Paraplegia

Surgical Rehabilitation of the Upper Limb in Tetraplegia

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This is a review of the main problems discussed at the third International Conference on the Surgical Rehabilitation of the Upper Limb in Tetraplegia, held in Göteborg 14-16 May 1988, and attended by 80 workers in the field from 13 countries.

On this occasion, no discussion was necessary on the special classification necessary for surgery. The system with special evaluation for each arm, developed on the remaining sensory and motor functions, discussed and adapted at the Conference in Giens in France 1984, was generally accepted, as the classification for this purpose was found not to be exact enough. One of the reasons was that the arms differed much in every second case. The 2-point discrimination test should be used for all sensory examinations in this field.

The restoration of active elbow extension in about 70% of all cases lacking it was now accepted as a great functional plus for tetraplegics in spite of the fact that only exceptionally could it be helpful for transfer. But it is most useful for driving, swimming, eating (especially in bed), taking objects down from above, hanging things up, etc. Control, not power, is essential. Several new technical modifications were presented, all in order to shorten post-surgical immobilisation and retraining. Generally the deltoid-triceps transfer was preferred instead of the biceps-triceps procedure, which was found to be less reliable. The latter technique, however, was preferred when the elbow was in considerable flexion contracture, especially the supination type (Ejeskär).

Many hand problems were discussed. Those dealing with almost purely technical details will not be discussed here.

Pringle showed by electromyography that there was independent control of the extensor carpi radialis longus and brevis muscles. In a paper by Phillips, Hughes and Law, it was shown that the physiological properties of muscles could change after transfer; fast muscles could go over to the slower type.

It was the general experience that when both hands could be operated on, different forms of grips were, when possible, advisable on the two sides in order to fulfil different functions, e.g. gripping of objects of different size.

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When using the extensor carpi radialis longus muscle as a transfer it is wise to test the brevis first. This is done by open surgery. If the brevis alone can lift 5 kg it is strong enough to maintain alone the necessary wrist extension. It must be remembered that after a longus transfer to finger flexors it becomes an antagonist to the brevis, therefore after a transfer, the brevis must at the same time counteract the longus and produce the necessary wrist extension. If, after surgery, the patient finds that the brevis is too weak, it is very disappointing (Moberg).

Cases were reported where spastic finger flexors were denervated and a non-spastic muscle transfer to the digits gave a much improved function, again showing that it is not arms or muscle groups, that are 'spastic', but individual muscles. Careful testing, often with blocking of individual muscles with repeated local anaesthetic is necessary.

Several speakers (Freehafer, House, etc.) preferred an active thumb flexor instead of a tenodesis, when possible, even if the tenodesis gave greater power. There were different opinions on the value of and possibilities for intrinsic reconstructions. The results might be of some use, but so far are not up to expectations.

Different opinions were given concerning the time for extensor reconstructions. Should they be performed before the flexor phase, or was it better to start with the last mentioned? Some workers said that even if it was more logical to start with the extensors, the patient did not feel that this operation had given him significant help and therefore he did not return for the very useful flexor phase.

Functional electrical stimulation of muscles were discussed from workers in Cleveland (Freehafer) and in Scotland (Phillips and Creasey), but it was found that, except for a few high level cases, it was not yet a practical alternative to surgery.

Several comprehensive reports were presented, built on long experience and a significant number of cases. From Palo-Alto and Denver, 10 years work with about 70 cases were reported (Ainsly, Hamlin and Hentz). Freehafer and collaborators in Cleveland had, after more than 20 years of work on many cases, definite points of view and so had Lamb from Edinburgh, who was also one of the early workers in this field. Moberg with coworkers in Göteborg (Dahllöf, Ejeskär) had now, after more than 17 years, a total of over 100 elbow extensors and over 200 hands operated on. House from Minneapolis also reported on his extensive experience. All these surgeons stated that experience should be built up slowly, and when this rule was followed the results were predictable.

A whole day was devoted to the examination of many patients operated on, some of them up to 17 years ago. The participants could observe about 20 different results of elbow and hand surgery, go around to examine in detail and speak to all the patients. They were given a scheme of the procedures performed, including the timetable. During this sunny day all examinations were performed outdoors on the lawn, the patients in wheelchairs, taking a lively part in the discussion and adding interesting points of view. One of the participating surgeons later wrote to me to say that during this discussion only a single voice questioned if the results obtained justified all the effort. This negative view was, however, in his words, not mine, 'overwhelmingly swamped by the very vocal and demonstrated approval of the surgery by the patients of the conference.'

The Sollerman test (Fig. 1) routinely used in Göteborg before, after, and between different phases of the surgery, was also demonstrated and discussed.

Figure 1 Parts of the standardised Sollermanns test. All the functions shown were not previously possible for the patients, they are obtained as a result of surgery, adding to the quality of life and independence, often also to paid employment. **A** Screwing on a large cover. **B** Screwing on a small nut. **C** Using a screwdriver.

The fourth Conference on the Surgical Rehabilitation of the Upper Limb in Tetraplegia is planned to take place in San Francisco 1991, coinciding with the meeting of the American Society for Surgery of the Hand.

The author has often been asked about the resources in surgery, in nursing and follow-up facilities, necessary to start this programme of rehabilitation. The answer is simple: when a surgeon is found who is willing to spend enough time and interest in order to lead the development, every centre already has enough resources. The development will always come slowly. The thinking in this field is quite special, very different from that in other aspects of hand surgery, which many unsuccessful trials have shown. This surgery can never be based on bringing in a surgeon as a technician every second week. One can get to know the procedures to be performed from books and papers but only personal experience, built up slowly, can tell which of the procedures will be best for the individual patient. One should start with patients likely to give good results and advance slowly. A single failure will be known by other patients much more than in other types of surgery and will be a serious drawback. That means that in the first year perhaps 4 to 5 cases will be operated on, in the second perhaps a few more. For such a

limited number every adequate centre has enough capacity. The surgeon has to build up the team and there is no better stimulus to hesitant patients than a few good results. They all know each other and can explain pros and cons much better than we can.

Figure 2 **A** With restored elbow extension and a key grip it is possible to sup soup. **B** The same surgery makes it possible to hang up clothing.

A few cases (Fig. 1, Fig. 2) will demonstrate results from the present status of this surgery. The literature in the field is already quite important and rapidly growing.*

No doubt these recent developments show that the time has come, when it is urgent to let all tetraplegic patients have access to a thorough evaluation of the possibilities for surgical help to a better quality of life. This should be an integral part of their care.

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* An almost complete list of the last 10 years' literature in the field can be obtained from the author.

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