# Section of Orthopædics

President—B. WHITCHURCH HOWELL, F.R.C.S.

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## An Operation for the Correction of Madelung's Deformity and Similar Conditions

By H. JACKSON BURROWS, M.D., F.R.C.S.

BROCKMAN, in 1932, described an operative procedure which he had used for correction of a case of talipes varus resulting from defective growth at the lower end of the tibia. Two months ago I showed before this Section a similar case treated by his method. I have adopted the same principle in three cases of deformity resulting from defective growth at the lower end of the radius.

The steps in the procedure are as follows: A portion of the ulna, near its lower end and including the epiphyseal disc, is excised. A "linear" osteotomy of the radius is performed in a plane parallel with that of the lower articular surface and at the level relative to this at which the epiphyseal disc should lie. This osteotomy incision, which should not pass quite through the bone, is then prized open in such a manner as to correct the direction of the lower articular surface and is kept so by wedging into the gap the fragment excised from the ulna. The wrist is placed in such position as will allow the cut surfaces of the ulna to come together, the wound is closed and a plaster of Paris case is applied. Fig. 7 (p. 35), from Case II, at this stage, illustrates the procedure.

### CASE ABSTRACTS

*Case I.*—The patient was a schoolboy, aged 14 years and 3 months at the time of operation, who had a deformity of the right wrist.

*History.*—"Sprain" of right wrist six years previously; deformity noticed, but not progressive till one year before operation, when a further fall caused a hyper-extension injury; thereafter the deformity progressed.

*On examination* (see fig. 1).—Radial displacement and tilting of hand. Prominent ulna, extending below the level of the corresponding portion of the radius. Range of movement: Extension full; flexion limited by about 50°; adduction negligible, abduction being correspondingly increased; pronation full; supination limited by about 45°.

*Skiagrams before operation.*—Shortening of radius, with expansion and deformity of its lower epiphysis, the lower articular surface facing downwards and backwards at an angle of about 30° with the horizontal. Irregularity, thinning, and partial obliteration of the epiphyseal disc.

*Operation.*—Excision of about ¼ in. of lower part of the ulna, including the epiphyseal disc, but leaving the lowest part of the epiphysis in place. Linear osteotomy of radius about three-eighths of an inch above the lower articular surface in a plane parallel with it; wedge-shaped gap opened out to correct the direction of the articular surface. Fragment from ulna wedged into gap in radius. Plaster case with hand in adduction (retained five weeks).

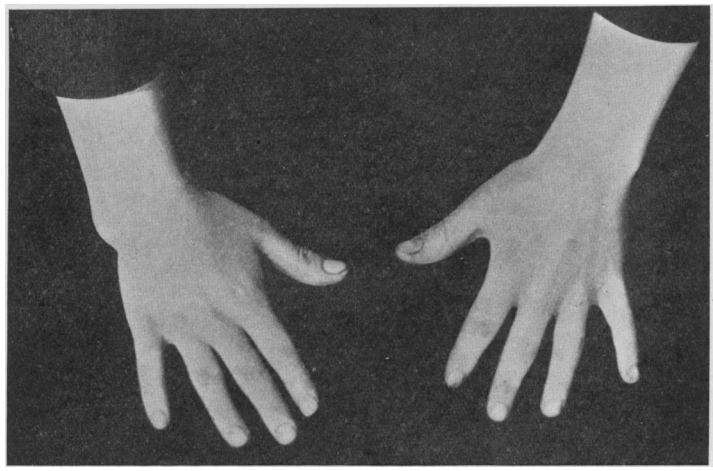

FIG. 1.—Case I, before operation.

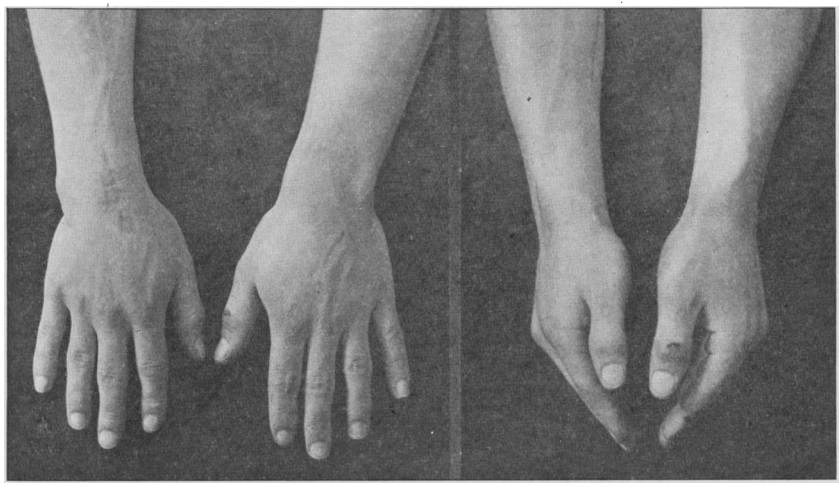

FIG. 2.—Case I, thirty-three months after operation.

*Clinical condition thirty-four months after operation* (see fig. 2 at thirty-three months).—The tilting of the hand has been corrected, but some displacement is still present. The lower end of the ulna is prominent, but its tip lies above the corresponding part of the radius. Abduction is the only movement of full range; supination is of about two-thirds range, and the other movements about half range. The forearm is shortened by 1 in. and its circumference is ¼ in. less than that of the left, although the patient is right handed. His grip is excellent. The boy is a junior clerk and is not inconvenienced by the limitation of movement.

*Case II.*—The patient was a warehouseman, aged 17, at the time of operation, who complained of pain in the right wrist.

*History.*—Seven months previously there was a spontaneous onset of pain in the right wrist, worse after work. Attention was thus directed to a "swelling" at the lower end of the ulna. No known injury.

*On examination* (see fig. 3).—Lower end of ulna prominent, its styloid process and that of the radius being at the same level. Hand displaced radially and tilted

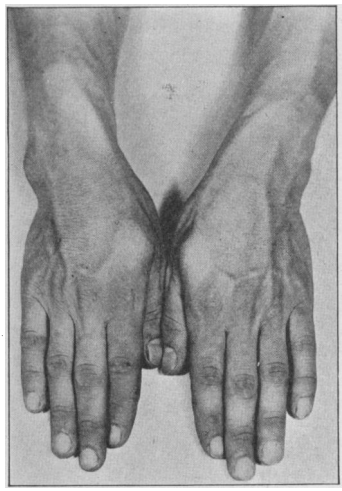

FIG. 3.

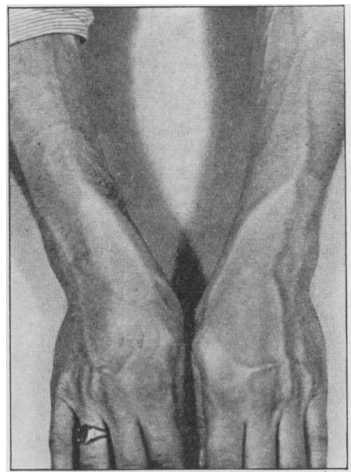

FIG. 4.

FIG. 3.—Case II, before operation.
FIG. 4.—Case II, twenty-nine weeks after operation.

into slightly valgus position: range of abduction correspondingly increased at the expense of adduction; flexion full, but extension of two-thirds range only.

*Skiagrams before operation* show a shortened right radius (and also a slightly short left); the lower right radial epiphyseal disc has disappeared, the corresponding structure in the left radius and both ulnæ being still well defined, though fusion of the epiphyses with the shafts appears to be about to take place. The lower articular surface of the right radius faces abnormally forwards at an angle of about 30° to the horizontal. (Figs. 5 and 6.)

*Operation.*—Excision of lower ulnar epiphyseal disc. Linear osteotomy of radius about ¾ in. above lower articular surface and parallel with it. Wedge-shaped gap prised open to correct direction of lower articular surface. Fragment from ulna wedged into gap in radius. Plaster case with the carpus dorsiflexed and adducted (retained for nine weeks). Skiagrams of the position in plaster are shown in fig. 7, p. 35.

*Clinical condition thirty-three weeks after operation* (compare fig. 4 at twenty-nine weeks).—Good correction; normal movements (including pronation and supination); no measurable shortening; circumference of forearm the same on both sides (right-handed patient); no symptoms. Is doing heavy work as before.

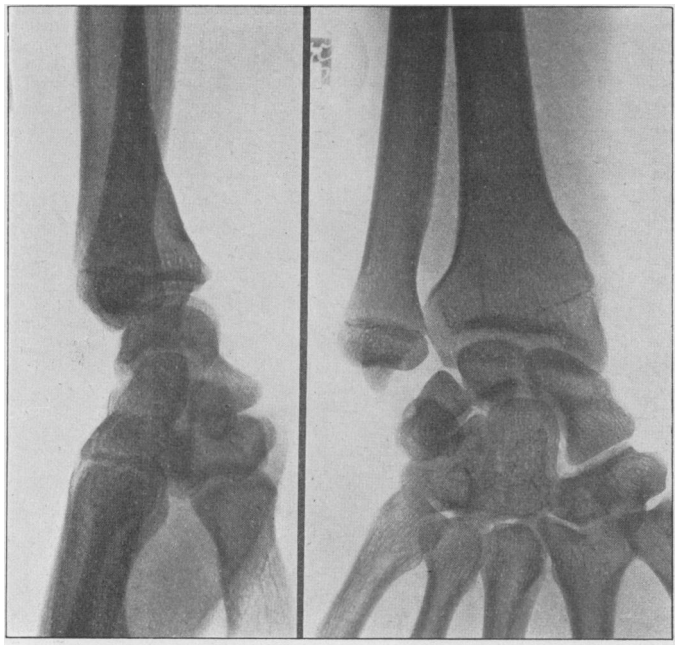

FIG. 5.

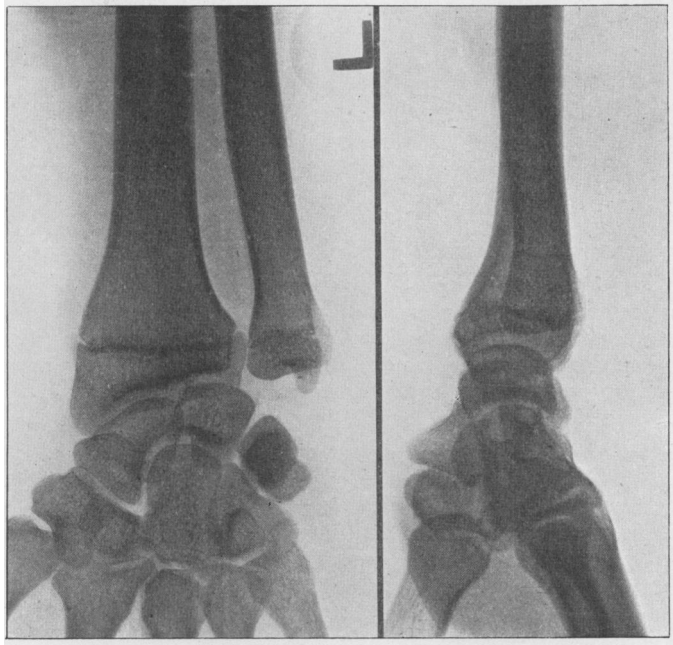

FIG. 6.

**FIGS. 5 and 6 (Case II), showing the condition before operation. (Note premature fusion of the right lower radial epiphysis, with shortening of the bone and tilting of the lower articular surface. The left radius also is somewhat short relative to the ulna.)**

FIG. 7.—Skiagram through plaster in Case II, illustrating the operative procedure. (Note that (*a*) a portion of ulna, including the lower epiphyseal disc, has been excised, (*b*) a "linear" osteotomy of the radius has been opened out to correct the tilt of the lower articular surface, and (*c*) the fragment of ulna has been impacted into the resulting gap to hold it open.)

*Case III.*—The patient was a girl, aged 10 years and 4 months at the time of operative correction, six months ago. She complained of aching and deformity of the left wrist.

*History.*—Five years and three months previously a sterile (? tuberculous) abscess involving the lower left radial metaphysis had been evacuated through a dorsal incision, the cavity being curetted. Nine months later she appeared to have made a complete recovery. About eight months before the present operation she began to have indefinite aching pain in the left wrist, and this drew the mother's attention, from four to five months later, to the deformity of the wrist.

*On examination* (see fig. 8, p. 36).—The left hand was displaced forwards and slightly outwards and was in the valgus position. The lower end of the radius was unduly prominent dorsally, and the lower end of the ulna dorsally and internally; the ulna was the more prominent and its styloid process extended lower than the corresponding part of the radius. Flexion was increased at the expense of extension; abduction was increased at the expense of adduction; the range of pronation and supination was full.

*Skiagrams before operation* showed a shortened radius with absence of the anterior part of the epiphyseal disc, the articular surface facing forwards at an angle of about 60° with the horizontal.

*Operation.*—Excision of lower ulnar epiphyseal disc. Low osteotomy of the radius, as in the other cases, with correction of the direction of the articular

cartilage. Additionally, posterior displacement of the lower fragment, to correct anterior displacement of the hand, and light impaction of the apex of the upper fragment into the lower. Excised portion of ulna placed in the anterior wedge-shaped gap. Dorsiflexion plaster (retained eight weeks).

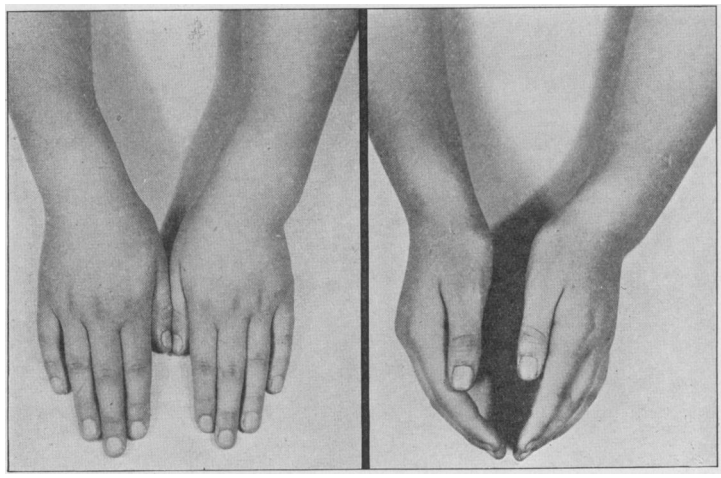

FIG. 8.—Case III, before operation. (The scar on the dorsum of the affected wrist is the result of the old operation for curetting a metaphyseal abscess.)

*Clinical condition twenty-four weeks after operation* (see fig. 9, at eleven weeks).—Good correction; normal movements (including pronation and supination); scars rather ugly.

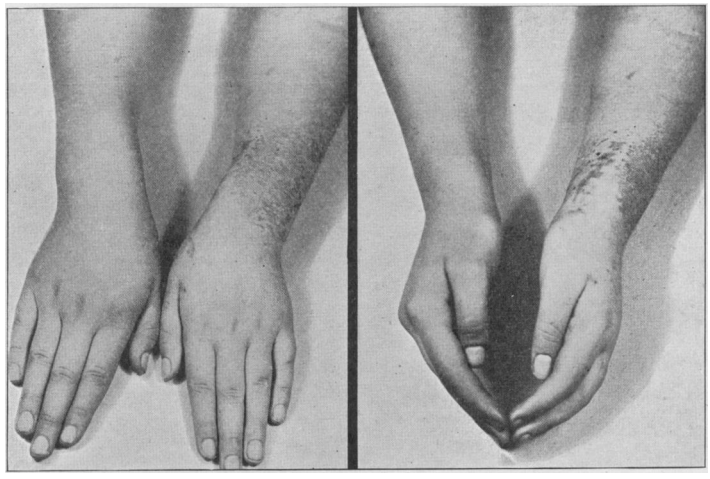

FIG. 9.—Case III, eleven weeks after operation.

COMMENTS

The objects of the operation are twofold: (1) To correct the deformity without immediate sacrifice of length, and, if possible, with restoration of a normal range of movement, and (2) to prevent the recurrence of deformity by eliminating further growth in the lower part of the ulna (and of the radius, if any part of its disc is still functioning).

Clinically, the correction in each case appears to be good—though not perfect—and the patients are very much pleased with the outcome. They are not concerned with the radiological appearances, which show a much less perfect restitution than the clinical results suggest. Excessive caution, lest non-union should result from too liberal removal of ulna, has resulted in a rather deficient resection in Cases I and III; this bone looks long in the skiagram of Case II also, but matches that on the other side. When the forward or backward tilt of the lower radial articular surface is pronounced—e.g. 60°—correction in the way described tends to leave the hand displaced somewhat forwards or backwards respectively. Profiting from such an event in Case I, I modified the operation slightly in Case III. The osteotomy incision was carried completely through the radius, the lower fragment was then displaced backwards, as well as rotated on a horizontal axis, and lightly impacted on to the apex of the upper fragment; the wedge-shaped gap was plugged open, as in the other cases, by the fragment taken from the ulna. The persistent slight radial displacement is unimportant; I see no simple way of remedying it, since it depends on a new radio-carpal relationship which has gradually become established during growth. The functional result has been satisfactory in every case, though it should be noted that the range of movement in Case I is moderate only.

The radiological appearances in Cases I and II leave no doubt that growth at the lower radial and ulnar epiphyses has been successfully arrested on the affected side and that recurrence is therefore impossible. In Case III the appearances are less certain, and it will be necessary to watch the patient over some period of time.

The stage at which the condition calls for operation is debatable. If the appearance of the lower radial disc, or of its remains, is such that little useful growth can be expected from it, then the operation should be proceeded with. There must however, be cases in which a part of the disc appears of normal thickness and there is not as yet much deviation of the articular surface; in such circumstances it might be justifiable to destroy the lower ulnar epiphysis as a first stage, and later, when some part of the lower extremity of the radius had reached an appropriate level relative to the ulna, to perform the low osteotomy of the radius, using a fragment of bone from some other convenient site to wedge the osteotomy wound open.

It is of interest to consider whether the condition in all or any of these three cases is that of Madelung's deformity; if they conform anatomically with the description given in Madelung's cases, then they are properly so described, irrespective of causation, since the terminology is one of deformity and not of disease. If ætiological correspondence is to be implied, the term "Madelung's syndrome" or "Madelung's disease" should be used. Madelung's paper was written before the era of radiology, but it is clear that the outstanding characteristics of the deformity, as he described it, are the prominent extremity of the ulna and the forward tilt of the lower articular surface of the radius; the direction of lateral tilt seems to have varied. Madelung ascribed the condition to a disturbance of growth, involving the lower end of the radius, and compared it with adolescent deformities such as genu valgum. Of his 12 cases, in two the deformity was bilateral. There were 8 female patients. No history of acute trauma or sign of previous inflammation was found. From a consideration of these facts I conclude that

Cases II and III exhibit Madelung's *deformity* ; whereas only Case II—which happens to be the least severe of the three—conforms to Madelung's *syndrome*. Case I differs, in that the tilt was backwards—so-called " reversed Madelung's deformity ". The terminology has all the faults of eponymous nomenclature, but a better has yet to be devised.

I am indebted to Mr. R. C. Elmslie for kindly allowing me to operate upon and show the second and third cases.

REFERENCES.

BROCKMAN, E. P. (1932), *Proc. Roy. Soc. Med.*, **25**, 1093 (Sect. Orthop., 79).
BURROWS, H. J. (1937), *Proc. Roy. Soc. Med.*, **30**, 207 (Sect. Orthop., 7).
MADELUNG (1897), *Arch. f. klin. Chir.*, **23**, 395.

The following were also shown :—

(1) **Case for Diagnosis.** (2) **Protrusio Acetabuli.**—ALAN H. TODD, M.S.

**Slipped Femoral Epiphysis.**—H. J. SEDDON, F.R.C.S.

(1) **Skiagrams of Three Cases of Protrusio Acetabuli.** (2) **Case for Diagnosis.**—E. P. BROCKMAN, M.Ch.