

The value of revision surgery after initial amputation of an upper or lower limb

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Abstract

The value of revision surgery when carried out more than six weeks after initial amputation of the upper or lower limb was assessed. When performed for stump and/or phantom limb pain alone, only 33/95 (35%) obtained satisfactory results after one revision; 25/95 (26%) of the patients required four or more surgical procedures without relief of pain. However, when carried out for local specific pathology, the results of surgical revision were 100% successful, even if the procedure had to be repeated once in 15% (28/189) of this group of patients. Transcutaneous nerve stimulation appeared to offer no long lasting relief of pain following amputation surgery.

Introduction

Revision surgery after initial amputation of an upper or lower limb is often necessary. The revision rate at the authors' Amputee Clinic is 25% for all levels of upper and lower limb amputees. Fifty per cent were revised at the same level and 50% to higher levels. Indications for such a procedure include:

1. Stump pain and/or phantom limb pain.
2. Late infection of the stump.
3. Symptomatic bone spurs.
4. Revision of a skin graft used primarily to conserve stump length.
5. Improvement of the stump for prosthetic fitting.

It is the purpose of this review to assess the results of revision surgery performed for the above indications at least six weeks after the

initial amputation of an upper or lower limb (excluding partial hand and partial foot amputations, which have previously been reported from this clinic. Harris and Silverstein, 1964; Harris and Houston, 1967; Lily, 1974).

Patients and methods

The case histories of patients who had revision surgery performed at least six weeks after the initial amputation were reviewed from the files of the Amputee Clinic of the Workers' Compensation Board of Ontario. The timing of six weeks was chosen to exclude minor debridement and stump closure as surgical "revision" procedures.

All patients with peripheral vascular disease (either pre-existing or developing after accident) were excluded from this study.

Revision surgery for pain in the absence of local tissue pathology included excision of neuromata (56%) or proximal amputation (44%). Either of these two procedures was often combined with proximal neurectomy and the nerve was buried into adjacent muscle or soft tissue away from the suture line.

When carried out for local specific pathology, surgical treatment included management of late infection, removal of bone spurs, adjustment of skin and soft tissues after skin grafts or provision of a better stump for prosthetic fitting.

After chart review, postal questionnaire, telephone interview and where necessary, personal examination, there was sufficient information to include 284 patients in the study.

The average age of the patients at the time of accident was 38 years with a range of 17 to 64 years. The period of follow-up after surgical treatment varied from 1-21 years with a mean of 8 years.

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Results

Success after revision surgery was defined as the relief of the postoperative problem. Failure was defined as persistence of the preoperative problem often requiring one or more further surgical procedures on the stump.

The results (Table 1) indicate that when revision surgery was carried out for pain alone, in the absence of local specific pathology, only 33/95 (35%) of patients obtained satisfactory relief of pain after the first revision operation. In this group with chronic pain, revision surgery included excision of the neuroma, proximal neurectomy and/or proximal amputation. Often during the prolonged treatment, all of these procedures had been attempted on one or more occasions.

A total of 239 procedures had been carried out on 95 patients for stump and/or phantom limb pain alone at the time of review and 25 of these patients had four or more revision procedures with little ultimate benefit.

However, when revision surgery was carried out for the treatment of chronic infection, removal of bone spurs, revision of skin grafts or to provide a better stump for prosthetic fitting, the results were successful in 161/189 (85%) of patients after the first revision and 100% successful after a second revision procedure.

Regarding the site of amputation and revisions, $\frac{2}{3}$ of patients had lower limb amputations and $\frac{1}{3}$ had upper limb amputations. There appeared to be no difference between reasons for revisions or results of revisions in these two groups.

Approximately three of four amputees were limb wearers, but there were problems with recurrent skin breakdowns and problems of pain. There were more problems in lower limb amputations than upper limb because of weight-

bearing and this prevented full use of a prosthesis. (Millstein et al, 1985).

Discussion

In this series, local revision surgery was unsuccessful in relieving stump and/or phantom limb pain in the absence of local specific pathology.

Other authors have also found stump revision for pain to be unsuccessful. Leriche (1939) emphatically states reamputation must be avoided, even if the stump is not very satisfactory. Mitchell (1965) stated that he did not reamputate any of his patients, but that he certainly was aware of other people who had reamputated because of pain and had not been rewarded in their efforts. Sherman et al (1980) found non-surgical treatment methods were more successful than surgical treatment. Sherman et al (1984) reported that 52% of 27 amputees had only minor temporary improvement following stump revision.

Following loss of a limb, most amputees will suffer stump and/or phantom limb pain for a varying period of time. At this Amputee Clinic, 68% of amputees reported stump and phantom limb pain with a 14 year follow-up. Millstein et al (1985) and Sherman et al (1984) found phantom limb pain was as high as 78% and correlated with stump pain.

The treatment of pain following loss of a limb is difficult to assess, because there are many aetiological factors (Table 2) and there is no reliable way to measure precisely the intensity of pain.

In the authors' Amputee Clinic the standard measures are employed, such as analgesics, biofeedback, acupuncture, and on occasion nerve blocks and neurosurgical procedures to treat the established pain syndrome following amputation.

Table 1. Number of revisions performed on 284 patients

Number of revisions	Pain	Chronic infection	Bone spurs	Revisions of skin graft	Poor stump modified for prosthesis
1	33	58	13	50	40
2	18	18		7	3
3	19				
4	15				
>5	10				
Number of patients Total=284	95	76	13	57	43

Table 2. Causes of pain following loss of limb

Painful phantom limb
 Reflex sympathetic dystrophy (causalgia)
 Referred pain, e.g. neck, back.
 Psychogenic pain

Intrinsic stump problems

Bone spur or fracture
 Ischaemia
 Infection
 Bursitis
 Neuroma
 Skin problems
 Recurrent tumour

Extrinsic prosthetic problems

Volume changes of stump
 Malalignment
 Inlet impingement of prosthesis

In retrospect, many of these patients exhibit features suggestive of a chronic pain syndrome (Table 3). Psychological assessment prior to surgery cannot be over-emphasized, but it should be stressed that this particular group of patients often deny psychosocial factors and are resistant to standard psychotherapy.

The development of a neuroma is a natural response to section of a nerve; it is not surprising that excision of the neuroma, proximal neurectomy or proximal amputation would only be successful in relieving pain in one of three patients when no local specific pathology was identified (Table 1). Leriche (1939) stated nerves were not meant to be divided and the effectiveness of neurosurgical techniques for phantom limb pain have been disappointing (Sunderland and Kelly, 1948).

The fact that 25/95 (26%) of patients required four or more revision procedures would indicate a degree of "Mania Operativa" (Hunter and Kennard, 1982) as a result of chronic pain syndrome.

Since all these patients sustained their amputation as a result of a work related accident, they were covered by the Ontario Workers' Compensation Board. Under the Workers' Compensation Board Act, patients currently receive benefits for medical expenses and loss of wages (75% to 90% of their earnings up to a maximum of \$32,100.00). Upon completion of treatment, and when the patient is ready to return to work, patients are awarded a permanent disability pension based on their level of amputation and their earnings. Under the Act, patients who accept W.C.B. compensation benefits relinquish the right to litigation and the majority of patients do not

Table 3. Features of chronic pain syndrome

(Spengler et al, 1980)

1. Symptoms lasting longer than six months and which affect the patient's life style.
2. Few if any objective findings.
3. Addiction to medication or alcohol.
4. Insomnia.
5. Depression and hostility.
6. Manipulative behaviour.
7. Suffering inappropriate to somatic problems.
8. Failure of standard medical and surgical methods to relieve pain.
9. Denial of psychosocial factors.
10. Minimally productive with no realistic plan for future.
11. Possible secondary gain factors.

pursue litigation except under unusual circumstances.

Repeated surgery may be due to a simple desire not to work, coupled with secondary gain, as patients generally receive benefits almost equal to their salaries while on medical treatment (Hunter and Kennard, 1982). It should be noted, however, that permanent disability pensions are relatively small by today's standards, even for proximal limb amputation and there is no doubt that the patient would be better off financially returning to the work force.

It is difficult to understand why operations were performed without any specific reason in the stump. Often the reason for revision was not evident and difficult to determine in a retrospective study. Baumgartner and Riniker (1981) reported operating on stumps which externally presented a normal aspect and found deep scars and thus suggested the amputee has a chance for relief from his pain by operative revision, even if an exact diagnosis cannot be established preoperatively.

The authors' have found that revision surgery for pain when no specific stump pathology can be determined, is usually unsuccessful in relieving the amputee's pain problem.

The results were successful when objective findings necessitated revision surgery, even if the operation had to be repeated once in 28/189 (15%) patients (Table 1).

Should non-operative treatment be resorted to in the hope of relieving pain following amputation? In a separate review, a group of 35 patients, who had not responded to standard methods of treatment for stump and/or phantom limb pain were given a transcutaneous nerve stimulator (T.N.S. Neuromod) if preliminary

tests indicated relief of symptoms. Most patients adjusted the use of their machine to suit individual requirements.

At one year follow-up, 15/35 (43%) reported improvement in symptoms, but only six months later, only 4/35 (11%) continued to have relief of pain. These results are compatible with other T.N.S. studies that indicate an initial success of 60%, but with a marked tendency to decrease with time to about 30% or less. (Erikson et al, 1979; Myerson, 1983).

Eleven out of 35 (31%) patients were found to have a significant psychological handicap, but there did not appear to be any correlation between the result of the psychological testing (including the Minnesota Multiphasic Personality Inventory) and the success or failure of T.N.S.

Although the effectiveness of T.N.S. is not impressive, it is a non-invasive treatment, easy to use and has no side effects and may help some patients (Miles and Lipton, 1978; Gessler and Struppler, 1981; Winnem and Amundsen, 1982). The reduction of pain from T.N.S. appears to be temporary at best. Any treatment technique that ignores the multifactorial influences on chronic pain is unlikely to lead to a satisfactory result. Sherman et al (1984) when assessing the effectiveness of treatment for chronic phantom and stump pain found that only 1% reported lasting benefits from any of a multitude of treatments attempted.

Until the mechanism of pain following amputation is better understood, the authors strongly advise against repeated local revision surgery in the hope of relieving stump and/or phantom limb pain.

When local specific pathological findings were present, however, surgical treatment was successful in relieving the patients' problems and should allow early prosthetic fitting and rehabilitation.

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