FRACTURE OF THE HEAD AND NECK OF THE RADIUS.*

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PREVIOUS to the discovery of the Röntgen ray this fracture was practically unknown, or was discovered only in anatomical dissections; it was regarded as a surgical curiosity. The first case was reported in 1834, as the result of a post-mortem examination. Up to 1880 but 21 cases were known, and of these 20 were discovered only after operation or dissection. As late as 1905, four years ago, the literature contained but 48 cases, only 8 of which had been recognized by clinical signs during life. At this time, four Röntgenologists in Philadelphia found 55 cases in their collections of plates, which exceeded the total number recorded at that period.

The literature of the subject has been thoroughly reviewed, and some excellent experimental work on the mode of production of this fracture has been done by T. Turner Thomas,[1] whose writings have placed this subject on a sound scientific basis.

The ever increasing use of the Röntgen ray in fracture work has revolutionized our knowledge of this subject. We are enabled to make a more accurate diagnosis, and with the knowledge thus gained to make a more careful reduction of the fragments without resorting to aimless and often harmful manipulation. We can then verify our results to ascertain whether the reduction has been properly accomplished. All this is well recognized.

But we owe a further debt to the Röntgen ray. Many fractures hitherto unknown, and formerly treated as sprains, have been brought to light, and many fractures thought to be rare are now known to be fairly common. Many frac-

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tures, from their obscure position or from the nature of their surroundings, give none of the well-recognized signs which we have learned to associate with a broken bone. Crepitus, abnormal mobility and impaired function are often absent, and pain may be the sole symptom to guide us in reaching a correct diagnosis. So it is with fractures of the head of the radius, and usually this condition is unsuspected until revealed by the X-ray plate. Its importance has been underestimated as well, for, on its recognition and proper treatment may depend the integrity and usefulness of two of the most important joints in the body—the elbow and wrist.

Anatomy.—The orbicular ligament and the lesser sigmoid cavity of the ulna form a sling in which the head of the radius rotates easily through nearly half a circle. Any injury at this point interferes with the important movements of pronation and supination, and, from its intimate relation with the elbow-joint, limits flexion and extension as well.

A fall on the hand is the most frequent cause of fracture of the radius at some point. Whether this occur at the wrist, in some part of the shaft, or at the head or neck of the bone depends on many factors. Turner has shown that the more nearly vertical the forearm at the time of the fall, the more likely is the force of the blow to be expended at the upper part of the bone, since in this position there is less cross-breaking strain. The tension of the muscles at the time of fall and the degree of rotation of the forearm also have an influence in determining the point of fracture.

Diagnosis.—As I mentioned above, the symptoms are deceptive. Pain is the only one I have found constant. Crepitus may be obtained in favorable cases on rotating the forearm, and this is the movement which usually gives most pain. Flexion and extension are ordinarily performed with less discomfort, but these movements may be painful. A point of localized tenderness is usually found over the head or neck of the bone. The diagnosis is made quickly and without pain to the patient by the Röntgen method, and this agent should always be employed. The objection of some writers

that this fracture is not shown, or is sometimes overlooked, by the X-ray, I have not found borne out by experience, if the pictures have been correctly taken. Oftentimes the anteroposterior and lateral views of the elbow-joint as ordinarily made are not sufficient to show this fracture clearly. Dr. Frank E. Peckham and the writer have devised an apparatus by which the head of the radius is brought in close contact with the photographic plate. This view, in connection with the ordinary anteroposterior and lateral positions, allows the bone to be viewed from all sides. By this X-ray study of the elbow the fracture is shown if present. In one of the cases given below, the views, as ordinarily taken, failed to show the fracture, until this procedure was employed.

The fracture may be of the fissure type, in a vertical direction through the head or neck, the fragment often being wedge-shaped, or the head may be impacted. In both of these types the fragment is usually in good position. There may be enough displacement to interfere with flexion as well as rotation. When the fracture occurs in the neck of the bone, the upper fragment is more likely to be displaced downward and outward, and can often be palpated. In these cases the disability is greater and the symptoms more pronounced. The head is often split into several fragments, one or more of which will be displaced, often to some distance, and may interfere with complete flexion of the elbow. This fracture is often overlooked, in the absence of the well-marked signs which accompany the more easily recognized fractures, and treated for a sprain or contusion. In these cases free use of the joint, which is often encouraged, may lead to permanent disability of the joint to some extent, or possibly to non-union of the fragment.

Prognosis.—This is good in the small class of cases where there is a vertical fissure through the head and oftentimes in the impacted cases. The fragments are held firmly by the orbicular ligament, which prevents displacement and encourages firm bony union. With comminution and separation of fragments, however, the chances of obtaining a perfectly use-

ful elbow are not so favorable. The extrusion of bone into the joint cavity and the formation of callus may interfere with flexion and extension as well as with rotation, and the patient should be warned of this possibility.

Treatment.—In cases with good approximation of fragments and but slight displacement, I have had the best results with the right-angled tin splint fashioned for the individual arm and supported by a sling. The splint should be left in place for several days to a week. It is then removed at intervals of two or three days and massage and gentle passive movements begun. These manipulations should be under the care of the physician, and great pains must be taken not to displace the fragments by injudicious movements, as has happened in the hands of an unskilled masseur. By the end of the third or the beginning of the fourth week the splint may be omitted and the arm carried in a sling for another week. At the end of this time all apparatus may usually be omitted. This early joint movement, when used with due care, will tend to preserve the mobility of the joint and prevent the formation of the firm adhesions and ankylosis which are the bane of fracture work. If the motion is begun early and continued with caution and regularity, it will be found, on omitting the splint, that the joint is much more useful than when continuous fixation has been employed. Most writers speak of limitation of motion as almost invariably present on removing the splints. This partial ankylosis may be eliminated in many cases if due care in treatment is exercised.

Where there is marked displacement of fragments which encroach upon the joint cavity, there will naturally be some ankylosis no matter what the treatment, and the question of operative interference arises. Each case must be judged on its own merits as shown by the Röntgen examination, but the best results will usually be obtained where a conservative method of treatment has been followed, leaving the open operation for those cases of displaced fragment with limited motion in the joint, or the rare cases of non-union. If the

plate show a fragment so greatly displaced, that, if left in position it will result in partial ankylosis, or is in danger of becoming a foreign body through non-union, it had best be removed at once by operation.

Bardenheuer[2] states that he has never found it necessary to operate on a case of this fracture.

As an aid in the after-treatment of these fractures, baking in the hot-air oven will be found of the greatest value in affording relief from pain and in restoring motion to the joint, and massage and passive motion are much more effective after such treatment.

In looking over our collection of plates, I find 11 cases * of fracture of the head and neck of the radius out of 224 cases of all fractures taken during the past three years. Of these 11 cases, five were referred for X-ray examination within a few days of the injury, and in no case was the condition accurately diagnosed until the X-ray plate had been taken. Four of the remaining cases were seen from three to seven months after the injury, and came for relief of pain or in hopes of obtaining a more useful elbow. In none of these cases, nor in the two which I have treated personally, was the diagnosis made until the Röntgen examination had been made. The cases that I have been permitted to see in the practice of other physicians have been very instructive. I believe the condition is a difficult one to diagnose, and in most cases impossible without the aid of the X-ray.

I have treated two cases of this fracture, both of the head of the radius. The first case occurred in the practice of Dr. Frank E. Peckham, and was treated by me during his absence. I am indebted to Dr. Peckham for the privilege of reporting this case.

CASE I.—A young clergyman came to the office with an injury to the right elbow, of six days' standing. He had been thrown from his horse while riding. Pain was distinctly local-

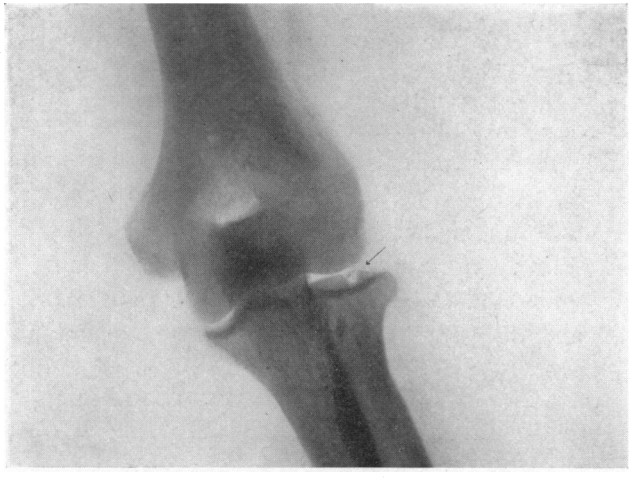
* Since writing this paper three other cases of this fracture have been seen out of a total of 344 cases of all fractures.

ized at the head of the radius, most marked on rotation of the forearm, and to a lesser extent on flexion and extension. The X-ray examination (Fig. 1) showed a wedge-shaped vertical fracture of the head of the radius with slight displacement at the upper end. A right-angled tin splint was fitted and worn for three and a half weeks. The splint was left in position for a week, and was then removed every other day for two weeks, and then twice a week until finally omitted. At each visit the elbow was moved gently but as much as possible in all directions. On finally omitting the splint there was perfect function in the elbow in pronation and supination as well as in flexion and extension, and no pain was experienced.

CASE II.—A physician, æt. 61, came to me for treatment of an injury to the left elbow. Five days previously, while coming out of his house, he had fallen on some stone steps, striking, he thinks, on his elbow. There was marked tenderness about the head of the radius, and motion was decidedly limited in all directions. The Röntgen examination made in the usual anteroposterior and lateral positions failed to show any fracture. This case resembled the first one so strongly, however, that I was convinced that some fracture was present, and the symptoms all pointed to the head of the radius as the most probable location. Accordingly, I placed the head of the radius in close contact with the photographic plate, and demonstrated a vertical fissure in the head with practically no displacement. The treatment was the same as far as splinting and manipulation were concerned, as in the preceding case. This injury occurred in sultry weather, and the patient suffered much pain. The splint was irritating and required frequent adjustment. On omitting the splint there was considerable pain, and some limitation in flexion and extension. The elbow was baked in a hot-air oven for four to five weeks, and at the end of this time complete function had returned, and pain was much less noticeable. The latter symptom was present to a slight extent for six months, but since that time, nearly two years since the fracture, the elbow has given no inconvenience whatever.

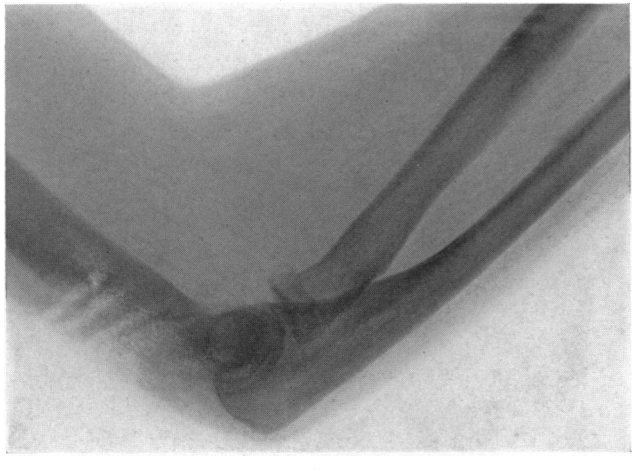
I have also had the opportunity of making a Röntgen examination in 12 other cases of this fracture occurring in the practice of other physicians. I wish to thank these gentle-

FIG. 1.



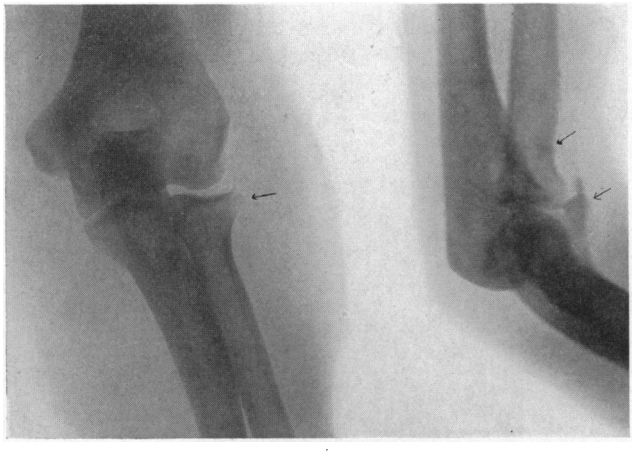
Vertical fracture of the head of the radius. Case I.

FIG. 2.



Impacted fracture of the head of the radius. Case VII. Patient of Dr. J. W. Keefe.

FIG. 3.



Comminuted fracture of the head of the radius with separation of fragment. Case XIV.

men for the courtesy of allowing me to describe briefly these fractures from a radiographic standpoint, and to add them to the scanty literature of the subject.

CASE III.—Female (patient of Dr. E. E. Moore). Right elbow. Oblique fracture of the head of the radius down through the neck, with splitting off and slight separation of fragment. Complicated by backward dislocation of the elbow which had been previously reduced.

CASE IV.—Female (Orthopedic Department, Rhode Island Hospital). Left elbow. Oblique fracture of head and neck of radius, with separation outward and forward of a fragment half the size of the head.

CASE V.—Female (patient of Dr. E. S. Allen). Right elbow. Slight separation of fragment involving about one-third of articular surface of radius, and vertical fissure extending down into neck. Upper portion of neck is bent inwards.

CASE VI.—Female (patient of Dr. F. E. Peckham). Right elbow. Similar to Case V in size and displacement of large fragment, but also slight comminution of fragments in joint.

CASE VII.—Female (patient of Dr. J. W. Keefe). Left elbow. Impacted fracture of entire head of radius with displacement forward, inward and downward.

CASE VIII.—Male (patient of Dr. H. DeWolf). Left elbow. Oblique fissure fracture of outer third of head of radius with almost no displacement of fragment.

CASE IX.—Male (patient of Dr. F. A. Fearney). Right elbow. Fracture of outer half of head of radius with displacement of fragment upward into flexure of elbow.

CASE X.—Male (patient of Dr. W. R. Morse). Left elbow. Comminuted fracture of outer fourth of head of radius. Slight displacement of main fragment, but a small fragment displaced one-half inch upward into flexure of elbow.

CASE XI.—Male (patient of Dr. E. C. Murphy). Right elbow. Impacted fracture of head of radius with slight displacement forward and outward.

CASE XII.—Female (patient of Dr. F. E. Peckham) aged five. Right elbow. Fracture and dislocation of head and upper end of radius for one-fourth inch below the epiphyseal line, and displacement of fragment, including small part of shaft, downward and outward.

CASE XIII.—Male (patient of Dr. F. E. Peckham). Right elbow. Oblique fracture of outer third of head of radius of the vertical fissure type. Slight displacement of fragment.

CASE XIV.—Male (patient of Dr. F. E. Peckham). Right elbow. Comminuted fracture of head of radius with separation of an irregularly shaped fragment upward into flexure of elbow.

The above cases were all adults with the exception of Case XII.

REFERENCES.

[1] Thomas (T. Turner): Univ. Penna. Med. Bull., Sept. and Oct., 1905. (Contains complete bibliography.) Penn. Med. Jour., April, 1906, ix, 504. ANNALS OF SURGERY, August, 1907, xlvi, 280.

[2] Bardenheuer und Graessner: Die Technik der Extensionsverbände.
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