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Case Report

Unexpected venous anomaly around the brachial plexus during supraclavicular block: A case report

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ABSTRACT

Anatomical variations in the supraclavicular region can greatly affect the success and safety of regional anesthesia techniques, particularly supraclavicular brachial plexus blocks. Identifying these variations is essential to minimize risks. This case involves a 32-year-old male patient with a distal humeral fracture, where an ultrasound-guided supraclavicular block revealed an unusual venous structure encircling the brachial plexus. This atypical vein could pose significant risks, including vascular injury, local anesthetic toxicity, and even cardiac arrest, depending on the anesthetic uBased on its anatomical location and Doppler features, the vein was hypothesized to originate from the subclavian or external jugular vein. This finding underscores the critical importance of thorough ultrasound evaluation and real-time guidance during the procedure to avoid complications. Recognizing such anatomical anomalies is vital to ensuring patient safety, and the integration of ultrasound into routine regional anesthesia practice enhances both precision and effectiveness.

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1. Introduction

Peripheral nerve blocks, an essential component of regional anesthesia, have become increasingly popular with the widespread use of ultrasound [1–3]. The supraclavicular block is an excellent technique for anesthesia and analgesia of the upper extremity, especially with the widespread use of ultrasound. The use of ultrasound in peripheral nerve blocks has not only improved the understanding of anatomy but also allowed the identification of anatomical variations. As a result, it has positively contributed to the benefit side of the risk-benefit curve in regional anesthesia and led to the resurgence of certain peripheral block techniques.

The supraclavicular block involves blocking the brachial plexus at the supraclavicular fossa. After its first description in 1912 [4], its use significantly declined due to catastrophic complications such as pneumothorax, hemothorax, local anesthetic toxicity, and phrenic nerve paralysis [5,6]. These complications arise from the critical anatomical relationships of the brachial plexus in the supraclavicular fossa with structures such as the subclavian artery, subclavian vein, and pleura. In the supraclavicular fossa, the brachial plexus lies within the connective tissue, with the middle scalene muscle laterally and the subclavian artery anteromedially. Below lie the apex of the lung, the pleura, and the first rib. The advancement of ultrasound-guided regional anesthesia techniques has led to the renewed popularity of the supraclavicular block. Additionally, following the widespread use of ultrasound, many anatomical variation reports have also been published [7,8]. From this perspective, ultrasound may contribute to patient safety by reducing complications, as it reveals anatomical diversity during the procedure. This case report aims to discuss the identification of an anatomical variation recognized during a supraclavicular block and its safe application.

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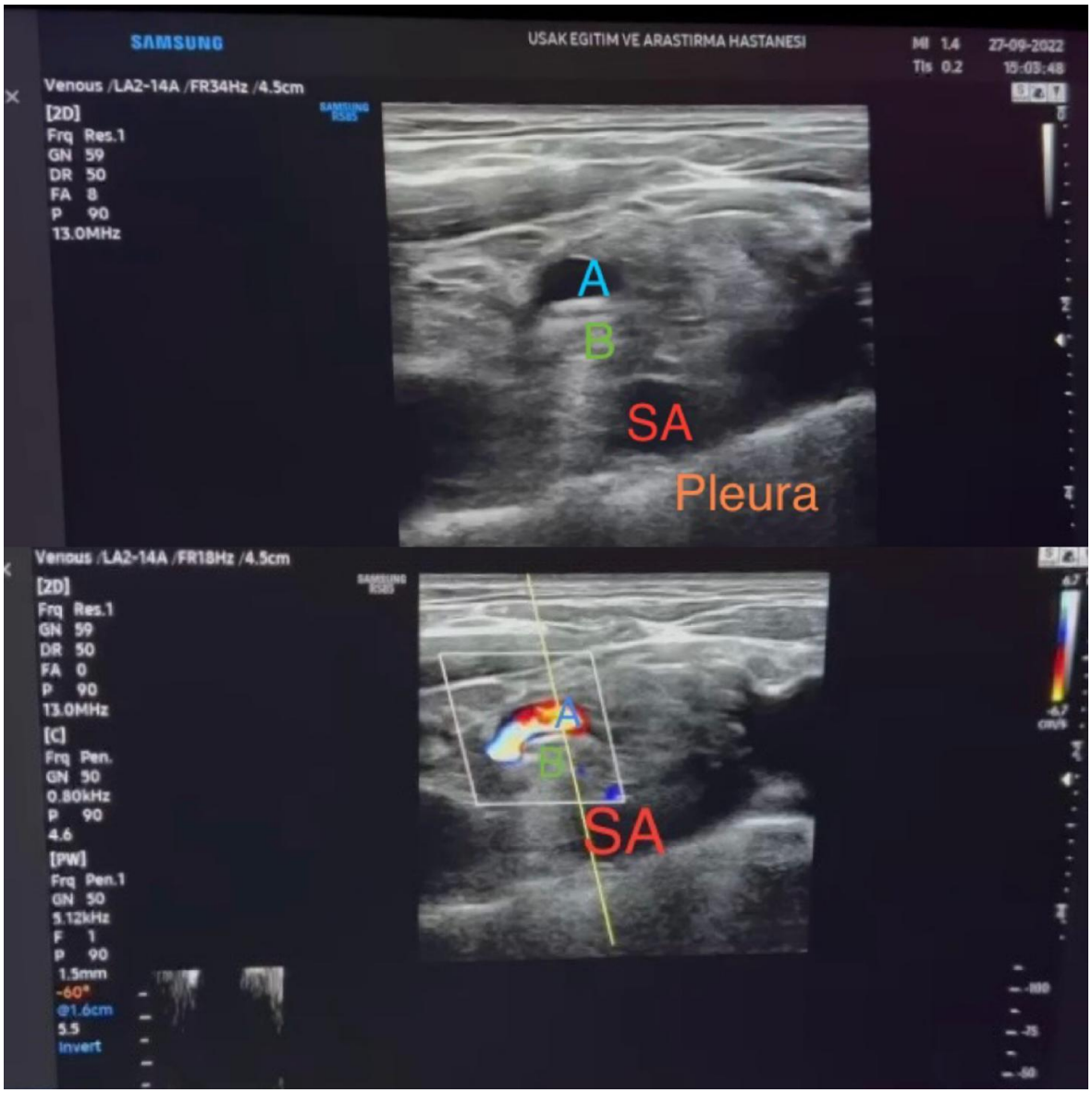
2. Case Presentation

A 32-year-old male patient presented with a distal humeral fracture following a same-level fall. No significant medical history, including surgeries, chronic illnesses, or allergies, was noted. Physical examination and diagnostic tests, including ECG, chest X-ray, and laboratory investigations, revealed no abnormalities. Both peripheral nerve block and general anesthesia were explained to the patient. Based on patient preference, a supraclavicular block was planned. Written informed consent was obtained. According to the surgical plan, the patient was taken to the operating room and then to the block room for the supraclavicular block. Blood pressure and oxygen saturation were monitored, and 1 mg of midazolam with 50 mcg of fentanyl was administered intravenously. The ultrasound device was positioned on the patient's left side, and the right supraclavicular region was scanned using a linear ultrasound probe. The prob is placed into the supraclavicular fossa, paralel to the clavicula. The subclavian artery, which is the primary anatomical landmark for the block, and brachial plexus were visualised. A vascular structure encircling the brachial plexus was observed (Fig. 1-a), and venous flow within this structure was confirmed using Doppler ultrasound (Fig. 1-b). To ensure safety and avoid vascular puncture, a real-time ultrasound-guided in-plane technique was used.



A: Unexpected vascular anomaly; B: Brachial plexus; SA: Subclavian artery.

Fig. 1. (a) A vascular structure encircling the brachial plexus; (b) Venous flow within this structure.

A linear ultrasound probe (LA2-14A; Samsung HM70 EVO) visualized the brachial plexus in the postero-supero-lateral aspect of the subclavian vein. An abnormal vascular structure, likely originating from the external jugular or subclavian vein, entered the imaging field. In the classical supraclavicular approach, the needle was advanced to the 'corner pocket' (first rib to the anterior aspect of the plexus), then redirected to the superficial

plexus portion. Local anesthetic (LA) was injected at both sites. To avoid puncturing the vascular structure, the safest point was identified as the corner pocket. Doppler confirmed the injection site, and a 22G 50 mm needle (Braun Stimuplex Ultra) was used. A mixture of 20 mL LA (10 mL 0.05% bupivacaine + 10 mL 2% lidocaine) with 100 mcg adrenaline was injected at the 9 o'clock position relative to the subclavian vein. Negative aspiration preceded every 3 mL injection, and no pressure was applied with the probe.The procedure was completed without complications. Approximately 30 minutes post-injection, sensory and motor blockade of the musculocutaneous, median, radial, and ulnar nerves was evaluated using a 3-point scale (0: No blockage, 1: Analgesia, 2: Anesthesia). The patient was transferred to the operating room, where standard monitoring and 1 mg of midazolam were administered. The 90-minute surgical procedure concluded without the need for additional analgesia or sedation. No postoperative complications were observed. Although a CT angiography was planned to determine the vascular structure's origin, the patient declined.

3. Discussion

Peripheral nerve blocks, a cornerstone of regional anesthesia, have gained popularity with the widespread use of ultrasound. The supraclavicular approach, commonly used for upper extremity surgeries, has seen a resurgence due to ultrasound guidance, which enhances safety and efficacy. Despite its benefits, the supraclavicular region's complex anatomy—close to vascular structures, the phrenic nerve, recurrent laryngeal nerve, and pleura—poses risks [9]. Serious complications such as delayed pneumothorax, hemothorax, and even cerebral edema have been reported in the literature following supraclavicular block [5,6,10]. However, with the widespread use of ultrasound, not only has normal anatomy become more visible, but anatomical variations can now also be visualized in real time. This allows us to anticipate and mitigate not only the natural complications associated with the block itself but also those arising from anatomical variations during the procedure. Ultrasound improves block success and minimizes complications by visualizing anatomical variations preoperatively and intraoperatively [11]. In our case, ultrasound revealed an unexpected vascular anomaly, potentially leading to catastrophic outcomes, such as cardiac arrest, during LA injection if undetected. Such variations are common in the supraclavicular region [12–14]. Ultrasound enabled a safe and effective block, highlighting its critical role in this anatomically complex area. Therefore, in our case, despite the identification of an anatomical variation during the pre-procedural ultrasound assessment, the supraclavicular technique was not abandoned. Additionally, based on our clinical experience and the existing literature, the supraclavicular block provides superior anesthesia compared to infraclavicular techniques for mid and distal humerus surgeries [15]. However, there are also studies in the literature that find the infraclavicular block to be as effective as the supraclavicular block [16].

4. Conclusions

This case highlights the critical role of ultrasound guidance in ensuring safe and effective supraclavicular brachial plexus blocks. The identification of an unexpected vascular anomaly emphasizes the importance of thorough ultrasound evaluation to prevent life-threatening complications, such as vascular injury or anesthetic toxicity. Given the frequent anatomical variations in this region, careful planning and real-time imaging are essential for successful outcomes. Integrating ultrasound into routine practice enhances patient safety and enables a tailored approach to anatomical variability.

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Conflict of Interest
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Data Availability
The datasets created and/or analyzed during the current study are not publicly available, but are available from the corresponding author upon reasonable request.

Ethics Approval and Consent to Participate
Not applicable.

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