Simple Elbow Dislocation in Patients With High Body Mass Index

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Summary: In patients with a body mass index (BMI) above 30, simple elbow dislocations can have associated soft-tissue stripping and severe instability not typically seen in patients who have lower BMIs. Possible treatment options include open soft-tissue repair with temporary fixation of the joint to allow healing of the soft tissues. Soft-tissue repair only without joint stabilization may lead to failure of the repair and recurrent elbow instability because the sutured ligaments cannot support the weight of the arm. Early motion of the elbow joint is preferred because it decreases the chances of elbow stiffness. We describe a patient with a BMI above 30 who had a simple elbow dislocation and a complex elbow injury with severe soft-tissue stripping. Treatment included open reduction of the elbow joint, repair of the lateral ulnar collateral ligament, and placement of an internal joint stabilizer. At 4-year follow-up, the patient has a painless joint without arthritis and full range of motion without any deficit.

Key Words: elbow, dislocation, obesity

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INTRODUCTION

Elbow dislocations have an incidence of 5.2 cases per 100,000 people in the United States.1 Most elbow dislocations are simple elbow dislocations, which are typically treated with closed reduction, splinting for 14 days or less, and early mobilization. However, in patients with a body mass index (BMI) above 30, simple elbow dislocations can be more challenging because the degree of soft-tissue disruption tends to be more severe than in patients without obesity.2 Obesity is known to be more prevalent,34 and BMI in itself is associated with higher rates of injury.5 Obesity was found to be a negative prognostic factor in treating terrible triad injuries,6 elbow arthroscopy,7 and ankle fractures,8 as well as elbow,9 shoulder,10,11 and knee arthroplasty.12 In orthopaedic trauma, obesity can impact anesthesia, positioning, incision site, and implant considerations.13 Open surgical treatment of simple elbow dislocations in patients with a BMI above 30 is about 15 times greater than that for patients who are not obese.2

The elbow is stabilized by bony structures that include the capitellum/radial head articulation and coronoid/trochlear articulation.14 The surrounding soft tissues, including muscle that spans the elbow joint and the medial and lateral collateral ligaments, provide additional stability to the elbow. The elbow joint does not stay reduced when the soft-tissue structures are disrupted. It is imperative to repair these damaged structures. In patients with a BMI above 30, the rate of complications and rate of reoperation are both high even with well-repaired soft tissues.2,15 The soft-tissue repair must be protected, and the addition of a joint fixator is often required to maintain a concentric joint while the soft tissue heals. The indication for repeat surgery is typically related to recurrent instability after soft-tissue repair without additional joint fixation at the index procedure.15

The surgeon should preoperatively plan for persistent instability after soft-tissue repair in this patient population. Options for stabilization include utilization of an external fixator, ulnomemural pins, or an internal fixator. The internal fixator is the authors’ preferred method. External fixators have high complication rates and are difficult to manage in patients with high BMIs.15 Placement of external fixator pins in the humerus poses a risk to the radial nerve at the distal third of the humerus. Placement of ulnomemural pins is an option but the pins must go through the joint articular surface, which causes damage to the
articulated surface. In both of these scenarios, the elbow joint is fixed and early motion is not possible. The internal fixator available, the internal joint stabilizer (IJS) (Fig. 1), has proved to be an excellent option for simple elbow dislocations in patients with a BMI above 30 with a grossly unstable elbow. The IJS is a low-profile implant that provides adequate stability for early motion, protects the soft-tissue repair, and has a straightforward removal.16,17

Surgically, it is much more difficult to reoperate for recurrent elbow instability than to identify the instability intraoperatively and stabilize the elbow joint at the index procedure. It is important to recognize the increased risk in patients with a BMI above 30. We present a patient with a BMI of 35 who had an elbow dislocation with severe instability despite no bony involvement. He was treated with collateral ligament repair and placement, followed by removal of the IJS, with excellent outcome at 4-year follow-up.

**Patient Information**

The patient was a 35-year-old motorcyclist, who hit a cow at 70 miles per hour. His BMI was 35 at the time of the injury. He had multiple injuries, including a simple elbow dislocation (Fig. 2). He underwent 3 attempts at reduction, which all failed at maintaining a concentric elbow joint (Figs. 3–5). He underwent open reduction of the elbow dislocation with repair of his lateral ulnar collateral ligament using bone tunnels and stabilization with IJS (Fig. 6). At 4-year follow-up, the patient has full range of motion of the elbow with no deficit and a stable, functional, and painless elbow.

**Surgical Technique**

The IJS is an elbow internal hinge used for the treatment of elbow instability.16 This implant has proved extremely useful in the treatment of patients with elevated BMI and simple dislocations. The degree of distal humerus soft-tissue stripping in these patients is profound with intraoperative findings of a denuded distal humerus. The IJS is a beneficial treatment option because these patients can immediately mobilize the elbow and are not encumbered by external pins that inevitably apply tension to the skin and have a high rate of infection.

The IJS is composed of a central axis pin, ulna posterior plate, and boom arm. The central axis pin is smooth and rotates within the distal humerus. The boom arm has 3 points of articulation: one at humeral axis pin, one at the hinge, and one where the boom arm connects to the plate. These 3 separate points of articulation allow significant degrees of freedom in adjusting the position of the boom arm in relation to the central axis pin and plate. It allows concentric reduction and stabilization of the elbow joint no matter the size of the patient.

The central axis pin is placed first using a trochlear guide. The trochlear guide is advanced and firmly stabilized on the lateral aspect of the trochlea. The guide should fit concentrically on the trochlea. There are 3 sizes, small, medium, and large. The trochlear guide is placed so that it lies nestled against the trochlea and parallel to the joint line. It is important that the orientation of the distal humerus is well visualized. The trochlear guide is then used to place the central anchored based on the orientation and measurements of the distal humerus.
Postoperative Course

Our patient removed his own splint 1-day postoperatively. It is recommended that a posterior splint be applied for 10–14 days after ligament repair and IJS placement. However, our patient was a polytrauma patient and needed one hand to feed and care for himself. He had little pain in his left elbow, and his elbow range of motion was smooth on examination. His wishes were respected, and the splint was not reapplied. The patient was unable to attend physical therapy because he was caring for his wife who was also injured in the motorcycle accident, thus his postoperative rehabilitation was self-motivated under guidance. His range of motion was 0–120 degrees of flexion by 2 weeks postoperatively (Fig. 7). IJS was removed at 8 weeks (Fig. 8) postoperatively, in which he had near full range of motion. At final follow-up at 4 years postoperatively, the patient had full range of motion of the elbow with no deficit (Fig. 9). He had a normal, concentric elbow with no pain. On x-ray, he had a normal elbow joint with minimal heterotopic bone formation on the lateral side.

DISCUSSION

The IJS as a treatment option for elbow stabilization in patients with a high BMI has multiple advantages. The IJS avoids the
placement of an external fixator, which has associated external pins and high rates of complications. The IJS is all internal and lies adjacent to the bone, allowing maximum stability to the joint. The system provides guides that facilitate the surgical procedure. The most critical portion of the procedure is the placement of the central axis pin. The joint will not be concentric and will not move normally if the central axis pin is placed off-axis, thus the IJS mechanism may not withstand the torque of the off-axis joint. If this is noted intraoperatively, the position of the central axis pin must be corrected. The base plate placement has more freedom with respect to placement. However, for best results, the plate should be placed over the posterior aspect of the proximal ulna with the plate just proximal to the tip of the olecranon. This allows the base plate to be joined to the boom arm efficiently with the shortest distance being from the plate to the central axis pin.

It is recommended that the plate be removed at 6–8 weeks postoperatively; however, many patients refuse to have additional surgery because the implant is not bothersome. Recommendations and risks are clearly explained, but the patient’s choice is ultimately respected. Once the ligaments heal and the joint is concentric, the IJS is no longer providing stability. In cases where IJS dissociates, the joint remains stable and concentric. In the authors’ experience, there have been cases where IJS dissociates and is not bothersome to the patient, thus the implant is left in place. The main advantages of using the IJS are the avoidance of external pins, immediate mobilization of the elbow joint within 14 days, and good clinical outcomes as represented by this case of concentric, painless elbow joint with normal motion at 4 years follow-up.

CONCLUSION

In patients with elevated BMI, simple elbow dislocations are complex problems. Closed reduction and splinting or bracing is less successful in obese patients with elbow dislocations due to severe soft-tissue stripping. In these situations, it is imperative to recognize the severity of the injury and plan to provide additional stability to the elbow joint. In this patient’s case, he was involved in a motorcycle crash and presented with a simple elbow dislocation with profound instability. Treatment with the IJS proved to be an excellent option with maintenance of a concentric joint, immediate range of motion motivated by the patient, and excellent outcome at 4 years follow-up. The patient had full range of motion in supination and pronation and flexion and extension with no pain as well as x-rays showing a concentric elbow joint with minimal heterotopic bone formation and no arthritis.

FIGURE 9. Patient at 4-year follow-up with full elbow flexion and extension and supination and pronation. Anteroposterior and lateral x-rays showing heterotopic bone formation on the lateral side of the elbow joint. The patient has no deficit in motion.

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REFERENCES


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