in a case of oligozoospermia the presence of a few fully active seminiferous tubules with complete inactivity in the remainder indicates little prospect of improvement, whereas if most tubules are found to be active, but at a reduced rate, treatment is well worth trying.

Only 128 biopsies have been performed at this laboratory to date, and if nothing has been achieved beyond the fact that 27 patients could confidently be advised to abandon treatment, I feel amply repaid by the considerable time and expense thus saved.

The subject of testicular histology and its correlation with semen findings and with the effects of treatment is likely to prove of the greatest importance. It is mentioned here only briefly, as material is being collected for a more detailed report.

Summary

A survey is made of the semen findings in 3,182 male partners of subfertile marriages, 125 of whom produced pregnancies subsequently. A separate group of 15 selected normally fertile men is described. Cases are quoted illustrating the need for adequate investigation of the male and for standardization of seminological technique.

I am indebted to Roche Products Ltd., Vitamins Ltd., Ciba Laboratories Ltd., and Organon Laboratories Ltd. for the generous free supply of their products for our experimental series.

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THUMB RECONSTRUCTION BY TRANSFER OF BIG TOE

BY

PATRICK CLARKSON, M.B., B.S., F.R.C.S.

*Casualty Surgeon, Guy's Hospital; Plastic Surgeon, Basingstoke
Plastic Centre and Royal Northern Hospital*

AND

RONALD FURLONG, M.B., B.S., F.R.C.S.

Orthopaedic Surgeon, St. Thomas's Hospital

This is an interim report on the treatment of a patient whose lost thumb we have restored by a method seldom used, and one not everywhere held in good repute. Nevertheless we believe the method has advantages which should be seriously considered in cases in which restoration of a missing thumb or finger is thought to be desirable.

Nicoladoni (1900) introduced the method in 1898, and he reported an instance of successful tendon function when a toe had been used to replace an injured thumb. Gueullette (1930) reported from the literature 12 instances of the transfer of the big toe and five of the use of the second toe: there were only three good results. Five of the toes necrosed and the remainder were stiff and useless (quoted by Bunnell, 1949). We can find no record of the use of the method in this country until 1947, when J. B. Cuthbert demonstrated a successful result in a man at the Plastic Centre at Rookdown House, Basingstoke. Cuthbert stressed the fact that selection of this method depends on the size of the big toe. A massive bulky toe is of little use because of its unpleasant appearance. Bunnell, in condemning the method, writes: "The second toe is too narrow and weak and the great toe is too gross." He

draws attention to the disappointing results up to 1930, but states that he has seen one case successfully operated on by H. Hoyle Campbell, in which suture of the digital nerves had been followed by some return of sensation but without stereognosis.

The possibilities of a successful nerve suture, restoring cutaneous sensibility, and the maintenance of motion in the transferred interphalangeal joint make the method attractive. A point of great importance with many of the younger patients, particularly girls, is the appearance of the new thumb. To look well, a repaired digit must have a nail of appropriate length and skin of colour and texture approaching the normal. Other methods of reconstruction will cater for length and, to some extent, skin texture, but only by digital transfer can a nail be restored.

Unless the new thumb is elegant and functional the patient will develop "cover-up" mechanisms and will avoid use of the laboriously produced digit, which is often of more satisfaction to the surgeon than either function or appearance can justify.

Case Report

The patient was a girl aged 9. When 2 years old she fell on to an electric fire and burnt both her hands. The burning was so severe that all the digits of the left hand were destroyed. The burns of the right hand were less severe, but there was sufficient scarring and ankylosis to impair function.

Fig. 1 shows the condition of her left hand at the age of 3, in 1942. The maximum loss is in the index finger and thumb, only the epiphyses of the proximal phalanges remaining. The middle finger is represented by most of the shaft of the proximal phalanx, and the fourth and fifth fingers have been similarly destroyed.

When the child was 3 Sir Harold Gillies replaced the palmar scar by a dermatome graft. Later he deepened the first cleft by a large dorsal rotation flap with a free skin graft to the secondary defect. These operations were completely successful.

Six years later it was clear that the child could not develop a proper pick-up mechanism between the thumb stump and any digit, as the thumb stump was too short to be opposed even to the longest finger stump. Choice of this method of repair was suggested by Sir Harold Gillies, in the light of Cuthbert's case, because of the age and sex of the patient, and was influenced by the fact that her big toes were neat and not bulky. The tactics of the surgical campaign were explained to the parents so far as was possible, also the discomfort to be borne and the fact that the method was one that had seldom been used. The foot on the same side was chosen, as the hand can comfortably lie on the foot on the proper axis with less strain. The digits of both hand and foot lie parallel, and zinc oxide strapping ensures adequate fixation. The technique of the operation is described below.

Subsequently the transposed toe was shortened, with obliteration of the volar groove. The cleft between the middle and index fingers was deepened to increase their active length and aid the development of a pick-up mechanism. The extensor tendons of the thumb and transposed hallux were joined. Figs. 2, 3, 4, 5, and 6 show the appearance and condition of the hand.

FIG. 1.—The hand at 3 years of age. Only the stump of the proximal phalanx of the thumb remains. The stumps of the medial four digits are bound to the palm. At this stage the complete palm was replaced by a dermatome graft and the digital stumps mobilized by Sir Harold Gillies.

FIG. 2.—The attachment. The hand is shown inserted underneath the dorsal flap. This photograph was taken a month after the attachment.

5), but is handicapped by the instability of the union between graft and host. Although stability is increasing it is almost certain that a bone graft will be necessary to produce union between the phalangeal fragments. At a very much later stage it may be practical to do a flexor tendon transplant or graft.

FIG. 3.—The big toe on the hand immediately after being detached from the foot. It is too long, too thick, and there is a deep volar groove.

ment of raw surfaces, such as may be expected to nourish the toe when its digital vessels are divided, a large dorsal flap is necessary. This must be hinged distally, and for safety is therefore best delayed. A circular flap (Fig. 7), about 8 cm. in diameter and leaving the proximal and distal pedicles of 4 cm. intact, was elevated and then sutured back

FIG. 4.—Photograph of the two hands eight months after the transfer, but before elongation of the third digit by deepening its webs.

Suture of the digital nerves has yet to be done, but an appreciation of deep pressure returned to the pulp three months after operation. After 10 months there was some appreciation of pin-prick all over the pulp. Appreciation of deep pressure, which is present everywhere in the pulp, may possibly be referred from the stump of the true thumb.

The patient already has the ability to pick up and hold fairly bulky objects, such as a pencil or a fork (Fig.

The colour of the new thumb is more pink than a normal one, but there is a brisk capillary response to pressure. The pulp of the toe has shrunk since transfer, and this reduction in overall bulk has improved the cosmetic appearance and produced a thumb nearer to normal size. Further thinning by surgery may yet be desirable, and is certainly practicable.

The stump of the toe on the foot is soundly healed and stable; the patient runs, dances, and plays hockey without disability.

Technique of Toe-Thumb Transfer

Method of Attachment.—In order to get a broad attachment of raw surfaces, such as may be expected to nourish the toe when its digital vessels are divided, a large dorsal flap is necessary. This must be hinged distally, and for safety is therefore best delayed. A circular flap (Fig. 7), about 8 cm. in diameter and leaving the proximal and distal pedicles of 4 cm. intact, was elevated and then sutured back in position (a bigger and broader flap would have permitted the transfer of two or more toes). For the next two weeks the patient practised maintaining for increasing periods the posture that was to be necessary during the period of attachment. At operation the proximal pedicle was divided and the flap elevated up to its distal pedicle at

the base of the big toe. The proximal phalanx of the big toe was divided through the middle of its shaft. The extensor hallucis longus was divided about 10 cm. from its distal attachment. The raw area on the dorsum of the foot was covered with a hand-cut split-skin graft. The scar on the thumb stump and an area of dorsal skin smaller than the foot flap were excised. This stump with its dorsal raw area was then inserted under the foot flap. The extensor hallucis tendon was sutured proximally under the dorsal thumb-skin. The foot flap was sutured to the margins of the thumb defect by interrupted fine serum-proof silk sutures.

Period of Attachment.—Zinc oxide strapping fixation between hand and foot was used. It was not completely effective, and some detachment on the lateral side of the

FIG. 5.—The pick-up mechanism present between the third digit and the reconstructed thumb ten months after operation.

FIG. 6.—Radiograph eight months after the transfer of hallux to base of thumb. The new digit is decalcified compared with the bones of the right hand, but not so much in comparison with the phalangeal stumps on the same side. There is a gap between toe and thumb phalangeal fragments which is to be filled with a bone graft.

flap occurred. For this reason the period of attachment of the hand to the foot was increased from four to six weeks. The posture caused continuous discomfort and pain for the first three or four days, during which time morphine was often necessary. Subsequently massage and changes in posture controlled most of the discomfort.

Method of Division.—At two weeks the medial digital nerve and vessels of the hallux were divided, and at four weeks the lateral vessels and nerve. It would have been better if the nerves had been divided

FIG. 7.—Diagram to show proportions of delayed flap (width of flap 8 cm. at widest point). In a subsequent case of complete adactyly at present under treatment a dorsal flap comprising the skin and subcutaneous tissues of the dorsum of the foot from 3 in. (7.5 cm.) proximal to the bases of the toes has been used.

well proximally, as the extra length so obtained would facilitate suture with the thumb digital nerves. At six weeks the remaining volar attachment of the toe and the flexor tendon were divided. The toe stump was covered with a split-skin graft, and some split skin was also spread on the volar defect of the thumb at the level of the attachment. Healing of thumb and foot was complete two weeks later.

Discussion

There are good points and bad points about all current methods of thumb reconstruction or elongation—that is, about pollicization of index, abdominal tubed pedicle plus bone graft, phalangization, and the Gillies "chapeau flap" with bone graft.

A successfully pollicized index, having full mobility and sensation, gives much the best functional result, but the appearance is that of a lobster claw and can be grotesque. Furthermore, in our experience a pollicized index has tended with time to fall back into its original plane flush with the other three digits. For these reasons the method may not appeal for certain cases, particularly young female patients.

An opposition post made of a tube pedicle plus bone graft is rigid unless borne on a mobile metacarpal stump. Its sensation remains poor and is always lacking in stereognosis. It is often of very poor appearance, and increasing mobility of the abdominal skin on the bone graft interferes with its usefulness as a gripping mechanism. It is, nevertheless, the alternative method of choice for adult males when, owing to loss of other digits, pollicization cannot be done.

In partial losses the thumb may have its apparent length increased and its function improved by deepening the first web—that is, the operation called by Bunnell "phalangization." The method is a useful one for cases with substantial remnants of the proximal phalanx.

The Gillies "chapeau flap," by which an additional 1 in. (2.5 cm.) may be added to a thumb stump, is an alternative method for similar cases. The flap contains most of the skin of the thumb stump and is based distally on the lateral side of the first web—a precarious attachment and one best delayed. When the flap is elevated and displaced distally, a 1-in. bone graft is inserted under it into the phalangeal stump to elongate it. A free skin graft covers the proximal secondary defect. A considerable return of sensation occurs in these stumps, as the repair is by hand skin which has touch corpuscles. This repair is most suitable for adult males, but it makes no attempt at restoration of normal appearance or of interphalangeal movement in the thumb.

It is reasonable to suggest, in view of the limitations of other methods of thumb repair in spite of their value, that the advantages of a hallux-thumb transfer should be given more consideration. This holds particularly for the young, who stand the posture best and who suffer most psychologically from the appearance of a missing digit or an ugly repair. The

three cases (of which one is reported here) done in this country are known to have been successful. In the third case (Fig. 8), where all five toes have been transferred to the hand, all the transferred digits are viable (case under treatment at the moment). Previous experience (Gueullette) has probably exaggerated the hazards of the method.

Adactyly.—The method would seem to be of special value for trial in congenital absence of all digits. There are no greater surgical difficulties in transferring five toes than in transferring one—indeed, the dorsal flap for five toes is larger and therefore safer (Fig. 8). The toes with their nails provide the only repair which can give a reasonable match to normal fingers for these difficult and distressing cases.

It is a pleasure to acknowledge our thanks to Sir Harold Gillies, who referred this case to us both with the suggestion that we adopt this method and with much valuable advice on how it could best be done.

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Medical Memoranda

Prolapsed Intervertebral Disk After Lumbar Puncture

It would seem from the increasing number of cases of prolapse of the disk with a history of symptoms beginning after lumbar puncture that this hazard of the procedure is more common than is generally accepted. The case described below illustrates the normal sequence of events where damage has occurred to the disk. The condition was finally cured by operation, the laminectomy findings being in support of a possible rupture of the disk by a needle.

CASE REPORT

The patient, a young man aged 22, stated that he had had trouble with his back since November, 1945. At this time he was given spinal analgesia in a military hospital in order to carry out a radical cure of an inguinal hernia. Unfortunately this analgesia was unsuccessful, and, furthermore, while the needle was being inserted he felt a sudden sharp pain down the sides of both legs and they shot out into the extended position quite involuntarily. It is interesting to note that this was followed by a spinal headache for as long as 14 days after the operation. From that time he developed attacks of backache which could be brought on by such minor trauma as jumping down from a lorry.

When seen in the orthopaedic department of the Coventry and Warwickshire Hospital he was suffering from left-sided sciatic pain extending down the outer side of the thigh and into the ankle, which he had had for three months. This was the first attack of sciatica that he had experienced.

On examination he was found to have a slight degree of scoliosis convex to the left, which he stated had been much worse. Forward flexion of the spine was grossly diminished, but lateral flexion was fairly free. There was no evidence of disturbance of sensation or reflexes of the limbs. A radiograph of the lumbar spine showed a narrowing of the disk space between L4 and 5. It was decided to explore the above disk space, and the patient was admitted to hospital.

FIG. 8.—Diagram to show delayed dorsal flap used for transfer of five toes (in a case of congenital adactyly at present under treatment). The flap is elevated between two parallel incisions. After an interval of at least two weeks it is divided along the dotted line and elevated again up to the base of the toes. This large flap gives additional security to the pedo-carpal transfer.