



Clinical and radiographic outcomes of the modified McLaughlin procedure for locked posterior dislocation of the shoulder: a systematic review



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Background: Multiple treatment options for locked posterior dislocation of the shoulder (LPDS) have been described, including the modified McLaughlin procedure. The purpose of this review, therefore, was to perform a systematic review of the literature to synthesize the available data reporting on the clinical and radiographic outcomes of patients undergoing the modified McLaughlin procedure for the treatment of LPDS.

Methods: A systematic review of the PubMed Central, MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library databases from inception through January 2023 was performed. Outcomes studies reporting on clinical and radiographic outcomes in patients undergoing the modified McLaughlin procedure for LPDS were included. Postoperative complications and episodes of recurrent instability were noted.

Results: A total of 1322 studies were initially identified, of which 9 were deemed eligible for inclusion in our review. Among included studies, a total of 97 shoulders (96 patients) with a mean age of 37.7 years (range, 26–51) were identified. The most common mechanisms of injury included trauma, seizure, and electrocution. Reverse Hill-Sachs lesions ranged in size from 20% to 50% of the humeral head articular surface. At final follow-up, the weighted mean University of California at Los Angeles shoulder score, Constant-Murley Score, American Shoulder and Elbow Surgeons shoulder score, and visual analog scale for pain score were 29 (range, 27–31), 75 (range, 65–92), 92 (range, 83–98), and 1.9 (range, 1–2.4), respectively. Postoperative Constant-Murley Score and University of California at Los Angeles scores were highest in the one study reporting exclusively on treatment during the acute period. Weighted mean postoperative forward flexion, abduction, external rotation, and internal rotation were 154° (range, 102–176), 144° (range, 118–171), 64° (range, 44–84), and 47° (range, 42–56), respectively. Osteointegration of the lesser tuberosity was noted in all patients at the final follow-up. Postoperative complications occurred in one patient (1.0% of cohort); a screw migration successfully treated with operative removal. Recurrent instability was noted in two epileptic patients (2.1% of cohort).

Conclusion: The literature surrounding the use of the modified McLaughlin procedure for LPDS remains sparse. This review demonstrates that this procedure is associated with favorable clinical and radiographic outcomes with overall low rates of complication and recurrent instability, especially when the time from injury to surgery is minimized. These findings illustrate that in patients presenting with LPDS and a reverse Hill-Sachs lesion between 20% and 50% of the humeral head articular surface, the modified McLaughlin procedure is a safe and effective treatment option.

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Posterior dislocation of the shoulder is a relatively rare injury, accounting for 2%–4% of all shoulder dislocations.^{7,10} The most common etiologies include trauma, seizures, and electric shock.²⁰ It is estimated that misdiagnosis occurs in 50%–79% of patients, owing

to inadequate physical examination and insufficient radiographic imaging.^{15,17} Clinical signs that may indicate the presence of a posterior dislocation include palpable prominence of the coracoid, prominence of the humeral head in the posterior aspect of the shoulder, and associated loss of external rotation.²⁸ Axillary and anteroposterior radiographs can reveal the diagnosis. Computed tomography can be utilized to quantify articular involvement of the humeral head and identify associated fractures of the tuberosity, surgical neck, and glenoid.² An estimated 50% of posterior dislocations are associated with an impression fracture of the anteromedial aspect of the humeral head, a so-called “reverse Hill-Sachs lesion.”²

Failure to treat a posterior dislocation can result in persistent instability, osteonecrosis, chondrolysis, and resultant glenohumeral osteoarthritis.^{5,19,22} Although treatment is dependent upon both the duration of dislocation and the size of the humeral head defect, it is the size of the reverse Hill-Sachs lesion that determines appropriate treatment. Humeral head defects less than 25% can often be treated with reduction and conservative measures. Conversely, defects greater than 50% often require autograft or allograft transplantation, hemiarthroplasty, or total shoulder arthroplasty.¹⁶ Dislocations neglected for longer than 6 months also frequently necessitate an arthroplasty procedure due to concerns regarding the viability of humeral head cartilage.¹⁶ When the defect is between 25% and 50% of the humeral head articular surface, surgical options including transfer of the subscapularis tendon (McLaughlin procedure),²³ transfer of the lesser tuberosity with its attached subscapularis tendon en bloc (modified McLaughlin),¹⁶ rotational osteotomy,^{18,26} and autograft or allograft reconstruction have been described.^{13,14}

Consistent with the rarity of posterior dislocation, most studies reporting on the outcomes of patients undergoing the modified McLaughlin procedure have been limited to small retrospective case series. To our knowledge, there have been no rigorous reviews dedicated to synthesizing the available data and evaluating the role of the modified McLaughlin procedure in the treatment of locked posterior dislocation of the shoulder (LPDS). Thus, the purpose of this systematic review is to create a better understanding of the functional and radiographic outcomes following treatment of LPDS with the modified McLaughlin procedure.

Materials and methods

Search strategy

A systematic review of the literature was performed according to the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).²⁵ A comprehensive search of the PubMed Central, MEDLINE, Embase, Scopus, Web of Science, and Cochrane Library databases from inception through January 2023 was performed. References were manually reviewed for the addition of further studies. The search strategy was determined *a priori* and performed using keywords related to posterior dislocation of the shoulder and modified McLaughlin, lesser tuberosity transfer, and subscapularis tendon transfer.

Eligibility and screening

Studies were included if they met the following inclusion criteria: reported clinical outcomes of the modified McLaughlin procedure for LPDS, and had available text written in the English language. Studies were excluded if they were systematic reviews/meta-analyses, letters to the editor, elemental analyses, or case reports of 4 or fewer patients, did not separately report data for

patients undergoing the modified McLaughlin procedure for LPDS, or reported a mean follow-up less than 12 months. Studies were not excluded based on level of evidence.

A total of 1322 studies were initially identified. After the removal of duplicate studies, the abstract and title of 559 articles were screened, of which 509 did not meet inclusion criteria, leaving 50 articles for full-text review (Fig. 1). Following a full-text review, a total of 9 studies met our eligibility requirements and were included in the qualitative analysis. The most common reasons for exclusion were failure to report clinical outcomes of the modified McLaughlin procedure for posterior dislocation of the shoulder ($n = 24$) and publication of manuscripts in a foreign language with unavailable translation ($n = 6$).

Methodological quality and risk of bias assessment

Study quality was assessed using the methodological index for non-randomized studies (MINORS) criteria. The MINORS criteria is a validated scoring tool for non-randomized studies with a score of 0 to 16 for noncomparative studies, and 0 to 24 for comparative studies.²⁹

Data collection and analysis

Data were extracted from each individual study and organized into a spreadsheet for further analysis. Extracted data included study design, level of evidence, sample size, length of follow-up, injury details, radiographic outcomes, select patient-reported outcomes (PROs), range of motion (ROM), complications, and episodes of recurrent instability. PROs of interest included the University of California at Los Angeles (UCLA) shoulder score, Constant-Murley Score (CMS), American Shoulder and Elbow Surgeons (ASES) shoulder score, and visual analog scale for pain (VAS-pain) score. Most studies did not report preoperative data. Therefore, only postoperative values were included in our analysis.

Due to the heterogeneity with which data were reported, a formal meta-analysis was not undertaken. Patients were pooled across included studies and weighted means calculated on the basis of sample size where appropriate. Data are presented as weighted mean (range) unless otherwise specified.

Results

Study characteristics

Nine studies with a total of 97 shoulders (96 patients) met the criteria for inclusion.^{1,3,4,6,9,19,21,24,28} All studies were uncontrolled case series published between 2009 and 2022, with five (56%) being published since 2016. Six studies were retrospective in nature, while three were prospective. The mean MINORS score was 10 (range, 8–11), reflecting an overall fair level of methodological quality. Among studies reporting mean age, the average was 37.7 years (range, 26–51) (Table 1). The average length of follow-up was 40.1 months (range, 18–62.8) among seven studies. Among the two studies reporting minimum follow-up only, values of 14 and 24 months were reported. Mechanism of injury was detailed in seven studies (71 shoulders) and included trauma in 44 patients (62%), a seizure in 22 patients (31%), electrocution in 2 patients (3%), and an unknown mechanism in 3 patients (4%). Seven studies reported on chronic LPDS,^{1,6,9,19,21,24,28} one study reported on acute LPDS (defined as diagnosis less than 3 weeks from dislocation),⁴ and one study included patients with both acute and chronic LPDS.³ The mean period of neglect among studies reporting exclusively on chronic LPDS was 8 to 25 weeks. All surgeries utilized a standard

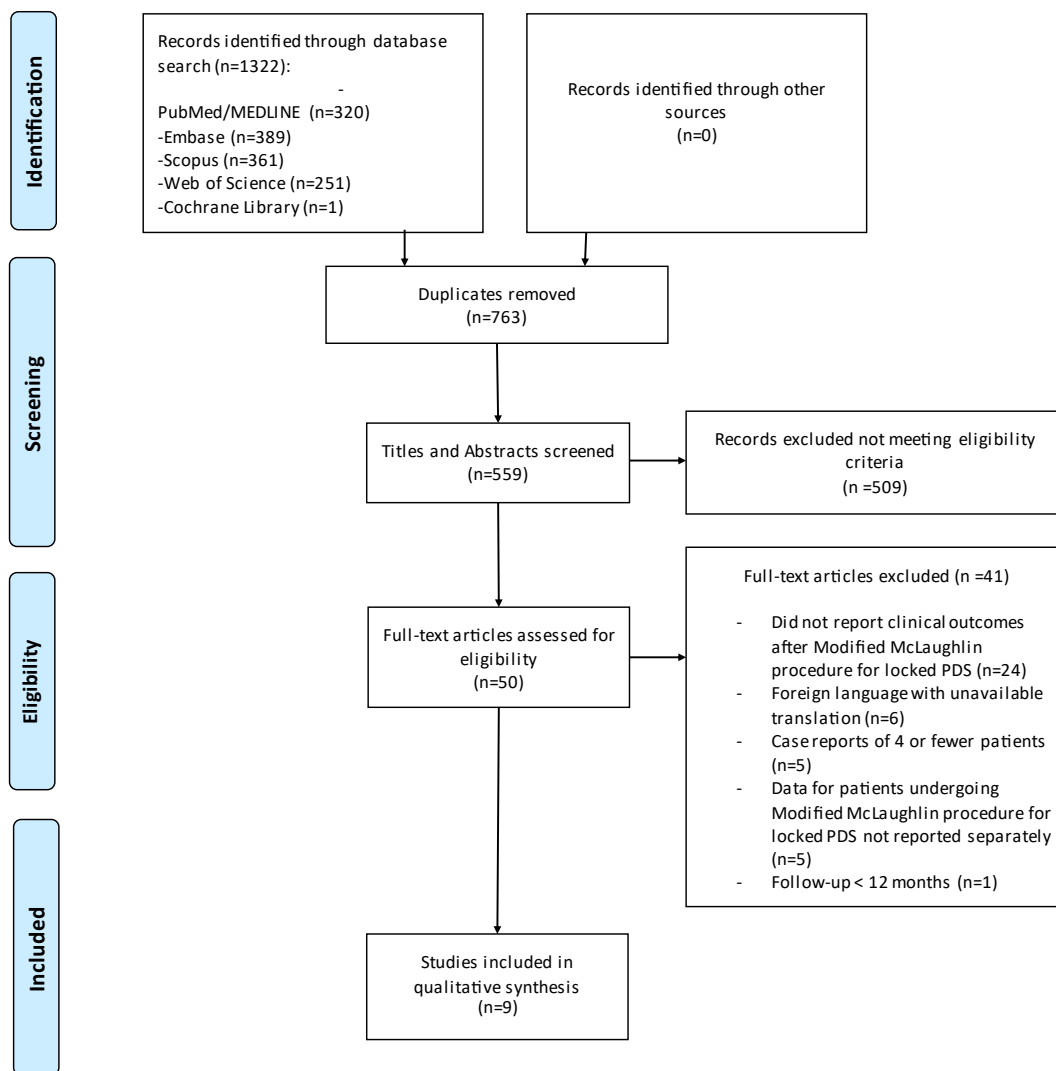


Figure 1 PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) diagram demonstrating study selection process. PDS, posterior dislocation of the shoulder.

deltopectoral approach and positioned patients in the beach chair or modified beach chair position. Of the 9 included studies, 5 achieved fixation of the lesser tuberosity with suture anchors and 4 with cannulated screws. Two studies augmented the transfer of the lesser tuberosity with autograft or allograft reconstruction. The size of reverse Hill-Sachs lesions ranged from 20% to 50% of the humeral head articular surface. Postoperative immobilization ranged from 4 to 6 weeks.

Patient-reported outcomes

PROs were reported in all 9 studies (97 shoulders), including the UCLA shoulder score in 6 studies (68 shoulders), the CMS in 4 studies (39 shoulders), the ASES shoulder score in 2 studies (12 shoulders), and VAS-pain in 2 studies (15 shoulders). At the final follow-up, the weighted mean UCLA shoulder score, CMS, ASES shoulder score, and VAS-pain scores were 29 (range, 27-31), 75 (range, 65-92), 92 (range, 83-98), and 1.9 (range, 1-2.4), respectively (Table II). Postoperative CMS and UCLA scores were highest in the one study reporting exclusively on treatment during the acute period.⁴

Range of motion

Postoperative ROM including forward flexion, abduction, external rotation, and internal rotation were reported in eight studies (76 shoulders). Among studies reporting ROM values, one did not report on abduction.⁹ At the final follow-up, weighted mean postoperative forward flexion (76 shoulders), abduction (66 shoulders), and external rotation (76 shoulders) were 154° (range, 102-176), 144° (range, 118-171), and 64° (range, 44-84), respectively (Table III). Six studies (59 shoulders) reported internal rotation in degrees, which was found to have an average value of 47° (range, 42-56) at the final follow-up. Two studies (17 shoulders) reported values relative to highest vertebral level reached posteriorly which ranged between the waist and T12 in one study, and the thigh and L5 in the other.

Radiographic outcomes

Radiographic outcomes were reported in seven studies, of which five reported on the osteointegration of the lesser tuberosity

Table 1
Study characteristics.*†

Study	Study design	Level of evidence	Patients (N)	Shoulders (N)	Laterality (L/R)	Sex (M/F)	Mean age (y)	Mean follow-up (mo)	Indication for surgery‡	Graft use	Fixation	Mechanism of injury	Time from dislocation to surgery	Mean size of RHS lesion (%)	MINORS score
Castagna, 2009 ⁶	Retrospective case series	IV	16	16		16/0	41.9 (32-51)	62.8 (7.1-139.6)	Chronic LPDS	None	Suture anchors	Trauma: 14 Seizure: 2	25w (6w-7m) [§]	20-50	10
Kokkalis, 2013 ²¹	Retrospective case series	IV	5	6	2/4	5/1	51 (40-70)	20 (15-26)	Chronic LPDS	Morselized femoral head allograft	Suture anchors	Trauma: 3 Seizure: 3	8w (3w-16w)	38 (30-45)	9
Banerjee, 2013 ⁴	Retrospective case series	IV	7	7		13/1	39.0 (22-60)	41 (27-54)	Acute LPDS	None	Cannulated screws	Trauma: 6 Seizure: 1	<3w	32 (25-45)	10
Abdel-Hameed, 2015 ¹	Prospective case series	IV	9	9	3/6	7/2	29.5 (22-46)	18 (14-25)	Chronic LPDS	None	Suture anchors	Trauma: 4 Seizure: 2 Electrocution: 1 Unknown: 2	40 (35-45)	9	
Shams, 2016 ²⁸	Prospective case series	IV	11	11	3/8	9/2	39 (31-49)	29 (24-39)	Chronic LPDS	None	Suture anchors	Trauma: 3 Seizure: 7 Unknown: 1	9w (3w-18w)	35 (30-40)	10
Khira and Salama, 2017 ¹⁹	Prospective case series	IV	12	12	3/9	10/2	26 (22-36)	30 (24-48)	Chronic LPDS	Iliac crest autograft	Cannulated screws	Trauma: 9 Seizure: 2 Electrocution: 1	8w (4w-3m) [§]	40 (30-45)	11
Babhulkar, 2018 ³	Retrospective case series	IV	21	21			40.5 (26-57)	14 (minimum)	Acute and chronic LPDS	None	Cannulated screws		6w (2w-13w)	20-50	8
Mittal, 2022 ²⁴	Retrospective case series	IV	5	5				24 (minimum)	Chronic LPDS	None	Cannulated screws		<50	9	
Cohen, 2022 ⁹	Retrospective case series	IV	10	10	3/7	9/1	36.3 (23-54)	59.4 (24-110)	Chronic LPDS	None	Suture anchors	Trauma: 5 Seizure: 5	23w (6w-14m)	32 (22-35)	11

LPDS, locked posterior dislocation of shoulder; MINORS, methodological index for non-randomized studies; RHS, reverse Hill-Sachs.

*Data presented as mean (range).

†Blank indicates not reported or could not be determined.

‡Chronic is defined as time from dislocation to recognition greater than 3 weeks.

§Time from dislocation to diagnosis.

Table II
Postoperative PROs.*

Study	UCLA	CMS	ASES	VAS-pain
Castagna, 2009 ⁶		75 (65-82)		
Kokkalis, 2013 ²¹		84 (77-90)		
Banerjee, 2013 ⁴		92	98	
Abdel-Hameed, 2015 ¹	31 (27-34)			
Shams, 2016 ²⁸	29 (20-34)			
Khira and Salama, 2017 ¹⁹	30 (28-33)			
Babhulkar, 2018 ³	28 (17-35)			
Mittal, 2022 ²⁴	27 (24-30)		83 (78-86)	1
Cohen, 2022 ⁹	27 (8-33)	65 (22-82)		2.4 (0-7)
Weighted mean (range)	29 (27-31)	75 (65-92)	92 (83-98)	1.9 (1-2.4)

ASES, American Shoulder and Elbow Surgeons; CMS, Constant-Murley Score; PROs, patient-reported outcomes; UCLA, University of California at Los Angeles; VAS, visual analog scale.

*Data presented as mean (range).

into the reverse Hill-Sachs lesion and two reported on the development of glenohumeral osteoarthritis (Table IV). All studies reporting on osteointegration (44 shoulders) noted complete union at the final follow-up. Among the two studies (17 shoulders) reporting on the development of glenohumeral osteoarthritis, one noted evidence of degenerative changes.⁹ Cohen et al reported grade 1 osteoarthritis in 6 patients, grade 2 osteoarthritis in 2 patients, and grade 3 osteoarthritis in 2 patients according to the Samilson-Prieto classification.⁹ One study in which patients underwent postoperative MRI found no evidence of humeral head necrosis or fatty infiltration of the subscapularis at the final follow-up.⁶

Complications and recurrent instability

Postoperative complications occurred in one patient (1.0% of cohort). Banerjee et al noted one episode of screw migration which was treated with operative removal.⁴ The patient was satisfied with their outcome and reported no further complications. No episodes of humeral head necrosis or infection were documented in any study. One study reported two episodes of recurrent instability in two separate patients with epileptic seizures and moderate joint stiffness (2.1% of cohort).¹⁹ These patients had approximately 50% capability of elevation, overhead activity, and lifting. Moderate instability with positive apprehension of the arm in the extended position was also noted. No episodes of recurrent dislocation were noted in any of the included studies.

Discussion

This systematic review aimed to synthesize the existing literature on clinical and radiographic outcomes as well as complications related to the modified McLaughlin procedure in patients with LPDS. This study found favorable clinical and radiographic results, as well as an overall low rate of complications (1.0%) and recurrent instability (2.1%).

LPDS presents a significant challenge to orthopedic surgeons due to its relative rarity, lack of objective clinical presentation, and absence of clear radiographic signs. Owing to its elusive and heterogeneous nature, treatment of LPDS is frequently delayed and complex. A paucity of clinical data has precluded the development of reliable treatment guidelines, thus forcing surgeons to rely on a combination of low-level evidence, anecdotal experience, and practice preference. Closed reduction and immobilization in external rotation can be attempted in patients with reverse Hill-Sachs lesions up to 25% and dislocations less than 3 weeks old. In patients with persistent dislocation beyond 3 weeks, and in those

with defects larger than 25%, closed reduction is highly ineffective.^{8,12,16,23} Surgical options for defects between 25% and 50% include the McLaughlin procedure, modified McLaughlin procedure,²³ rotational osteotomy,^{18,26} and autograft or allograft reconstruction.^{13,14}

The rationale for reconstruction of the humeral head was first described by McLaughlin in his landmark description of subscapularis tendon transfer.²³ Although injury to the posterior capsule may contribute to instability, McLaughlin recognized that the degree of instability was largely determined by the extent of the reverse Hill-Sachs lesion as it reengages with the posterior aspect of the glenoid. Furthermore, it is thought that transfer of the lesser tuberosity with the subscapularis tendon allows for better bony filling and a more secure tendon reinsertion than transfer of the subscapularis tendon alone.^{27,28}

Despite the modified McLaughlin procedure demonstrating acceptable postoperative PROs and ROM in the setting of reverse Hill-Sachs lesions between 25% and 50%,⁶ there is some concern regarding the ability of the procedure to adequately restore stability at the upper end of this spectrum. Additional concerns include alteration of humeral head anatomy and the presence of hardware requiring removal. Some have also questioned whether subscapularis dysfunction after tendon transfer could impact the outcome and stability of future arthroplasty due to weakness of internal rotation (though less relevant in patients undergoing reverse total shoulder arthroplasty). With these concerns in mind, anatomic reconstruction with both autograft and allograft impaction has been described.^{11,13,14} Among a series of 19 patients (14 allograft, 5 autograft) with reverse Hill-Sachs lesions of at least 30%, Gerber et al reported an average CMS of 77 at a mean follow-up of 128 months (very similar to the weighted mean CMS score of 75 that was found in this review). No perioperative complications were reported, and two patients reported mild to moderate pain.¹³ In a cohort of 13 patients undergoing allograft humeral head reconstruction of defects between 25 and 50%, Diklic et al reported an average CMS of 87 at a mean follow-up of 54 months.¹¹ One episode of spontaneous osteonecrosis and no episodes of recurrent instability were noted. Additional studies have described a rotational osteotomy of the proximal humerus; however, due to technical demand and the risk of devascularizing the humeral head, this approach has largely been abandoned.³⁰ Due to the rarity of LPDS and a lack of comparative data, there is no consensus regarding the critical humeral head defect size above which the modified McLaughlin procedure should not be performed. Ultimately, appropriate treatment requires consideration of many complex factors including patient demand, comorbidities, preoperative evaluation, intraoperative assessment, and surgeon skillset.

Analysis of radiographic outcomes demonstrated complete osteointegration of the lesser tuberosity and a low rate of degenerative joint disease at the final follow-up. Importantly, no episodes of infection or humeral head necrosis were observed. The only study to report evidence of glenohumeral osteoarthritis reported six cases of mild arthrosis and four cases of moderate to severe arthrosis.⁹ These findings suggest that nonanatomic reconstruction of the humeral head may improve joint kinematics and that transfer of the subscapularis tendon does not alter kinematics in a manner significant enough to contribute to progressive degeneration. Furthermore, the observation of complete union of the lesser tuberosity at final follow-up in all patients confirms that the risk to neurovascular structures is low and that despite osteotomy of the lesser tuberosity, current fixation and rehabilitation protocols are sufficient to promote necessary healing.

The rate of recurrent instability in this study was 2.1%. Notably, both episodes occurred in patients with a known history of epileptic seizures reflecting the successful nature of the modified

Table III
Postoperative ROM.*

Study	Forward flexion (°)	Abduction (°)	External rotation (°)	Internal rotation (°)
Castagna, 2009 ⁶	152 (140-170)	138 (130-150)	52 (40-60)	42 (30-60)
Kokkalis, 2013 ²¹	163 (150-175)	142 (130-155)	64 (50-80)	47 (40-55)
Banerjee, 2013 ⁴	176 ± 5	171 ± 6	84 ± 9	Waist - T12
Abdel-Hameed, 2015 ¹	166 (155-175)	155 (140-165)	75 (60-85)	50 (45-65)
Shams, 2016 ²⁸	162 (140-170)	130 (110-155)	70 (55-80)	45 (35-55)
Khira and Salama, 2017 ¹⁹	165 (150-175)	150 (145-160)	75 (60-80)	50 (40-60)
Mittal, 2022 ²²	102 (10-130)	118 (100-130)	44 (30-50)	56 (40-70)
Cohen, 2022 ⁹	126 (60-160)		51 (20-70)	Thigh - L5
Weighted mean (range)	154 (102-176)	144 (118-171)	64 (44-84)	47 (42-56) [†]

ROM, range of motion; SD, standard deviation.

*Data presented as mean ± SD (range).

[†]Among studies reporting internal rotation in degrees.

Table IV
Postoperative radiographic outcomes.

Study	Outcome	Findings
Castagna, 2009 ⁶	MRI to evaluate subscapularis tendon and humeral head necrosis	No evidence of humeral head necrosis, or detachment or fatty infiltration of the subscapularis muscle in any patient at final follow-up
Kokkalis, 2013 ²¹	X-ray to evaluate incorporation of morselized allograft into humeral head defect	Complete incorporation of morselized allograft into the humeral head defect in all patients at final follow-up
Banerjee, 2013 ⁴	X-ray to evaluate glenohumeral osteoarthritis (Samilson-Prieto) and incorporation of lesser tuberosity	Complete integration of the lesser tuberosity into the defect in all patients at final follow-up. No signs of osteoarthritis according to Samilson and Prieto
Abdel-Hameed, 2015 ¹	X-ray to evaluate incorporation of lesser tuberosity	Complete integration of the lesser tuberosity into the defect in all patients at an average of 8 weeks
Shams, 2016 ²⁸	X-ray/CT to evaluate incorporation of lesser tuberosity	Complete integration of the lesser tuberosity into the defect in all patients within 8-12 weeks
Khira and Salama, 2017 ¹⁹	CT to evaluate incorporation of lesser tuberosity	Complete integration of the lesser tuberosity into the defect in all patients at an average of 12 weeks (range, 10-16)
Cohen, 2022 ⁹	X-ray to evaluate glenohumeral osteoarthritis (Samilson-Prieto)	Grade 1: 6 patients Grade 2: 2 patients Grade 3: 2 patients

CT, computed tomography; MRI, magnetic resonance imaging.

McLaughlin procedure when patient appropriateness is adequately evaluated. In patients with significant medical comorbidities and those with epilepsy and limited demand, the role of surgery vs. supervised neglect must be seriously considered. In such patients, normal ROM in the contralateral shoulder may be sufficient to compensate for functional deficits thus absolving the need for surgery.

Prior literature has utilized the terminology “chronic,” “neglected,” and “locked” to describe dislocations that are detected 3-6 weeks after initial injury.^{20,24} As Robinson et al described, the temporal delay in diagnosis is a continuum, during which the humeral head defect becomes progressively larger and the shoulder becomes increasingly difficult to reduce, until it eventually becomes deformed and arthritic.²⁷ There is no question that there is a correlation between the duration of dislocation and quality of outcomes. This was clarified by the greater CMS and UCLA scores in the one study reporting exclusively on patients with a period of dislocation to surgery of less than 3 weeks.⁴ However, appropriate treatment is ultimately determined by the ability of the surgeon to adequately reconstruct the humeral head in addition to the quality of glenohumeral bone/cartilage. As such, classification based on the timing of the diagnosis alone should be avoided.

This study is not without limitations. First, our review included exclusively level IV studies with small patient cohorts reflecting the overall low level of evidence regarding the modified McLaughlin procedure. While three studies were prospective in nature, six were retrospective which makes the collection and reporting of certain baseline data difficult. Further, the lack of direct comparison with

other generally accepted treatment strategies further limits interpretation of results. Nonetheless, the presented study is the only review dedicated to summarizing outcomes of patients undergoing the modified McLaughlin procedure. Given the rarity of LPDS and paucity of studies describing outcomes after the modified McLaughlin procedure there is significant value in summarizing the available data in a single location as was done in this review.

Conclusion

The literature surrounding the use of the modified McLaughlin procedure for LPDS remains sparse. This review demonstrates that this procedure is associated with favorable clinical and radiographic outcomes with overall low rates of complication and recurrent instability, especially when the time from injury to surgery is minimized. These findings illustrate that in patients presenting with LPDS and a reverse Hill-Sachs lesion between 20% and 50%, the modified McLaughlin procedure is a safe and effective treatment option.

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Board, Board Member of the OrthoCarolina Research Institute. Nady Hamid, MD, is a paid consultant for Stryker (unrelated to the study). Bryan M. Saltzman, MD, receives research support from Arthrex, Inc. and publishing royalties, financial or material support from Nova Science Publishers (unrelated to study). The other authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

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