

MINI-OPEN APPROACH FOR INTERNAL FIXATION OF RADIAL HEAD FRACTURES

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Abstract

The traditional approach to the radial head is the Kocher's approach which involves a long lateral incision extending from the lateral aspect of the humerus above the lateral epicondyle and extending along the radius up to the radial neck. This approach has the potential of damage to many important structures involved in the stability of the elbow including the lateral collateral ligament and the annular ligament of the radius. Due to the exposure extending down to the level of the radial neck, the chances of damage to posterior interosseous nerve were also high. The technique described involves a shorter incision and less dissection but, provides good exposure for a successful fixation. The authors regularly use the technique described for fixation of radial head fractures of Mason's 2 and above where fixation is indicated. The most recent was a patient with bilateral radial head fractures following a fall on to both out stretched hands and the technique described was used effectively with a shorter operating time and satisfactory surgical outcome.

Introduction

Background

This mini-open technique of radial head open reduction and internal fixation is an effective technique of achieving a good reduction with anatomical precision and solid fixation with no risk of damaging the posterior interosseous nerve.

The article titled mini open approach for open reduction and internal fixation of radial head fractures, describes a technique which is different from the traditional Kocher's approach used for this procedure. The technique involves an incision <5cm and minimises the dissection of the lateral collateral ligament of the elbow and the annular ligament is not divided, thus preserving the stability of the elbow.

Case presentation

A thirty year old lady fell off her horse and landed on both her out stretched hands resulting in bilateral Mason's 2 radial head fractures. Her elbows were swollen and bruised with no external injury. She had no pain anywhere else in the body.

The elbow movements were globally restricted bilaterally of both elbows. Flexion beyond 90 degrees was impossible due to pain and extension was possible to about 170 degrees from 90 degrees. Pronation and supination were nil. The integrity of both posterior interosseous nerves were maintained with no finger drop noted. The radial pulses of both sides were equal and normal in volume and rate. Her cervical spine was non-tender and her lower limbs and hip joints were normal without any clinical or radiological evidence of injury. Both radial head fractures were closed fractures.

Investigations

X rays of the elbows showed bilateral Mason's 2 fractures of the radial head.

Differential diagnosis

Mason's 2 closed fractures of right and left radial head fractures

Treatment

Surgical Technique

The patient positioned supine following general anaesthesia with an appropriate nerve block. The operating side shoulder is brought as close to the edge of the table and a side arm table is used. The tourniquet is applied as far away from the elbow as possible and the arm is fully cleaned and draped as for any elbow surgery. (Figure 01: - The cleaned and draped elbow) The anatomical land marks are marked and the incision is marked on the patient which extends from below the lateral epicondyle of the humerus to a point just beyond the palpable head of the radius. It is not more than 5cm in length. (Figure 02: - marking of the land marks; figure 03: - the incision) The deep fascia of the forearm is split longitudinally and the common extensor origin is visualised. One would observe the brachioradialis muscle at the superior aspect of the incision at this stage with the rest of the extensors occupying the majority of the surgical field. The muscles are traced back to the lateral epicondyle and the common origin is peeled off (Figure 04: - Common extensor origin peeled off; figure 05: - the lateral collateral ligament divided along its line of fibers) from the inferior aspect of the epicondyle just sufficient to expose the lateral collateral ligament of the elbow. The ligament is split longitudinally along the axis of its fibres exposing the radial head. With the use of bone levers the exposure is enhanced and under direct vision the fracture is reduced (figure 06: -Radial head is visualised; figure 07: - the fracture is reduced) K wires of 1.2mm diameter are used to maintain the reduction. The appropriate cannulated drill is used to drill through on the guide wires and self-tapping, self-compressing screws with a variable pitch is used to compress Mini-open fixation of radial head and fix the fracture. (Figure 08: - drilling over the guide 45 wires; figure 09: - using the self tapping and self- compressing screws for fixation) Once the fracture is fixed the stability is checked under direct vision and image intensifier views are used for confirmation of the fixation adequacy. (Figure 10: - the radial head after fixation) A layered closure is done with a sub-cuticular stitch to the skin. The elbow is immobilized on an above elbow plaster of Paris back slab.

Outcome and follow-up

The patient concerned made a full recovery without any complications. Full movement of both elbows were gained within 06 weeks of the procedure. The patient is followed up to monitor the development of myositis ossificans. We have a series of 15 patients who have undergone the same procedure with a mean follow up of one year. None of the 15 patients had a posterior interosseus nerve injury following the operation. None of the fifteen patients had elbow instability during follow up.

Discussion

The lateral collateral ligament complex is one of the main stabilizers of the elbow on the lateral side and the annular ligament provides rotational stability to the radio-capitular joint.^{1,2,3} The classical postero-lateral Kocher's approach to the elbow and the radial head, involves the incision to be made from a level above the lateral epicondyle of the humerus all the way down to a point beyond the radial neck risking the damage to the posterior interosseus nerve. This approach is known to cause lateral instability of the elbow following surgery on the radial head 1-2 The technique described by the authors is a much less extensive approach reducing the risk of damage to the main lateral stabilizers of the elbow, namely the lateral collateral ligament of the elbow and the annular ligament of the radius. 1-2 The approach does not divide the lateral collateral ligament of the elbow and involves splitting of the ligament in line with its fibres and following fixation the split is repaired. The annular ligament is not divided or involved in the exposure. The use of self-tapping and self-compressing screws has made the described approach to be sufficient for reduction and internal fixation eliminating the need for compressing clamps and reduction clamps. This makes a wide exposure unnecessary. Further, as in the Wrightington approach to the 78 radial head exposure in this technique does not involve elevation of the anconeus and it does not involve an osteotomy of the insertion of the lateral ligament complex to the ulna. 1 Due to the limited the exposure the overall operating time and tourniquet time is markedly reduced as well. We present a series of eleven patients who had their radial head fractures fixed using the miniopen technique done by a single surgeon within a period of five years. The mean follow up was three months. None of the patients in the series developed posterior interosseus nerve palsy and one patient had restriction of supination and pronation of the elbow which was overcome following vigorous physiotherapy. None of the patients in our series developed myositis ossificans. We appreciate the fact that the numbers in our series are small

and no statistically significant inferences could be drawn out of the data. Radial head fractures without elbow instability requiring open reduction and internal fixation are uncommon.

Learning points/take home messages

The mini-open technique to fix radial head fractures is an effective technique which is simple and prevents the complications of elbow instability and nerve injury.

References

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Figure captions



Figure 01- Marking of the head of the radius and the distal end of the humerus



Figure 02- Skin incision which is made below the lateral epicondyle and not extending beyond the radial neck



Figure 03- The Deep fascia is split along the line of it's fibres



Figure 04- The common extensors are elevated and the lateral collateral ligament is split along its fibres



Figure 05- The radial head is exposed and the annular ligament is not disturbed



Figure 06- fracture is reduced using Mcdonald's dissectors and the articular surface is Reconstructed



Figure 07- The reduced fracture is seen demonstrated in relation ship with the radio-capitular joint



Figure 08- The guide wire is drilled in with a sleeve for protecting the soft tissues around.



Figure 09- The compression screw with variable pitch is threaded along the guide wire and screwed home compressing the fractured fragments



Figure 10- Another fragment is fixed in the same method by rotating the head and getting the fragment into the operating field