



## Transient bilateral sciatic nerve palsy after beach chair positioning: a case report and review of literature



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Beach chair positioning is widely utilized in open and arthroscopic upper extremity surgery, with reported advantages including anatomic positioning of the shoulder, mobility of the surgical arm, and ability to both stabilize and access the scapula.<sup>14</sup> Nevertheless, while beach chair positioning affords advantages, complications have been reported including stroke, cervical radiculopathy, and peripheral nerve compressive neuropraxias, including lateral femoral cutaneous nerve (LFCN) palsy, brachial plexopathy, and common peroneal nerve palsy.<sup>1,6,8-10,16,22,24</sup> The authors present a unique case of transient bilateral sciatic nerve palsy following repair of a pectoralis major tendon tear in a collegiate offensive lineman. This represents the first report of a neurologic complication at this level in the literature. The authors hope reporting this complication will inform surgeons as to its potential, outline preventative measures, and provide guidance for management should it arise postoperatively.

### Case presentation

#### Patient presentation

The patient is a 19-year-old male who presented for evaluation of left shoulder injury sustained three days prior. He is a college football lineman and reported experiencing a pop followed by pain, swelling, and bruising in the left chest and shoulder while bench pressing over 136 kg (300 pounds). While his pain improved, he also noticed chest asymmetry and continued swelling after the

injury. At the time of his clinic visit, he described his pain as 5/10 on the visual analog scale. The patient weighed 121 kg (267 pounds) and was 187.5 cm tall. Clinical examination revealed distortion of the axillary fold in comparison to the contralateral side as well as axillary ecchymosis (Fig. 1). MRI was obtained and revealed a sternal head pectoralis major tear. He was informed of the diagnosis and treatment options and the risks and benefits of surgery were discussed. Given his injury and activity level, he opted for surgical management and provided written and verbal consent.

#### Operative intervention

In the operating room, the patient underwent interscalene block followed by general endotracheal intubation. He was then placed in the standard beach chair position with protective padding for the sacrum and the peroneal nerve which is a standard safety measure at our institution to prevent iatrogenic compressive neuropathy (Fig. 2). The left upper extremity was prepped and draped in a sterile fashion. Intraoperatively, the sternal head of the pectoralis major was found to be completely torn and retracted from the proximal humerus. This portion of the pectoralis proved difficult to access given the intact clavicular head and its degree of retraction into the remaining pectoralis muscle. Due to the difficulty locating the tendon within the musculature, the patient was moved to more Trendelenburg, tilting the bed to approximately 30° from horizontal. Tendon repair was carried out with the use of 3 suture anchors placed on the lateral bicipital ridge. No significant blood pressure abnormalities were experienced intraoperatively. The patient awoke from anesthesia without complication and was immobilized in a sling postoperatively. Operative time was 122 minutes and total anesthetic time was 202 minutes.

Institutional review board approval was not required for this case report.

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**Figure 1** Clinical image obtained preoperatively which reveals loss of axillary fold with comparison to contralateral side as is commonly seen in the setting of a pectoralis major tear.

### Postoperative course

The patient was admitted for overnight observation and planned to return home on postoperative day one. After fully emerging from general anesthesia, the patient reported numbness and tingling in bilateral lower extremities. Physical examination on postoperative day zero revealed tibialis anterior (TA), extensor hallucis longus (EHL), and gastrocnemius strength of 3/5 on the right and 4/5 on the left. Sensation to light touch was decreased but intact globally in bilateral lower extremities below the mid tibia. Pulses were 2+ and equal bilaterally. The patient underwent an MRI of the lumbar spine to rule out spinal pathology given bilateral motor findings which showed no abnormality (Fig. 3). The patient was determined to have suffered a compressive peripheral neuropathy and was treated with expectant management. On postoperative day 2, the patient reported decreased paresthesias in bilateral lower extremities. Physical examination revealed 4/5 strength of the right TA, EHL, and bilateral gastrocnemius complex and 5/5 strength of the left TA and EHL. His bilateral sciatic nerve palsy resolved on postoperative day 3 and he was discharged home. He was seen at follow-up six weeks postoperatively and was experiencing no residual symptoms in the bilateral lower extremities. His strength was 5/5 bilaterally with no residual loss of sensation to light touch. His shoulder rehabilitation was uncomplicated, and he was cleared for return to activity at 6 weeks with gradual progression to play.

### Discussion

Beach chair positioning, while the preferred method of positioning for many shoulder surgeons, carries unique perioperative risks. The patient presented in this report sustained a transient, bilateral sciatic nerve palsy that completely resolved in the acute postoperative period. While current literature reveals a variety of potential complications related to beach chair positioning, this is the first report in the literature of a compressive neurologic complication involving bilateral sciatic nerves.

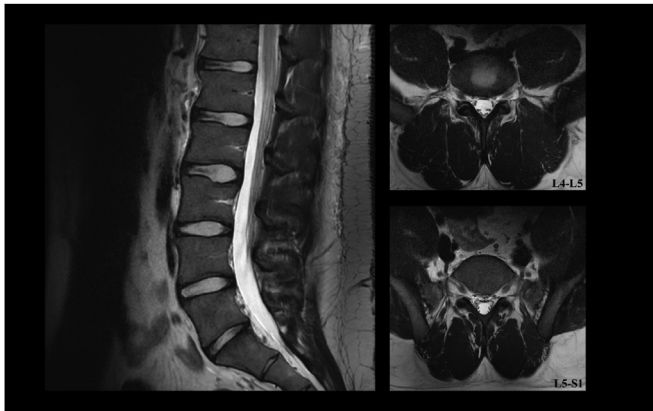
Hemodynamic management and cerebrovascular or neurologic sequelae from hypotensive surgery in the beach chair position remains a controversial topic.<sup>10,11,16,22,24</sup> Cerebrovascular and neurologic complications after shoulder surgery in the beach chair



**Figure 2** Standardized beach chair position at our institution as was utilized in this case (Note: image shows a different patient). The patient is positioned on a padded bed with additional padding over the hips, under the thighs, knees, and ankles, in addition to padding on the nonoperative upper extremity.

position are exceedingly rare, occurring in <0.1% of cases, but can be devastating, including stroke, spinal cord ischemia, deafness, blindness, and death.<sup>2,10,18,20,22,24</sup> Papadonikolakis et al reviewed catastrophic complications including stroke and death related to shoulder surgery in the beach chair position, demonstrating that the hydrostatic gradients in the sitting position cause blood pressures measured at the calf to be falsely elevated to those measured at the arm or intracranially.<sup>18</sup> Multiple studies have postulated that intravenous and inhaled anesthetics hinder the ability for the autonomic nervous system to respond to the upright position, therefore leading to cerebral oxygen desaturation events.<sup>11,16,22</sup> Koh et al<sup>10</sup> demonstrated that the use of sedation and regional anesthesia in the beach chair position resulted in the detection of significantly fewer desaturation events compared with patients who were under general anesthesia, although none of these desaturation events resulted in long-term neurologic or cognitive sequelae. While there is still much to be understood regarding the effects of intraoperative cerebral desaturation events in the beach chair position, the potential for more serious cerebrovascular complications should be recognized by both the surgical and anesthesia teams in any case utilizing the beach chair position. In our case, due to the rapid recovery of the patient postoperatively, the likelihood of an ischemic event due to decreased blood pressure is unlikely.

There have been multiple reports of arthroscopic shoulder procedures resulting in serious respiratory complications including subcutaneous emphysema, pneumothorax, and pneumomediastinum.<sup>1,4,5</sup> Bamps et al described the possible pathomechanisms of this complication which include either rupture of the alveoli/airways, rupture of the visceral pleura, or rupture of the parietal pleura.<sup>1</sup> These structures can be damaged by a preoperative or postoperative regional anesthetic block, damage to the airways during intubation, or injury from the arthroscopic procedure itself.<sup>5</sup> In the case of shoulder arthroscopy without the use of a regional block, the mechanism is more likely related to excessive air pressurization from the arthroscopic pump into the prevertebral space leading to rupture of the mediastinal pleura.<sup>1</sup>



**Figure 3** Representative sagittal and axial images from lumbar spine T2 MRI obtained to evaluate for spinal pathology in the setting of bilateral lower extremity weakness. Axial images show findings at L4-L5 (top) and L5-S1 (bottom). MRI revealed no spinal abnormality or compressive pathology explaining neurologic deficits observed postoperatively. MRI, magnetic resonance imaging.

Li et al describe the various equipment used to secure a patient who is placed in the beach chair position and its potential for iatrogenic nerve injury.<sup>14</sup> It is critical that the operating room staff assisting with patient positioning are familiar with this equipment, as errors in this pivotal task can result in patient harm.<sup>14</sup> There are multiple possible risk factors that could have contributed to the patient's postoperative sciatic nerve palsy. In the operating room, it is the standard practice at most institutions to ensure padding under all bony prominences that may be in contact with the operating table including the lateral aspect of the knees over the peroneal nerve, heels, and contralateral arm.<sup>7,13,21</sup> Neuropraxias of the greater auricular, lesser occipital nerves, and hypoglossal nerves have been described as a sequelae of rotation and traction of the head and neck during beach chair positioning, direct pressure on nerves via headrest equipment placement, and traction of the operative extremity during surgery.<sup>9,12,15,17,19</sup> In addition, placing additional padding or pillows between structures such as the abdominal pannus and the anterior thigh or the lateral knees and the bed is important to prevent compression on nearby structures such as the LFCN or common peroneal nerve. Diskina et al reported five cases of peroneal nerve palsy after beach chair positioned shoulder surgery, citing potentially contributing factors such as preexisting spinal pathology, taller patients, longer surgeries, and greater blood loss.<sup>6</sup> In a review of nearly 400 consecutive patients undergoing shoulder surgery in the beach chair position, Holtzman et al observed a LFCN palsy prevalence of 1.3%.<sup>8</sup> In their subanalysis, they determined that elevated body mass index (BMI) and patient weight were risk factors associated with this complication.<sup>8</sup> Levy et al found a 1.5% prevalence of LFCN palsy in patients with a BMI  $\geq 30$  kg/m<sup>2</sup>, and this risk was reduced with standardized placement of padding under the abdominal pannus.<sup>13</sup> While there are no current reports discussing patient positioning associated with bilateral sciatic nerve palsy, the body habitus of the patient (BMI: 34.4, weight: 121 kg) likely contributed to the complication. Standard positioning precautions were carried out in this case, with the patient being positioned on a well-padded operative table with additional padding placed under the thighs, knees, and ankles, in addition to padding over the hips and the nonoperative upper extremity. Additionally, anesthetic time in the beach chair position was likely a contributing factor in this complication. The authors hypothesize that high BMI and longer operative time are independent yet multiplicative risk factors for peripheral compressive neuropathies arising from beach chair positioning, although no data yet exist to support this.

A cadaveric study evaluating sciatic nerve intraneural pressures with various degrees of hip and knee flexion offers some insights into potential techniques that may maximize intraneural blood flow and mitigate this complication.<sup>3</sup> Borrelli et al<sup>3</sup> observed that pressure elevation within the sciatic nerve was highest with hip flexion of 90° and full knee extension, a position which maximizes the distance between the sciatic notch and the distal aspect of the leg. The authors also observed that intraneural sciatic pressures significantly decreased with increasing knee flexion and decreasing hip flexion, with lowest pressures being observed at 45° of hip flexion and 45° of knee flexion. Given these findings, surgeons may consider utilizing a more recumbent beach chair position which allows 45° of hip and knee flexion, especially in patients that with longer surgical interventions and/or higher BMI. Although the patient in this case was placed in a recumbent beach chair position, knee flexion at the time of positioning (approximately 10°–15°) was not modified to decrease tension on the sciatic nerve.

In the presented case, the patient emerged from anesthesia with bilateral yet asymmetric deficits of the lower extremities. In discussing the etiology and management of this unforeseen complication, both peripheral and central causes of lower extremity weakness and paresthesias were explored. Additional aspects of his history were taken into consideration as well, such as his status as a football lineman predisposing him to a higher risk for spondylolysis and other spinal pathologies.<sup>23</sup> An MRI of the lumbar spine without IV contrast was ordered to rule out any pathology at the level of the spinal cord or nerve roots. This revealed a patent spinal canal and neural foramina without any evidence of neural compression. The presence of bilateral lower extremity weakness and absence of upper extremity symptoms or cognitive deficit postoperatively made central etiologies, such as cerebrovascular stroke, unlikely. As such, he was treated with expectant management for bilateral peripheral compressive neuropathy. On postoperative day 1, his strength was fully intact on the left lower extremity and improved to 4/5 on the right. His bilateral sciatic nerve palsy completely resolved on postoperative day 3 and he was discharged home without further issue.

## Conclusion

While beach chair positioning remains highly utilized, it does carry the risk of complication. This case of transient bilateral sciatic nerve palsy following beach chair positioning was treated with expectant management. The authors hope the report of this rare complication will inform surgeons as to its potential and provide guidance for management when it arises in the postoperative period.

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