



## Case Report

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# What Should Be the Surgical Position Choice in A Patient Having Proximal Humeral Fracture with Developed Hypotension?

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## Abstract

Proximal humerus fractures with increasing prevalence in the geriatric age group are treated in a wide range from nonoperative treatment to arthroplasty and the treatment issue is still controversial. Developments in proximal humeral locking plate technology have increased the plate osteosynthesis option. Although surgical position in shoulder arthroscopy is as controversial as fracture treatment, osteosynthesis with locking plate is performed in the beach chair and in the supine position. In our clinical experience, the osteosynthesis with a locking plate was performed in beach chair position. Due to the hypotension developing after anesthesia, lateral decubitus position was used in the presented case and the surgical procedure of the patient was completed safely. In this case, it was aimed to operate the presence of hypotension that may cause cerebral perfusion failure in such a way that does not cause cerebral desaturation for surgical safety of the patient.

## Keywords

Lateral decubitus position, Proximal humerus fracture, Plate fixation, Hypotension

## Introduction

Proximal humerus fracture constitutes 4-5% of all fractures and it is the most frequent fracture type seen in the elderly after hip and distal radius fractures [1-3]. The purpose of the treatment of proximal humerus fractures is the restoration of a painless shoulder having a satisfactory function. This requires an understanding of the injury including information about the patient's age, expectations, medical condition, quality and current fixation techniques and limitations. Many different techniques consisting of osteosynthesis and prosthesis options have been identified for the fixation of proximal humerus fractures [4-7]. Surgical procedures are carried out in the beach chair and supine positions. In the case subject of the article, the hypotension developing after anesthesia was attributed to the Bezold-Jarisch reflex defined in 1867 and resulting in apnea, bradycardia and hypotension by stimulation of chemical and mechanical receptors [8]. It is known that this reflex can develop in orthostatic position and hypovolemia during neuroaxial and general anesthesia depending on pain and anxiety [9]. The surgical procedure on the developing hypotension was performed in the lateral decubitus position.

A distance is remained for lateral decubitus position especially in arthroscopic procedures that can be switched to open surgery in order not to have approach and orientation problems [10]. When the literature was examined, no study was found indicating that osteosynthesis of proximal humerus fracture with locking plate was performed in lateral decubitus position. Considering the presence of systemic hypertension (HT), renal stent history and smoking, which may cause cerebral perfusion failure, it is aimed to operate the patient in a way that will not cause cerebral desaturation for surgical safety. For the safety of surgical procedures of patients with

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proximal humerus fractures having a clinical picture that may cause cerebral perfusion failure, it may be beneficial to keep lateral decubitus position in mind as an alternative.

### Case Report

A 78 year-old female patient applied to the emergency room of our hospital due to the complaint of pain in the left shoulder after falling from a height of approximately 1 meter. In the examination and tests, there was a 3-part fracture in the left proximal humerus in which the surgical neck and tuberculum majus were broken according to Neer classification (Figure 1). There was no neurovascular deficit. In the patient's history, there was HT, history of renal stenting, and hemorrhoids. In addition, there were an undiagnosed preoperative hyperglycemia and smoking history. She was receiving verapamil treatment for HT. In her preoperative evaluation, it was assessed that her effort capacity was normal, hemodynamics was stable, and her ejection fraction was 55%. The feature was not found in the laboratory results and PA chest x-ray. It was monetarized with standard electrocardiography (ECG), heart rate (HR), noninvasive blood pressure (BP) and peripheral oxygen saturation (SPO2). No abnormalities were observed in the monitorization results. Anesthesia induction was performed with 2mg/kg propofol, 1 mg/kg lidocaine, 1 mcg/kg fentanyl, 20 mg ketamine and 0.6

mg/kg esmerone. After the induction, the patient with stabile hemodynamics was intubated without any problem once with the tube no: 7.0. For maintaining anesthesia, 2% sevoflurane was initiated. Since the patient who was brought to the sitting position for the operation was administered with atropine, ephedrine and noradrenaline. She was returned back to the supine position since her hypotension and bradycardia could not be fixed with supportive therapy. 1ml/kg of fluid replacement was given. The patient, whose hemodynamics quickly stabilized in the supine position, was brought back to the sitting position. However, since the deep hypotension and bradycardia were repeated, it was decided to perform the operation of the patient in lateral decubitus position in order not to disturb the cerebral vascular nutrition (Figure 2).

### Surgical Procedure

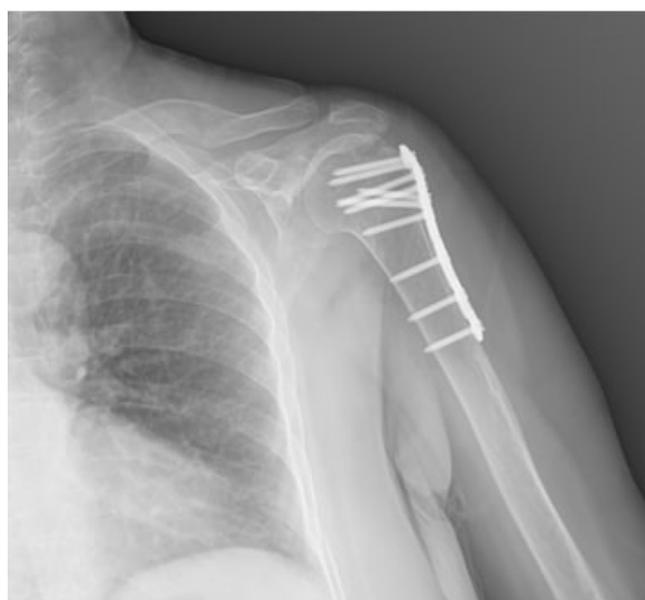
We used scapular and sacral supports on the back, sternal and pubic supports on the front side and gel pad supports to protect the bone protrusion and superficial nerves in order to hold the patient in this position. Right arm flexion was increased in order to allow the surgeon to work more comfortably. The surgical procedure was performed using the standard deltopectoral approach. In order to facilitate the incision and approach, the table was tilted at partial distances to the right and left at certain stages of the surgery. For the



Figure 1: Preoperat if radiological view.



**Figure 2:** Photograph of the patient in the intraoperative lateral decubitus position.



**Figure 3:** Radiological view at postoperative 6<sup>th</sup> month.

reduction and determination of the displaced tuberculum majus, no: 2 polyethylene multifilament sutures were applied to the bone tendon junction. For the reduction of the humeral surgical neck fracture, manual traction was applied in arm abduction, the medial force effect of the pectoralis major muscle was eliminated with a folded surgical drape placed between the arm and the trunk. After the reduction of fracture lines, fixation was achieved with a locking proximal humerus plate after temporary fixation with multiple k wires.

The sutures passing through the bone tendon junction were passed through suture holes in the plate proximal, knotted and the osteosynthesis was completed. Follow-ups of perioperative ECG, SPO2 blood pressure values were stable. The operation lasted for 75 minutes. After the muscle relaxant was antagonized, she was extubated without any problem. No hemodynamic problem was experienced in the postoperative period. For the radiological imaging,

C-arm fluoroscopy was rotated under the surgical table and positioned so that the shoulder can be seen anteriorly. Proximal humerus Anteroposterior/Lateral images were obtained by moving the arm. A shoulder arm sling was used until the skin sutures were taken. Pendulum and assisted joint range of motion were then started. Strengthening exercises started in the 6<sup>th</sup> week. In the outpatient clinical follow-ups, it was found that bone healing and joint range of motion were complete (Figure 3).

## Discussion

The best part of orthopedic and traumatology surgery is that a surgical procedure can be performed with different instruments, different techniques and in different positions. Proximal humerus fractures are among the most common fractures in human body with a peak incidence in elderly population. Its treatment is still a matter of discussion and it covers a wide range of options such as non-operative treatment, osteosynthesis and arthroplasty [6,7,11-14]. Depending also on surgical procedure, implants vary from k-wire to arthroplasty material. Open reduction internal fixation (ORIF) indications have expanded for some fracture types and in patients particularly having osteoporotic bone following the developments in locking plate technology in proximal humerus fractures [15]. Positions in shoulder surgery are beach chair, supine and lateral decubitus positions depending on the procedure, surgical experience and operating room facilities. When examining the hypotension that developed in the patient, the course without any complication for about 15 minutes following the intubation and the induction of anesthesia, sudden development of unresponsive bradycardia and hypotension to inotropes and atropine after placing the patient in the sitting position, a quick response to support treatment performed in the supine position but the inability to stabilize hemodynamics in the sitting position suggested us Bezold-Jarisch reflex. Hypotension, bradycardia, and asystole seen in sitting position depending on Bezold-Jarisch reflex quickly respond to the intervention when s/he is placed in the supine position and the findings can improve quickly [8,9]. In the osteosynthesis with locking plate in displaced and unstable proximal humerus fractures, we routinely prefer beach chair position. When the literature is examined, it is seen that patients are operated in beach chair or supine positions [16-18]. However, we did not find any study in the literature preferring lateral decubitus position. Optimal positioning according to the clinical condition of patient is necessary for a successful surgical procedure.

In the presented case, since TA values dropped after anesthesia and the desired increase could not be obtained at the desired time despite inotropic agents in the case, we changed the surgical plan as the lateral decubitus position. The possibility of cerebral oxygen desaturation during the beach chair position and hypotension of the patient lay on contribution to this change. Complications in patients after shoulder surgery in beach chair position vary from cranial nerve damage [19] to vision loss [20] and cerebral infarction [21-23]. Although the exact pathogenesis of these events has

not been fully explained, it has been assumed that the beach chair position may be responsible for these complications. Moerman, et al. showed that cerebral oxygen desaturation occurred during the beach chair position by using Near-infrared spectroscopy [24]. Although there is a short-term orientation problem in the lateral decubitus position, the fact that it does not impair cerebral perfusion can be seen as a great advantage in this regard.

## Conclusion

Although it is rare for a particular surgical procedure is performed only in a certain position, surgical positions can have various complications along with their pros and cons. Although a partial surgical orientation problem was experienced, lateral decubitus position enabled us to perform the surgical procedure safely in the patient who had proximal humerus fracture and developed hypotension. In addition, axial traction to the humerus for fracture reduction can be achieved more effectively manually or by using a traction system. In addition, the elimination of the medial force effect of the pectoralis major muscle with the folded surgical drape placed between the arm and the trunk, and easy reduction are other important advantages.

## Conflicts of Interest and Source of Funding

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