and reported two interesting cases of closed ethmoidal empyema which had been completely cured of epiphora by drainage of the ethmoidal labyrinth alone. The incidence of nasal sinus infection in lacrymal obstruction, as was shown in that communication, is, however, rare, and I do not wish to convey the impression that the cure of suppuration in an interior nasal sinus will always relieve epiphora.

It is of course essential to ascertain before the operation that there is no abnormality or stenosis in the puncta and canaliculi, otherwise an artificial intranasal opening of the lacrymal sac will spontaneously close if tears are unable to flow along the canaliculi. If Bowman's operation (slitting of the lower canaliculus) is accurately performed, it would not seem to preclude a successful result, as was indicated in four cases in the present series.

In regard to the lacrymal sac an external sinus discharging at the time of the operation, provided it is not acutely inflamed, does not of itself prejudice a successful West operation. The sinus should be gently scraped with a fine curette and a very light dressing applied. This was done three times in the present series with successful results in each case. If the sinus is acutely inflamed, external drainage should be maintained until all inflammation has subsided.

Occasionally pressure with the finger over the sac causes its contents to flow into the nose rather than along the canaliculus, although epiphora and distension of the sac may be present. Fraser considers that a West operation in these circumstances is not likely to be so successful. In the present series such a condition was noted in five cases, two of which were failures. While the figures are interesting, they are obviously too small to furnish any conclusions.

There can, I think, be no doubt that the operation is relatively easier with thick-walled than thin-walled, scarcely palpable sacs; yet in the present series of 63 West operations the consistency of the sac wall would of itself seem to have no bearing on the end-result. The consistency of the sac was recorded in 45 cases—namely, thin-walled in 11 and thick-walled in 34. Unsuccessful West operations were performed on three (approximately 27 per cent.) of the thin-walled sacs and 10 (29 per cent.) of the thick-walled sacs. Other factors, such as recurrent acute dacryocystitis with possible cicatricial kinking or inflammatory stenosis of the canaliculus, a history of which was obtainable in the majority, no doubt prejudiced a favourable result in what was, apart from the consistency of the sac, an easy operation.

Intranasal dacryocystostomy should not be attempted when the tear sac is acutely inflamed. The inflammatory condition must be treated on the usual lines by an external incision, if necessary, and at least six weeks should elapse after subsidence of the acute phase before resorting to a West operation. Excessive bleeding otherwise adds considerably to the difficulties of the operation, while there is the added risk of exciting a serious spreading septic osteomyelitis of the facial bones.

I have the impression that recurrent attacks of acute dacryocystitis with abscess formation, which have either spontaneously discharged externally or been incised, prejudice a successful result. The sac wall is often very firm and thick; the contents of the sac cannot be expressed either along the canaliculi or into the nose; and there is occasional difficulty at the operation in passing the lacrymal probe into the sac. It is interesting to note that such a history of recurrent dacryocystitis accounted for four of the eleven complete failures. A history of dacryocystitis, however, either single or recurrent, occurred seventeen times in the total series of 63 West operations, eleven successes, two moderate

results, and four failures being recorded. None of the patients with successful or moderate results had, however, had more than one attack of acute dacryocystitis. It would appear, therefore, that, although a single attack of acute dacryocystitis does not prejudice a successful issue, yet recurrent inflammations producing thick-walled sacs, perhaps loculated with malformation, kinking, or inflammatory stenosis of the canaliculi, though not a definite contraindication, are not so likely to yield successful results.

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RECONSTRUCTION OF THE FOREARM AFTER AMPUTATION OF THE HAND

BY

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In 1928 I described an osteoplastic operation, performed in the previous year; my object was to make the forearm prehensile after complete loss of a hand.¹ My first patient was an Egyptian policeman whose left hand had been cut off in a tramway accident, and in December, 1928, one and a half years after the operation, he demonstrated the strong and adroit function of his reconstructed limb before the Surgical Section of the International Congress of Tropical Medicine. This result encouraged me to repeat the reconstruction at the first opportunity, and in the same year, through the courtesy of Professor Ali Bey Ibrahim, who sent me the case, I performed a similar operation, this time on the right forearm of a boy aged 8 (Fig. 1).

AIM OF THE OPERATION

The aim is to make a new digit provided with bone, tendinous attachments, and skin, and nourished by the radial trunk; this digit is allowed to become ankylosed with the shaft of the radius at such an angle that the movement of pronation brings it into firm contact with a stiff artificial finger attached to a gauntlet fitting the stump; grip and its relaxation are thus secured by pronating and supinating the forearm.

The initial difficulty was to obtain an aseptic field in the granulating stump, and I knew that if I discharged the boy from hospital to live down latent infection, his family would soon be content to leave his forearm useless. For this reason I tried, as I had tried in my first case, to rid the unhealed stump of sepsis by means of the high-frequency current. In neither patient was this attempt entirely successful, but the subsequent reaction in both was mild, and did not harm the new digit.

THE OPERATION

I repeated the two-stage procedure of the first operation at one sitting.

Stage I.—With sparks from the high-frequency apparatus, I began by charring the granulations of the stump, and also an inch-wide margin of skin. I then coagulated the region of the carpus; the limb was cleaned afresh with ether and a 5 per cent. solution of picric acid in alcohol, and after a change of gloves and instruments I began the second stage of the operation.

Stage II.—A circular disarticulation dividing the skin just distal to the radial styloid removed the remains of the

FIG. 1.—X-ray of the stump of right forearm before operation.

FIG. 2

FIG. 3

FIG. 4

FIG. 5

FIG. 2.—Separation of the radial rod by a saw-cut. FIG. 3.—Tendons are attached to the rod (see text). FIG. 4.—The radial and ulnar skin-flaps. FIG. 5.—The radial skin-flap is sutured round the bony rod; the ulnar flap folds down like a hood, and is sutured at the base of the new digit.

FIG. 6

FIG. 7

FIG. 8

FIG. 6.—The boy's right forearm reconstructed. FIG. 7.—The reconstructed left forearm of the policeman (the first case) two and a half years after operation. FIG. 8.—Enlargement taken from a cinematographic film to illustrate the function of the reconstructed forearm.

FIG. 9.—X-ray of the boy's right forearm two years after operation. (The ulna was shortened eighteen months ago, as it developed an exostosis that blocked pronation.)

carpus. I then made two longitudinal incisions on the forearm, one in the mid-line of its flexor aspect, the second on the dorsal side, a fingerbreadth radial to the middle line. Owing to the small size of the child's limb each incision was only 3 inches long, while in the man's the measurement was 5 inches. In order to provide a web at the base of the new digit, both incisions approached the ulna at their proximal ends; both were deepened to the bone—the volar incision between the tendon of the flexor carpi radialis and the flexor tendons of the fingers, the dorsal between the radial extensors of the wrist and the common extensors of the fingers. Special care was taken to mobilize and retract the bellies of the abductor pollicis longus and the extensor pollicis brevis which crossed the line of incision. The periosteum of the radius was divided longitudinally, and, with a fine saw, a 3-inch rod, a quarter of an inch square in cross-section, was separated from the distal third of the radial shaft on its lateral side. I find it a mistake to use a motor-driven saw for this purpose; the force of its revolution tends to tear the bony rod out of its periosteal covering, an accident that happened in my first case, though fortunately without causing the rod to necrose. [Ligatures tied round the rod as the saw-cut is deepened reduce the risk of enucleation (Fig. 2). The base of the rod should be incompletely separated, by greenstick fracture, from the shaft.] The tendon of the flexor pollicis longus, the radial artery, and the tendon of the flexor carpi radialis were next transferred *en bloc* to the flexor face of the bony rod; the dorsal face carried five tendons, the brachioradialis insertion, and, fastened to the rod with catgut, four tendons—the two radial extensors of the wrist, the short extensor, and long abductor of the thumb (Fig. 3). [These tendons, after re-education, become pronators and supinators, and act powerfully because they are attached to projecting bone.]

The radial skin-flap (Fig. 4) was stitched round the new digit (Fig. 5), and the ends of the ulnar and radial shafts were shortened sufficiently to allow the ulnar skin-flap (Fig. 4) to be turned over them like a hood, the edge of which was sutured to the raw edge of skin at the root of the new digit, thus completing the web between the digit and the stump (Fig. 5). The new digit was then splinted at an angle to the volar face of the forearm. In this way the limb, as in my first case, was provided with an extremity shaped somewhat like the small glove used in prize fights (Figs. 6 and 7). To this it was my intention, in the boy's case, to add a second digit, made from the ulna, instead of completing the grip by means of an artificial finger; the skin of the child's limb, however, was insufficient for this purpose.

AFTER-TREATMENT

This was begun as soon as an x-ray showed that the new digit was ankylosed with the radius (Fig. 8). The forearm was then fitted with a temporary prosthesis made of plaster-of-Paris that bore a "finger," against which the new digit was carried by the movement of pronation; this afterwards served as a model for the definitive apparatus.

My first patient used a strong leather gauntlet, stiffened with lateral plates of metal and laced to his forearm, for more than a year; at first this was quite satisfactory, but in time it worked loose and began to turn round when the new digit pressed on its artificial opponent. To avoid rotation of the gauntlet I had it fixed to a leather arm-piece by means of two lateral plates hinged at the elbow. Both patients now wear this improved form of prosthesis.

The use that the second patient makes of his reconstructed forearm is shown in one of the enlarged extracts from a cinematographic film that illustrates this paper (Fig. 8).

For the skilled movements of both patients I am indebted in a special degree to Miss Gwillim, sister-in-charge of the re-education and massage department, Kasr-el-Aini Hospital, and my thanks are due to my colleague Dr. R. A. Gardner, director of the department of radiology, for his x-rays. The improved gauntlets were made for me by Mr. A. Moring of Cairo.

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PUERPERAL COMA: RAPID RECOVERY FOLLOWING INFLATION OF BREASTS

BY

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The following case is recorded, partly because of the rather unusual treatment adopted, and partly to draw attention to the possibility of the occurrence in puerperal women of a condition analogous to milk fever in cows.

A primipara, aged 21, with nothing of note in her previous history, was first seen early in September, 1930. Her pelvic measurements were normal, the foetus was presenting by the vertex, and nothing unusual was found in the urine. Labour commenced about 5 a.m. on September 24th, and delivery was accomplished on the following day at 12.30 a.m., the head, which was in an occipito-posterior position, having been rotated manually and extracted with forceps. The child, a full-time healthy male, was alive, and there was no perineal tear or laceration of the vaginal walls. During the next forty-eight hours progress was satisfactory, but on the night of September 26th the patient was disturbed by nausea and vomiting. This continued next day, but her temperature remained normal until 6 p.m., when it rose to 101° F., the pulse rate being 128. She then looked very ill and complained of epigastric pain. Nothing abnormal was detected on physical examination, and she had a fairly good night after a dose of chloral and bromide. On the morning of September 28th the temperature was 100.5° and the pulse 110; she looked unwell and had a flushed face and slight icteric tinge of the conjunctivae. Her mental condition was normal. On examination some tenderness was felt over the liver; the uterus was not specially tender, and appeared to be involuting normally; the lochia were also normal. She was given glucose salines and later glucose by the mouth, and vomited twice only during the day. She was seen again at 8 p.m., when her temperature was 98°, and the pulse 100. She had been asleep and seemed dazed; she did not answer when spoken to, but this was attributed to her sleepy condition. At 4 a.m. on September 29th she was found to be in a very stupefied condition, her speech being unintelligible. The temperature was 102.8°, and the pulse 140. Her condition was so alarming that 0.5 c.cm. of pituitrin, and a rectal saline, were given. When seen half an hour later her pulse had improved considerably, but she was almost completely comatose. At 11 a.m. her temperature was 100°, and her pulse 120; she was jaundiced and practically in a state of coma, resenting only the most painful stimuli and being quite incontinent of both urine and faeces. There was a slight froth at her lips, and she dribbled saliva, though she usually swallowed fluid placed in her mouth. The tongue was moist, the eyes were open and occasionally rolled about, but apparently she did not see. The pupils were widely dilated, but reacted to strong light. Knee-jerks and ankle-jerks were present and equal; there was no clonus, and the plantar reflex was flexor. Nothing abnormal was detected in the chest. A vaginal examination was made, but nothing abnormal was found. An intracervical swab yielded a scanty growth of diphtheroids and *Bacillus coli*, but no streptococci or other pyogenic organisms. A catheter specimen of urine was found to contain numerous pus cells, and gave a pure growth of *B. coli*. It also contained bile and a trace of albumin, for which the pus cells would account. There were no leucin or tyrosine crystals. A leucocyte count showed: white blood cells 27,900, polymorphs 84 per cent., lymphocytes 10 per cent., monocytes 6 per cent., no eosinophils or basophils being seen.

The condition remained much the same throughout the day, during which 30 c.cm. of antistreptococcal serum was given. During the night she was rather restless, and cried out occasionally "like a meningitic." Next morning (September 30th) she was much more restless than on the previous day, and tossed about the bed. She still took no notice of questions or of her surroundings, and was still incontinent and dribbled saliva, but took fluids fairly well. Her temperature at 11 a.m. was 100°, pulse rate being 128. At 7 p.m. she was seen by Professor Oldfield, her condition