SYSTEMATIC REVIEW

A Systematic Review of the Management of Upper Extremity Orthopaedic Injuries in Epileptic Patients

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Received: 15 March 2021 *Accepted: 02 July 2021*

Abstract

Background: During seizures, injury of the upper extremities may occur. Standardized guidelines are deficient for diagnosis and perioperative care.

Methods: PubMed, Embase, Cochrane, Scopus, and Web of Science databases were systematically screened using predefined search terms.

Results: Of the 59 patients included, 36 (61.0%) involved a posterior shoulder dislocation. Associated fractures were observed in 34 (57.6%) cases with surgical procedures performed in 30 (50.8%) patients. Functional outcomes were reported in 44 patients, with over half (23 of 44, [52.2%]) endorsing range of motion deficits.

Conclusion: Standardized guidelines, to guarantee timely management of injury in post-seizure patients, are needed with a customized treatment approach that accommodates the various aspects of their condition.

Level of evidence: III

Keywords: Epilepsy, Orthopaedic injuries, Orthopaedic surgery, Perioperative management, Upper extremity

Introduction

Posterior or bilateral dislocations and fracture-dislocations of the shoulder are rare upper extremity orthopaedic injuries. They are frequently related to seizure disorders (1-6). Forceful contractions that seizure and epileptic patients may experience can cause atypical stress on the bones and joints, leading to injury ranging from mild shoulder subluxations to serious fracture-dislocations (4). Posterior shoulder dislocations are uncommon and make up 2 to 5% of all shoulder dislocations, with less than 5% being bilateral (5, 6). It is estimated that almost half of these cases are due to seizure episodes, and close to 90% if a fracture-dislocation is involved (4, 6). Furthermore, the use of anti-epileptic medications to manage seizures is known to have negative effects on bone integrity. This may predispose patients to injury and recurrence (7, 8).

Although rare upper extremity injuries are known to be associated with seizure disorders, there is still a lack of knowledge throughout the literature in regard to the orthopaedic treatment of these patients (5). Initial diagnosis is often missed as a result of the rarity and complexity of these injuries, and no standardized protocols currently stand for perioperative care (5). Since epilepsy and anti-epileptic medications have various related complications, surgical and post-operative treatment should be customized in order to alleviate

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THE ONLINE VERSION OF THIS ARTICLE ABJS.MUMS.AC.IR

recurrence and complications.

The following study is a systematic literature review that outlines the upper extremity injuries that are commonly seen and the surgical and non-surgical intervention performed in the management of these injuries in epileptic and seizure patients. Special attention is on the association between seizures and upper extremity injury, surgical techniques implemented to accommodate the patients' condition and specific injury, and functionality following intervention.

Materials and Methods

Various databases including PubMed (https://www.ncbi.nlm.nih.gov/pubmed/), Embase (https://www.embase.com/) Cochrane (http://www.cochranelibrary.com/), Scopus (https://www.scopus.com/), and Web of Science (https://apps.webofknowledge.com/) were queried to look for studies involving orthopaedic injuries involving the upper extremities in seizure and epileptic patients. The keywords "Orthopaedic", "Fracture", "Fall", "Injury", "Dislocation", "Periprosthetic", "Spine", "Vertebrae", "Vertebral", "Osteoporosis", "Prosthetic dislocation of total joint", OR "Arthroplasty", AND "Status epilepticus", "Seizure", "Convulsion", OR "Epilepsy" were included in the search syntax. The articles' titles and abstracts that were found were examined and checked for eligibility and the search was restricted to the English language. Full-text abstracts and publications detailing upper extremity injury associated with seizure or prior history of epilepsy in at least one patient were chosen. Comments, editorials, errata, corrigenda, and responses, were excluded. Non-human investigations were also excluded.

According to the inclusion criteria, all data were independently evaluated by three authors (XXX, YYY, and ZZZ). The details gathered from each publication included the first author's last name, enrolled patients' number, sex, age, type and anatomic location of injury, reason for trauma, medications, comorbidities, operative complications, operative technique, and functional outcomes.

Results

A flow diagram reviewing the gathered articles' screening and selection processes is shown in [Figure 1]. The initial query yielded a total of 108,825 articles,

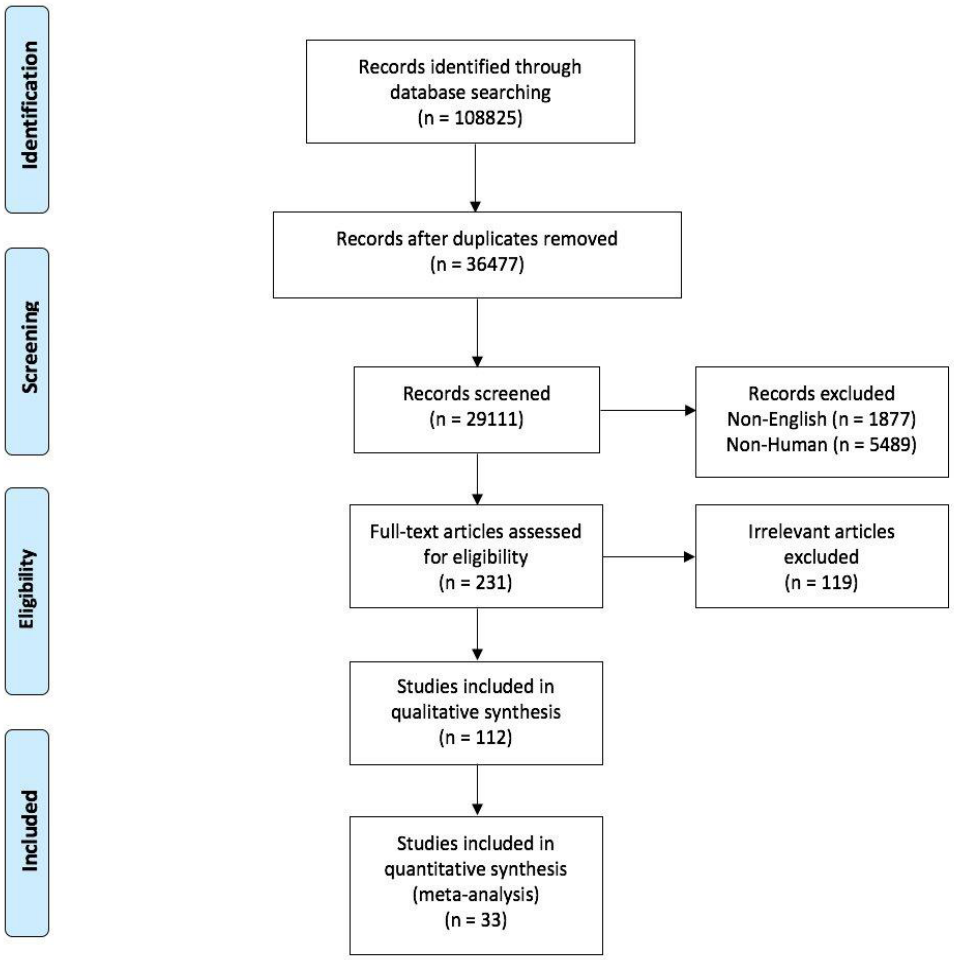

Figure 1. Depiction of the PRISMA flowchart utilized for study identification, exclusion, inclusion, and analysis.

72348 of which were indexed in at least two sources. Of the remaining 36477 publications, 7366 foreign language or animal studies were excluded, as were 28880 articles that did not meet eligibilities, including commentaries, errata, corrigenda, editorials, and responses. After exclusion, 231 articles remained. 119 of these were considered irrelevant to our study. After a second review, 112 publications met the eligibility conditions for qualitative analysis, while 33 complete manuscripts and abstracts were eligible for quantitative analysis and included for further comprehensive synthesis [Table 1].

Of the 59 patients enrolled, 22 (37.2%) lacked details pertaining to their age (22 [37.2%]) and/or sex (12 [20.3%]). There were 39 males (83.0%) and eight females (17.0%) with a mean age of 37.5 years (range, 15.0 to 62.0 years). Bilateral shoulder dislocations were seen in 38 (64.4%) cases, while unilateral shoulder dislocation was identified in 13 (22.0%) [two left shoulder (15.4%), three right shoulder (23.1%), eight unspecified (61.5%)] patients, along with eight (13.6%) upper limb injuries that were not described. Posterior dislocation was reported in 36 (61.0%) patients while 14 (23.7%) anterior dislocations were identified. One (1.7%) patient had both an anterior and posterior

Table 1. Studies evaluating upper extremity orthopaedic injuries and treatment in seizure patients

Study	Sample Size[a]	Injury Type	Age (Years)[a]	Cause of Injury	Surgery (Y/N)	Follow-Up (Months)[a]
Amir *et al.* (1)	1	Bilateral Posterior Shoulder Fracture-Dislocation	37	Status epilepticus (medication non-compliance	Y	14
Betz *et al.* (2)	1	Bilateral Posterior Shoulder Dislocation	25	Tonic-clonic seizure (hyperglycemia)	N	-
Cautero *et al.* (3)	1	Bilateral Posterior Shoulder Fracture-Dislocation	46	Epileptic seizure	Y	-
Cyffka *et al.* (4)	1	Bilateral Anterior & Posterior Shoulder Fracture-Dislocation	29	Epileptic seizure	Y	6
De Pascali *et al.* (5)	12	Bilateral Posterior Shoulder Dislocation (4); Unspecified UE fracture (8)	-	Epileptic seizure (12)	-	-
Gopinath *et al.* (6)	1	Bilateral Anterior Shoulder Fracture-Dislocation	30	Fell from truck after epileptic seizure	Y	24
Iosfidis *et al.* (7)	1	Bilateral Posterior Shoulder Fracture-Dislocation	47	Tonic seizure	N	36
Jansen *et al.* (8)	1	Bilateral Posterior Shoulder Fracture-Dislocation	48	Epileptic seizure	Y	1
Kakhki *et al.* (9)	1	Bilateral Anterior Shoulder Dislocation	21	Epileptic seizure (medication non-compliance)	N	3
Konda *et al.* (10)	1	Bilateral Posterior Shoulder Fracture-Dislocation	38	Drug induced seizure	Y	-
McKean *et al.* (11)	1	Unilateral Posterior Fracture Dislocation	56	Tonic-clonic seizure	N	24
Peshin *et al.* (12)	1	Unilateral Posterior Fracture Dislocation	15	Epileptic seizure	Y	24
Robinson *et al.* (13)	5	Unilateral (4) and Bilateral (4) Anterior Glenohumeral Instability w/ Coracoid Fracture Non-union	27	Tonic-clonic seizure (3) Generalized clonic seizure (1) Partial seizure (1)	Y (5)	24
Raptis *et al.* (14)	1	Bilateral Anterior Shoulder Fracture-Dislocation	41	Tonic-clonic seizure (medication non-compliance	N	12

Table 1. Continued

Rouhani *et al.* (15)	1	Bilateral Anterior Shoulder Dislocation	37	Epileptic seizure	Y	-
Sanel *et al.* (16)	1	Bilateral Anterior Shoulder Fracture-Dislocation	21	Tonic-clonic seizure	N	24
Siuni *et al.* (17)	10	Locked Bilateral Posterior Dislocation (7); Bilateral Posterior Shoulder Fracture-Dislocation (3)	-	Epileptic seizure (10)	N (7); Y (3)	-
Tellisi *et al.* (18)	1	Bilateral Posterior Shoulder Fracture-Dislocation	59	Generalized seizure	Y	24
Torrens *et al.* (19)	1	Bilateral Posterior Shoulder Fracture-Dislocation	45	Epileptic seizure	Y	24
Tripathy *et al.* (20)	1	Bilateral Anterior Shoulder Dislocation	32	Tonic-clonic seizure	N	3
Woo *et al.* (21)	1	Bilateral Anterior Shoulder Dislocation	22	Fall with UE extension caused by epileptic seizure	N	0.75
Yigit *et al.* (22)	1	Bilateral Posterior Shoulder Fracture-Dislocation	32	Epileptic seizure with loss of consciousness and urinary incontinence	Y	-
Upasani *et al.* (23)	1	Bilateral Anterior Shoulder Fracture-Dislocation	35	Epileptic seizure	Y	3
Rhee *et al.* (24)	1	Bilateral Posterior Shoulder Fracture-Dislocation	62	Seizure caused by intracranial tumor	Y	-
Abbas *et al.* (25)	1	Bilateral Posterior Shoulder Dislocation	30	Tonic-clonic seizure associated with chronic Tramadol use	N	-
Wijers *et al.* (26)	1	Bilateral Posterior Shoulder Fracture-Dislocation	39	Tonic-clonic seizure	Y	24
Gurzi *et al.* (27)	1	Bilateral Posterior Shoulder Fracture-Dislocation	61	Tonic-clonic seizure	Y	24
von Keudell *et al.* (28)	1	Bilateral Posterior Shoulder Fracture-Dislocation	52	Generalized seizure	Y	24
Saoussen *et al.* (29)	1	Bilateral Posterior Shoulder Fracture-Dislocation	46	Epileptic seizure	Y	6
Gosens *et al.* (30)	2	Unilateral Posterior Shoulder Fracture-Dislocation (2)	49	Epileptic seizure (1) Alcohol withdrawal seizure (1)	Y (2)	24
Murphy *et al.* (31)	1	Bilateral Posterior Shoulder Fracture-Dislocation	61	Epileptic seizure	Y	-
Everisto *et al.* (32)	2	Unilateral (1) & Bilateral (2) Posterior Shoulder Fracture-Dislocation	30	Epileptic seizure (1) Alcohol withdrawal seizure (1)	Y (2)	12
Ibrahima *et al.* (33)	1	Bilateral Anterior Shoulder Fracture-Dislocation	31	Epileptic seizure	N	1.5

[a]Reported as individual values and means in case reports and series, respectively.
Abbreviations: no (N); yes (Y); upper extremity (UE)

dislocation of his shoulders while eight (13.6%) cases were unspecified. Associated fractures with dislocation injury was reported in 34 (57.6%) cases. Surgical intervention was done in 30 (50.8%) cases while non-surgical closed reduction was used in 16 (27.1%) patients. Therapeutic modality was not provided for 13 (22.0%) patients. For 29 (49.2%) patients postoperative follow-up was reported and averaged 16.4 months (range, three weeks to 36 months).

In all 59 cases, a seizure episode was found to be the cause of upper extremity injury. Of these cases, thirty-eight (64.4%) were reported as unspecified epileptic seizures, 11 (18.6%) cases were tonic-clonic seizures, and alcohol withdrawal seizures were outlined in two (3.4%) patients. Status epilepticus, drug induced seizure, and hypoglycemic seizure due to insulin non-compliance were found in one (1.7%) patient each respectively. Nine (15.3%) patients were reported to have a history of epilepsy, while other co-morbidities include diabetes mellitus type 1, alcohol abuse disorder, intracranial tumor, lung cancer, coronary heart disease, hypertension, reactive depression, learning disability, and previous rotator cuff tear were also reported. In one patient with recurrent bilateral anterior shoulder fracture-dislocation, a previous incident of bilateral shoulder dislocation was reported two years prior (9). Medication therapy with anti-epileptic drugs was identified in 13 (22.0%) patients including levetiracetam, valproic acid, phenytoin, carbamazepam, lamotrigine, and phenobarbital.

Of the 30 cases involving surgical intervention [Table 2], open reduction and internal fixation with deltopectoral approach (10 [33.3%]), hemiarthroplasty (seven [23.3%]), modified McLaughlin procedure (six [20.0%]), Latarjet technique (four [13.3%]), and Eden-Hybbinette technique (two [6.7%]) were primarily utilized, along with Bankart repair with remplissage technique, osteosynthesis, and anatomical prosthesis,

Table 2. Surgery technique, intra- and post-operative complications, and functional outcomes in 30 patients treated with surgical intervention

Study	Surgery Technique	Intra- and Post-Operative Complications	Outcome
Amir *et al.* (1)	Modified McLaughlin procedure	-	Pain free, stable, ROM restored
Cautero *et al.* (2)	Stemless anatomical prosthesis (b/l), with bone graft from osteotomized humeral head (R)	-	Stable, ROM and strength restored
Cyffka *et al.* (3)	Open reduction and fixation via deltopectoral approach with angular stable plate osteosynthesis	-	Pain free, Full ROM (L), minor deficits in abduction and anteversion (R)
Gopinath *et al.* (4)	Open reduction and internal fixation via deltopectoral approach, staged 3 weeks apart; K-wire stabilization (L)	Joint capsule was contracted, glenoid cavity filled with fibrous tissue	Pain Free; deficits in abduction flexion, extension, external rotation
Jansen *et al.* (5)	Cementless hemiarthroplasty (R); Open reduction and internal fixation via deltopectoral approach w/ angular stable plate (L)	Dislocation of a fragment (L) 4 months later, was resected; L shoulder impingement by plate and osteophyte w/ abduction 1year post-op, plate removed and osteophyte resected; AVN of L humeral head 18 months post-op, inverse prosthetic replacement	Pain Free; deficit in abduction (b/l)
Konda *et al.* (6)	Modified McLaughlin procedure (b/l)	-	Healed fracture with reduced GH articulation, active ROM restored
Peshin *et al.* (7)	Open reduction, humeral head reconstruction with autogenous tricortical graft and modified Latarjet procedure	-	No pain, ROM restored, minor deficit in abduction
Robinson *et al.* (8)	Latarjet technique (3) Eden-Hybbinette technique (2)	-	ROM restored, no recurrence, fixation failure, or graft resorption

Table 2. Continued

Sanel *et al.* (9)	Bankart repair and remplissage technique in arthroscopic fashion	-	ROM restored with minor deficits, no recurrence
Siuni *et al.* (10)	Open reduction and internal fixation via deltopectoral approach with interfragmentary osteosynthesis with plate and screws (1); Neer modification of McLaughlin (2)	-	ROM restored, deficit in internal rotation (2)
Tellisi *et al.* (11)	Open reduction via deltopectoral approach	-	Pain free restored full ROM (R); Stiff and painful with deficit in abduction and rotation with osteoarthritic changes (L), required hemiarthroplasty
Torrens *et al.* (12)	Hemiarthroplasty (L); osteochondral autograft from L humeral head was used for (R)	Sclerosis of articular segment of R graft at 2-year follow-up, suggesting avascular (may collapse over time)	Pain free, mild deficits in flexion and external rotation, good bone integration of graft
Yigit *et al.* (13)	Surgery (unspecified)	-	-
Upasani *et al.* (14)	Open reduction deltopectoral approach (R)	R shoulder did not relocate during open reduction after subscapular release due to glenoid tuberosity adherence to underlying bone (GT was freed repositioned and fixed, capsule was repaired); partially displaced greater tuberosity after 3 weeks (continued rehab and monitor)	No pain, ROM restored, mild deficit in abduction (R); union of greater tuberosity
Rhee *et al.* (15)	Hemiarthroplasty (R then L)	-	-
Wijers *et al.* (16)	Open reduction and internal fixation via deltopectoral approach (L); cemented shoulder hemiarthroplasty 4 months after (L); hemiarthroplasty 16 months later (R)	Dislocation of osteosynthesis after 2 days ORIF post-op (L), extensive comminution and posterior dislocation of fracture parts after initial open reduction (L). Required hemiarthroplasty	Significant limited ROM (b/l) can perform ADL, but cannot work or enjoy hobbies
Gurzi *et al.* (17)	Hemiarthroplasty (L); Osteosynthesis (R)	-	Pain and ROM satisfactory
von Keudell *et al.* (18)	Open reduction and internal fixation via deltopectoral (R); Press-fitted hemiarthroplasty 10 days later (L)	-	Minimal pain, frequent stiffness, limited ROM on rotation (b/l), abduction, flexion (L)
Saoussen *et al.* (19)	Modified McLaughlin procedure	-	Restored full ROM, no recurrence
Gosens *et al.* (20)	Open reduction and internal fixation via deltopectoral approach with 2 screw stabilization (1) Hemiarthroplasty (1)	-	Pain free, suboptimal ROM hindering ADL
Murphy *et al.* (21)	b/l reverse total shoulder arthroplasties	-	Satisfactory
Everisto *et al.* (22)	Modified McLaughlin procedure (1) Open reduction internal fixation via deltopectoral approach with PHILOS locking plate (1)	-	Restored full ROM, satisfactory

Abbreviations: range of motion (ROM), bilateral (b/l), right (R), left (L), post-operation (post-op), avascular necrosis (AVN), glenoid tuberosity (GT), open reduction and internal fixation (ORIF), activities of daily living (ADL)

depending on the case severity. In the 16 non-surgical patients, the Kocher technique for closed reduction was described in four (25.0%) cases. Of the six cases in which the modified McLaughlin procedure was performed, five (83.3%) were due for bilateral posterior shoulder fracture-dislocation injuries while one (16.7%) was unilateral. In three of the four (75.0%) cases where the Latarjet technique was used, a diagnosis of unilateral anterior glenohumeral instability with coracoid fracture nonunion was made. In 16.7% (five of 30) of patients, intra- and post-operative complications [Table 2] were reported, with appropriate management and improved outcomes achieved in all but one (20.0%) patient. Improvement in functional ability was reported for 44 (74.6%) patients with 21 (47.7%) patients detailing full recovery of range of motion with pain free movement, 21 (47.7%) cases with minor deficits in shoulder mobility, and two (3.4%) cases with significant impairment of shoulder movement affecting activities of daily living.

Discussion

Epileptic and seizure patients face various challenges associated with their condition. Musculoskeletal injuries resulting from convulsions, especially in the upper extremities, cause significant impairment of the patient's mobility and function, adding to their disease burden (4, 10, 11). Although both anterior and posterior dislocations can occur in patients following a seizure, less frequently seen among the general population are posterior dislocations, which are almost exclusively associated with seizures, electric shock or high velocity trauma (5, 6, 10-14). The unnatural strain placed on the glenohumeral joint due to muscle contraction or high-energy trauma, causes a forced adduction, flexion, and internal rotation of the arm along with an axial loading pressure, displacing the humeral head posteriorly from the glenoid fossa (1, 5). Specifically, in cases of epileptic convulsions, strong, involuntary contractions of the latissimus dorsi, pectoralis major, subscapularis, and teres major likely explain the posterior dislocations often found in seizure patients (2, 11, 15). Humeral fractures are also known to occur along with shoulder dislocations, the most common being reverse Hill-Sachs fractures, followed by humeral neck and tuberosity fractures (5, 12, 13, 16-20). Consequently, patients lose range of motion in their shoulder, endure various levels of pain, and are often unable to carry out their daily activities such as bathing, combing their hair, or lifting objects.

After anteroposterior (AP), axillary, and lateral, radiographs confirm the diagnosis, non-surgical closed reduction or surgical intervention are generally considered the standard of care. The extent of humeral head defect, often a reverse Hill-Sachs impression fracture, and the duration of injury is considered when determining the modality of treatment (2). Since posterior shoulder fracture-dislocations are initially misdiagnosed in up to 79% of patients, delays in treatment is not uncommon (5, 13, 21-24). Closed reduction under general anesthesia is preferred when there is only a minor defect of the humeral head, involving less than 25%, and the duration of the injury is less than three weeks (2, 6, 25). However, if closed reduction is not achieved or if the duration of injury is greater than three weeks, an open reduction and internal fixation (ORIF) with the deltopectoral approach should be performed (2). If the defect is greater than 25% but less than 50%, a modified McLaughlin is utilized (2, 13, 19, 25-28). Defects greater than 50% or a non-viable humeral head requires hemiarthroplasty (2, 10-12, 20, 23, 29, 30).

This systematic review describes the upper extremity injuries frequently found among epileptic and seizure patients, identifies the treatment performed for these injury types, and details the complications and functional outcomes for 59 patients. In the 59 cases of shoulder dislocations resulting from convulsions, 61.0% were posterior dislocations and 57.6% had evidence of fracture. Cases were mostly seen in males (83.0%). ORIF with deltopectoral approach, hemiarthroplasty, and modified McLaughlin technique were most commonly performed (23 of 30 [76.7%]). Although 95.5% (42 of 44) of patients reported adequate mobility, over half (23 of 44 [52.2%]) still described mild to severe range of motion (ROM) deficits. Among the two patients with unsatisfactory outcomes, significant limitations in shoulder ROM with associated joint stiffness was described, resulting in considerable impairment while performing activities of daily living (ADL) (10, 11). Furthermore, Ibrahima et al. describes one patient who had a recurrence of anterior shoulder fracture-dislocation despite a previous successful reduction performed for the same injury two years prior (9). These findings convey that current interventions are to some extent effective in restoring shoulder functionality. However, in order to further improve complications of epilepsy such as residual deficits in mobility and prevent recurrence, additional consideration should be given.

Epilepsy and anti-epileptic drug (AED) use is frequently associated with poor bone health (7, 8, 31-35). Compared to the general population, epileptic patients are two to six times more likely to experience fractures (7, 36). Beerhorst et al. reported an 80% prevalence of low bone mineral density (BMD) among patients with chronic epilepsy (7, 37). Restrictions in physical activity and exercise due to risks associated with epilepsy may weaken bones and increase susceptibility to fractures when patients fall during convulsive episodes. In addition, AEDs may further exacerbate fracture risk by its deleterious effects on bone density and metabolism. Although several mechanisms have been proposed, AEDs, including carbamazepine, phenytoin, valproic acid, primidone, and phenobarbital, induce hepatic cytochrome 450 (CYP450) and may accelerate the breakdown of Vitamin D into inactive metabolites. This explains the metabolic effects on bone (7, 31, 33, 34). The resulting decrease in calcium absorption can elicit parathyroid (PTH) release, and thus cause drug-induced hyperparathyroidism with elevated bone catabolism (7, 31). Similarly, Rocha et al. described

the modulating effects of AED on primary bone cells, with carbamazepine, lamotrigine, and gabapentin inhibiting the production and maturation of osteoblasts and osteoclasts, effectively impairing bone remodeling (8). Chronic use of AED has therefore been associated with the development of osteoporosis, osteomalacia, and rickets in adults and children respectively, placing patients at greater risk for fracture (8, 31, 33, 35). In the management of epileptic patients before and after orthopaedic injuries, further evaluation of the individual and their seizure disorder should be taken into account when determining the appropriate anti-epileptic therapy course in each case. Certain medications can predispose patients to increased risk of fracture and injury recurrence, and may need to be avoided in patients with decreased bone density especially.

Cases of posterior shoulder dislocation alleged after a seizure episode is difficult to recognize as it is generally not suspected due to its rare occurrence (21, 24). Up to 79% of patients are not diagnosed initially, resulting in a delay of treatment and deteriorating functional outcomes (5, 13, 21, 22, 24, 29). Vascular compromise resulting from a long duration of unreduced shoulder dislocation may worsen humeral head viability and result in chronic pain and suboptimal ROM. Schliemann et al. described an observable decline in functional scores for patients who had a delay in diagnosis longer than four weeks (5, 21, 38-41). Therefore, a diagnostic protocol should be established for epileptic patients and those with a prior history of seizure who present with upper extremity complaints, as a delay in appropriate diagnosis can lead to poor functional outcomes that is permanent. A thorough patient history and physical exam in patients with a recent seizure along with diagnostic radiographs, as described in the articles included in our study, should be performed if there is suspicion of a shoulder dislocation or fracture.

Although systematically conducted to include all subjects with a history of epilepsy or seizure disorder and upper extremity orthopaedic injuries, there are limitations to our analysis. Collective studies were heterogeneous and patient demographics and follow-up, medications, surgical techniques, and clinical outcomes were lacking in the documentation. However, with this systematic review, our findings progress what is currently known of upper extremity injuries in relation to seizure disorders as well as the management of rare orthopaedic injuries.

Although the current management of upper extremity orthopaedic injuries in epileptic and seizure patients is adequate in restoring range of motion and general function, in order to decrease functional complications and prevent recurrence of injury, advancements in diagnosis, surgical methods, and medication management should be made. Currently standardized, evidence-based perioperative guidelines and diagnostic protocol are lacking for the management of post-seizure patients with rare dislocation and/or fracture injuries. Furthermore, certain anti-epileptic drugs frequently prescribed to avoid convulsion episodes and traumatic falls can decrease bone density and potentiate risk of fractures. In most cases epileptic patients with upper extremity injuries are managed similarly as those without a history of seizures. A customized approach, including standardized guidelines for diagnosis and patient treatment, should be strongly considered when addressing the various nuances associated with epilepsy and seizure in the context of upper extremity orthopaedic injuries in order to optimize function and prevent recurrence.

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