



FIG. 1.—Photograph of hand before operation. Palmar view.

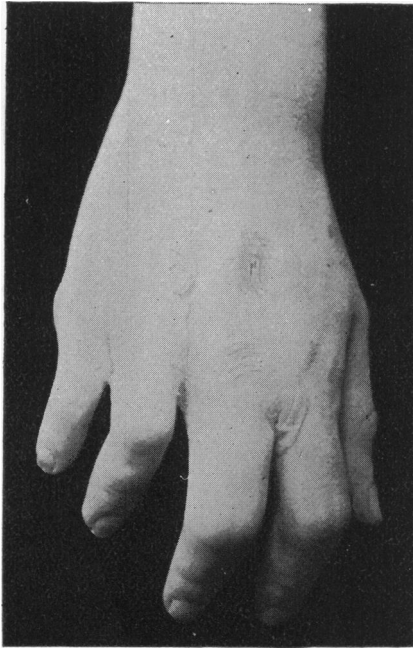


FIG. 2.—Photograph of hand after operation.

CLEFT HAND: A REPORT OF A CASE SUCCESS-  
FULLY TREATED BY THE USE OF PERI-  
OSTEAL FLAPS.<sup>1</sup>

By CHARLES N. DOWD, M.D.,

OF NEW YORK,

SURGEON TO THE NEW YORK CANCER HOSPITAL; ASSISTANT SURGEON TO ST. MARY'S  
HOSPITAL FOR CHILDREN.

Congenital deformities of the hand are usually more interesting to the pathologist or anatomist than to the surgeon. Numerous detailed descriptions of various grades of these deformities are found in medical literature, but few suggestions for treatment, excepting by the amputation of supernumerary or useless digits and the separation of webbed fingers.

*Cases of Cleft Hand previously reported*—A cleft in the hand is one of the rarest of all malformations. Otto (1841), Foerster (1865), Shaefer (1891), and Kümmel (1895), in describing cases of this deformity have made careful studies of the literature of the subject. Seventeen cases are recorded in which there was a cleft extending a greater or less distance into the metacarpus. In all but one there were accompanying webbed fingers or fusion of carpal or metacarpal bones. The middle finger was absent in all cases. In six instances the index or ring fingers were also absent. In six, both hands had malformations of a somewhat similar type. I find no record of the surgical treatment of any of the cases.

*The etiology* of this malformation is, of course, conjectural, but evidence is continually accumulating to show that the adhesions which sometimes are formed between the amnion and the

<sup>1</sup> Presented to the West End Medical Society of the city of New York, January 4 and May 2, 1896.

foetus can mechanically prevent or pervert the growth of the parts which they draw upon. It is believed that such adhesion to the mid-point of the developing hand could cause the deformity. For an elaborate discussion of this topic the reader is referred to Kümmel.

*The Author's Case.*—In the case here figured there was not an absence of any metacarpal bone, but the fourth and fifth were fused into one bone and separated from the third. The resulting cleft extended only part way to the carpus, but the effect was most revolting and uncanny. The ring and little fingers were widely separated from the others, and had an unpleasant resemblance to the claws of a crab or lobster, which was increased by the independent movements which took place in the two parts of the hand. The hand, however, presented several features which were capable of benefit by surgical means.

- (1) The adduction of the ring and little fingers.
- (2) The cleft.
- (3) The webs.
- (4) The palmar contractions of the index, middle, and ring fingers.

The adduction of the ring and little fingers was remedied by removing a wedge-shaped piece from the distal end of the fused fourth metacarpal bone and forcibly abducting the fingers, and the fragment of bone with them. (See Fig. 3.) This was only done after an unsuccessful attempt to abduct the fingers without cutting. The articulation of the ring-finger to the side of its metacarpal bone was so firm that it was better to cut the bone than the joint. The joint of the little finger was so weak that it permitted the moving of the finger about the end of its part of the fused bone.

The closure of the cleft was accomplished by bringing the metacarpal bones together from each side, turning back a lateral flap of periosteum from each at the place of contact and sewing these periosteal flaps together with catgut. A chromicized gut ligature, passed around the shaft of the third metacarpal bone and through that of the fused fourth and fifth ones, maintained firm apposition until the callus about the periosteal flaps was firm. It was then removed as it was a source of irritation. At the time



FIG. 3.—Röntgen picture of hand after operation, taken by Dr. William J. Morton, of New York, showing the congenital fusion of the fourth and fifth metacarpal bones and the peculiarities in its joints and those of the corresponding fingers; also the bony union between the third and fourth metacarpal bones and the angular change in the shape of the fourth, which were produced by operation.

of the first operation an effort was made to obtain fibrous union between the ends of these metacarpal bones by dissecting up such portions of fibrous tissue as could be raised and sewing them together. These fibres, however, failed to hold the bones together. A bony union was manifestly necessary if the cleft was to be firmly closed.

The webs were treated by Zeller's method.

The power of extension in the ring-finger was increased by incising the palmar skin and fascia and skin-grafting, and by manipulation; that in the index and middle fingers by manipulation.

*General Considerations.*—In considering the general surgical treatment of these deformities, one can lay down few rules as the cases differ so much from each other. The bones, the joints, the tendons, and the soft parts present individual peculiarities which must be met in each case. The device of raising and uniting periosteal flaps, and thus joining the bones together by the newly-formed bony deposit, has not been recorded, so far as I know, but it is so manifestly the thing to do that it must have been done where suitable conditions existed. The good result obtained here certainly commends it, and it has many advantages over such devices as wires, pegs, nails, etc. This bony union gave a most satisfactory firmness to the hand, and it caused no practical inconvenience from lack of pliability.

The Röntgen pictures must be of much value in studying this class of deformities and indicating the plan of treatment. The one here presented throws much light on the details of the deformity and condition after operation. The broad union obtained between the third and fourth metacarpal bones is well shown, and the angular deformity caused in the fourth one by operation, also the imperfect carpo-metacarpal joint where the bones were abducted; it is fair to believe that this will improve with time. The peculiarities of the fused metacarpal bones and their other articulations are well shown, also the rudimentary character of the little finger.

*Hospital History.*—R. H., aged thirteen years, a well-grown, healthy, intelligent boy, with no deformities excepting the hand, was admitted to St. Mary's Free Hospital for Children, July 16, 1895. No family history of malformation.

*Right Hand.*—*Carpus* apparently normal. *Metacarpus* presents a cleft between its third and fourth metacarpal bones, which extends half-way from the normal web to the carpus. This cleft can be voluntarily narrowed and widened, and the separated portions of the hand can be moved independently. The first, second, and third metacarpal bones are normal, the fourth and fifth are fused together, but have separate articular ends for their respective fingers.

*Digits.*—(1) Thumb normal.

(2) Index finger. Extension at first phalangeal joint limited to 100 degrees apparently by the skin and fascia, which seem thick. There is a short and very thick web between this and the middle finger.

(3) Middle finger. Similar to index finger, excepting that it has 15 degrees less of extension.

(4) Ring-finger. Adducted 50 degrees at its metacarpal articulation, which permits only slight motion.

Extension at first phalangeal joint limited to 85 degrees.

The power of extension is very slight when the finger is fully flexed. There is a firm, thick web between this and the little fingers, which extends nearly to the first phalangeal joint.

(5) Little finger. Small, capable of very slight motion, adducted similarly to ring-finger.

*First Operation.*—July 22, 1895. Incision along sides of cleft from its apex to middle of first phalanx on each side.

Cuneiform osteotomy of fourth metacarpal bone just above its phalangeal joint; this permitted the needed abduction of ring and little fingers.

Web between these fingers separated by taking a flap from its posterior portion, sewing it into the commissure, after dividing the web, and then sewing the margins of the wounds together as far as possible at the sides of the fingers (Zeller's method).

Fibres were dissected up from the ends of the third and fourth metacarpal bones and sewed together.

The skin was united on palm and dorsum by continuous silk sutures. A small area was left to granulate at the side and anterior aspect of the ring-finger.

October 1. Healing was satisfactory, and splints and manipulation have been used to secure better extension and mobility of the fingers.

*Second Operation.*—October 11. The skin was incised on the palmar aspect of the ring-finger, the fascia dissected out, and the

defect skin grafted by Thiersch's method. The finger was dressed on a palmar splint in extended position.

Dissection was also made to the flexor tendons of the little finger to learn their condition, but they were found rudimentary, as was the rest of the finger, and the incision was simply closed.

December 1. Considerable gain has been made in the extension of the fingers by the last operation and by splints and manipulation.

*Third Operation.*—December 4. The web between the index and middle fingers was removed by Zeller's method, and the uncovered surfaces were skin-grafted.

January 1, 1896. Healing good. Function of hand improving, but the site of the cleft is weak.

*Fourth Operation.*—January 8, 1896. Cleft reopened. Periosteal flaps one-half inch long, raised from sides of third and fourth metacarpal bones at their places of contact, and sewed together with catgut.

Chromicized gut ligature passed about the shaft of the third metacarpal bone and through that of the fused fourth and fifth, and so tied as to hold the bones firmly together.

Palmar splint and firm bandage.

March 1, 1896. Chromicized gut removed, as it was causing irritation.

April 20, 1896. Patient discharged from hospital.

*Condition of Hand.*—The hand is firm and strong. He has excellent "grip" in it, can write well, and use it skilfully in all ordinary forms of manipulation. The photograph shows its appearance. Sensation good in all parts of hand.

*Thumb* normal.

*Index Finger:* Voluntary extension in first phalangeal joint, is limited to 160 degrees. Forced extension, to 180 degrees. Flexion normal. Motion in other joints normal. Abduction and adduction normal. Web almost normal, moderate scar. (See photograph.)

*Middle Finger:* Flexion normal. Voluntary extension in first phalangeal joint limited to 120 degrees. Forced extension to 160 degrees. Extension in other joints normal. A little thickening about second phalangeal joint. Abduction and adduction normal. Bony ankylosis between metacarpal bones of this and ring-finger. Good web between this and ring-finger. (See photograph.)

*Ring-Finger*: Flexion, so that tip touches palm. Voluntary extension, proximal phalanx 180 degrees; middle phalanx 100 degrees; distal phalanx 170 degrees. Metacarpo-phalangeal joint indistinct in formation, located three-quarters of an inch above the level of that of the middle finger, has very little motion.

Little finger has only twenty-five degrees of motion in any joint and retains much of its rudimentary aspect.

LIST OF CASES WHICH ARE REFERRED TO ABOVE.

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12. *Ewh*: Ueber angeborene Defecte der Extremitäten, In. Diss. Erlangen, 1890.
- 13, 14. *Chaleux*: Cas de Malformation des Mains, Journ. de Méd. de Bordeaux, 1890, No. 28.
15. *Shaefer*: Bruns Beiträge, 1891, p. 437.
16. *Meller*: Berliner klin. Woch., 1893, No. 10, p. 232.
17. *Kümmel*: Bibliotheca Medica, Abtheilung E. Chir., Heft. 3, p. 21.