Case Report

Simultaneous Reduction of Bilateral Anterior Shoulder Dislocation Following Nocturnal Hypoglycemia-Induced Convulsion Using the Boss-Holzach-Matter Technique

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Keywords

Bilateral anterior shoulder dislocation · Reduction technique · Nocturnal hypoglycemia · Convulsion · Diabetes mellitus

Abstract

Bilateral anterior shoulder dislocation is rare. We describe the case of a 21-year-old male with bilateral anterior shoulder dislocation following a nocturnal, hypoglycemia-induced convulsion. The relatively uncommon Boss-Holzach-Matter technique provides an easy, atraumatic, and time-efficient self-reduction method to achieve simultaneous reduction of bilateral anterior shoulder dislocation, without the need for anesthesia or analgesia.

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Introduction

Unilateral anterior shoulder dislocation is a common, usually trauma-related injury with an estimated incidence of 12.3–56.3 persons per 100,000 inhabitants per year, depending on the country of residence [1]. In contrast, bilateral anterior shoulder dislocation is rare, with a limited number of reported cases in the literature [2]. Bilateral anterior shoulder dislocation is mostly associated with trauma (50%), muscle contractions due to convulsions (37%), or electrocution [2]. Convulsions are typically seen in epilepsy or intoxication, but

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may also be induced by severe hypoglycemia [2, 3]. Although asymptomatic nocturnal hypoglycemia occurs relatively frequently in diabetic patients, bilateral anterior shoulder dislocation following a hypoglycemic convulsion is uncommon [1, 3, 4]. Swift, atraumatic shoulder reduction is important in relieving pain and preventing iatrogenic fracture or injury to the axillary nerve and brachial plexus [5, 6]. We present a case of bilateral anterior shoulder dislocation following a nocturnal, hypoglycemia-induced convulsion in a diabetic male, which was simultaneously reduced using the relatively uncommon, atraumatic self-reduction technique by Boss-Holzach-Matter (BHM) [7].

Case Report

A 21-year-old male presented to the Emergency Department (ED) with acute, bilateral shoulder pain after awakening in bed. There was no preceding trauma, and there were no other symptoms or previous shoulder complaints. His medical history only stated insulin-dependent diabetes mellitus. A physical examination showed a muscular male, with both shoulders slightly abducted and internally rotated and a painfully, restricted range of motion. Bilaterally, a gap was palpated at the lateral deltoid muscle, and the humeral head was palpated anterior to the glenohumeral joint. There were no signs of sensory loss or vascular compromise. Plain radiography of both shoulders confirmed the clinically diagnosed bilateral anterior shoulder dislocation (shown in Fig. 1). Because of his type 1 diabetes, his nonfasting blood glucose level was measured, and it was 7.7 mmol/L.

Our preferred self-reduction technique was discussed with the patient, and he was cooperative. Simultaneous, bilateral shoulder reduction was achieved using the BHM technique without anesthesia or analgesia, resulting in immediate relief of pain and restoration of shoulder function. Sensory function remained intact. Plain radiography confirmed bilateral glenohumeral reduction without fractures, Hill-Sachs, or bony Bankart lesions. The underlying cause of dislocation remained unclear. The patient was discharged from the ED with immobilization of both shoulders in an immobilizer for 2 weeks. Two weeks after presentation in the ED, he was seen in the outpatient clinic. He was doing well and was instructed to start with movement exercises while taking care to avoid joined external rotation and abduction for 4 weeks. Six weeks after presentation, he remained asymptomatic with full restoration of shoulder function, and a routine referral to a physiotherapist was made to assist in the strengthening of his shoulder musculature. Nonetheless, during these weeks, he awoke with muscle contractions following nocturnal hypoglycemic episodes on multiple occasions, for which he consulted his diabetes specialist. Repeated glucose measurements revealed that he was asymptomatic during his hypoglycemic episodes, and he was diagnosed with asymptomatic nocturnal hypoglycemia. After adjustment of his insulin regimen, the nocturnal convulsions subsided and he became symptomatic during a hypoglycemic episode. In hindsight, a nocturnal hypoglycemia-induced convulsion was the most likely cause of his bilateral anterior shoulder dislocation. For educational purposes, a follow-up call was made after 2 years. He had regained full bilateral shoulder function without recurrent dislocation or signs of instability and with adequate glycemic control; he no longer experienced nocturnal hypoglycemic episodes.

Discussion

Nocturnal Hypoglycemia

Recurrent episodes of hypoglycemia may lead to hypoglycemic unawareness, which increases the risk of severe hypoglycemia and associated complications such as convulsions

Fig. 1. Plain radiography of the right (**a**) and left (**b**) shoulder showing anterior glenohumeral dislocation without associated fracture, Hill-Sachs or bony Bankart lesion.

[8]. In long-standing diabetes, autonomic neuropathy combined with a reduced glucagon response to insulin may cause blood glucose levels to drop to dangerously low levels without an adequate autonomic counter-regulatory response, which may lead to convulsions [4]. Shoulder dislocation associated with hypoglycemic convulsion usually results in posterior glenohumeral dislocation, following violent muscular contractions in which the shoulders are usually flexed, internally rotated, and adducted by the more powerful posterior muscles of the shoulder [9]. In contrast, anterior shoulder dislocation is more frequently caused by direct impact to an abducted, externally rotated, and extended arm [6]. Interestingly, Özçelik et al. [3] suggested that all shoulder dislocations associated with hypoglycemic convulsions, both uni- and bilateral, are anterior in nature. Yet, the mechanism remains unclear. In the present case, the patient did not experience any symptoms of hypoglycemia other than convulsions. It is likely that his long-standing diabetes resulted in autonomic dysfunction, which is strengthened by the notion that his ability to sense hypoglycemia was restored after adjustment of his insulin regimen. In the BHM reduction technique, we used the relatively unknown BHM technique to simultaneously reduce both anterior dislocated shoulders in an atraumatic manner [7]. This method applies traction-countertraction by intertwining the fingers of both hands, or tying the wrists together with a bandage, around a 90° flexed knee (shown in Fig. 2). A hard surface, such as the examination bench or floor, is preferable. The patient then leans his torso backwards with a hyperextended neck while extending the elbows and hips, causing axial traction. Simultaneous shrugging of the shoulders rotates the scapula around a vertical axis and pushes the humeral head anteriorly, allowing glenohumeral reduction [7, 10, 11]. Advantages of this technique are the atraumatic nature without the need for anesthesia or analgesia while being time-efficient, as both shoulders can be reduced simultaneously in a single motion. Additionally, leaving the patient in control of the situation adds to the ability to relax, which facilitates an easy reduction. The success rate for unilateral anterior shoulder dislocation is estimated between 60 and 70%, which is comparable with other techniques [10, 11]. Alternative reduction techniques various alternative reduction

Fig. 2. The self-reduction technique by BHM. BHM, Boss-Holzach-Matter.

techniques for anterior shoulder dislocation have been described, of which the Hippocratic, Kocher and Stimson techniques are the most commonly used [6]. All techniques can be classified into 3 categories, according to their mechanism of action [12]. Traction-countertraction methods, including the Spaso, FARES (Fast, Reliable, and Safe), Stimson, and BHM technique, rely on the application of longitudinal force to the humerus to overcome muscular tension to allow glenohumeral reduction [12]. Leverage techniques combine axial traction with external rotation and include the Kocher and Milch technique [12]. Finally, scapular manipulation techniques rely on repositioning the glenoid fossa into a position to allow humeral head reduction, instead of repositioning the humeral head through traction or leverage [12]. The applied technique is mainly dependent on the preference and experience of the physician and type of dislocation, with no consensus on the best technique [12]. Essential in all reductions is relaxation and cooperation of the patient, as muscular tension is the main force that keeps the humeral head displaced [10]. It is imperative not to apply too much traction, as some techniques bear an increased risk of iatrogenic fracture or injury to the axillary nerve or brachial plexus [5, 6].

Conclusion

Bilateral anterior shoulder dislocation following nocturnal hypoglycemia-induced convulsion is rare. The BHM technique provides an easy, atraumatic, and time-efficient self-reduction method for bilateral anterior shoulder dislocation, without the need for anesthesia or analgesia.

Statement of Ethics

Written and verbal consent for publication of this article and any accompanying images were obtained from the patient.

Conflicts of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All the authors made a substantial contribution to the conception of this work. Dr. Leeuwerke treated the patient in the ED, drafted most of the manuscript, and processed revisions. Dr. Keuning aided in the literature research, wrote part of the manuscript, and processed revisions. Dr. Ek was the referring physician, conducted follow-up calls with the patient, and provided revisions. Dr. van Beveren was the supervising physician, provided outpatient clinical follow-up to the patient, and provided revisions. Final approval of the version to be published was provided by all authors.

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