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CASE REPORT

Neglected posterior dislocation of the shoulder: A systematic literature review

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Summary Posterior dislocation of the shoulder (PSD) is a rare injury; the diagnosis is often missed on initial examination. We present a systematic review of the current literature and discuss the key of the diagnosis of PSD. We searched the MEDLINE, PubMed, EMBASE, MD Consult, and the Cochrane Controlled Trial Register databases for the articles according to our eligibility criteria. Finally, 53 articles were included in our systematic review. There were 242 shoulders in 205 patients. In total, in the initial assessment with anteroposterior radiographs in 166 cases, only 19 (11.4%) cases confirmed the right diagnosis. When anteroposterior combined with axillary or Y view radiographs or computed tomography were present as the initial assessments in 36 cases, the diagnoses were made correctly and timely (100%). When axillary or Y view radiographs or computed tomography were taken subsequently, the diagnosis was confirmed in all 205 patients.

Introduction

Posterior dislocation of the shoulder is a rare injury (< 4% of all shoulder dislocations). The diagnosis of this injury is often missed (60—79%) on initial examination [1—4]. The special clinical and radiographic characteristics made McLaughlin [4] consider it as a "diagnostic trap".

Although the imaging technique is advancing and it is well known now that it is important to recognize posterior dislocations of the shoulder, many cases continue to be missed by the physicians who first see the patients and therefore appropriate treatment is delayed. Delay between injury and diagnosis has been reported to be as long as 10 years in some cases. A considerable number of patients with delay on diagnosis resulted in chronic pain, stiffness, and functional disability. The most common causes for delay include the physician's failure to suspect the

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Table 1 Inclusion/exclusion criteria.

Inclusion criteria	Exclusion criteria
General adult population	Radiologic reports, review articles, technical notes
Original journal publication in English	Case report/series with no details about patients
Published between 1980 and 2013	Only observational or descriptive studies without follow-up
Level I, II, III, or IV study	

diagnosis on the initial examination, late presentation by the patient, and inadequate radiographic investigation. The key to diagnosis of this injury lies in maintaining a high index of clinical suspicion and performing appropriate radiographic investigations.

Because of a relatively high incidence of delay on the recognition of PSD, this paper presents a systematic review of the current literature and discusses the key of the diagnosis of PSD.

Systematic review of the literature

In December 2013, a systematic search was performed in the MEDLINE, PubMed, EMBASE, MD Consult, and the Cochrane Controlled Trial Register databases by two independent reviewers. Article inclusion criteria consisted of all journal articles published from 1980 to November 2013. Search keywords included: shoulder, posterior dislocation, and reverse Hill–Sachs. Studies without full-text were not included. Articles referring to traumatic posterior instability without actual traumatic dislocation were also excluded. References of the obtained articles and relevant articles were also screened. Search results were screened according to the eligibility criteria (Table 1). Finally, a set of 53 articles [2,5–56] was included in our systematic review (Tables 2 and 3).

Results

Study flow is outlined in Fig. 1. Only 53 articles were retained for data extraction after evaluation. Of these articles, 15 were case series (> 5 patients) and 48 were case reports (< 5 patients). There were 242 shoulders in 205

Table 2 Patients missed initially.

Study	Year	Population	Age (y)	Sex	Aetiology	Uni/ Bilateral	Delay (mo)	Initially radiological investigation
Vastamäki and Solonen [5]	1980	2	50.5	F (1), M (1)	Seizures	Uni (1), Bil (1)	13.5	AP
Hawkins et al. [2]	1987	21	49.2	M	Trauma (11), seizures (10)	Uni	12	AP
Keppler et al. [10]	1994	7	53	M	Trauma	Uni	5.2	AP
Gerber et al. [12]	1996	4	56	F (3), M (1)	Trauma (1), seizures (3)	Uni	5	AP
Cheng et al. [15]	1997	5	58	F (3), M (2)	Seizures	Uni (3), Bil (2)	23	AP
Aparicio et al. [18]	2000	6	53.7	F (2), M (4)	Trauma (2), seizures (4)	Uni (5), Bil (1)	3.9	AP
Bozkurt et al. [26]	2004	1	41	M	Trauma	Uni	6	AP
Sperling et al. [27]	2004	12	56	F (6), M (6)	Trauma (6), seizures (6)	Uni	26	AP
Spencer et al. [29]	2005	2	45	F (1), M (1)	Trauma	Uni	1.25	AP
Takase et al. [30]	2006	1	41	F	Trauma	Uni	28	AP
Verma et al. [31]	2006	1	26	M	Trauma	Uni	1	AP
Duralde et al. [33]	2006	4	52	M	Seizures	Uni	0.13	AP
Martinez et al. [35]	2008	6	31.6	F (3), M (3)	Trauma (3), seizures (3)	Uni	2	AP
Agarwal et al. [36]	2008	1	66	M	Seizures	Bil	0.03	None
Ivkovic et al. [37]	2007	1	52	M	Seizures	Bil	3	None
Chalidis et al. [38]	2008	1	34	F	Trauma	Uni	3	AP
El Shewy et al. [39]	2008	17	48.5	F (3), M (14)	Trauma (14), seizures (3)	Uni	0.75	AP
Gavriilidis et al. [41]	2010	11	53	F (1), M (10)	Trauma (8), seizures (3)	Uni (10), Bil (1)	13.9	AP
Singh et al. [42]	2009	3	37	M	Trauma	Uni	4.7	AP
Diklic et al. [43]	2010	13	42	F (3), M (10)	Trauma (10), seizures (3)	Uni	4	AP
Modi et al. [45]	2009	1	64	M	Trauma	Uni	0.6	AP
Toker et al. [46]	2012	1	34	M	Trauma	Uni	0.07	AP
Schliemann et al. [47]	2011	25	53	M	Trauma	Uni	2.2	AP
Li et al. [48]	2011	1	30	F	Trauma	Uni	1	AP
Poyanli et al. [50]	2011	1	52	M	Seizures	Bil	1	None
Torrens et al. [51]	2012	1	45	M	Seizures	Bil	3	AP
Kokkalis et al. [55]	2012	1	40	M	Seizures	Bil	4	AP

AP = anteroposterior radiograph; F = female; M = male.

Table 3 Patients diagnosed initially.

Study	Year	Population	Age (y)	Sex	Aetiology	Uni/ Bilateral	Delay (mo)	Initially radiological investigation
Vastamäki and Solonen [5]	1980	4	35.3	F (2), M (2)	Trauma (2), seizures (1), electric shock (1)	Uni (2), Bil (2)	0.45	AP + Axi
Nicola et al. [6]	1981	1	39	M	Seizures	Bil	0.13	AP + Axi
Reckling [7]	1986	1	75	M	Seizures	Uni	0.3	AP + Axi
Blasier et al. [8]	1988	2	39	M	Seizures	Uni	0	AP + Axi + CT
Goldman et al. [9]	1987	1	52	M	Seizures	Uni	0	AP + Axi
Keppler et al. [10]	1994	3	53	F	Seizures	Uni	0.7	AP + Axi
Page et al. [11]	1995	1	43	M	Seizures	Bil	0	AP + Axi + CT
Naresh et al. [13]	1997	1	45	M	Trauma	Uni	0	AP + Axi
Connor et al. [14]	1997	1	44	M	Seizures	Bil	0	AP + Axi
Altay et al. [17]	1999	10	37.6	F (3), M (7)	Trauma (7), seizures (3)	Uni (7), Bil (3)	0	AP + Axi
Ito et al. [19]	2000	1	73	M	Seizures	Uni	0.07	AP
Oakes et al. [20]	2001	1	35	M	Trauma	Uni	0	AP + Axi + Y
Kilicoglu et al. [21]	2001	1	60	M	Seizures	Bil	0.03	AP + CT
Brackstone et al. [22]	2001	1	50	M	Seizures	Bil	0.03	AP + CT
Mancini and Lazzeri [23]	2002	1	46	M	Seizures	Bil	0	AP
Ide et al. [24]	2003	1	21	M	Trauma	Uni	0	AP + Axi
Hayes et al. [25]	2003	1	28	M	Trauma	Uni	0	AP
Stone and Wright [28]	2005	1	30	M	Electric shock	Uni	0	AP
Iosifidis et al. [32]	2006	1	47	M	Seizures	Bil	0	AP + CT
Duralde et al. [33]	2006	3	52	M	Seizures	Uni	0.13	AP
Mnif et al. [40]	2009	1	42	M	Seizures	Bil	0	AP + CT
Engel et al. [44]	2009	1	64	F	Seizures	Uni	0	AP + Axi
Schliemann et al. [47]	2011	10	53	M	Trauma	Uni	1	AP
Patrizio and Sabetta [49]	2011	1	57	M	Seizures	Uni	0	AP + CT
O'Neill et al. [52]	2012	1	45	M	Seizures	Bil	0	AP + CT
Begin et al. [53]	2012	1	46	M	Seizures	Bil	0	AP + Axi + CT
Banerjee et al. [54]	2012	2	41	M	Trauma (1), electric shock (1)	Uni (1), Bil (1)	0	AP
Moroder et al. [56]	2012	1	50	M	Trauma	Uni	0.03	AP + CT

AP = anteroposterior radiograph; Axi = axillary view radiograph; CT = computed tomography; F = female; M = male; Y = Y-view radiograph.

patients. The average age was 47.6 years and the range was 19–76 years. There were 170 male (82.9%) and 35 female (17.1%) patients. In 37 patients (18%), the posterior dislocations were bilateral. The aetiology of the dislocation in the 205 patients was trauma in 121 (59%), seizure in 82 (40%), and electric shock in two (1%).

The average interval between injury and diagnosis was 5.88 months (range, 0–300 months). For 150 patients (73.2%), the initial diagnosis of posterior shoulder dislocation was missed. Of these initially missed patients, almost all (147/150, 98%) had anteroposterior (AP) or lateral radiographs, but none had axillary view or Y view radiographs or computed tomography (CT) scans. For the other 55 (26.8%) initially confirmed cases, only 19 (11.4%) cases were confirmed by AP radiographs. During initial radiographic assessment, axillary or Y view radiographs or CT confirmed the diagnosis in all 36 (100%) cases.

In total, AP radiographs were taken in 166 cases, but only 19 (11.4%) cases were confirmed. AP and axillary view radiographs or CT were present in 36 cases, which were all (100%) confirmed. When axillary or Y view radiographs were made subsequently, the diagnosis was confirmed in all 205 patients.

Discussion

The shoulder is the most frequently dislocated joint in the body [57], whereas posterior dislocation is a rare injury, which only accounts for 1–5% of all shoulder dislocations [58,59]. The most common mechanism for the unilateral injuries is trauma, such as a direct blow to the humeral head, a fall on an outstretched arm, or a motor vehicle collision [60–62]. Bilateral posterior shoulder dislocations are most commonly caused by seizures. Although electrocution, drug dependency [63], and hypoglycemic episodes [64] have also been implicated as causes. Of the 205 cases included in the literature review, 168 were unilateral and 37 were bilateral. Of the 168 unilateral shoulder injury patients, 118 (70.2%) were attributed to trauma, 49 (29.2%)

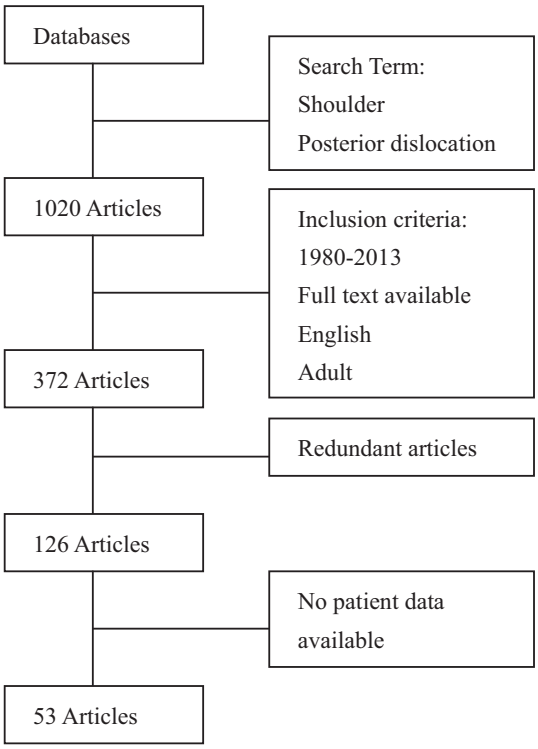

Figure 1 Study flow chart.

were caused by seizures activity, and one (0.6%) was caused by electric shock. For the 37 bilateral shoulder injury patients, 33 (89.2%) were attributed to seizures activity, two (5.4%) were caused by trauma, and two (5.4%) were caused by electric shock.

Patients with PSD do not show striking deformities. Proper clinical examination is essential. The classic signs of posterior shoulder dislocation were first reported by Cooper [65], which included posterior fullness and rounding with subsequent prominence of the coracoid process, flattening of the anterior aspect, severe limitation of external rotation with the arm in elastic internal rotation and limited elevation of the arm (often $< 90^{\circ}$). Lack of pain during external rotation may indicate a chronic dislocation.

The diagnosis of PSD is often difficult. We found that the initial misdiagnosis rate is 73.2%, ranging from 60% to 80% [2,58]. Few injuries become chronic. PSD gives rise to fewer prominent symptoms and the clinical picture may appear similar to more common diagnosis, such as a shoulder contusion or rotator cuff tear. Severe swelling immediately after the injury hampers diagnosis. AP radiographs can appear grossly normal, and the classic appearance of the "light bulb sign" is absent in most cases [66]. Axillary view or Y view radiographs or CT scans are often neglected. These factors may contribute to the high rate of misdiagnosis.

Hawkins et al. [2] found an average 1-year delay in diagnosis in a series of 40 patients with only 30% diagnosed within 6 weeks from injury. In our literature review, most of the cases were neglected initially, by an average of 5.88 months. In fact, most of these cases were misdiagnosed as "frozen shoulder" or "shoulder sprain".

To avoid misdiagnosis, a high index of suspicion, accurate examination, and an insistence on the proper initial radiographic evaluation are necessary. When a PSD is suspected, initial imaging should include full three-view radiography of the injured shoulder: AP, lateral scapular, and axillary or Y view. As the classic appearances of the "light bulb sign" and "rim sign" on the AP view are often absent and neglected, the axillary or Y view radiographs are often the key to diagnosing this injury. In our literature review, we found only a 11.4% diagnosis rate using AP views, which increased to 100% when axillary or Y view radiographs were added. It may often be difficult to take an axillary view because of the pain, but we feel that it can always be taken with proper technique; it may, however, require the presence of the doctor to supervise. Goud et al. [67] provided a brief outline of the various shoulder projections obtained at their institution and the conditions for which they are most beneficial. They state that the axillary view is classically used in evaluating dislocations of the shoulder. Thus, a scapular Y view is often easier to acquire than axillary view when the latter is difficult to be obtained because of severe pain or limited mobility. Unfortunately, many developing countries have not regarded the axillary view or Y view radiographs as a routine radiological investigation. We recommend that the axillary view or Y view radiographs should be taken as routine radiological investigation for all patients with shoulder trauma, whilst CT scans should be taken to evaluate the damage of the humeral head and the associated fractures, which determine the extent of treatment necessary for each patient. Magnetic resonance imaging scans can further detail the tissue injury of the shoulder, such as rotator cuff damage.

The treatment of PSD is multifactorial and varies from benign neglect to total shoulder arthroplasty. According to the relevant literature, the main considerations include the extent of the reverse Hill—Sachs lesions, the duration of the dislocation, the condition of the glenoid fossa, and the age and the general health of the patient. If the injury is diagnosed acutely, a closed reduction is often successful and the prognosis is usually satisfied if the reverse Hill—Sachs lesions are $< 20\%$ in size. Lesions $> 20\%$ are often unstable after closed reduction and may require operation. In patients with unstable shoulder after PSD and lesions $< 30—50\%$ of the humeral head, the gold standard is operative stabilization with a McLaughlin procedure or a modified technique. Lesions $> 50\%$ typically require arthroplasty to restore stability [2]. Humeral head replacement should be avoided in younger patients.

PSD continues to be a "diagnostic trap" for clinical physician despite the advances in imaging techniques and recognition about the risk of missed diagnosis. A thorough and accurate clinical and radiographic investigation is very important when a PSD is suspected. We suggested that the axillary or Y view radiographs should be taken as routine radiological investigation for all patients with shoulder trauma. CT scans and magnetic resonance imaging can also be acquired to evaluate the damage if necessary.

However, the majority of the articles we selected were case reports, with the rest being small case series. It is better to upgrade the strength of the evidence. Therefore, further studies with a greater number of cases are still needed to establish our conclusions.

Conflicts of interest

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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