

## CLINICAL ARTICLE

# Results of the McLaughlin procedure for chronic locked posterior dislocation of the shoulder

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### Abstract

#### Aim:

To determine the functional outcome of patients undergoing McLaughlin procedure for chronic locked posterior dislocation of the shoulder.

#### Methods:

A retrospective review of six patients who underwent this procedure was carried out. There were four females and two males. Ages ranged from 27 years to 68 years (mean age of 46.5 years). The average time interval between injury and presentation was 26.5 weeks (range 3–65 weeks). These procedures were all performed by the senior author (AAA) between 2003 and 2007. Patients were followed up clinically and radiologically for an average of 10.1 months (range 6–24 months). Outcome was assessed in terms of function, pain and patient satisfaction with the help of the Constant and Murley score.<sup>1</sup>

#### Results:

No complications were noted and no recurrences were seen. At the last follow up, the average Constant score achieved was 73.5 (range 60–93). The maximum is 100 points.

#### Discussion:

A search of the literature resulted in a handful of articles dealing with chronic posterior dislocation of the shoulder. All of these were with very few patients and some of the articles presented results with more than one procedure. In our case series, the McLaughlin procedure proved to be useful in achieving a painless, stable shoulder with reasonable function.

#### Conclusion:

The McLaughlin procedure is a reliable operation and produces satisfactory results for chronic locked posterior dislocation of the shoulder.

## Introduction

Posterior dislocation of the shoulder is a rare occurrence accounting for less than 4 per cent of all gleno-humeral dislocations.<sup>2,4</sup> It is a commonly missed injury and up to 80% are misdiagnosed.<sup>3</sup> One should have a high index of suspicion when seeing these patients especially if there has been a history of a convulsion or electric shock. Patients with chronic posterior shoulder dislocations are often mistaken for having a frozen shoulder or a rotator cuff lesion.<sup>4</sup> If these patients are left untreated the complications that can develop include, among others, increase in size of the impression defect of the humeral head, and degenerative joint disease of the shoulder.<sup>4</sup>

Figure 1 illustrates the impression defect that has been created in one of the patients.

Diagnosis can be a clinical conundrum. Clinically, they may present with an abnormal appearance of the shoulder.



**Figure 1:**  
Impression defect. The illustration depicts the impression defect on the humeral head created by the posterior shoulder dislocation

They have a prominent acromion laterally and palpable coracoid anteriorly.<sup>4,5</sup> When viewed from the side, the humeral shaft is more posterior in relation to the acromion.<sup>5</sup> Figure 2 depicts a patient with the classical presentation.

These patients also have a reduced external rotation<sup>3,6</sup> and even under general anaesthesia this finding persists. Hawkins *et al* also noted that these patients have an internal rotation deformity, and the larger the defect, the greater the internal rotation deformity.<sup>5</sup>

Radiographs can be misleading, and on an AP view, one may see the typical 'light bulb' appearance of the humeral head due to the excessive internal rotation. There may be an 'empty glenoid' sign due to displacement of the humeral head and an increased gap between the articular surfaces.

The views one should request are an anterior-posterior view with the beam at right angle to the scapula, and a lateral view in the plane of the scapula<sup>5</sup> (Figure 3).

However one should proceed with extreme caution if only one view is provided. To the inexperienced, a posterior shoulder dislocation may easily be missed.

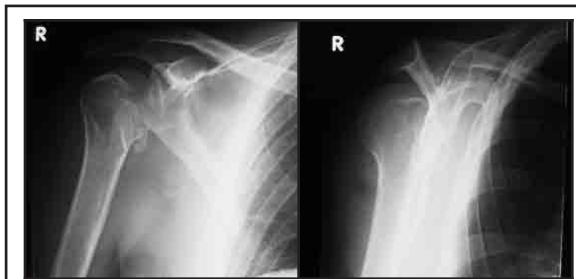
Other useful views include an axillary view and a CT scan<sup>4</sup> (Figure 4). The CT scan and axillary view is very helpful in pre-operative planning as it assists in measuring the size of the impression defect on the articular surface of the humerus.<sup>3,6</sup> Although an axillary view can be used to estimate the size of the impression defect, CT scan is used more commonly.

With posterior shoulder dislocation, these patients have a continual contraction of the deltoid and subscapularis. This forces the anterior aspect of the humeral head onto the posterior rim of the glenoid thus creating an impression defect.<sup>2</sup> With the McLaughlin procedure, the subscapularis tendon is transferred into the defect. The tendon acts as a sling and the posterior rim of the glenoid is prevented from falling into the defect with internal rotation.<sup>6,7</sup>

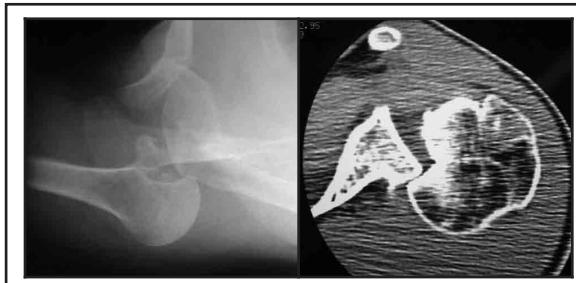
The McLaughlin procedure was initially described in 1952.<sup>7</sup> Since then there have been very few articles published about the outcome of this procedure.



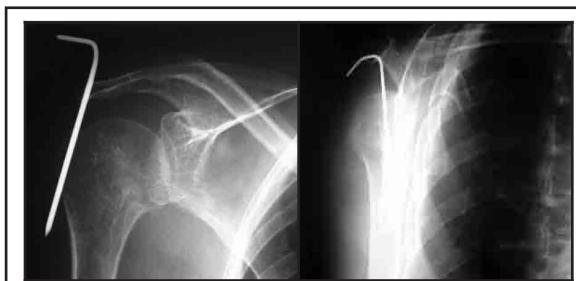
**Figure 2:**  
The classical clinical appearance. Clinically the patient presents with a prominent acromion and diminished external rotation both awake and under general anaesthesia



**Figure 3:**  
Pre-operative radiographs. AP and lateral view of right shoulder depicting posterior shoulder dislocation



**Figure 4:**  
Impression defect. Axillary view and CT scan showing impression defect



**Figure 5:**  
Unstable reductions. An example where the reduction was unstable and was held with a transacromial, transhumeral K-wire

The aim of our study was to determine the functional outcome of patients undergoing the McLaughlin procedure for chronic locked posterior dislocation of the shoulder.

## Materials and methods

A retrospective review of all patients seen at the Helen Joseph Hospital with chronic posterior dislocation of the shoulder from 2003 to 2007 was done. There was a total number of six patients. All were treated by the senior author (AAA).

There were two male and four female patients, with ages ranging from 27 years to 68 years (mean age 46.5 years).

In terms of mechanism of injury, two patients were epileptics, one patient had been assaulted, one patient had fallen and two patients could not recall any precipitating event (in these two patients, the time since the patient first noticed a problem was noted).

Pre-operative assessment included a detailed history and examination. Radiographs were done to confirm the diagnosis and a CT scan was done to measure the size of the impression defect. All patients had given their informed consent.

Of the six patients, closed reduction under general anaesthesia was attempted in only one patient. It was unsuccessful and we proceeded to an open reduction. Closed reduction was attempted only in this patient because he had presented at less than 6 weeks since his injury. It was not attempted in the rest of the group because of the high risk of iatrogenic fracture of the proximal humerus.

## Surgery

The surgery was done under general anaesthesia in the beach chair position (head elevated by 30 degrees). The anterior deltopectoral approach was used. The rotator cuff interval was identified and the tendon of subscapularis was then identified and dissected off the lesser tuberosity. The shoulder could be reduced once a meticulous soft tissue release had been done. The joint surface was examined for viability. The defect surface was then roughened and the subscapularis muscle was sutured into the defect using non-absorbable sutures passed through drill holes.<sup>5</sup>

Stability was checked intra-operatively and the shoulder was subjected to a range of movement.

If the reduction was unstable, a transacromial, transhumeral thick K-wire (minimum of 2.5 mm size) or thin Steinman pin was used to maintain the reduction. This was necessary in two cases (Figure 5). The wire was removed 3 weeks post-operatively. Within this short period no wires broke and there was no cut-through of either the acromion or the proximal humerus. In the senior author's experience this is only necessary if the shoulder is unstable and it is a safe and reliable method of achieving stability.

Post-operatively, radiographs were taken to confirm the reduction. All shoulders were immobilised in an ordinary sling with the arm in adduction and internal rotation for 3 weeks. A neutral or external rotation brace, which is recommended in acute posterior dislocation, was not necessary because the shoulder was primarily stabilised by subscapularis tendon filling the impression defect. Furthermore, immobilisation in internal rotation protects subscapularis tendon reattachment. However, as mentioned the thick wire had to be used in two cases to provide additional stability.

At the end of the third week, an intensive rehabilitation programme was commenced consisting of assisted passive exercises, followed by passive stretching exercises and finally resisted and strengthening exercises. External rotation was restricted for 2 months.

Follow-up was carried out at 2 weeks, 6 weeks and 6 months with minor deviations. One patient had to be followed up telephonically and with a home visit. Follow-up consisted of a clinical and radiological assessment. Patients were also assessed in terms of the Constant and Murley score<sup>1</sup> (maximum 100 points).

The Constant and Murley score looks at four parameters, viz. pain (maximum 15 points); activities of daily living – ADL (maximum 20 points); power (maximum 25 points); and range of movement – ROM (maximum 40 points).

To calculate the power component of the Constant score, standard 2-litre Ringers lactate in plastic bags were used. The maximum number that the patient could hold to 90 degrees abduction was used. This mass in kilograms was then converted to pounds using a standardised formula. This was used to determine the power score.

## Results

The total average Constant and Murley score was 73.5 points (*Table I*).

Looking at the pain component of the Constant and Murley score, all patients except one scored maximum points of 15 indicating that they were pain-free. One patient reported mild pain and thus scored 10.

### Three patients presented more than 6 months after their injury and still had a satisfactory outcome

In terms of ADL, three patients were working prior to their injury and were able to return to work. These were a domestic worker, an artist, and a computer software expert. The average score for ADL was 15.3 points.

Looking at power, the average score was 11.3 points out of a maximum of 25 points. The highest score was achieved by the youngest patient.

The average range of movement score was 32.7 out of a maximum of 40 points

Correlating the age to the Constant score (*Figure 6*), we found that even the older patients who were 51 years, 53 years and 68 years, had a reasonable outcome in terms of the Constant score scoring 69 points and above.

Looking at the relationship between articular defect size and Constant score (*Figure 7*), the largest defect size was 40 per cent. This was present in two patients and their Constant scores were also acceptable, viz. 69 and 79 points respectively.

At the time of presentation, patients had moderate pain and significant functional limitation. The average time interval between injury and time to presentation was 26.5 weeks (range 3 to 65 weeks). In *Figure 8* we noted that three patients presented more than 6 months after their injury and still had a satisfactory outcome of Constant scores of 69 points and above.

The follow-up ranged from 6 months to 24 months (average of 10.1 months). There were no complications noted, no axillary nerve palsy, no post-operative fracture and no dislocation. All patients were satisfied with the procedure. This is however a short follow-up period and a longer follow-up period will be required to determine if any of these patients develop a degenerative arthritis.

*Figures 9 to 12* depict some of the patients' pre-operative and post-operative improvement in range of movement.

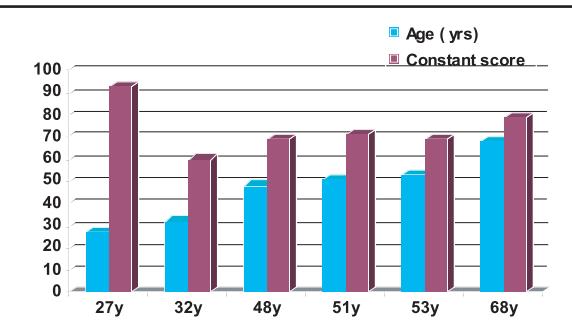
In the radiological follow-up, no patients showed any evidence of humeral osteonecrosis. Radiographs revealed no evidence of subluxation or recurrent dislocations. There was no evidence of glenohumeral osteoarthritis seen (*Figure 13*).

## Discussion

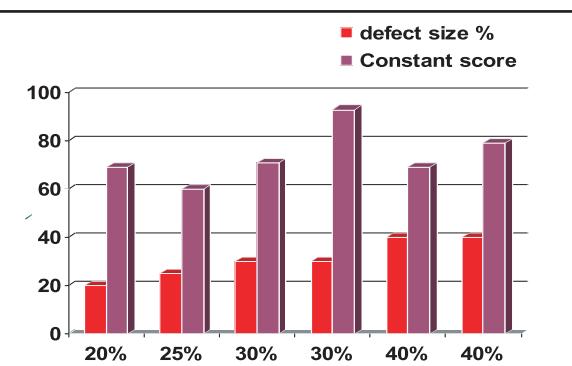
There are various treatment modalities available to treat chronic posterior shoulder dislocation. One of these is leaving the patient alone; this is done if the patient is medically unfit for surgery or if there is a risk of non-compliance.

**Table I: Summary of results for six patients**

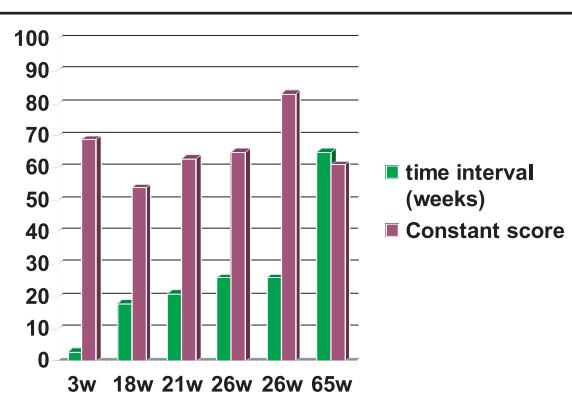
Patient	Sex	Age	Time interval	Pain	ROM	ADL	Power	Constant score	Defect size
Case 1	F	51	26 weeks	15	34	12	10	<b>71</b>	30%
Case 2	F	32	18 weeks	10	28	12	10	<b>60</b>	25%
Case 3	F	53	21 weeks	15	34	12	8	<b>69</b>	20%
Case 4	M	27	26 weeks	15	38	20	20	<b>93</b>	30%
Case 5	M	68	3 weeks	15	34	20	10	<b>79</b>	40%
Case 6	F	48	65 weeks	15	28	16	10	<b>69</b>	40%
Average		46.5	<b>26.5</b>	14.2	32.7	15.3	11.3	<b>73.5</b>	30.80%



**Figure 6:**  
Relationship of Constant score to age. Even the older patients had reasonable outcome in terms of the Constant score



**Figure 7:**  
Relationship of Constant score to defect size. The largest defect size was 40% in two patients, and the outcome was satisfactory



**Figure 8:**  
Relationship of Constant score to time to presentation. Three patients presented after 6 months and still had a good outcome



**Figure 9:**  
Pre- and post-operative images of patients. These patients demonstrate the improvement in range of movement post-operatively



**Figure 10:**  
Pre- and post-operative images. This patient had a marked improvement in range of movement at 10 months' follow-up

A closed reduction can be attempted if the dislocation is less than 6 weeks old and if the defect is less than 20% in size in relation to the articular surface.<sup>5,6</sup> However Richards *et al* noted that closed reduction can be extremely difficult and is fraught with complications.<sup>2</sup> There is a high risk of fracturing the humerus.

Neer's modification of the McLaughlin method involves transferring the lesser tuberosity of the humerus along with subscapularis tendon.<sup>5</sup>

The theoretical advantage is that one achieves a more stable bony fixation,<sup>5</sup> and it acts as a bone graft where the defect in the humeral head is large. However, performing an osteotomy of the lesser tuberosity can be difficult in neglected posterior shoulder dislocations where the bone is osteoporotic and the anatomy is distorted. On the other hand, achieving fixation with a screw through this small fragment of bone can be exceptionally difficult. Furthermore, disturbance of the bicipital groove may occur with resultant instability of the biceps tendon.<sup>4</sup>



**Figure 11:**  
Pre-operative images. Patients had a marked limited external rotation and internal rotation

The original technique, as employed in this series, with release of the subscapularis tendon, is simpler. Currently, with modern suture materials that are strong and reliable, the suture of the subscapularis tendon to bone is a safe procedure.

Most series recommend the use of a brace or even spica with the arm in a position of neutral to 10° of external rotation, 10° extension and 20° abduction. In our experience, subscapularis tendon transfer provides reasonable stability, and in only two of the six cases was it necessary to use a supplementary transacromial thick K-wire. However, in cases of persistent subluxation or instability, the use of a brace is advisable.

The improvement in range of motion as reported in this series is reflected in the literature. However, the average score for power (11.3 out of a maximum of 25) is by far the worst score compared to ADL, pain and ROM. This could be attributed to muscle wasting and fatty infiltration of rotator cuff muscles as well as deltoid due to prolonged disuse. This aspect could be a subject for further study in future.

Gerber described reconstructing the humeral head using femoral head allografts.<sup>8</sup> He reported on four cases and followed them up for 6 years showing good stability and satisfactory recovery. However the main shortcomings are unavailability of such allografts and the risk of transmission of infection to the patient.



**Figure 12:**  
Post-operative images. The patients had an improvement in external rotation and abduction



**Figure 13:**  
Post-operative radiographs. At a follow-up of 9 months the patient still had a congruent joint with no degenerative changes

The impression defect can also be treated by elevating the defect as is done in tibial plateau fractures.<sup>6</sup> However this is a very technically demanding procedure.

A derotation osteotomy of the proximal humerus can be done. This was reported by Keppler *et al.*<sup>9</sup> They had 10 cases of which six had good or excellent results. However there is an inherent risk of developing osteonecrosis of the humerus.<sup>3</sup>

Nikhil *et al* also have an anecdotal case report of a patient with chronic posterior dislocation of the shoulder being treated with arthroscopic assisted reduction.<sup>10</sup>

In 1987 Hawkins and Neer followed up a total of 41 patients with locked posterior dislocation of the shoulder.<sup>5</sup>

Patients were treated with different modalities ranging from being left alone, to McLaughlin or modified McLaughlin procedure to arthroplasty.

They advocated that if the dislocation was less than 6 weeks old and the defect less than 20 per cent, a closed reduction could be attempted. If unsuccessful, a modified McLaughlin procedure should be performed. If the injury is between 6 weeks and 6 months old, a modified McLaughlin can also be carried out. If the defect size is greater than 45 per cent or if the injury is older than 6 months, a hemi-arthroplasty or total shoulder replacement is recommended. The decision depends on the condition of the glenoid. This is however a technically demanding procedure with the amount of version of the implant being critical. The amount of version depends largely on the duration of the dislocation. Furthermore, it has to be noted that, when considering arthroplasty, the patient's age as well as level of activity should be taken into account. In our series all three patients whose injury was longer than 6 months were younger than 55 years, and they were too active for arthroplasty. This series would certainly indicate that the McLaughlin procedure may yield good results in cases presenting more than 6 months after injury.

#### The McLaughlin procedure is a reliable operation and produces satisfactory results

In 1995, Finkelstein *et al* carried out Neer's modification of McLaughlin procedure in seven cases<sup>6</sup> in which a defect involving 20% to 45% of the humeral head was treated. However all of his patients were acute posterior shoulder dislocations. He reported good stability with rapid return of active range of movement within 3 months.

Feroussis *et al* evaluated six patients in 2003.<sup>4</sup> They achieved an average Constant score of above 80 points. They recommended the McLaughlin procedure if the defect is less than 25 per cent and the modified McLaughlin if the defect is between 20 and 45 per cent. A shoulder arthroplasty was advocated if the defect was above 40 per cent in size.

Delcogliano *et al* in 2005 treated four patients with chronic posterior dislocation of the shoulder.<sup>3</sup> One patient was treated with the McLaughlin and two patients with the modified McLaughlin procedure. They achieved complete pain relief with no limitation in activities of daily living. They agreed that the McLaughlin or the modified McLaughlin procedure was a satisfactory procedure if the defect was between 20 and 40 per cent.

In comparison our study showed that even patients who presented up to 15 months after their injury still had satisfactory results when undergoing the McLaughlin procedure.

The McLaughlin procedure also had a satisfactory outcome for defects up to 40 per cent in size. However we are unable to comment on lesions above 40 per cent in size as we had none in our study.

We found no correlation between age and outcome (*Figure 6*).

In conclusion we found that the McLaughlin procedure is a reliable operation and produces satisfactory results.

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