A FOLLOW-UP OF ONE HUNDRED CASES OF FRACTURE OF THE HEAD OF THE RADIUS WITH A REVIEW OF THE LITERATURE

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THE elbow joint tolerates trauma poorly and even radiologically minor injuries can be followed by major disability. Fracture of the radial head is the commonest elbow injury, accounting for 37 per cent. of this injury at the Royal Victoria Hospital in the period under review (44 per cent. Murray (1940); 30 per cent. Mason (1954)).

In the two-and-a-half-year period, 1st January, 1958—30th June, 1960, 175 fractures of the radial head were treated at the Royal Victoria Hospital. This represented 1.7 per cent. of a total of 10,200 fresh fractures. Of the 175, for various reasons, only 100 could be reviewed. These form the basis of this paper. Seventy per cent. were female. The average age was 41 years, with extremes of 14 and 66 years. The elbow was X-rayed at the time of review in all cases and in those patients in whom the head of the radius had been excised X-rays were also taken of the wrist. The minimum period between injury and review was one year.

MECHANISM OF INJURY.

Cutler (1926), in one of the earliest comprehensive reviews, considered that direct trauma was the commonest mechanism of injury to the radial head. It is now generally accepted that indirect injury through the long axis of the radius is the usual cause. The direction of the force and the longitudinal trabecullar pattern of the head account for the usual longitudinal direction of the fracture line. Hein (1931), in a discussion of a paper by Key, considered that the same force carried to extremes caused dislocation of the elbow. These two injuries are frequently combined (6 per cent. of a series of 459, Murray (1940), and 5 per cent. of this present series). Between these extremes there can be severe cartilaginous and ligamentous damage not shown on X-ray. Thus, fracture of the head of the radius is not a localised injury but part of a widespread damage to the whole elbow joint.

CLASSIFICATION.

Although the actual damage is much greater than that seen on X-ray, a radiological classification is the only easily standardised one and has been used in this series.

Type 1.

Fissure fracture or marginal sector fracture without displacement.

Type II.

Marginal sector fractures with displacement causing widening of the head and depression or tilting of the segment.

Type III.

Comminuted fracture of the radial head.

Type IV.

Fracture of the radial head associated with dislocation of the elbow.

TREATMENT.

Type I.

Most authorities agree on conservative treatment, avoiding any forcible manipulation. They rest the injured limb in a sling of plaster-of-Paris back-slab for one to three weeks, depending on the severity of the lesion (Murray (1940); Mason (1940); Castberg and Thing (1953); Watson-Jones (1955); Bonnin (1957)). Wagner (1955) and Jacobs and Kernodle (1946) aspirate the joint prior to immobilisation. Gaston, Smith, and Baab (1949) also aspirate the joint but then start active motion in twenty-four hours within the limits of pain. They found that, although the final results were the same in six months whether or not aspiration was carried out, there was a more rapid restoration of movement if aspiration had been performed. Thus, 70 per cent. of the aspirated group, as compared with only 40 per cent. of the non-aspirated group, had a full range of movement in four weeks. Fontaine and Muller (1960) inject local anæsthetic into the fracture site and avoid all immobilisation.

Fifty-five per cent. of our series were Type I fractures and all were treated conservatively with one to two weeks' rest in sling or plaster-of-Paris back-slab. We consider that if the trauma of the original injury has not displaced the fragment, gentle active exercises are unlikely to do so. Thus relief of pain in the more irritable joints was the only indication for plaster-of-Paris immobilisation. The majority regained a full range of movement in one to three months. At the time of review all had a virtually painless elbow, but eleven patients (20 per cent.) stated that after heavy work and in cold weather they experienced an occasional ache. Five cases had slight limitation of movement consisting of an average loss of fifteen degrees extension and minimal loss of pronation. Approximately one-third had persistence of the fracture line on X-ray.

Type II.

It is in the treatment of Type II fractures that the greatest difference of opinion occurs. Jacobs and Kernodle (1946) and Böhler (1956) use conservative treatment with plaster immobilisation for two to three weeks unless there is marked displacement of the fragment. Bonnin (1957) attempts reduction of the displaced fragment by manipulation. He considers that the intact annular ligament pulls the fragment into position. Murray (1940) states that he has had little success with manipulation. Key (1931) excises the head if the fracture involves more than one-third of the circumference. Mason (1954) excises if the segmental fracture is more than one-quarter of the head or if there is even minimal tilting.

Wagner (1955) operates if he considers that the fragments will interfere with movement. He determines this by attempting to carry the joint through a full range of movement following intra-articular injection of a few cubic centimetres of local anæsthetic. Any bony block or persistent click are considered positive indications for resection of the radial head. Murray (1940) and Fontaine and Muller (1960) emphasize that removal of the displaced fragment alone is followed by poor results and advise removal of the whole head and part of the neck.

Twenty-nine cases (29 per cent.) in this series were Type II fractures. All except one were treated conservatively by immobilisation in a back-slab for one to two weeks, followed by active exercises. One was treated by complete excision of the head. More than 50 per cent. had a completely full range of movement at the time of review. In the remainder there was an average loss of ten degrees of extension but rarely any limitation of rotation. Ten (35 per cent.) complained of occasional pain after heavy work or in cold weather. The only patient with a poor result was the one treated by excision of the head. Unfortunately she developed wound sepsis, resulting in a painful elbow with a very limited range of movement. X-rays showed persistent radiological deformity in most cases. There was, however, no correlation between the final range of movement obtained and the degree of deformity seen on X-ray.

Type III.

Most surgeons agree that Type III fractures should be treated by total excision of the head within a few days of injury, followed by post-operative immobilisation for periods varying from one to three weeks. Gaston et al. (1949) consider that the operation should be performed within twenty-four hours, and active exercises commenced the following day. The results of excision are not uniformly good, and this has led some to use acrylic, stainless steel or vitallium prostheses. (Cherry, (1953); Titze (1955); De Borja-Araujo (1958); Waibel and Nigst (1959).) Surgical excision or replacement are inadvisable in the aged.

In this present follow-up there were eleven cases in Group III. Five were treated conservatively with two to three weeks' plaster-of-Paris immobilisation, and six by excision. Those treated conservatively had an average loss of 10 per cent. of rotation and five degrees of extension. Two were completely free of pain. One of these, in which the loose piece was displaced outside the joint, had also a full range of movement. In the six cases which were treated by excision within an average of four days, there was full rotation in all, but an average loss of ten degrees of extension. All complained of some elbow pain and two had mild myositis in this region. Four complained of wrist pain. This was due to subluxation of the inferior radio-ulnar joint in three and osteo-arthritis in one.

Type IV.

In this injury the discloation is usually reduced without difficulty and the fracture of the head of the radius is then treated as an isolated injury. Thus, if there is a displaced marginal fracture or comminution of the bone the whole

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head should be removed two to three weeks after reduction of the dislocation (Watson-Jones, 1955).

There were five patients in this group in our series. In four the head of the radius was excised two to three weeks after injury, and within twenty-four hours in one case. The five patients had an average loss of ten degrees flexion, twenty-five degrees extension, and 20 per cent. rotation. All complained of elbow pain after heavy work or in cold weather. Four patients had some degree of myositis ossificans. Three complained of wrist pain and X-rays showed osteo-arthritis of the inferior radio-ulnar joint in two of these and subluxation in one.

DISCUSSION.

Type I fractures practically all get a good result irrespective of treatment and therefore require no further discussion.

The main controversy revolves around Type II fractures. Mason's axiom (1954) is "If in doubt resect," but we consider that conservative treatment yields good results and operation is usually unnecessary in this group. Excision of the radial head should not be undertaken lightly as its results can not be described as uniformly satisfactory. There is danger of local new bone formation, valgus deformity of the elbow, and proximal displacement of the radial shaft with subluxation of the inferior radio-ulnar joint. As early as 1933 Swartz and Young found that although excision improved supination and pronation it was frequently followed by valgus deformity and relative instability of the elbow. The problem of subsequent subluxation of the inferior radio-ulnar joint has not been empha-sized in the literature. Murray (1940) found no subluxation in a series of 459 patients with 58 excisions; Jacobs and Kernodle (1946) none in a series of 42 with nine excisions; Gaston et al. (1949) none in a series of 261 patients; Jeffrey (1953) none in a large series (number not stated) and Mason (1954) none in a series of 100 patients with 23 excisions. Gaston et al. (1949) believe that this complication occurs only in children and McFarland (1953) found no tendency for upward migration of the radius even in children. Both Colbert and Stack (1955), however, in a discussion of Wagner's paper, stated that they were plagued with the complication of wrist pain following resection of the radial head. Wagner (1955) considered that this was due to subluxation occurring at the time of injury. Curr and Coe (1946) report one such case and Essex-Lopresti (1951) two cases associated with comminuted fractures of the radial head. McDougall and White (1957) consider that the subluxation occurs subsequent to the excision and not at the time of injury. In a careful clinical and radiological follow-up of 100 patients, 44 with resection of the radial head, no less than 25 developed some degree of upward shift of the radius post-operatively. Although our series contains only 11 excisions of the radial head, no less than seven of these com-plained of wrist pain. Subluxation of the inferior radio-ulnar joint was present in four and osteo-arthritis of this joint in the other three. Thus we would say "If in doubt, treat conservatively." Since 40 per cent. of the articular circum-ference of the radial head, on the lateral side, does not articulate with the ulna, damage in that region would theoretically not interfere with rotation. In practice

Murray (1940) found that if the fracture involves no more than 70 per cent. of the lateral circumference, rotation is not impaired. Thus we would expect many Type II fractures to regain full rotation on conservative therapy.

Excision of the radial head in Type III fractures is the generally accepted procedure. Fowler (1953) considers, however, that this is meddlesome and unnecessary when the fragment has been displaced right through the capsule into the soft tissues. One patient illustrated this point by regaining a full range of painless movement on conservative therapy. The unsatisfactory results following excision have led some surgeons to use prosthetic replacement of the radial head, but general acceptance of this is not the rule. Residual loss of flexion and extension in the elbow with these fractures is usually attributed to damage to the capitellum, against which the head of the radius is crushed. Laceration of the articular cartilage is frequently seen at operation (12.5 per cent. of Murray's series (1940) and 30 per cent. of a series reported by Gaston et al. (1949)). Flexion and extension of the elbow, however, is often still impaired even after excision of the radial head, although there can now be no mechanical barrier in the radio-humeral joint. Murray (1940) considers that this limitation of movement is due to associated damage to the cartilage of the humerus and the trochlear notch of the ulna. It has not been emphasized, however, that there must also be serious soft tissue damage in the region of the joint. The initial injury often causes partial rupture of the medial ligament, laceration of the brachialis muscle and tearing of the capsule. Subsequent fibrous repair causes soft tissue contracture. Should this be the cause of limitation of movement, there is probably a place for gentle manipulation under general anæsthesia. This is the practice of Wagner (1955), who obtained an increased range of movement in 16 out of 18 cases manipulated six months after injury.

Type IV injury carries the worst prognosis due to the complete disruption of joint and high incidence of new bone formation. It is probably that the complication of myositis ossificans could be reduced by excision of the radial head within twenty-four hours of injury instead of the more conventional two to three weeks. Gaston et al. (1949) illustrate this point with two series of patients. In their first series of 20 cases, 10 had excision performed within twelve hours of injury and none developed myositis ossificans. The remaining ten did not have their operations until two to four days after injury and five patients (50 per cent.) developed myositis. In a second series of 12 patients, operated on within an average of six hours from the time of injury, none had new bone formation.

Our series of five cases in this group is too small to be significant, but it is interesting that the four patients operated on two to three weeks after reduction of the dislocation all developed some degree of myositis. The remaining patient had excision carried out within twenty-four hours of injury and did not get any local new bone formation.

SUMMARY.

One hundred cases of fracture of the head of the radius have been followed up clinically and radiologically. The methods of treatment in the four groups

of fractures have been discussed and the results assessed. The complications of excision of the radial head are emphasized and a more conservative approach favoured. When excision is considered necessary, operation within the first twenty-four hours gives best results.

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