

Prevalence of the Shoulder Dislocation Due to Tramadol-Induced Seizure

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Background: Seizure is a known cause of shoulder dislocation and has been reported as the adverse effect of tramadol consumption, with both therapeutic use and overdose.

Objectives: The present study aimed to determine the prevalence and type of the shoulder dislocation due to tramadol-induced seizure.

Patients and Methods: This prospective and descriptive cross-sectional study was performed on patients with tramadol-induced shoulder dislocation referred to Shafa Orthopedic Hospital, Tehran, Iran, from October 2012 to April 2013. The patients' data on age, sex, ingested dose of tramadol, previous history of tramadol or other drug abuse, history of previous tramadol-induced seizure before presentation, side and type of the dislocation, and presence of accompanying fractures were recorded.

Results: A total of 72 patients with shoulder dislocation were admitted during the study period. According to our eligibility criteria, 15 patients (20.83%) were included. All patients had consumed tramadol orally during the preceding four hours of seizure. The dosage of tramadol consumption ranged from 100 to 3500 mg (mean, 650 mg). All of patients were male aging between 22-43 years old (mean age, 29 ± 2.0 years). The side of dislocation was right in 9 (60%), left in 4 (26.66%), and bilateral in two patients (13.33%). All the dislocations were anterior, except one (6.66%). Five patients (33.33%) had a history of another episode of previous tramadol-induced seizure. Four patients (26.66%) had accompanying greater tuberosity fractures.

Conclusions: In patient with shoulder dislocation and without any obvious trauma, tramadol-induced seizure should be considered. Tramadol should be prescribed cautiously and patients should be informed of its adverse effects including seizure-induced shoulder dislocation.

Keywords: Shoulder Dislocation; Seizure; Tramadol

1. Background

Tramadol is a weak codeine synthetic analogue and acts as a pure narcotic agonist. Its induced analgesia is due to inhibition of endogenous neurotransmitters, epinephrine, and serotonin, which causes pain damping (1). Furthermore, it induces weak agonistic effects in μ narcotic receptors (2). This sedative drug is used for treatment of moderate to severe pain (3). Evidences indicate a 6.9 in 1000 persons prevalence of tramadol abuse in the United States during 1995-1998 (4). Adverse effects of tramadol include dizziness, headache, central nervous system (CNS) stimulation, malaise, and seizure (3, 5). Moreover, its overdose causes bradycardia, seizure, respiratory depression, and coma (6). Seizure is rare (< 1%) in therapeutic doses (7). Seizure can induce shoulder dislocation, mostly posterior type, in epileptic patients (8). Diagnosis of posterior dislocation is difficult because the clinical signs are sometimes minimum or absent and radiographs may be inconclusive (9).

2. Objectives

To the best of our knowledge, there was no previous re-

ports of prevalence and type of tramadol-induced shoulder dislocation; therefore, this study was the first report of a case series of this adverse effect.

3. Patients and Methods

This prospective, descriptive, cross-sectional study was approved by our institutional ethic board. Inclusion criteria were diagnosis of shoulder dislocation or fracture-dislocation. Exclusion criteria were any causes for dislocation except tramadol-induced seizure. Therefore, we excluded cases with dislocations due to traffic accident, conflicts or contact sports injury, or falls, and those with head trauma, previous history of epilepsy, or other neurologic diseases. The study was done in Shafa Orthopedic Hospital, Tehran, Iran, from October 2012 to April 2013. During that period, 72 patients with shoulder dislocation were admitted. According to our eligibility criteria, 15 patients (20.83%) were included. Seizure was diagnosed by taking history from the patients, their families, or other accompanying people who observed them during seizure attacks. The dislocation was diagnosed by taking

Table 1. Demographic Data and Summary of Findings of Patient With Shoulder Dislocation after Tramadol Consumption^a

No.	Age, y	Side	Dislocation History With Tramadol	Greater Tuberosity Fracture	Tramadol Dose, mg	Tramadol Use Before Seizure	Other Drugs
1	23	Right Anterior, Unilateral	yes	Yes	200	yes	No
2	33	Left Anterior, Unilateral	No	No	100	No	No
3	42	Anterior, Bilateral	No	Yes	100	Yes	No
4	32	Right Anterior, Unilateral	Yes	No	200	No	Yes
5	23	Right Anterior, Unilateral	No	No	2000	No	yes
6	43	Right Posterior, Unilateral	No	No	500	Yes	No
7	26	Anterior, Bilateral	No	Yes	300	yes	Yes
8	32	Left Anterior, Unilateral	Yes	No	500	Yes	Yes
9	22	Right Anterior, Unilateral	No	No	3500	Yes	Yes
10	32	Right Anterior, Unilateral	No	No	100	No	No
11	23	Left Anterior, Unilateral	Yes	No	200	No	No
12	29	Right Anterior, Unilateral	No	No	100	Yes	Yes
13	28	Left Anterior, Unilateral	No	Yes	500	No	No
14	33	Right Anterior, Unilateral t	yes	No	300	no	Yes
15	28	Right Anterior, Unilateral	No	No	200	yes	No

^a All Patients Were Male.

history, clinical examination, and anteroposterior and true lateral scapular view radiographs. The patients' data on age, sex, ingested dose of tramadol during the preceding 12 hours of seizure, previous history of tramadol addiction or other drug or substance abuse, history of previous tramadol-induced seizure before presentation, side and type of the shoulder dislocation, and presence of accompanying fractures were recorded. All patients filled out written informed consent form consciously. All dislocations were reduced with successful closed reduction under general anesthesia and muscle relaxant agents.

Data were recorded in designed collecting form and then SPSS 16.0 (SPSS Inc, Chicago, Illinois, the United States) was used for statistical analysis. Descriptive statistics was used for determining prevalence of demographic variables and summarized data.

4. Results

During the study period, 72 patients with shoulder dislocation were admitted to our hospital among which 15 (20.83%) met inclusion criteria and were included. According to the patients' history, all patients had oral use of tramadol during the preceding four hours of seizure. Dose of tramadol consumption ranged from 100 to 3500 mg (mean, 650 mg). Two patients (13.33%) used higher doses (> 8-times) in comparison to mean dose of other cases (260 mg). One patient was a 22-year-old man with anterior dislocation of right shoulder without accompanying fracture who had ingested 3500 mg of tramadol. The other patient was a 23-year-old man with anterior dislocation of right shoulder without accompanying fracture who had ingested 2000 mg of tramadol. These two

patients (13.33%) were known case of heavy tramadol addiction who used to intake high dose of tramadol. By exclusion of the two patients with higher doses, the mean dose was calculated at 260 mg. None of our patients used tramadol for committing suicide. All patients were male between 22 to 43 years of age (mean age, 29 ± 2.0 years). Thirteen cases (86.66%) had unilateral and two cases (13.33%) had bilateral dislocations. The side of dislocation was right in 9 (60%), left in 4 (26.66%), and bilateral in 2 patients (13.33%). All dislocations were anterior, except one (6.66%). Five patients (33.33%) had a history of previous tramadol-induced seizure before presentation. Four patients (26.66%) had accompanying greater tuberosity fractures. Of 15 patients who had shoulder dislocation with seizure after tramadol abuse, 7 (46.66%) had used other narcotic substances as crack (four cases, 26.66%), opium (two cases, 13.33%), hashish (one case, 6.66%), heroin (one case, 6.66%), and amphetamine (one case, 6.66%) in addition to tramadol (Table 1).

5. Discussion

Tramadol is used to relieve medium to severe pain (3). Reports show that its use is increasing in Iran and the world (10). It may cause seizure after consuming therapeutic dose or over dosing (1, 7, 11-13); however, seizure incidence is rare in its therapeutic dose and is reported to be less than 1% in described patients (7). This drug permeates the blood brain barrier completely. Ninety minutes after consumption, the drug's plasma level reach its peak and five to six hours after consumption, it is eliminated from plasma, mainly by kidneys. Therapeutic blood level is about 100 to 300 ng/mL (0.1- 0.3 µg/mL) in adults (14, 15).

This drug is available in markets in the United States and Sweden since 1995 and in Germany since 1997. Tramadol was marketed in Iran since 1995 (16). According to Iran Ministry of Health reports, 24 million tramadol tablets (100-mg tablets) were sold during one year from March 21, 2004 to March 20, 2005 in Iran. It increased to 162 and 350 million tablets in the next two consecutive years (10).

Totally, 45% of all major joint dislocations are shoulder dislocation and 85% of all shoulder dislocations are anterior 15% of which are accompanied with tuberosity fracture (17). Posterior shoulder dislocation is rare and constitutes less than 5% of all shoulder dislocations (18). Shadnia et al. studied 114 cases with mean age of 23.66 ± 6.87 years with intentional tramadol intoxications and showed that 82 were male (19). Spiller et al. showed that 51 (59%) of 87 tramadol intoxication cases with mean age of 26.8 years were women (20). In the present study, 15 patients with shoulder dislocation had used tramadol, their shoulder dislocations were after seizure, and all of them were male with mean age of 29 ± 2.0 years. In contrast to abovementioned studies, we did not find any woman in our cases, but our patients were mainly in young ages. Talaie et al. performed electroencephalography (EEG) and computed tomographic (CT) scan of the brain in 132 patients who were considered as tramadol-induced seizure. Of 35 patients with documented seizure, all showed generalized tonic-clonic seizure and 12 patients had abnormal EEG (35.3%). They concluded that the incidence of seizure with tramadol is not dose dependent (5). Talaie reported that the most common dose of tramadol intake in patients with seizure is 500 to 1000 mg and concluded that the incidence of seizure with tramadol is not dose dependent (5). This study showed that seizure incidence is possible in every dosage of tramadol, which was similar to Talaie's findings. The most common type of seizure-induced shoulder dislocation in epileptic patients has been reported to be posterior type; the mechanism of injury is axial loading in adduction and internal rotation of arm due to severe muscular contraction during seizure (8). Anterior shoulder dislocation is a common complaint in emergency medicine. On the base of performing physical examination and approving findings by suitable radiographs, most emergency physicians can diagnose anterior shoulder dislocation quickly (18). Posterior dislocation of the shoulder is a rare condition compared with anterior dislocation and is often missed on first examination. Diagnosis is made difficult by the fact that clinical signs are sometimes minimum or absent and radiographs may be inconclusive. Although it is a diagnostic challenge, it can frequently be recognized clinically if one keeps this condition in mind (9). Farajidana et al. studied all traumas caused by tramadol-induced seizure and reported ten patients with shoulder dislocation all of which had anterior dislocation (21). Although the most common post-seizure shoulder dislocation has been reported to be the posterior type in the patients with epilepsy (8), anterior and posterior dislocations oc-

curred with equal frequency in a case series reported by Buhler et al. who studied 34 cases of post-seizure shoulder dislocation in 24 patients (22). In this study, all dislocations were anterior except one that was posterior and this finding is in contrary to the mentioned studies. We cannot explain the cause of this difference. Reports show that shoulder dislocation due to any cause may be accompanied with proximal humerus injuries (22, 23). Desai et al. studied five common fractures after seizure in individuals with epilepsy. According to their study, fractures of proximal humerus were 4.2 times more common in these patients than were in normal population (24). As found in the present study, fracture of the greater tuberosity is usually observed with anterior shoulder dislocations (25). Hovelius et al. showed that in 32 patients of 257 patients, anterior shoulder dislocation was accompanied by fracture of greater tuberosity (26). In the present study, four patients (26.66%) had shoulder dislocation accompanied by greater tuberosity fracture. We did not perform CT scan of the patients' shoulder for detecting any other small or occult fractures, especially glenoid rim fractures. Many addicts simultaneously use other drugs with tramadol (6, 27, 28). In the present study, five patients (33.33%) had a history of previous tramadol-induced seizure before presentation and all of them were tramadol addicts and 46.66% used other narcotic substances as crack, opium, hashish, heroin, and amphetamine. This finding is important in long-term treatment and follow-up of these patients. We did not find any similar study to compare these findings with.

Surprisingly, the most reports on tramadol-induced seizures and resulting shoulder dislocations were from Iran (5, 10, 16, 19, 21). In this study, we did not measure the blood level of tramadol. In addition, we did not rule out probably of underlying epilepsy or other structural brain damage by EEG or brain CT scan, which were amongst the potential defects of our study; however, according to their medical history, none of our patient had preoperative or postoperative unilateral or localized neurologic signs related to a structural brain damage. We recommend performing more studies with larger samples and determining simultaneous blood level of tramadol and other substances, performing EEG and brain CT scan, and following the patients for long-term consequences of these seizures and shoulder dislocations. Further studies should be done to explain the cause of more anterior dislocation instead of posterior type occurrence, which is usually seen in epilepsy-induced seizures. Finally, According to our findings, tramadol-induced seizure is common in patients with shoulder dislocation. Tramadol should be prescribed cautiously and patients should be informed about its adverse effects including seizure-induced shoulder dislocation.

Authors' Contributions

Study concept, design, and supervision: Morteza Na-

khaei Amroodi. Acquisition of data, drafting the manuscript, and critical revision of the manuscript for important intellectual content: Morteza Nakhaei Amroodi, Gholamreza Reza Shafiee, and Tahmineh Mokhtari. Analysis and interpretation of data: Tahmineh Mokhtari.

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