

Save that arm: a study of problems in the remaining arm of unilateral upper limb amputees

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Abstract

A study has been made by questionnaire, personal examination and telephone interview of unilateral upper limb amputees seen at the Prince Henry Hospital, Australia between 1994 and 1997. There were 60 questionnaires posted. Replies were received from 46. Problems were noted in the remaining arm of 23 (50%). The respondents' problems not only consisted of overuse symptoms, but also of an exacerbation of pre-existing arthritis and injury due to trauma to the remaining arm during the accident. Case histories are given in 3 typical cases. Treating professionals are warned about the hazards that one arm amputations present to the remaining arm.

Introduction

The loss of one arm is followed by the transfer of that arm's function to the other arm. The increased workload for the remaining arm may, at some time in the person's life, produce minor aches and pains or the more serious conditions of impingement in the shoulder, tenosynovitis in the abductor pollicis longus tendon, epicondylitis or other overuse syndromes.

A literature survey has not revealed any published articles on arm conditions in the remaining arm of a unilateral amputee. As there have been amputees attending the Prince Henry Hospital, Australia with conditions in the remaining arm, a simple study has been performed to note the extent of these conditions. Overuse injuries of workers with both arms have

had extensive worldwide coverage (Cullen and Molloy, 1994; Hales and Bernard, 1996; Novak and Mackinnon, 1997; Robert *et al.*, 1995; Von Schroeder and Bolte, 1996). Conditions such as tenosynovitis, epicondylitis, carpal tunnel syndrome, shoulder impingement and diffuse repetition overuse injuries are the syndromes precipitated. The following study illustrates how common such conditions are in unilateral upper limb amputees.

Method

All unilateral upper limb amputees, who were treated at the Prince Henry Hospital between January 1994 and January 1997, were sent a questionnaire asking if they had any problems with their remaining arm; if they used a prosthesis; and if they worked. Repeat questionnaires were sent to those who failed to reply. Where possible, those who replied and had arm problems, were given an appointment to be seen. Those, who could not be reviewed, were questioned by telephone. Where contact could not be made by telephone, their replies were classified into "unspecified arm pain".

Results

Questionnaires were sent to 60 upper limb amputees. Replies were received from 46 (76%). Of the 13 who did not reply, 1 had died and 6 were returned "addressee unknown". Of those who responded, the sex distribution was 5 females and 41 males. Amputation levels of all the respondents are shown in Table 1.

Age at amputation ranged from 6 to 71 years. The mean age was 32 years at the time of amputation. At the time the questionnaire was sent out, the ages ranged from 13 to 84 years. The mean age was 38 years. Prostheses were

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Table 1. Prince Henry Hospital upper limb amputees

Amputation level	No. of respondents	No. of amputees with pain in remaining arm
Partial hand	9	1
Trans-carpal	1	1
Wrist disarticulation	4	2
Trans-radial	13	8
Trans-humeral	15	8
Shoulder disarticulation	2	1
Forequarter amputation	2	2
Total	46	23

worn by 29 (63%) of these people. Of the 26 who were working, 19 (73%) wore a prosthesis. In the unemployed, prosthetic use was more evenly divided, with 10 wearing a prosthesis and 11 not wearing a prosthesis.

Problems with the remaining arm were noted by 23 (50%) of the respondents. Amputation levels of these people are also shown in Table 1. The people who had problems with their arm, are listed in Table 2. Some people had several problems.

The time from amputation until the first onset of symptoms varied widely, as did the response to treatment. Some had symptoms and signs soon after the amputation. With others, the onset of symptoms took years. The following case reports illustrate some of the problems these patients have had.

Case report 1

Mr N. B. was 24 when he underwent a

traumatic trans-humeral amputation in 1995 on his way home from work. He returned to his job as an electrician in an electricity plant, after 6 months, where he carried out his usual duties wearing a prosthesis. He had no problems with his remaining arm until just prior to Christmas 1996. At that time he had a flat car tyre on his way to an emergency at work. He had to undo stiff nuts on his car tyre with one arm. Then at work, he also had to undo some stiff nuts on bolts, following which he noted pain along the abductor pollicis longus tendons and flexor tendons of his wrist. He then found that repetitive nut and bolt work aggravated his symptoms. He presented at the Prince Henry Hospital after 1 month with classical tenosynovitis. This was treated with splinting, **local physiotherapy techniques and non-steroidal anti-inflammatories**. He was placed off work for three months. He then returned to part-time work on selected duties.

Table 2. Problems noted with remaining arm

Diagnosis	No.	WORKING		NOT WORKING	
			No. wearing prosthesis		No. wearing prosthesis
Epicondylitis	5	2	1	3	1
Shoulder Impingement	3	—	—	3	—
Tenosynovitis	3	3	2	—	—
Osteoarthritis	3	—	—	3	2
RSI-type symptoms	3	1	—	2	—
Carpal Tunnel Syndrome	1	1	1	—	—
Trigger finger	1	—	—	1	1
Non-specific problems	4	3	2	1	1
Arm injury from accident	3	3	3	—	—
Total	26	13	9	13	5

Plans were made to change to a voice-activated computer instead of a keyboard, but his job appeared to depend on a return to normal duties. However, by that time his tenosynovitis had resolved itself and he returned to work on normal duties. He is now undergoing part-time retraining to do Human Resource Management. The tenosynovitis does not trouble him now, but he now has symptoms and signs of epicondylitis.

Case report 2

Other people continue to suffer problems over a prolonged period. The following case report illustrates the distribution and severity of 1 patient's problems.

Mr G. W. was 40 years old when his left hand was crushed in a press in 1989. He underwent a left trans-radial amputation. He was right-hand dominant. He was fitted with a body-powered prostheses and returned to his former work as a factory foreman. He was an extremely good worker and in the next 2 years did extensive house renovations, wearing out his prostheses in the process. His medico-legal claim, except for medical costs, prosthetic costs and wages, was settled in 1992.

In 1993 he reported burning discomfort in the right first web space, forearm and shoulder. He had signs of impingement in his right shoulder which was treated with physiotherapy and steroid injections. The shoulder problems were exacerbated by the harness of his prosthesis. He also developed epicondylitis and a right carpal tunnel syndrome. He underwent a right carpal tunnel release in 1995. His prosthesis was changed to a myoelectric prosthesis in 1995. He had not wished for a myoelectric prosthesis formerly. His shoulder problems diminished for several years. When reviewed in 1998, Mr. G. W. had a further exacerbation of the supraspinatus tendonitis in his right shoulder. He had ceased using his prosthesis because of a recurrence of sensitivity in his stump of his amputated arm. The static forearm contraction required to activate the electrodes precipitated pain. He requested a further body powered prosthesis. He is now 59 and his problems with both arms threaten his employability.

Case report 3

Even if an amputee is not working, symptoms in the remaining arm may limit lifestyle as shown in the following report.

Mr K. H. underwent a traumatic short left trans-humeral amputation at the age of 17 in Syria. He was fitted with cosmetic prostheses in Germany. He studied in the US. He has not been employed since migrating to Australia 21 years after his amputation and 4 years prior to the onset of the right arm pain. This arm pain was along the right epicondyle and the thenar abductor tendon. He was noted to have epicondylitis and tenosynovitis of the abductor pollicis and longus tendon. He was advised to reduce his heavy lifting and writing. He can control his arm pain by this lifestyle adjustment, but is limited in his physical activity.

Discussion

It is surprising that no one has formally described overuse injuries in the remaining arm of upper limb amputees. The above study has noted that 50% of upper limb amputee respondents in this study had overuse problems of varying severity and type. These problems are found throughout the non-amputee population, but are not so prevalent. It was noted by Cullin and Molloy (1994) that people with tasks which require repetitive hand movement are at increased risk of carpal tunnel syndrome. It was also noted by Hales and Bernard (1996) that long-term exposure to excessive loading will result in soft tissue damage depending on duration, frequency and load. How much more repetitive work is done by the one-armed person! A prosthesis is at best a tool aiding activities. It is not suitable for the fine sensory work done by the remaining arm. We note the damage done to shoulders, elbows and wrists of the champion sports person with two arms repetitively playing tennis, cricket or golf. These are people in superb physical condition whose bodies respond to overuse with injuries similar to the amputee population.

The distribution of the injuries, shoulder impingement, epicondylitis, tenosynovitis and diffuse aching illustrate that the stress may fall on different parts of the body depending on the physical stress.

Many of this group of patients unfortunately tried to carry on life as though no injury had occurred to their physical detriment. The rehabilitation implications of this should be noted by those involved in the care of the upper limb amputee. These people should be advised that they are at significant risk of damage to their

remaining arm. They are not able to perform at the same level as formerly. This has medico-legal implications. The former manual worker may be able to continue in the same job for some years, but that person has a 50% chance of developing problems in the remaining arm.

The problems may continue with a carpal tunnel syndrome being followed with shoulder impingement so that, in the long-term, the person is no longer employable.

Counselling about the risk of overuse injuries should certainly be undertaken. This will help amputees to recognise these problems when they do occur and seek immediate medical advice. Until now there has been little research, indicating the prevalence of problems in the remaining arm and therefore, it is suspected that therapeutic staff have not been advising amputees of the potential problems. People may need to prove to themselves that they are still competent with only one arm and so do themselves further damage. It may also be that, despite counselling, amputees are aware that unless they resume their pre-injury duties they are unlikely to be employable in the short and long-term.

Once the person is symptomatic, then conservative management is most desirable. The only surgical intervention in this study was that of the carpal tunnel release in Mr. G. W. In his review of the patterns of a carpal tunnel syndrome and cumulative trauma, Dittmars (1993) notes that symptoms can usually be controlled without surgical intervention. Occupational therapy advice regarding work situations and specific interventions with employers for job modification may well be required. Vocational retraining to assist the amputee to change occupations is vital, especially for those who were previously doing manual work. Local physiotherapy techniques for inflamed tendons and shoulders, as well as

medical intervention with steroid injections, have also been useful. In the long-term, the person with an overuse injury of any type in the remaining arm has to come to terms with the problem and avoid those activities which precipitate symptoms. Neither lack of employment nor presence of prosthetic use is protective of the remaining arm.

Conclusion

It is a sad fact that in half of the amputees in this study, problems of varying severity were noted in the remaining arm. The more proximal the amputation, the more likely the person is to suffer problems in the remaining arm. Prosthetic use and lack of employment are not protective of the remaining arm.

The amputee needs to pace work and leisure activities so that these problems do not occur. Therapists need to warn their patients of the hazards they face, so that problems can be avoided. The patient with a legal claim, should have this factored in to protect them. With advice, the risk of these problems may diminish.

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