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FOLLOW-UP OF LOWER-LIMB AMPUTEES

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The object of the present follow-up study was to elucidate the causes of lower-extremity amputation and to investigate how often the amputees are free of pain and able to walk.

MATERIAL

During the period 1967–71 a total of 121 above-the-knee and below-the-knee amputations were carried out in the Surgical Department E of the Århus Municipal Hospital. In 12 of these cases bilateral amputation was performed, so that the number of patients was 109.

The cause of the amputation was arteriosclerosis in 74 patients, co-existing in 31 with diabetes mellitus. In 18 patients the amputation was done because of emboli. All the latter patients had previously undergone operation in the Department of Vascular Surgery and were transferred to us for amputation. In practically all the remaining 17 cases the amputations were done because of trauma.

The patients attended follow-up in 1972.

METHOD

The chief principle in selecting the amputation level was to perform primarily below-the-knee amputation on patients having a normal skin on the middle of the lower leg. If cutaneous changes were present or if no bleeding occurred from skin edges or muscles during the operation, the amputation was done above the knee. Old and frail persons, who should preferably not be subjected to operation more than once and whose prospects of being able to walk again were meagre, were treated by primary above-the-knee amputation. If a stump failed to heal, local revisions and non-weightbearing with bed rest were used. If this failed, and if the necrosis of the stump progressed, re-amputation was done above the knee.

In a number of cases preoperative determination of blood circulation in the anterior tibialis muscle was carried out, using $Xenon^{133}$.

The surgical technique was anterior and posterior skin-muscle flap with myoplasty. Postoperatively, the patients were fitted with an elastic stump bandage and were made to do joint-mobilizing and contracture-prophylactic as well as generally

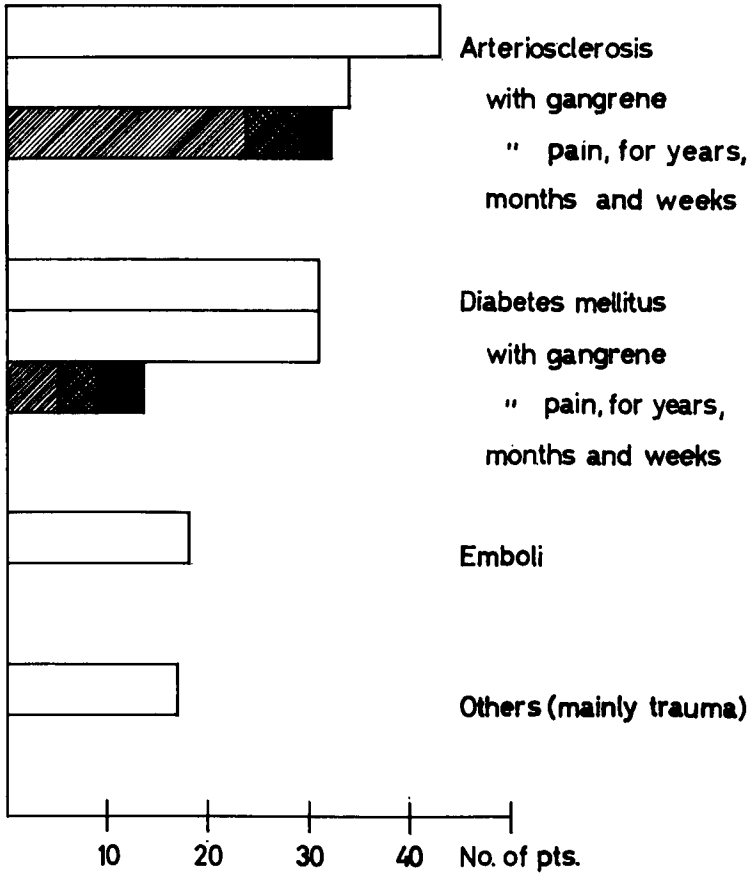

Figure 1. Cause of amputation and preoperative occurrence of gangrene and pain.

rehabilitating exercises, but weightbearing was not allowed. As soon as the stump had healed and was of a suitable shape, measurements were made for a prosthesis, if the general condition permitted this.

RESULTS

The causes of amputation as well as the preoperative occurrence of gangrene and pain may be seen from Figure 1.

Figure 2 gives the postoperative mortality.

Among the patients who survived the first postoperative weeks a total of 63 amputations were in the group arteriosclerosis-diabetes. Fourteen of these amputations were above and 49 below the knee. In 3 instances reoperation was done on the lower leg at a somewhat higher

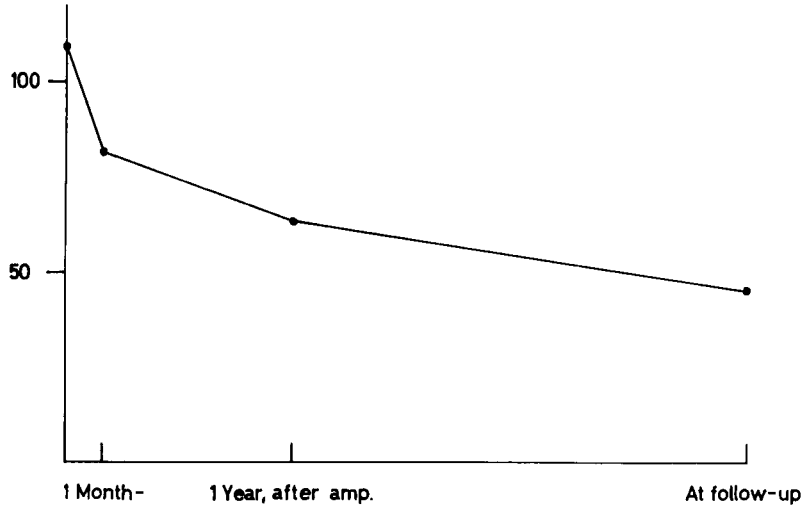

Figure 2. Number of survivors.

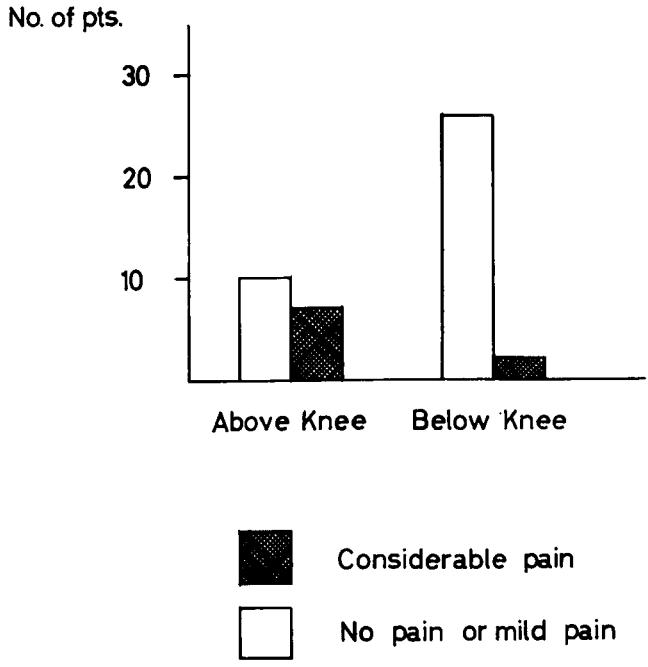

Figure 3. Pain.

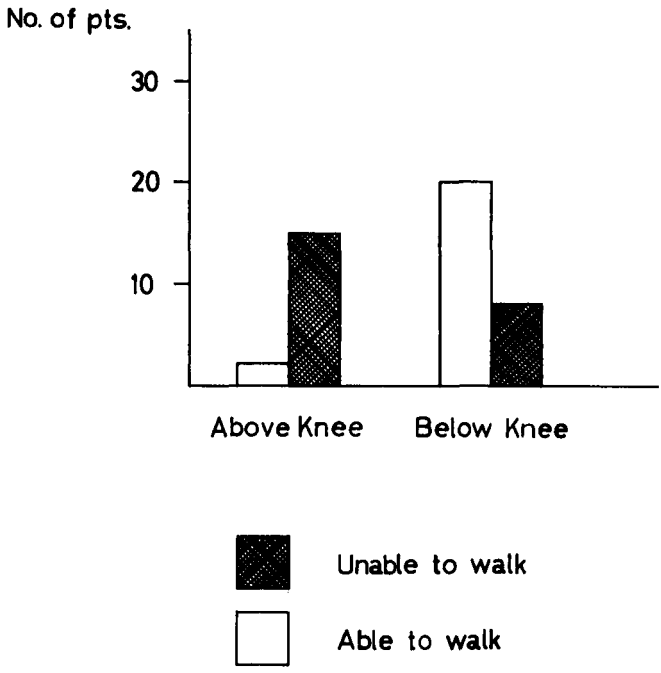

Figure 4. Walking ability with prosthesis.

level, whereas in 9 cases secondary amputation, this time above the knee, was done because of absence of wound healing. Thus, in 40 cases healing of a lower-leg stump and in 23 cases healing of a femoral stump was obtained.

In the embolic group 13 amputations were done, all above the knee. The remaining 14 amputations were carried out, in practically all cases, because of trauma. Five were above and 9 below the knee. No re-amputations were done in this group.

Blood circulation in the anterior tibialis muscle, assessed by the Xenon^{133} method, showed an average circulation of 16 ml/100 g muscle in the patients who later underwent above-the-knee amputation and of 24 ml in those who later underwent below-the-knee amputation. However, individual differences were marked.

Out of the 45 patients alive at follow-up 23 reported that they were free of pain, whereas 13 had fairly mild pain and 9 considerable pain. In nearly all cases there was a question of phantom pain. The relation of the pain to the amputation level may be seen from Figure 3.

Among the patients alive at follow-up 22 moved about freely using

the prosthesis, 7 could walk around a bit indoors, whereas 16 were confined to a wheelchair or bed. The relation of walking rehabilitation to the amputation level is apparent from Figure 4.

DISCUSSION

Most analyses of amputees have shown almost equal numbers of arteriosclerotics and diabetics, but during recent years the group of arteriosclerotics has grown larger (Tibell 1971). In the present study too the majority were arteriosclerotics. The immediate cause of amputation was gangrene of the foot in most of the arteriosclerotics and in all the diabetics. Preoperative pain was more common and had been more long-lasting in the arteriosclerotic than in the diabetic patients.

Amputation is an operation which carries a high mortality (Lindholm 1964, Engsig-Krarup 1963, Lindahl & Bolund 1969). In the present material the postoperative mortality was 25 per cent, and at follow-up more than half the patients had died. The mortality was affected by the relatively large number of patients with embolism who were transferred for amputation from the Department of Vascular Surgery. These patients had the highest mortality and were from a larger geographic area than the others. The higher mortality among patients with embolism is also apparent from Tibell's study (1971).

According to the literature phantom pain is present in about half the patients (Lunn 1948, Cronholm 1951), more often in those who have had above-the-knee amputation. Freedom from pain must be considered of more importance than walking rehabilitation, as an old patient without pain can lead a tolerable life in a wheelchair. In the present material half the patients had pain, but the pain was severe in only one-fifth. Severe pain was more common among patients who had had above-the-knee amputation than in those amputated below the knee. The difference is significant. Severe pain is taken to mean pain unchanged or aggravated since the operation and present almost constantly. In some cases it was reported to be worse than the ischaemic pain from which the patient had suffered prior to the operation. Milder pain was periodical and had been decreasing since the operation.

Most analyses have shown that only about half the elderly amputees succeed in learning to walk with a prosthesis (Bertelsen & Rønn 1960, Block & Whitehouse 1963, Hansson 1964, Vankka 1967), but during recent years better results have been obtained (Burgess et al. 1971). In the present material a full walking ability was attained by half the

patients, i.e. these patients moved about freely out of doors, indoors, and on stairs. One-sixth were able to walk about a bit indoors, as a rule with two sticks, whereas the remaining third were confined to a wheelchair. There was a significantly larger number obtaining full walking ability among the below-the-knee than among the above-the-knee amputees.

To afford freedom from pain as well as a walking ability, then, healing of a below-the-knee stump is of decisive importance. In the literature below-the-knee amputations are stated to make up less than half of the lower-extremity amputations (Jansen 1960, Dale & Jacobs 1962, Hansson 1964, Kelly & Jones 1970, Kolind-Sørensen 1970), but by the use of a special technique Burgess (1968, 1971) succeeded in obtaining healing of the below-the-knee stump in three-quarters. Secondary amputation was carried out in less than 10 per cent of Hansson's (1964) and Burgess et al.'s (1971) cases.

In the present material healing of a below-the-knee stump was obtained in 63 per cent of the arteriosclerotic-diabetic group—after a secondary above-the-knee amputation had been carried out in 14 per cent.

Determination of blood circulation in the anterior tibialis muscle by radioactive Xenon afforded no guidance as to the amputation level.

CONCLUSION

Arteriosclerotic patients had more often than diabetic patients a history of long-lasting pain prior to the amputation. The immediate cause of the amputation was gangrene in all the diabetics and in three-quarters of the arteriosclerotics.

The mortality was high, and only half the patients were surviving at follow-up 1–5 years after the operation.

Two-thirds of the survivors were able to walk with a prosthesis, but only half of them could be said to have attained a full walking ability. The walking ability was far better among the below-the-knee than among the above-the-knee amputees, and this is in accordance with previous findings.

Freedom from pain was found in half the patients, but four-fifths were free of severe pain. Freedom from pain was also obtained more commonly after below-the-knee amputation. True, this has also been demonstrated previously, but is perhaps less well-known.

Therefore, below-the-knee amputation, when possible, is preferable

also in old and frail persons, even though the prospects of attaining walking ability are slight.

Among the vascular amputees (except in the embolic patients) healing of a below-the-knee stump was obtained in three-fifths. Secondary above-the-knee amputation had been carried out in one-seventh.

SUMMARY

A follow-up of 109 patients who underwent lower-extremity amputation at the Århus Municipal Hospital during the period 1967–71 is reported.

Arteriosclerotic patients had more often than diabetic patients a history of long-lasting pain prior to the operation.

There was a high mortality, postoperatively as well as in the subsequent years.

Among the patients with arteriosclerosis and diabetes 63 per cent obtained healing of a below-the-knee stump.

Of the survivors about one-fifth had considerable pain and about half were unable to walk satisfactorily with a prosthesis.

The above-the-knee amputees were significantly worse off than the below-the-knee amputees in both respects.

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