# Treatment Of Mason Type II Radial Head Fractures With External Fixation- A Novel Technique

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#### Abstract

Management of Mason type II fracture is controversial and there is no consensus as to the best modality of treatment. Open reduction and plate fixation though most popular modality is more invasive and associated with hardware related problems. In this study, 17 patients with Mason type II radial head fractures were treated with a novel technique of closed reduction and external fixation. The patients were evaluated for pain by visual analogue scale (VAS), time to discharge and time to union. Functional assessment was done at 3 and 6 months with Mayo elbow performance score. Pain gradually decreased with time with average VAS of 0.3 at 3 months. The average time to discharge was 1.5 days and time to union was 6.8 weeks. The functional outcome was excellent in all patients at end of 6 months with no major intraoperative or postoperative complications. This study concludes that closed percutaneous reduction and external fixation can prove to be a good alternative to conventional open reduction and fixation procedures.

## INTRODUCTION

Radial head fractures are challenging injuries to treat. Mason's type has been the most commonly used and universally accepted classification system. It is based on the severity of the fracture and has a good interobserver reliability1,2. Though treatment options for Mason's Type I and Type III fractures are fairly defined, Type II fractures pose a therapeutic challenge. The treatment options range from conservative treatment with immobilization in long arm cast to open reduction and plate fixation with none of them having a clear advantage. With conservative treatment yielding unsatisfactory results and hardware-related problems in more invasive plate fixation, we believe that any method which is less invasive, provide stable reduction and eliminate long term hardware-related problems will yield better results 3,4. Hence, we studied a novel and minimally invasive technique for treatment of Mason's type II radial head fractures by mini-external fixator.

## MATERIAL AND METHODS

Local ethical committee approval was obtained prior to commencement of the study. This was a prospective study done at a single tertiary care trauma centre by an experienced trauma surgeon from June 2009 to Sept 2013. Patients with isolated, closed Mason type II radial head fracture were included in the study. Those with compound fracture, polytrauma patients, associated radial neck fractures, or associated Essex-Lopresti injury were excluded from the study. All the patients were evaluated radiologically with standard AP, lateral and 45 oblique views of the elbow (Fig 1). The patients were clinically and radiologically evaluated for wrist pain to rule out Essex-Lopresti injury. The fracture was classified by the Mason's classification and those with type II fracture and willing for surgery were included in the study. During the study period, 21 patients were diagnosed Mason's type II radial head fractures out of which 17 satisfied the inclusion criteria and were included in the study. One patient with associated Monteggia fracture and another with associated ipsilateral humeral shaft fracture were excluded from the study. Two patients refused surgery and opted for conservative treatment. All the patients were informed about the procedure and an informed written consent was obtained.

#### Figure 1

Mason type II radial head fracture



### SURGICAL TECHNIQUE

All procedures were performed under general anaesthesia with the patient supine and the elbow flexed and supinated on a lateral support. A 1.5 mm k-wire was inserted percutaneously and was used as a joystick to maneuver the displaced radial head fragment into place. The same wire was advanced through the fragment and the fracture site into the radial head. Another wire was then inserted similarly in another plane. Two wires were inserted in the shaft about 3-4 centimeters from the head. A connecting rod with universal clamps connecting the proximal and distal wires completed the construct (Fig. 2). The arm was supported in a sling for 4 weeks and flexion-extension movements were encouraged from day 1. Pronation-supination movements were started after the removal of the fixator after 4 weeks. All the patients were discharged on the same day or a day later and assessed for pain by Visual Analog Scale (VAS) at discharge. All patients were reviewed on day 7, 14 and day 30 after the operation. Pin site dressing was applied at each visit. All patients were encouraged to perform full flexionextension movements (Fig. 3, Fig. 4). At 4 weeks the external fixator was removed and an x-ray was done to

assess the status of the union. Pronation-supination movements were started immediately thereafter. All the patients were assessed for pain by VAS at 1 and 3 months after the operation. Radiographs of the elbow were repeated at 6, 8 and 12 weeks to assess the status of the union. The functional status was assessed at 12 weeks and 6 months by the Mayo elbow performance score5. Patients were also assessed for any complications during the study period.

### Figure 2

External fixation for Mason Type II radial head fracture



**Figure 3** Flexion of elbow with external fixator in situ



#### Figure 4

Extension of elbow with fixator in situ



### RESULTS

There were 14 males and 3 females in the study group. The results are summarized in Table 1.

### Table 1

Results

	Mean ± Std. Dev. (Range)
Age (years)	42.5 ± 8.4 (28-62)
Time from injury to operation (days)	1.2 ± 0.8 (1-3)
Time to discharge (days)	1.5 ± 0.4 (1-2)
VAS at discharge	3.6 ± 1.2 (1-4)
VAS at 1 month	1.4 ± 0.8 (0-3)
VAS at 3 months	0.3 ± 0.2 (0-1)
Time to union (weeks)	6.8 ± 2.0 (4-8)
Mayo elbow performance score at 3 months	92.3 ± 4.4 (87-97)
Mayo elbow performance score at 6 months	96.6 ± 3.4 (90-100)

The minimum follow up was 6 months with average of 1.2 years. No major complications were noted during or after the procedure. No patient had loss of reduction on the postoperative follow-up radiographs. One patient had single pin site discharge after three weeks which settled with oral antibiotics and removal of external fixator at 4 weeks. The functional outcome at 3 months was 'excellent' in 12 patients (71%) and 'good' in 5 patients (29%). At 6 months all the patients had 'excellent' outcome. All patients returned to their preoperative work after 6 months after the injury.

## DISCUSSION

Radial head fractures are challenging injuries to treat with long term results largely favorable6. Mason classification

has been a universally accepted classification system since quite some time. Owing to its simplicity it has a good interobserver reliability1,2. Mason type II fractures are two part fractures of the radial head with displacement1. Though conservative treatment has been advocated for minimally displaced fractures the results are inferior to open reduction in case of displaced fractures3,7. Similarly, radial head excision is reserved for more comminuted fractures8. Thus, there has been no consensus on the ideal treatment modality. Though open reduction and plate or screw fixation has yielded good results this modality is more invasive. With the proximity of posterior interosseous nerve to the proximal radius, one has to be very careful while plating radial head 9. Also, the need to place the implant in the 'safe zone' cannot be overemphasized to prevent restriction in the rotation movement 10-12. Therefore, as an alternative to this invasive approach, we studied a novel technique of treatment for Mason type II fractures using a mini-external fixator system. We believe that the most important advantage of this modality is the ability to achieve satisfactory reduction by joystick maneuver with a minimally invasive percutaneous k-wire. The same wire when advanced across the fracture site helps in satisfactory fixation of the fracture. To avoid the posterior interosseous nerve, a small stab incision is made at the distal wire insertion site and blunt dissection is used to reach the bone. We believe that the construct is fairly rigid to allow immediate elbow range of motion except rotations. Similarly, another major advantage is that, removal of the implants is extremely easy, at times in the outpatient department using a simple incision.

The anatomy of the proximal radius is subject to wide variation13. Though open reduction and plate fixation is currently the most preferred modality of treatment for displaced two-part fractures, none of the current low profile radial head plates caters this wide anatomic variation 14,15. To facilitate minimally invasive surgery and less hardware need in an already constrained area of radial head and neck, Pearce et.al. used Herbert screw fixation and yielded good results16. Similarly, based on the same principle, Otink et.al. et.al. used meniscal arrows to fix radial head fractures again claiming good results17. To our knowledge there have been no published studies in English literature to date describing closed reduction and external fixation as the modality of treatment in Mason type II radial head fractures. Ikeda et.al evaluated the results of open reduction and mini condylar blade plate fixation in radial head and neck fractures and reported good to excellent result in the majority of the patients18. Our result with an external fixator as the

modality of treatment is comparable to this study.

There are certain drawbacks of this study. Firstly, this is not a comparative study. But the aim of this study was to present this novel technique as a safe and less invasive modality of treatment. Secondly, the sample size may be too small to study any complications but we believe that the immediate or short term complications are bound to be less due to the simplicity of the technique and early removal of the implant. Thirdly, the follow-up period was too short to study long term complications like radio-capitellar arthritis. But we believe that this complication will also be less owing to early removal of the hardware. Also, it is understood that the ultimate outcome by any treatment modality is largely based on the ability to achieve anatomic reduction and maintain stable fixation, both of which can be satisfactorily achieved by this technique. We agree that conclusive evidence regarding efficacy and safety of this technique cannot be established but this technique has definitely shown promise and this study can serve as a pilot study for future randomized controlled trials.

## CONCLUSION

Percutaneous reduction and external fixation offers a less invasive modality of treatment for Mason type II radial head fractures with minimal complications and excellent functional outcome.

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