Arthroscopic Management of Bennett Fracture

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KEYWORDS

• Bennett • Arthroscopy • Fracture • Thumb metacarpal • Percutaneous

KEY POINTS

- Thumb carpometacarpal arthroscopy for Bennett fractures is the best method of assessing reduction while allowing for percutaneous fixation, as fluoroscopy alone may underestimate residual joint incongruity.
- If there is a severe injury to the joint, need for shaft fixation, or concomitant soft tissue repair or reconstruction, then open reduction internal fixation is preferable.
- It is important to be aware of the local anatomy surrounding the first carpometacarpal portals, as injury to the dorsal sensory nerve branches is possible.
- If using percutaneous screws for fixation, arthroscopy ensures that the tips of the screws are not too long, as they may enter the thumb/index metacarpal articulation space.

INTRODUCTION

At the British Medical Association meeting held in Cardiff in July of 1885, Edward H. Bennett, MD, a professor of surgery at the University of Dublin and president of the Royal College of Surgeons of Ireland, documented and supported his findings with pathologic specimens of the most common fracture of the base of the thumb, which later took his name.[1–5] He dedicated a large part of his career toward the study and collection of skeletal specimens, despite criticism by his peers, in the hope of improving clinical diagnosis by physicians, as well as to improve the outcomes of his patients. We now know that the mechanism of injury is typically an axial force applied to the thumb in a flexed position. This fracture produces a predictable deformity of the first metacarpal shaft in a supinated, dorsal, radial, and proximal direction while the volar ulnar fragment is held in place by the anterior oblique ligament, which is attached to the trapezium.[6–8] Forces exerted by the abductor pollicis longus, extensor pollicis longus, extensor pollicis brevis, and adductor pollicis produce this deformity. The ulnar fragment may vary in size and the metacarpal may be either subluxated or grossly dislocated (**Fig. 1**). A classification system set forth by Gedda divides this injury into 3 categories.[9] Type 1 represents a first metacarpal subluxation with an associated large volar ulnar fragment; type 2 is not associated with subluxation but includes joint impaction; and type 3 involves dislocation of the metacarpal with a small ulnar remnant attached to the anterior oblique ligament. Recognition of this injury in the emergency room or office is necessary, as missing it may lead

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Fig. 1. Bennett fracture with dorsal, radial, proximal, and supinated deformity of the first metacarpal, and maintenance of reduction of the volar ulnar fragment to the anterior oblique ligament.

to irreversible posttraumatic arthritis and loss of function. Initial closed reduction of these injuries should be attempted, as some patients may be lost to follow-up or take a significant amount of time to present to an orthopedic physician for appropriate care.[10] A reduction maneuver should include axial traction, palmar abduction, and pronation while applying force to the metacarpal base.[11,12] Maintaining this reduction in a splint as a definitive treatment may be difficult, as prolonged pressure on the skin can lead to wounds and the fracture may displace over time as swelling subsides. Nondisplaced and stable fractures may be treated in a thumb spica cast for 4 to 6 weeks. Fractures with residual subluxation, dislocation, and a joint step off greater than 1 mm should undergo operative fixation. The exact degree of persistent joint step off that leads to long-term symptoms is unknown, but reduction of joint subluxation or dislocation should be accomplished.[13] A technique for arthroscopic evaluation of the first carpometacarpal (CMC) joint was described by Berger[14] in 1997, and since that time, has led to the ability to reduce and fix fractures under direct visualization while causing minimal morbidity to local soft tissues. Closed reduction and percutaneous pinning under fluoroscopic guidance may lead to equivalent outcomes as open reduction internal fixation in long-term studies, but fluoroscopy may underestimate persistent joint incongruity that may be better seen with traditional radiography, arthroscopy, or open means, and may lead to long-term posttraumatic arthritis.[15] At present, no one technique of surgical management has been shown to be superior in clinical or cadaveric studies.[16,17]

INDICATIONS

Arthroscopic reduction and fixation of Bennett fractures remains a viable option of treatment for any fracture that necessitates surgery. Placement of the thumb in the arthroscopy tower with 5 to 10 pounds of traction aids in reduction and distracts the joint to allow for inspection of the articular surface with a 1.9-mm to 2.7-mm 30° angled short arthroscope (**Fig. 2**).[18] This technique obviates the need for an extensile open surgical approach and diminishes soft tissue stripping of fracture fragments and injury to the dorsal ligamentous complex, which is important for stability.[19] Evaluation with the arthroscope also helps to ensure that percutaneous screw fixation does not penetrate the joint surface and also allows for debridement of any posttraumatic loose bodies or cartilaginous flaps.[20]

CONTRAINDICATIONS

Any complex articular fracture that is not amenable to percutaneous pinning or screw fixation is not appropriate for arthroscopic treatment and may require open reduction internal fixation (**Table 1**).[21–23] Chronic injuries requiring osteotomy and reduction may also require open treatment.[24] If there is an active infection overlying the area of injury, this should be addressed appropriately with debridement and/or antibiotic treatment. Associated soft tissue injury near the first CMC joint that requires repair or reconstruction may also preclude arthroscopy.

SURGICAL TECHNIQUE

Preoperative Planning

Fractures of the base of the first metacarpal may occur by low-energy or high-energy mechanisms of injury. There may be associated fractures in the ipsilateral upper extremity, as well as soft tissue and neurovascular injuries that may preclude use of an arthroscopy tower. A reduction attempt should be performed on initial injury, but may not