Modified McLaughlin Technique for Neglected Locked Posterior Dislocation of the Shoulder

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Abstract

Several surgical techniques have been described for the treatment of posterior shoulder dislocation depending on the time elapsed between injury and surgery and the size of the humeral head impression fracture. When the bone defect is between 25% and 50% of the articular surface of the head, the procedures of choice are autologous bone graft or allograft or subscapularis tendon or lesser tuberosity transfer. In neglected cases in which patients undergo surgery more than 3 weeks after injury, no standard accepted treatment for this injury exists.

This article presents a modification of the McLaughlin technique for patients with neglected locked posterior dislocation of the shoulder. Using this technique, the shape of the humeral head was nearly restored with impaction of morselized bone allograft; two suture anchors were inserted into the defect, and the lesser tuberosity with the attached subscapularis tendon was transferred into the defect and secured with sutures. Postoperative rehabilitation included immobilization of the shoulder with an external rotation brace for 6 weeks followed by progressive passive, active-assisted, and active range of motion and rotator cuff strengthening exercises for another 6 weeks. This technique resulted in pain-free range of motion, a stable shoulder, and good joint congruency.

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The authors have no relevant financial relationships to disclose.

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doi: 10.3928/01477447-20130624-22
Posterior dislocation of the glenohumeral joint is a rare injury accounting for less than 2% of all shoulder dislocations. Misdiagnosis of the injury may occur in 50% to 79% of patients, most commonly due to lack of critical physical examination and inadequate radiographic examination or insufficient radiograph reading skills of the attending physician.\textsuperscript{1,2} Posterior shoulder dislocation may occur after trauma, seizures, or electric shock.\textsuperscript{1-7} It should be suspected in patients with a palpable prominence of the coracoid, increased palpable prominence of the humeral head in the posterior aspect of the shoulder, and a marked complete loss of external rotation.\textsuperscript{8} An axillary view, if tolerated by the patient, in addition to the standard anteroposterior view is helpful to establish the diagnosis.\textsuperscript{9} Computed tomography can quantify the involvement of the articular surface of the humeral head and identify fractures of the tuberosity, surgical neck, and glenoid. In certain patients in whom concern exists about associated soft tissue injury, magnetic resonance imaging is useful to reveal cuff tears and posterior labrum lesions.\textsuperscript{10,11}

Treatment options vary and depend on the size of the humeral head defect, the duration of dislocation, and the degree of instability. Various techniques have been described for the management of this injury, including disimpaction with elevation and bone grafting of the defect, transposition of the subscapularis tendon or the lesser tuberosity into the defect, rotational osteotomy of the proximal humerus, and hemi- or total shoulder arthroplasty for large defects and neglected dislocations.\textsuperscript{3-6}

This article presents a modified McLaughlin technique using absorbable suture anchors for patients with neglected locked posterior dislocation of the shoulder.

**MATERIALS AND METHODS**

The authors used this technique in a clinical series of 5 patients (6 shoulders) between 2010 and 2012 (Figure 1; Table). All patients had neglected locked posterior dislocation of the shoulder. Preoperative computed tomography scans were obtained for all patients. Mean time from injury to surgery was 8 weeks (range, 3-16 weeks), and mean humeral head defect was 38% (range, 30%-45%). The latter was measured from the axial computed tomography scan as described by Chen et al.\textsuperscript{12} In all cases, stability of the shoulder joint and reconstruction was documented intraoperatively through the entire range of shoulder motion; glenohumeral stabilization with Kirschner wires was not necessary in any case.

**Surgical Technique**

With the patient under general anesthesia and in the beach-chair position, the standard deltopectoral approach was used to expose the shoulder joint. The lower edge of the subscapularis tendon

<table>
<thead>
<tr>
<th>Patient No./ Sex/Age, y</th>
<th>Shoulder</th>
<th>Mechanism of Injury</th>
<th>Time From Injury to Surgery, wk</th>
<th>Follow-up, mo</th>
<th>% Humeral Head Defect</th>
<th>Constant Score</th>
<th>Flex</th>
<th>ER</th>
<th>IR</th>
<th>Abd</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/M/65</td>
<td>R</td>
<td>Seizures (electric shock)</td>
<td>4</td>
<td>18</td>
<td>40</td>
<td>90</td>
<td>170</td>
<td>80</td>
<td>55</td>
<td>135</td>
</tr>
<tr>
<td>2/F/70</td>
<td>R</td>
<td>Fall</td>
<td>4</td>
<td>15</td>
<td>45</td>
<td>78</td>
<td>160</td>
<td>60</td>
<td>40</td>
<td>150</td>
</tr>
<tr>
<td>3/M/44</td>
<td>R</td>
<td>Fall</td>
<td>4</td>
<td>24</td>
<td>30</td>
<td>82</td>
<td>175</td>
<td>55</td>
<td>50</td>
<td>155</td>
</tr>
<tr>
<td>4/M/47</td>
<td>L</td>
<td>Fall</td>
<td>3</td>
<td>26</td>
<td>35</td>
<td>77</td>
<td>150</td>
<td>50</td>
<td>40</td>
<td>130</td>
</tr>
<tr>
<td>5/M/40</td>
<td>R</td>
<td>Seizures (epilepsy)</td>
<td>16</td>
<td>18</td>
<td>40</td>
<td>86</td>
<td>160</td>
<td>70</td>
<td>50</td>
<td>140</td>
</tr>
<tr>
<td>Mean</td>
<td>L</td>
<td></td>
<td>8</td>
<td>20</td>
<td>38</td>
<td>84</td>
<td>163</td>
<td>64</td>
<td>47</td>
<td>142</td>
</tr>
</tbody>
</table>

Abbreviations: Abd, abduction; deg, degrees; ER, external rotation (arm in 90° of abduction); F, female; Flex, flexion (forward elevation); IR, internal rotation (arm in 90° of abduction); L, left; M, male; R, right.
was identified and tagged with a nonabsorbable #2 suture (FiberWire; Arthrex Inc, Naples, Florida) at the myotendinous junction (Figure 2A). The lesser tuberosity was osteotomized with the subscapularis tendon and capsule attached to it and was elevated to expose the humeral head and glenoid. Reduction was usually difficult; a Cobb elevator was used with gentle maneuvers, paying attention to avoid further damage to the humeral head and glenoid. After meticulous removal of any bony or cartilaginous debris tissue, the joint was thoroughly irrigated. The posterior capsulolabral structures were found stretched but left without being repaired or imbricated. To restore the shape of the humeral head, the defect was packed and elevated with morselized femoral head bone allograft. Before packing the bone graft into the defect, 2 absorbable 5.5-mm suture anchors (Bio-Corkscrew FT with two #2 FiberWire and needles) were inserted at the bottom of the defect (Figure 2B). Next, 2 transosseous holes were created with a 2.5-mm drill at a direction from the defect to a point just lateral to the bicipital groove. Then, the lesser tuberosity was transferred into the defect and fixed with the suture anchors with 2 transosseous horizontal mattress sutures (Figure 2C). The tag suture at the subscapularis myotendinous junction was passed transosseous via the humeral head, with a 2-0 nylon suture using a 40-mm needle as a suture lasso retriever, and tied lateral to the bicipital groove, achieving strong fixation (Figure 2D).

Stability of the shoulder and the construct was evaluated intraoperatively with direct observation and fluoroscopy views through the entire range of motion. Temporary glenohumeral stabilization with Kirschner wires was unnecessary. The wound was closed in layers using a suction drain. Mean total operative time was 80 minutes. Perioperative antibiotic prophylaxis with a double dose of a second-generation cephalosporin was administered.

Postoperatively, the shoulder was immobilized with an external rotation brace (UltraSling III ER; DJO Global, Vista, California) for 6 weeks. Internal rotation of the shoulders was not allowed during this period; wrist and hand exercises were instructed. Physical therapy was initiated, including passive, active-assisted, and progressively active range of motion and rotator cuff strengthening exercises. At 12 weeks postoperatively, full activity was allowed.

RESULTS

Mean follow-up was 20 months (range, 15-24 months). At last follow-up, all patients were asymptomatic with painless and stable shoulder joints without apprehension or recurrence of instability. Mean Constant score used to evaluate patient satisfaction was 84% (range, 77%-90%); all patients were very satisfied with their level of function with no restrictions in activities of daily living. Mean range of shoulder motion was 163° of flexion (forward elevation: range, 150°-175°), 64° of external rotation (range, 50°-80°), 47° of internal rotation, and 142° of abduction (range, 130°-155°) (Figure 3). In all cases, radiographs showed the humeral head to be concentrically reduced in relation to the glenoid and complete incorporation of the allograft into the defect (Figures 4, 5).

DISCUSSION

Posterior dislocation of the shoulder is an uncommon injury. The rarity and high rate of misdiagnosis of this injury led McLaughlin5 to call it a diagnostic trap. Once diagnosed, the management of this injury must be individualized depending on the amount of the defect of the humeral head and the time from injury. The size of the humeral head impaction fracture is key to the decision process.13 Defects of the articular surface of the humeral head up
to 25% in patients with dislocations less than 3 weeks old can be treated by closed reduction and immobilization in external rotation; however, for chronic dislocations (older than 3 weeks), closed reduction is highly unsuccessful. \cite{13} Defects larger than 50% of the articular surface should be treated with shoulder arthroplasty. \cite{14,15} The management of defects between 25% and 50% are more challenging. \cite{16}

McLaughlin\cite{5} was the first surgeon to recognize the importance of the impaction fracture of the humeral head in patients with shoulder dislocation and recommended a subscapularis tendon transfer into the defect. A more secure fixation of the subscapularis tendon into the defect can be obtained through a modification of McLaughlin’s technique described by Hawkins et al.\cite{4} They recommended the transfer of the lesser tuberosity with the attached subscapularis tendon into the defect and reported excellent results in 4 patients.\cite{4} Charalambous et al.\cite{17} described another modification of McLaughlin’s technique that involves plication of the subscapularis tendon into the humeral head defect using suture anchors rather than detachment and reattachment of the tendon into the defect.

These techniques have been criticized in the literature because they alter the humeral head anatomy.\cite{18-23} They can compromise an eventual secondary prosthetic reconstruction and may lead to limitation of internal rotation of the shoulder joint.\cite{18} To address this problem, Gerber\cite{19} described an anatomic reconstruction of the joint with the use of autogenous iliac crest bone graft impacted into the depressed cancellous bone; he reported satisfactory results in 2 cases of acute traumatic dislocation. Anatomical restoration of the humeral head surface by allograft impaction and fixation with suture anchors has also been described.\cite{20} Dubousset and Lambert\cite{21} suggested combined reconstruction of the shape of the humeral head with autogenous iliac crest bone graft and the posterior capsulolabral complex. Other authors described allograft reconstruction of the humeral head and rotational osteotomy of the proximal humerus.\cite{22,23} However, the latter technique has not gained popularity due to technical difficulties and risk of devascularization of the humeral head.
CONCLUSION

This article described a modified McLaughlin technique using absorbable suture anchors instead of the standard screw fixation for patients with neglected locked posterior dislocation of the shoulder. In cases with bilateral involvement, this technique can be performed in the same surgical session, if allowed by the health status of the patient, resulting in excellent patient satisfaction and shoulder range of motion. The presented technique involves no detachment of the posterior capsule or posterior soft tissue repair. Morselized fresh-frozen femoral head bone allograft was used to fill the impaction defects and reconstruct both humeral heads, thus allowing advancing as much subscapularis tendon as necessary to ensure adequate stability. Despite the delay in diagnosis and treatment, no head collapse or arthritis was observed at last follow-up in any patient. The grafts healed completely, and no recurrent instability occurred in any shoulder. By avoiding complex reconstructions, complications were avoided. In neglected locked posterior dislocation of the shoulder, the described modification of the McLaughlin technique may be associated with excellent functional results and patient satisfaction.

REFERENCES