

Results of Closed Reduction and Percutaneous Pinning of Bennett's Fracture

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ABSTRACT

Introduction: Treatment of Bennett's fractures has been controversial with surgeons preferring any of the techniques viz., conservative treatment using thumb spica, open reduction and closed reduction and K-wiring with different outcomes. The aim of this study was to assess outcomes of Bennett fracture treated by closed reduction and percutaneous pinning.

Material and Methods: A retrospective study of 14 patients of Bennett's fracture treated between November 2016 to October 2019 by closed reduction and percutaneous pinning was done in a tertiary care hospital of J&K. Results and complications were at 3, 6 and 12 months.

Results: We got satisfactory results in most of the patients (85%) 2 patients had stage 3 arthritic changes, 1 had pin tract infection, and 1 patient had tingling sensation over radial aspect of thumb, one case needed reoperation because of loss of reduction. Functional testing of pinch and grip strength showed no significant difference.

Conclusion: Our satisfactory results suggest that closed reduction and percutaneous pinning is an excellent method of treatment for these fractures.

Keywords: Bennett's Fracture, Closed Reduction, Percutaneous Pinning, Arthritis, K-Wire

INTRODUCTION

Fractures of first metacarpal base are classified using Green and O'Brien classification. Five fractures have been defined: Bennett's fracture, Rolando's fracture, transverse extraarticular, oblique extra-articular and epiphyseal.

Bennett's fracture is an intraarticular fracture in which the shaft is laterally dislocated by the unopposed pull of the abductor pollicis longus (1882, Bennett, an Irish surgeon). Radiographs are essential in the evaluation of these injuries and in helping to plan a surgical approach for reduction, as these fractures are considered unstable. Standard hand radiographs include anteroposterior (AP), lateral, and oblique views. Additional dedicated views of the thumb can be obtained to provide additional information about the injury, including Robert's view and Bett's view. Based upon the radiographic appearance, Gredda classified Bennett fractures into three types, with type 1 being a fracture with a single ulnar fragment and subluxation of the metacarpal base, type 2 an impaction fracture without subluxation of the first metacarpal, and type 3 an injury with a small ulnar avulsion fragment in association with metacarpal dislocation.

The injury is typically caused by axial loading on a partially flexed metacarpal and may be associated with other carpal bone fractures or ligament injuries. The medial projection

of the thumb metacarpal base on which the volar oblique ligament attaches remains in place. Due to this fracture, the first metacarpal shaft subluxes dorsally, proximally, and radially due to the pull of the abductor pollicis longus, extensor pollicis longus, extensor pollicis brevis, and the adductor pollicis brevis, which remain attached to the fracture fragment.

The surgical treatment is varied for these fractures. It may consist of closed reduction with percutaneous pinning or open reduction with either pins or interfragmentary screws. If there is a good alignment of the fracture fragments at postsurgical fixation, clinical outcomes are generally good.

Long-term patient-reported outcomes following displaced Bennett fractures treated by closed reduction and Kirschner wire fixation show excellent functional results. At a mean follow-up of 11.5 years the 62 patients in this study had a high level of patient satisfaction and none required a revision or salvage procedure.

MATERIALS AND METHODS

In this retrospective study, hospital's research ethics committee's approval was obtained to review the records of all the treated patients with Bennett fractures between November 2016 to October 2019. Procedures were performed in accordance with the 1975 Declaration of Helsinki.

Inclusion criteria were Bennett fractures (Gedda type I) treated with percutaneous K-wire fixation; no previous injury on the 1st metacarpal and minimum age of 15 years at the time of injury. A total of 14 patients were included in the study (Table 1). Patients who did not meet the inclusion criteria were excluded. When patients met all the inclusion criteria, they were invited to return the outpatient clinic.

Surgical procedure

- Maintaining fracture reduction by manual traction and pressure, one or more 0.045- or 0.062-inch K wires were drilled into the base of the metacarpal across the joint

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and into the trapezium.

- Reduction was checked under C-arm if it was accurate, wires were cut near the skin (Fig 1).
- A forearm cast was applied, holding the wrist in extension and the thumb in abduction; leaving the thumb interphalangeal joint free.
- The cast was removed for wound inspection at 2 to 3 weeks but was replaced and worn until 4 weeks after surgery.

Patients were seen for follow-up after 1, 3, 6 and 12 months. At 1 ½ -month follow-up, radiographs were made to confirm consolidation. When callus formation was present, the K-wires were removed under local anaesthesia but cast was given again for 2 to 4 weeks. In the absence of callus formation, the patient was re-examined with radiographs 1 or 2 weeks after the first evaluation. At 3-and 6- month follow-up, wound healing and functional recovery were evaluated. During the outpatient assessment, subjective hand strength was determined using a Scale from 0 to 10 to Score the patient's self-reported strength in comparison with strength before the injury event. To evaluate pain, we used a Visual Analog Scale (VAS). Postoperative complications and re-operations were documented. Sensory examination of the radial side of the operated thumb was compared with the patient's non-injured hand and classified as normal intact sensation, tingling or numbness. Grip- and pinch-strength of both hands was assessed.

At final follow up radiographs were taken in two separate views to evaluate post-traumatic arthritis of the first carpometacarpal joint using the Eaton and Littler classification: stage I – no clear arthritic changes; stage II – osteophytes smaller than 2 mm; stage III – osteophytes larger than 2 mm or joint narrowing and stage IV – joint space more or less disappeared.

RESULTS

All 14 patients were clinically and radiologically assessed during the outpatient review visit. Mean follow-up time was 1.5 years. The average age at the time of injury was

31.4 years. Nine patients were male and five were female. The dominant hand was injured in 9 patients. Mechanism of injury varied from sports injuries, motorcycle accidents and car accidents, to involvement in a fight and a fall on an outstretched hand. Medical history showed no relevant injuries or illnesses prior to the treatment of the Bennett's fracture.

All patients were treated by closed reduction and percutaneous pinning and consisted of transmetacarpal fixation between metacarpal I and II or with metacarpotrapezoidal K-wires. Post-operative management varied from cast immobilization and removable splint to functional rehabilitation.

Functional outcomes

The mean DASH Score for all patients was 4.85. Grip- and pinch-strength were good in the majority of patients in comparison to the non-injured hand for both techniques. In total, 4 patients reported pain at follow-up. Statistical analysis showed a significant correlation between the DASH and Pain Score and also a significant correlation between pain (VAS) and strength. A higher Pain Score correlated significantly with a higher DASH and lower strength.

Complications

Complications were reported in 5 (35.7%) treated patients. Pin-tract infection occurred in one CRPF-treated patient who was successfully treated with oral antibiotics and K-wire removal after the fracture healed. Sensory examination of the operated hand found normal sensation in 13 patients.



Figure-1:

Case No	Sex	Age	Dominant Hand	Injury side	Days to surgery	Complication	DASH	Pinch (R)	Pinch (L)	Grip (R)	Grip (L)	VAS score
1	M	18	R	R	5	-	0	9.5	11.3	37	37	0
2	M	21	R	L	3	Pin tract inf.	5	10.3	8.3	32	30	3
3	F	17	R	R	2	-	4	10.0	11.5	35	34	0
4	M	45	R	R	4	-	0	10.2	12	41	41	0
5	F	54	R	R	1	Arthritis	0	8.7	12.0	43	42	5
6	M	29	R	L	2	-	0	12.5	10.3	46	40	0
7	F	32	R	R	3	Loss of reduct.	15	7.8	9.5	36	35	0
8	F	23	R	L	2	-	0	11.8	9.1	33	31	0
9	M	46	L	L	5	-	4	12.0	9.4	38	37	0
10	M	26	R	L	4	-	3	12.4	8.7	40	39	0
11	M	19	R	R	3	Tingling	5	10.8	12.9	34	33	2
12	F	33	R	R	3	-	0	9.1	11.6	43	41	0
13	M	37	R	L	2	Arthritis	28	9.4	7.2	31	30	5
14	M	40	L	L	8	-	4	11.9	8.3	54	53	0

Table-1:

Tingling was found in 1 patient.

Radiographs

In two patients, the radiographs showed Eaton–Littler Grade III or IV carpometacarpal arthritis at a follow-up of 3 years. There was a significant correlation between a persistent step-off or gap after surgical fixation larger than 2 mm and the development of post-traumatic arthritis. Loss of reduction was reported in one patient who was successfully re-operated with the same technique.

DISCUSSION

Bennett described the treatment of these fractures with closed reduction and splinting, which remained the preferred method of treatment until the 1970s. Reduction by traction is easy but is difficult to maintain. Proper reduction requires traction in an axial direction with palmar abduction, and pronation while applying external pressure over the first metacarpal base. Thumb extension (known as the hitchhiker position) has been shown to cause fracture displacement and should be avoided.

The use of a cast that maintains reduction by pressure on the base of the metacarpal is often unsatisfactory because immobilization is incomplete and verification of alignment by radiographs through the overlying cast is difficult. Too much pressure causes skin necrosis, and too little allows loss of reduction.

In the 1950's the first reports were published showing better results when this unstable fracture is treated surgically. In the following years, several surgical techniques have been described and new techniques have been introduced. Previous research has shown that fracture reduction after percutaneous fixation can be adequately assessed with fluoroscopy. The need for anatomical reduction via ORIF or even arthroscopy might be less important since previous smaller studies also reported good outcomes when the step-off was smaller than 2 mm but should reduction be unsatisfactory, open reduction is indicated.

In our study pain was mostly seen in pin tract infections and arthritis because of functional impairment. In line with previous publications with shorter follow-up, our study confirms good clinical results for CRPP for treating Bennett's fracture. In our study we found high pain scores (VAS > 3) in three patients. A higher Pain Score was significantly correlated with a higher DASH and lower strength which makes these findings clinically important. Another important finding of our study is the significant correlation between a persistent step-off and gap of 2 mm and the development of post-traumatic arthritis.

CONCLUSION

Despite a relatively simple appearance on radiographs, Bennett fractures are very unstable fractures. CRPP, a relatively simple technique, by providing anatomical reduction and thereby preventing post-traumatic arthritis, gives mostly satisfactory results. Moreover, it avoids many of the complications (numbness, persistent pain) that are frequently seen in ORIF technique. Based on our findings, a

Bennett fracture can be safely treated with CRPP technique.

REFERENCES

1. Van Niekerk JL, Ouwens R. Fractures of the base of the first metacarpal bone: results of surgical treatment. *Injury* 1989;20:359–62.
2. Bennett EH. Fractures of the metacarpal bones. *Dublin Med Sci J* 1882;73:72–5.
3. Moberg E, Gedda KO. Surgical therapy of Bennett's fracture. *Nord Med* 1952;47:751–2.
4. Gedda KO, Moberg E. Open reduction and osteosynthesis of the so-called Bennett's fracture in the carpo-metacarpal joint of the thumb. *Acta Orthop Scand* 1952;22:249–57.
5. Kjaer-Petersen K, Langhoff O, Andersen K. Bennett's fracture. *J Hand Surg Br* 1990;15:58–61
6. Capo JT, Kinchelow T, Orillaza NS, Rossy W. Accuracy of fluoroscopy in closed reduction and percutaneous fixation of simulated Bennett's fracture. *J Hand Surg Am* 2009;34:637–41
7. Guss MS, Kaye D, Rettig M. Bennett fractures. A review of management. *Bull Hosp Jt Dis* 2016;74:197–202
8. Stanton JS, Dias JJ, Burke FD. Fractures of the tubular bones of the hand. *J Hand Surg Eur Vol.* 2007;32:626-36.
9. Gedda Ko. Studies on Bennett's fracture; anatomy, roentgenology, and therapy. *Acta Chir Scand Suppl.* 1954; 193:1-114
10. Fischborn T, Beckenbauer D, Held M, Daigeler A, Medved F. Analysis of Operative Techniques of Fractures of the First Metacarpal Base. *Ann Plast Surg.* 2018;80:507-514.
11. James H. Calandruccio. Fractures, dislocations and ligamentous injuries. *Campbell's Operative Orthopaedics.* 13th ed. Vol-4, Philadelphia: Elsevier; 2017. pp. 3406-3410

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