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# ON THE TECHNIQUE AND POSSIBILITIES OF RECONSTRUCTIVE HAND SURGERY

BY

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The aim of reconstructive hand surgery is naturally to restore the function to injured hands. The basis of the reconstruction has been set out by Sterling Bunnell: that a hand with some form of sensation and prehension is better than any prothesis, while, on the other hand, one which cannot be made to grasp with feeling is not worth retaining, even if it looks like a hand. The same may be applied to a certain extent to the different parts of the hand.

Difficulties arise on three essential points, when it is a question of performing such reconstructions with positive results.

1. *The diagnosis.* It is important to ascertain in detail before begining treatment which tendons are not functioning, and why, whether movement is restricted by skin, ligament, joint, or tendon, etc. These problems of diagnosis will not be discussed here, but it should be pointed out that they are the biggest part of the problem for the hand surgeon, and it should be emphasised that the most frequent cause of poor results is incorrect or incomplete diagnosis, even by those with long experience.

2. *The operative technique.* This must be "atraumatic", which necessitates operating with delicate instruments in a completely bloodless field. Remains of scar tissue often impair the final result. The gliding surfaces cannot be treated with too great care, and every damage to their surface causes adhestions. Infection must be avoided, and this applies not

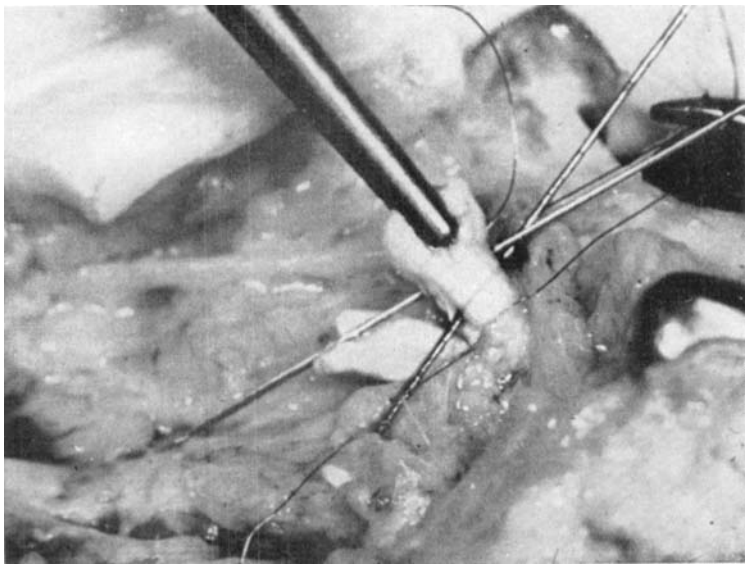

*Fig. 1.*
Tendon suture in progress. Note the need for a completely bloodless field, if a gliding function is to be obtained. Swabs must not be used. The only hold of the tendon which is allowed is by forceps on its tip, which is later cut off.

only to infection leading to suppuration, but also to the slighter degrees, which cause only temporary redness and swelling. Suppuration generally makes further reconstruction impossible for ever, while milder infection prevents the desired gliding movement. Even post-operative swelling of the tissues must be prevented by elastic compression bandages. (Demonstration of operative technique with coloured illustrations).

3. *The planning of a reconstruction.* This depends entirely upon what can and what cannot be done. Neither sensation nor nutrition can be transplanted, but both can be improved by excising scar tissue from round the nerves and vessels; this can often make an atrophic, cold, clammy, hand, warm and soft again. But it is not possible to replace sensation and nutrition which have been completely lost. This implies, at

least in our cold climate, that thumbs or fingers built up by transplantation have a very limited working value, if any.

However, the possibilites of reconstruction are considerable. Plastic skin methods are frequently used, and are particularly practicable in the hand. The correct incisions must be chosen, and planned so that secondary scar contractures, which are unfortunately still common, are avoided.

Suture of sensory nerves has been successfully performed as long as 5 or more years after complete division of a nerve. Suture of a digital nerve, provided it is surrounded by soft tissue, has a particularly favourable prognosis.

Bone operations, e.g. substitution of metacarpal bones, lengthening of thumb stumps and straightening crooked parts, are widely used. For joints, arthrodesis for instability (ligament injuries) is often important. In the metacarpo-phalangeal joints so-called capsulectomy, with resection of the collateral ligaments can restore mobility to joints which have stiffened in extension due to the all too common shortening of the ligaments here, and joint plastics also have possibilites (except in the thumb). Neither of these operations has yet appeared to be of value for the interphalangeal joints, where stability is essential for function.

As regards tendons and muscles the recent advances have been of great importance. The technique of free tendon transplantation has been so developed that its results are quite as reliable as those of other operations.

Similarly, transference of muscle power has now a much wider use than formerly, and a suitable functioning system can be built up by distributing the available muscle on the remaining mobile parts, e.g. the different operations for restoring opposition and adduction to the thumb, and substitution of extensors and flexors and the restoration of lost interosseous function (demonstration of results).

The results of skin reconstructions, arthroplastics and free tendon grafts are shown.

In multiple reconstructions the question is, when and in what order should the different defects be treated. Treatment

includes, of course, not only surgery but also splinting, etc. Nerves always have priority. A multiple reconstruction often begins first with the repair of the skin, which is followed by repair of the nerves. No joint can be made to function without sensation, and it is equally useless to attempt to reconstruct the muscular system with muscle and tendon until the joint to which its effect is transmitted has free passive mobility. While reconstruction of one system is in progress, the others must not be neglected, or it may happen that by the time the skin and nerve reconstructions are completed the condition of the joints and muscles makes a favourable final result impossible. This is particularly liable to happen when the treatment has been divided into e.g. plastic surgery for treatment of the skin, neuro-surgery for repair of the nerves, and, finally, orthopaedic surgery for treatment of the joints and muscular apparatus. The hand must be treated as a unit, and favourable results can only be obtained by those prepared to learn to work on all its tissues. (Demonstration of extensive reconstruction cases).

SUMMARY

Recent advances in the surgery of the hand have entirely changed the possibilities of restoring function to disabled hands.

The particular diagnostic and technical difficulties encountered in this work are stressed. The planning of hand reconstruction by treating skin, nerves, skeletal system and tendons is discussed, and results are demonstrated. Multiple reconstructions of a number of tissues of the hand can only be carried out successfully by a surgeon who can work on all the parts affected, and good results will not be obtained in hand surgery if the treatment is distributed amongst different specialists.

RESUME

Les progrès de la chirurgie de la main, réalisés au cours de ces dernières années, ont entraîné des vues toutes nouvelles sur les possibilités de rendre aux mains invalidisées leurs fonctions normales.

On souligne les difficultés particulières que l'on rencontre dans le domaine diagnostique et technique. Le programme du travail de reconstruction, en tenant compte des possibilités existantes par rapport à la peau, aux nerfs, au système osseux et aux tendons, est examiné et il est donné un exposé des résultats pouvant être obtenus. Les reconstructions multiples, portant sur la plus grande partie des tissus et des organes de la main, ne peuvent être exécutées avec chance de succès que par ceux travaillant avec tous les éléments de la main. C'est pourquoi, la chirurgie de la main ne peut pas être divisée en différentes spécialités si l'on veut obtenir des résultats favorables.

ZUSAMMENFASSUNG

Die Fortschritte der Handchirurgie in den letzten Jahren haben zu einer ganz neuen Beurteilung der Möglichkeiten geführt, invalid gewordenen Händen ihre Funktionstüchtigkeit wiederzugeben.

Die besonderen Schwierigkeiten, die auf diagnostischen und technischem Gebiete vorliegen, werden hervorgehoben. Die Projektierung der Rekonstruktionsarbeit hinsichtlich der bezüglich Haut, Nerven, Skelettsystem und Sehnen gegebenen Möglichkeiten wird besprochen und das Ergebnis demonstriert. Die multiplen Rekonstruktionen, die mehrere Gewebe und Organe der Hand umfassen, können mit Erfolg nur von jemandem ausgeführt werden, der sich für die Arbeit mit sämtlichen Elementen der Hand qualifiziert hat, und die handchirurgische Praxis lässt sich nicht in verschiedene Spezialitäten aufteilen, wenn das Ergebnis gut werden soll.

DISCUSSION

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