processing (simultaneousness of several events taking place simultaneously)

problem-solving

Personality changes (emotional life)

slowed thought and action

flatlined ability to perceive and feel emotions

frequent, quick change in mood

depression

Damages to Cerebellum:

Motor Function

loss of ability to walk due to disturbances in equilibrium

loss of fine motor function movements

speech impairment

Damages to Brain stem

High risk of death due to the vital tasks carried out by the brain stem.

Disturbances in motor function and sensory abilities, on one or both sides of the body,

through to complete paralysis of the motor system, i.e. the so-called locked-in syndrome.

Other situations that can also lead to these effects:

Damages due to an accident (cranial cerebral trauma)

Brain tumor or the surgical removal of a tumor

Encephalitis

Yet the stroke is the most frequent cause, responsible for approx. 80% of all brain damage.

Which functions are affected by a stroke depends on the kind of stroke and the place in the brain that was not supplied with oxygen as well as which cerebral cells have died. As mentioned above, there are six blood vessels (arteries) that supply the brain with blood. In principle, each of these vessels could be hit and completely blocked, however, it is more often the case that only one part of the vessel's adjacent and complicated "branching," the branches and twigs off the main trunk that is interrupted.

It can thus be imagined that there are a number of possible variations in where damage occurs and a correspondingly large number of possibilities in damage patterns. Though there are reoccurring typical patterns in brain damage, the problems each person affected encounters differs from person to person upon closer examination. Each person shows a personal, individual pattern of damage.

What happens after a stroke?

After the initial acute treatment, which in the best case scenario occurs in a stroke-unit, the patient is transferred to a normal unit and takes part in further treatment at a rehabilitation clinic, where there are different treatment departments according to the degree of severity. The treatment of recognizable damages must begin immediately and stroke-units have a suitable therapy team available for this.

Who helps after a stroke?

In the days and weeks immediately after the stroke, the damage done becomes increasingly clear and an assessment can be made for the development of treatment. There is of course initially the primary doctor, who takes and follows the necessary medical actions for the stabilization of the patient's condition. The doctor also has to determine, usually in tandem with therapists, the other therapeutic measures that need to be taken.

The Team of Therapists:

Physiotherapy

Occupational Therapy

Neuropsychology

Speech Therapy

These professional groups form the interdisciplinary treatment team along with the doctors in a clinic, who all work together to develop individual therapy plans for every patient. As a rule, an intensive therapy schedule is possible when needed, i.e. everyday (5x per week or more) in the different therapy departments.

Physiotherapy is responsible for all motor functions, including the improvement or restoration of the ability to walk and the use of hands and arms.

Occupational Therapy primarily works on functional improvement with the hands and coaches how to accomplish everyday activities like dressing, food preparation, and personal hygiene. If necessary, patients are also coached on how to use aids in order to carry out activities with the use of only one hand.

Neuropsychology extensively examines and treats the efficiency of the brain with so-called higher brain performance like memory, attention, concentration, spatial and temporal orientation, and visual-spatial perception, among other activities.

Speech Therapy examines and treats all disorders regarding the ability to communicate: the ability to use language in order to communicate, using the right words and sentences, understanding language from others or selecting the correct speech sounds. This involves speaking and hearing as well as reading and writing (technical term: *Aphasia*). It also involves the ability to correctly move speech organs like the larynx, tongue, lips etc., having a voice and speaking normally and understandably.

Moreover, after a stroke problems absorbing nutrients (difficulty swallowing) appear very often, which must be urgently treated, as the results can be life threatening. Since the 1990s, these problems are also within the field of speech therapy.

What steps are taken after the rehabilitation clinic?

After therapy in a rehabilitation clinic, the patient can either go directly home or, in severe cases, a transfer to a care facility will take place. A third possibility has existed for a number of years now – day centers, where the patient continues to receive therapy but returns home in the evenings and the next day comes back to the day clinic. The duration of care here is also limited.

In all cases there is still the possibility to receive continued therapy on an out-patient basis at a therapy office. All types of therapists that are active in the clinic also exist as independent practices with the exception of neurophysiologists, as there are not many of them (approx. 100 in all of Germany).

The treatment of neurological damage is often long and requires more intense

therapeutic procedures, which are often limited, however, by the prescribing doctors and the health insurance companies financing the care. They may additionally not be able to be guaranteed by independent practices at a sufficient frequency due to capacity problems. The continuation of intensive therapy after the clinic is important, however.

Which long-term effects can a stroke have?

The effects of a stroke are often serious and significantly life changing. The physical damage caused by paralyzes can lead to the loss of mobility, make walking very difficult or not possible at all, leaving the wheel chair the only possibility for locomotion.

The inability to communicate can be just as difficult or have an even more serious effect on everyday life. Language is the means by which our life is determined – our social connections, our cultural interactions. We confide in others, communicate wishes or annoyances, and express our personality all through language. The loss of these abilities is often the worst effect of a stroke when no or only a difficult, very limited exchange is possible with family members and friends.

Speech therapists are the professionals that help with these issues. They support patients in rebuilding his or her linguistic abilities or in finding other ways to communicate if speech turns out to be very difficult or impossible. Speech therapy has its boundaries just as it provides opportunities for therapeutic success. This is also valid for other areas of professional therapy.

Prejudices against people with impediments after stroke:

At first glance the effects from a stroke and from dementia (usually from Alzheimer's) occasionally appear similar, they are however, in reality quite different: A person who had a stroke and thus has a speech disorder has **no** mental defects, the stroke victims perceive situations just like others, he or she does not lack spatial or temporal orientation. They are simply not able to translate thoughts into words or perhaps do not correctly understand what is said. Only small areas of the brain have been damaged, the rest of the brain continues to function quite normally. With a patient suffering from dementia, however, wide areas throughout the entire brain have been affected, and the damaged areas gradually continue to spread. It is not only a separate "branch" affected, but also the entire "tree."

Additional Information:

A Central Information Center has been opened recently in Berlin, which can answer all questions regarding strokes:

Servicepunkt Schlaganfall an der Charité, Luisenstr. 9 (entrance) 10117 Berlin
Tel.: +49- 30/450560600

For further reading (books available in German):

Huber, W., Klaus Poeck, Luise Springer, *Klinik und Rehabilitation der Aphasien*
Stuttgart, Thieme Publisher 2006

Lutz, L., *Das Schweigen verstehen - Über Aphasie* Berlin, Springer Publisher 1992