COMPLETE BRACHIAL PLEXUS LESIONS

A TEN-YEAR FOLLOW-UP OF TWENTY CASES

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Twenty patients with complete brachial plexus lesions were reviewed approximately nine and a half years after injury. Thirteen were amputees and seven had received no surgical treatment. Amputation did not alleviate pain and a prosthesis was frequently of no greater use to the patient than the useless limb it replaced: only two of the thirteen amputees were true prosthetic users and they both had dominant limb involvement, the rest adapting easily to being one-handed.

Initial treatment should therefore be conservative, with intensive rehabilitation and retraining. It is recommended that amputation should not be considered until a year after injury and only if the flail limb causes repulsion, prevents sporting activities or if the patient has difficulty in converting to the non-dominant limb. In no instance should amputation be done for relief of pain.

Injuries to the brachial plexus occur particularly in young men from motor cycle accidents. Invariably they are traction injuries and are the result of the head being forced laterally at the moment of impact (Fletcher 1969). These lesions are frequently associated with other injuries, and in a few there is complete avulsion of the brachial plexus.

In initially complete lesions, certain factors such as pain, the presence of a Horner's syndrome, a pre-ganglionic lesion diagnosed by a histamine response (Bonney 1959) or by evidence of cervical meningoceles (Yeoman 1968), indicate a poor prognosis for recovery. Yeoman and Seddon (1961) stated that if the injury was perfused methodically the prognosis could be settled within eight weeks from the time of injury.

When it has been established that the lesion is complete, the choice of treatment is between three alternatives: to leave the limb alone, to undertake extensive surgical reconstruction of the flail anaesthetic arm as advocated by Hendry (1949), or to arthrodese the shoulder and amputate the limb as advised by Yeoman and Seddon in 1961.

Most of the patients who acquire the injuries are just starting their careers, are in semi-skilled manual work and ill-equipped for alternative employment (Bonney 1974; Leffert 1974).

In 1961 Yeoman and Seddon reviewed thirty-six patients under their care with complete brachial plexus lesions, seventeen of whom had had amputations, eight had had various reconstructive procedures and twelve had had no operation. They concluded that amputation with arthrodesis of the shoulder offered a better functional result than either reconstruction or no operation, and stated that "amputation and arthrodesis within two years is the best chance the patient has of remaining two-handed".

Wynn Parry in 1974 reviewed twenty-three patients with complete lesions of the brachial plexus and found twenty with pre-ganglionic lesions. Fourteen of these patients had had an amputation and arthrodesis within six months of their injury, ten of whom returned to work within one year.

An early amputation policy was continued at this hospital until about 1968 when it was realised that many of the humeral amputees were not fully using their prostheses. In addition, a stimulus to delaying amputation was provided by the eventual near-total recovery of a boy with a complete brachial plexus lesion of poor prognosis (Seddon 1972).

We therefore reviewed a group of patients who had sustained complete brachial plexus injuries just before and just after 1968. This enabled us to compare various treatments and provided an approximately ten-year follow-up. Twenty patients were interviewed, thirteen amputees were compared with seven patients who had received no surgical treatment, and average follow-up was nine and a half years.

RESULTS

We realise that in a small series such as this, statistical analyses would be misleading. Certain generalisations are, however, acceptable. On the whole, nine and a half years after injury most patients were satisfied with their lot; they had adjusted to their disability and there

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seemed little to choose between the methods of treatment. The amputees were glad they had had it off ("just a lump of meat", "got caught in the door"), and those with a flail limb were also content ("well it's part of me, isn't it?").

**Pain**—Pain is not alleviated by amputation. One patient in each group had no pain at all while others had pain of varying degrees and intensity. We were unable to confirm the view that there was an increase in pain during the prodromal phase of an intercurrent illness. Pain was however "worse" during an illness itself (or a hangover). The observation that pain could be helped by gripping the affected hand, whereas this was impossible after amputation, was not considered important by the amputee group. One non-amputee found that pain was relieved by applying a vibrator to his hand for thirty minutes each day.

**Prosthetic use versus limb dominance**—All thirteen amputees had been supplied with a prosthesis. 

*Dominant limb involvement* (seven patients)—Two used the claw hand and were true prosthetic users (Fig. 1), three used the cosmetic hand only, one the prosthesis but no hand ("I need the prosthesis for balance but the hand makes it too long"), and one with an additional above-knee amputation never wore the prosthesis ("too many bits and pieces to bother").

*Non-dominant limb involvement* (six patients)—Three never wore the prosthesis, two wore the cosmetic hand and one the limb with no hand.

It seems that greater emphasis should be placed on dominant or non-dominant limb involvement. Certainly there are reports of excellent users of the upper limb prosthesis (Fletcher 1969). Indeed those with bilateral involvement would hardly survive were they not so. We do feel, however, that being one-handed is so easy that there is no impetus to master a prosthesis except where the dominant limb is involved and the amputee is unable to convert to the non-dominant hand. Only two of our patients were true prosthesis users. This will be further investigated in a follow-up study, but at present we would recommend amputation for the very one-handed patient, where the dominant limb is involved.

**Sporting activities versus limb dominance**—None of the flail-limb patients or dominant-limb amputees played any sport. It is certainly difficult to play sport with a dangling, withered arm. If the dominant limb is involved it hardly matters whether it is flail or amputated. The non-dominant amputee group were more active. One was captain of a rugby football team, another water-skied and a third played squash. We would, therefore, recommend amputation in athletically inclined individuals with non-dominant limb involvement. They are unlikely to be true prosthetic users.

Swimming was not popular. It is naturally rather difficult to swim with a paralysed or amputated arm. A paralysed limb is probably easier to camouflage on a beach, but sunbathing was embarrassing to both groups.

**Humeral amputation versus forearm amputation**—Humeral amputation seems to be preferred by the prosthetists. We were, however, impressed that in two of our series a mid-forearm amputation and arthrodesis of the shoulder was very satisfactory ("something to lean on"; Fig. 2). A full range of passive elbow movement is
helpful. Prosthetic suspension may be easier and a shoulder strap avoided.

**Arthrodosis of the shoulder**—A paralysed deltoid muscle produces a cosmetically unattractive shoulder. Arthrodosis makes it even more prominent and bony, and rubbing by the prosthesis may become a problem; subluxation of the humeral head, however, is resolved. Arthrodosis is necessary in the true prosthetic users and as these are rare some caution is recommended here. One of our humeral amputees had not had an arthrodosis but was able to wear a cosmetic prosthesis quite satisfactorily.

**Prosthetic use versus time to amputation**—Yeoman and Seddon (1961) felt that really early amputation “before the patient has become one-handed” would improve prosthetic use. In spite of an active “early amputation policy” the earliest in this series was seven months. Most patients have other injuries which delay the necessary preliminary investigations and implementation of this policy. A patient probably becomes one-handed after a few weeks. We feel that three months in a shoulder spica, awaiting fusion, provides ample time to encourage conversion. We no longer feel that delay is necessarily a relevant factor.

**Spinal compensation** (postural scoliosis)—The seven non-amputees had a slight list (up to 2 inches) towards the paralysed side, presumably to compensate for weight loss following muscle wasting. No vertebral rotation had developed as they were all injured after skeletal maturity.

The thirteen amputees had similar lists without vertebral rotation and these seemed most pronounced in those who did not wear a prosthesis (Fig. 3). It was not a true scoliosis (Fig. 4). Wearers of a cosmetic prosthesis often stated that they wore the prosthesis for balance.

**Cervical spine**—Follow-up radiographs were obtained of the cervical spines. Apart from a compensatory postural scoliosis away from the involved limb, there was no evidence that a traumatic brachial plexus injury predisposes an individual to cervical spondylosis (at least up to ten years after injury).

**Occupation**—At the time of the interview, all patients were working. Where necessary, retraining had been undertaken. Time off work varied between periods of three months and ten years. Some patients had severe associated injuries and were in or attending hospital for lengthy periods. In spite of very active rehabilitation policies (Brewerton and Daniel 1971) the amputee and flail-limb groups were each off work for about two years. We recommend early return to work and adaption to a one-handed existence while awaiting events.

**Horner’s syndrome**—None recovered. Lid droop did not seem a particular problem. The pupil remained
small but loss of sweating on the face had seemingly recovered or at least was not noticed (Fig. 5).

**Psychological aspects**—Most patients admitted to an initial severe depression (one had even resorted to hard drugs) but this eventually passed and they were now reasonably content. Most had got married. Only one amputee regretted the operation (he had submitted to amputation to relieve pain, without success).

**CONCLUSION**

This survey confirmed our current policy. Once a diagnosis of a complete brachial plexus lesion of poor prognosis has been made, the patient should undergo intensive rehabilitation, and retraining if necessary, and return to work on the understanding that he is, and will in all probability remain, one-handed.

At about twelve months after injury when all concerned are of the opinion that no recovery is taking place, an amputation can be discussed. If there is dominant-limb involvement and the patient has had difficulty converting to the non-dominant limb, an amputation and prosthetic provision might offer some success. Amputation should be encouraged if sporting activity is being prevented by the useless limb: this is usually the non-dominant limb. Some patients may request amputation due to repulsion. In no instance should amputation be done for the relief of pain.

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**REFERENCES**


