

## Leg amputations due to defective arterial circulation

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Defective arterial circulation in our latitudes is the cause of 80-90 per cent of all leg amputations. This figure has almost tripled during one generation, and continues to rise in spite of all the success of conservative and operative treatment, particularly vascular surgery. A comparison with other countries shows that this percentage varies directly with the standard of living of the population, or with the percentage of illiterates, the consumption of all energy, or, maybe, of soap. In any event peripheral vascular disease plays a subordinate role in the emerging nations, at least, for the time being.

The correlation with the standard of living indicates the main causes: longer life expectancy, lack of exercise, overweight, abuse of nicotine, and perhaps climatic conditions.

The shockingly high percentage alone, however, does not justify separate consideration of these patients. Rather, it is felt that there are other, more differentiated problems that make rehabilitation so difficult, and often impossible.

As in all other cases of leg amputation, the amputation and the fitting of a prosthesis in cases caused by defective arterial circulation are of focal importance. The result to the patient is not primarily affected.

Contrary thereto, amputation of the leg on account of defective arterial circulation is not the primary cause of the affliction, but one of the many possible consequences of a general illness. The basic illness is arteriopathy of highly varied origin, an incurable illness which can at best be retarded in its progress, but cannot be arrested, to say nothing of being reversed. Not only the lower limbs are threatened but also the heart, lungs, brain, sensory organs, kidneys, etc. Where today the stump and the fitting of it with a prosthetic device are at the centre of interest, tomorrow a heart infarction, an apoplectic stroke, or an arterial occlusion on the opposite

side may call for completely new priorities. It is no wonder, therefore, that even today not only the patient and his family, but even the physician, yield to discouragement and become sceptical, pessimistic, and sometimes even opposed to all efforts for a comprehensive and rapid rehabilitation.

It is, therefore, also understandable that for many years the surgeon saw his task as amputating the limb of a vascular patient principally through the thigh in order to achieve rapid healing without complications. The patient cannot be faulted for being accessible to these considerations, because he wants to be rid of his gangrenous leg quickly, and for good. If his physician is not aware of it, how can the patient be expected to know that rehabilitation is twice as difficult for one whose leg is amputated through the thigh rather than through the lower leg? How can he know that a person with both legs amputated through the thigh will only in rare cases ever walk again, whereas if both legs are amputated below the knee the patient has a good chance of walking once more? Disconcertingly, we still hear today the watchword "haut et tôt" (high and early). He who believes differently runs the risk of being criticised for "salami tactics." At best, in many circles, only the diabetic is still afforded an option of amputation below the knee.

The increase in the number of patients and the increasing urgency of the most rapid and comprehensive rehabilitation possible impelled us to search for a solution that would serve the patient better for the long term. First, let us emphasise the merits of internal and physical medicine, as well as those of vascular surgery, and at the outset seek a way to avoid amputation. Equally important in "amputation prophylaxis" is proper footwear for feet with poor circulation, or atrophied and often hypo- or even asensitive feet. However, when amputation can no longer be avoided, the first task is to find the level of amputation which should be as

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distal as possible and still yield a useful stump, i.e. one which is without pain and can control a prosthesis. The determination of the level of amputation is by far more difficult than the technique of the operation because the quality of the circulation does not decrease proportionally with distance, but, on the contrary, at the same level the tissue may very well have good circulation and at other times none. Amputation "in healthy tissue" however will always be an illusion, because all of the arteries are diseased and constricted.

Now as before, we consider anamnesis and clinical finding the most important criteria for the determination of amputation level. However, evaluation requires considerable experience and even then it is not free of mistakes. We are, therefore, glad for each further diagnostic contribution which would make the determination of the amputation level easier. The method which will generally prevail is the one that does not require a complicated and costly apparatus or a highly specialised technician. The majority of amputations will continue to be performed, not in large centres, but in medium and small hospitals where there is rarely the environment for costly procedures.

The same goes for the operative technique. By far, not each technique is "a priori" suitable for the vascular patient. We prefer the method which takes into consideration, as far as possible, the particular circulatory conditions and which leaves the smallest possible wound surface. The low vitality of the tissue does not tolerate unnecessary traumatisation, foreign material, osseous fusions, bloodlessness, or haematoma. We prefer exarticulation of individual toes, amputation through the bases of the metatarsalia, perhaps in the Lisfranc joint, amputation below the knee, exarticulation at the knee, and only subsequently amputation at the thigh and hip exarticulation. Occasionally, a local gangrene of the heel will heal by hemicalcanectomy. Less suitable are partial amputations of the toe (except for the big toe), transmetatarsal amputations in the distal two thirds, amputation in the posterior foot, and in the distal two-thirds of the lower leg. Healing of the wound must be promoted by timely infection prophylaxis and prevention in which asepsis has priority over antibiotics by stimulating the arterial and venous circulation by physical and, where necessary, medicinal means. However, if

the healing of the wound is complicated, conservative wound treatment or local stump correction generally suffice. Only at that time amputation below the knee takes priority in the vascular patient, followed by exarticulation in the knee joint as an alternative to thigh amputation.

Amputation represents the first important step towards rehabilitation. It is however meaningless if the subsequent measures do not follow continuously and are not administered professionally, because care, walking instruction, supply with prosthesis, and rehabilitation of the patient have their own peculiarities. Reduced physical ability considerably restricts the possibilities of physical treatment. Training usually has to start all over as the patients have been bedridden often for weeks and months. Care must be given very conscientiously, particularly when the patient's psychological state is poor. Decubital sores, incontinence of urine and stool, infections of respiratory and urinary tract are complications which should be prevented as much as possible by correct professional care.

A compression bandage on the stump should be applied in a manner to reduce compression from distal to proximal. Early provision of a prosthesis, as a rule after complete healing of the wound, makes it possible to put early and increasing load on the stump and thereby promote good circulation. However, this must not lead to areas of excessive pressure that will aggravate circulatory conditions. The prosthetist must take into account the sensitivity of the stump tissue and the varying stump volume. Only a socket with complete contact is suitable to avoid local stump oedemas and their unpleasant, often very serious consequences. The prosthesis must be light in weight but of sturdy construction and even infirm patients should be able to put on and take off the artificial leg without outside assistance, just to mention a few points. Even after these considerations there remains a limited number of patients who are better off without a prosthesis. In these cases rehabilitation aids, mainly the wheel chair, often solve the problem of independence surprisingly well. We always face the enormous task of instructing comprehensively all persons taking part in the rehabilitation of the vascular patient with an amputation and making sure that our orders are being followed.

The orthopaedic surgeon is in charge of carrying through and co-ordinating a case, which goes far beyond his professional specialty. Whether he likes it or not, he must encourage the co-operation of the family doctor, the internist, the psychiatrist, the dermatologist, the state physician, the social worker, and others. What appears as a matter-of-course to the specialist is by no means a matter-of-course to his

colleagues who are faced with these problems only occasionally and are therefore not able to recognise them in their full range. Co-operation is essential. It is one of our most important tasks to venture beyond the four walls of our professional specialty and help our vascular patients obtain optimal medical care where the orthopaedic surgeon is no longer solely responsible.