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Radial Nerve Injury following Renal Radiofrequency Ablation in the Lateral Decubitus Position

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Abstract

We present the case of a radial nerve injury above the level of the elbow following lateral positioning under general anesthesia. Perioperative peripheral nerve injuries are infrequently seen; however, they have significant patient quality of life implications and medicolegal ramifications. In the operating room where general anesthesia is routinely used, familiarity with positioning anesthetized patients is a shared responsibility. In the interventional radiology suite where patients are not routinely given general anesthesia, proceduralists and nurses may not be as acquainted with the challenges of positioning anesthetized patients. Heightened vigilance during positioning is needed to prevent nerve injuries in anesthetized patients.

Keywords

radial nerve; injury; lateral decubitus; positioning; computed tomography scanner

Introduction

Peripheral nerve injuries are a possible complication for both medical and surgical patients [1,2]. Based on information from the Closed Claims Analysis, where 16% to 22% of all claims were related to nerve injury, most were transient; however, some claims included permanent loss of function [3,4]. While proper positioning is well described for operating room (OR) tables, which have a consistent shape, in other locations, the tables are quite variable. In interventional radiology, the computed tomography (CT) table is curved, and the patient is located in the concavity of the table (Figure1). We describe a case of a peripheral nerve injury after CT where the patient was in the lateral position.

Case Report

This report complies with all the IRB requirements at the institution where the work was performed. The patient reviewed this case report and written informed consent was given to publish this material.

A 59-year-old morbidly obese male with a history of prostate cancer and celiac disease presented to the radiology suite for an elective biopsy and radiofrequency ablation (RFA) of an incidentally discovered right renal mass in the upper pole with imaging consistent with renal cell carcinoma. His daily medications included Vesicare 1 tablet and Cialis 5mg orally. Our practice is to perform renal ablation

under general anesthesia. On the morning of his procedure after his pre-anesthetic assessment, an 18 gauge peripheral IV was placed in his left arm. Standard monitors were applied, including a blood pressure cuff on his left lower extremity, and he received a standard general endotracheal anesthetic with Lidocaine, Fentanyl, Propofol and Rocuronium for induction. His airway was secured with an 8.0mm single lumen endotracheal tube. Anesthesia was maintained with Sevoflurane. The patient was placed in the right lateral decubitus position on the CT table to minimize lung excursion and to minimize the risk of pneumothorax when targeting the right upper pole renal mass. He was positioned with a pillow between his knees and a properly placed chest roll. The procedure lasted for sixty- six minutes. He remained hemodynamically stable throughout.

Upon arrival to post anesthesia care unit , the patient had difficulty extending his right wrist and his fingers. He also had difficulty closing his right hand. He reported numbness and tingling on the dorsal portion of his right hand. Neurology was immediately consulted for right wrist drop. Examination by the neurologist revealed 5/5 strength proximally in the arms as well as at the biceps and triceps bilaterally. On the left, he had 5/5 strength in wrist flexors and extensors and 5/5 strength in finger flexors and finger extensors. However, on the right, he had 0/5 strength in wrist extensors, 4/5 strength in wrist flexors and spreaders, 2/5 strength in finger extensors and 4/5 strength in finger flexors and spreaders. Lower extremities were 5/5 proximally and distally, bilaterally. There was decreased sensation to pinprick and light touch on the dorsal aspect of the lateral three and a half fingers on the right when compared to the left side as well as over the thenar eminence on the right. Sensation to his forearm was intact bilaterally. There was no weakness of his proximal arms or legs. Reflexes were 2+ and symmetric in the arms and legs bilaterally. His coordination was intact bilaterally, and his gait was normal. Babinski reflex was down going bilaterally. Based on his clinical presentation of weakness of wrist extensors and finger extensors on the right and decreased sensation on the dorsal aspect of his right hand, the neurologist concluded that his injury was most consistent with a peripheral radial neuropathy, likely compressive in nature. Neurology noted there appeared to be no ulnar involvement. The neurologist deferred an electro-myelogram nerve conduction study at that point in time as it would not show any major abnormalities, and would consider it if the patient did not show improvement at his two-week follow-up visit. He was seen two weeks following his injury and was found to have significant improvement in right hand function, though with some residual weakness. Six weeks post-procedure, he had near complete return to baseline function of his right hand. Follow-up at one year revealed the patient had completely recovered from his symptoms. Biopsy result showed clear cell renal cell carcinoma, Fuhrman grade 2. The follow-up imaging demonstrated an ablation zone with no evidence of recurrent disease.

Discussion

Perioperative peripheral nerve injuries (PPNIs) occurring while under general anesthesia is a recognized complication. While ulnar neuropathy is the most common PPNI, radial nerve injuries are comparatively rare, but still of consequence [4,5]. The radial nerve originates from the posterior cord of the brachial plexus (C5-T1), runs along the posterior aspect of the humerus (Figure 2) adjacent to the bone. The radial nerve provides motor innervation to the triceps, brachioradialis, supinator, wrist and finger extensors. It also provides sensory innervation to the dorsolateral hand and first three digits. Patient risk factors for PPNIs include: age, gender, pre-existing peripheral neuropathy, extremes of Body Mass Index (BMI), comorbid diseases (hypertension, diabetes, peripheral vascular disease, infection,

cancer), smoking, vitamin deficiency, and alcoholism [5-7]. Other causes implicated in PPNIs include vascular anomalies, profound hypothermia and injuries secondary to iatrogenic blood pressure cuff placement [8-11]. Classifications of PPNIs include neurotmesis, axonotmesis, and neuropraxia [6,12].

Mechanisms of injury are thought to be stretch, compression, ischemia, and possibly inflammation [1,6,13]. Low-grade stretching can lead to disruption of intraneural blood vessels and patchy nerve ischemia. More severe stretching may result in a tear in the intraneural connective tissue resulting in intraneural hemorrhage and necrosis. Compression may lead to a temporary interruption of blood supply potentially resulting in conduction block. Compression may also result in intraneural venous pressure elevation, endoneurial edema and impairment of axoplasmic flow. Further, continued pressure may even lead to Schwann cell damage, axonal loss, and Wallerian degeneration [14]. Prolonged disruption of blood flow to peripheral nerves eventually leads to nerve fiber degeneration. The generalized inflammatory response has also been implicated where there was no direct trauma to the biopsied nerves after surgery [13]. While anesthesiologists accept responsibility for positioning and padding patients, PPNIs may occur without direct compression or stretch as the primary mechanism of injury in most cases [15-17].

More and more anesthetics are being performed in "off-site" or non-OR settings. Proper positioning is well described for the OR table, however, in non-OR locations the tables are different and often are not uniform [18]. In the OR, familiarity with positioning sedated and anesthetized patients is a shared responsibility between anesthesia, surgical and nursing teams. In non-OR locations, proceduralists and nurses may not be acquainted with these challenges because their awake patients can complain of discomfort in positions that cause extreme stretch or pressure on peripheral nerves. In deeply sedated or anesthetized patients, this protective mechanism is abolished. Therefore, heightened vigilance during positioning is needed to prevent nerve injuries in these patients. Patients placed on the CT scanner table should be carefully assessed for adequate positioning and padding, as there is a risk for radial nerve injury in the lateral decubitus position.

In the lateral decubitus position, the radial nerve may be injured when the posterior aspect of the humerus is compressed against a hard surface due to improper settling [19]. We suspect this was a similar mechanism of injury in our patient. The patient was placed in the right lateral decubitus position on the CT table. The CT table is concave in the center (Figure 1), unlike the OR table which is a flat surface. Inadequate padding underneath the dependent arm coupled with the concavity of the CT table may have led to the compression of the nerve against the posterior aspect of the humerus. Positioning the patient with a beanbag to place the shoulder and elbow at the same level (Figure 1) may compensate for the shape of the CT table and prevent the arm slipping lower into the well of the table.

Figures

Figure 1

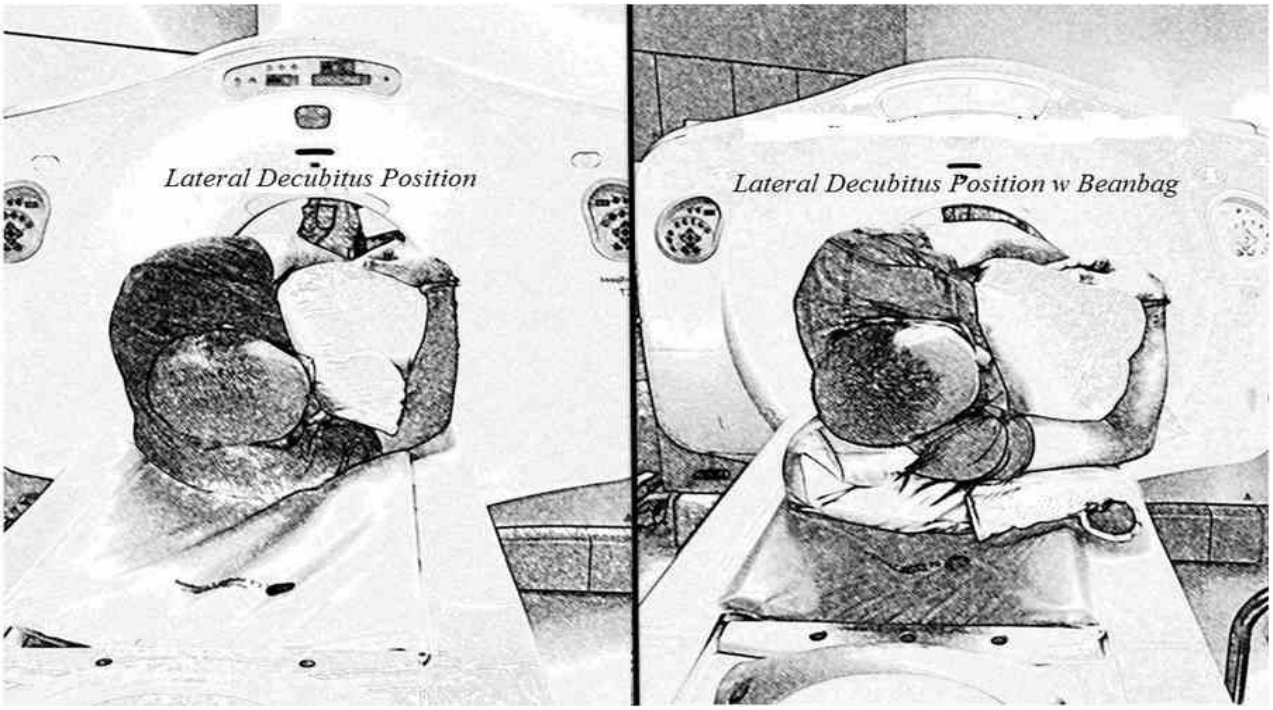
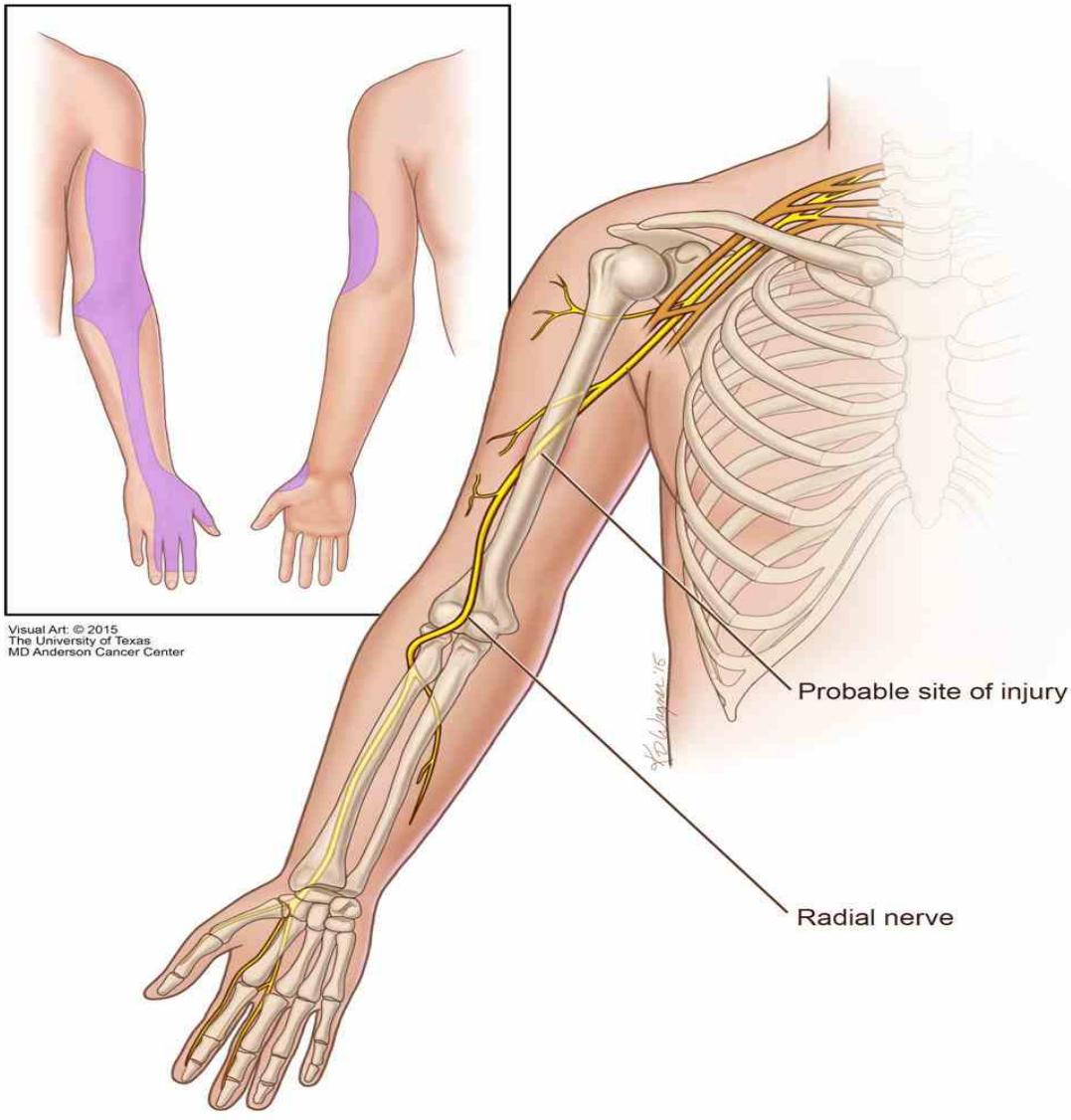


Figure 2



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