

Ultrasound-Guided Supraclavicular Block in a Patient with Toxic Goiter and Exposed Wrist Fracture

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Abstract

We report the case of an elderly woman with cervical deformity due to a large diffuse goiter and predictive data for a difficult airway, alteration of all thyroid hormone levels and an exposed wrist fracture. After a pre-block ultrasound scan, the supraclavicular approach to the brachial plexus was selected because the gland growth was in the anterior to posterior axis, without displacement of the anatomical structures in the neck. We then proceeded to insert the needle using an in-plane technique with a linear probe in an oblique coronal plane to inject the local anesthetic and observe its adequate diffusion. Excellent anesthesia was achieved for the surgical procedure avoiding other complications.

Keywords: Anatomic alterations; Brachial plexus anatomy; Diffuse idiopathic Goiter; Supraclavicular block; Ultrasound-guided regional anesthesia

Introduction

The use of ultrasound-guidance (US-G) for localization of neurovascular structures allows for real-time visualization of the anatomy. Variability in the arrangement of structures comprising the brachial plexus as well as the associated muscle, bone and vascular structures has been previously described. However, the impact of an enlarged thyroid gland in a supraclavicular approach has not been previously reported [1-3].

We present the case of a patient with a hyper-functioning goiter and a predicted difficult airway. She was admitted for emergency surgery of an exposed wrist fracture.

Case Report

Female patient, 78 years of age, admitted to the Emergency Department (ED) with the diagnosis of an exposed left wrist fracture and a toxic goiter from the time of her adolescence. She had never been under hormonal treatment, (retrospectively with intermittent periods of hypo-hyper thyroid function). When the patient was presented to the ED, she was not diaphoretic, tachypneic, nor with any relevant clinical data such as dyspnea, dysphagia or dysphonia. Her laboratory findings were:

Thyroxine (T4)=55.39 pg/mL (normal range up to 14.4 pg/mL).

Tri-iodothyronine (T3)=9.9 pg/mL (normal range up to 6.0 pg/mL).

Thyroid stimulating hormone (TSH)=<0.01 mIU/L with a low limit of reference of 0.34 mIU/L.

Her physical exam showed an elderly woman with mild exophthalmus and a large (7×15 cm) bi-lobular, very prominent thyroid gland in the neck, anterior to the trachea, nodular, soft, not tender and not adhered to deep planes (Figure 1). Her BMI was 23 m²; the thyromental distance was 3 cm. with a mouth opening >4 cm. The AP chest X-ray showed a marked tracheal deviation to the left (Figure 2). The EKG showed sinus tachycardia with an incomplete right bundle branch block. Due to the inherent characteristics of the exposed wrist fracture, surgery could not be postponed in order to correct the levels of thyroid hormones (this could have taken more than 4 hours, which is contraindicated in the surgical management of an exposed fracture). She was catalogued as ASA Physical Status III- U.

The preoperative anesthetic concerns were: 1) a potentially difficult airway, 2) thyroid hormonal imbalance, 3) cardiovascular disturbances.

Although the infraclavicular approach was also considered, after a very careful sonographic survey, it was realized that the anatomy of the supraclavicular plexus was well preserved and therefore it was decided to proceed with the supraclavicular approach [4-5] Revealing an infiltrative thyroid mass (Figure 3). After obtaining the informed anesthetic consent, the patient was placed under standard monitoring: EKG, SpO₂ and non-invasive blood pressure (NIBP). No sedation was given. A Hartman solution was initiated and continuously administered in the opposite arm. A linear 10-12 MHz ultrasound probe® (GE logiq E Medical Systems, GE Health Care Wauwatosa, WI) in an oblique coronal plane was used (Figure 4). The brachial plexus was identified as a compact group of nerves located over the first rib, lateral and posterior to the subclavian artery. The plexus was approached with a “corner pocket” in plane technique, using a 50 mm-22G Stimuplex® insulated needle (B Braun Medical, Bethlehem PA). A mixture of 0.75% ropivacaine plus 2% lidocaine in a volume of 25 mL was injected. An adequate perineural local anesthetic spread was observed after two needle advances. Complete motor and sensitive blocks were obtained after 15 minutes. During and after the

perioperative period, the patient remained calm, without any side effects or adverse events. Anesthesia did not have to be supplemented.



Figure 1: Patient with enlarged thyroid gland

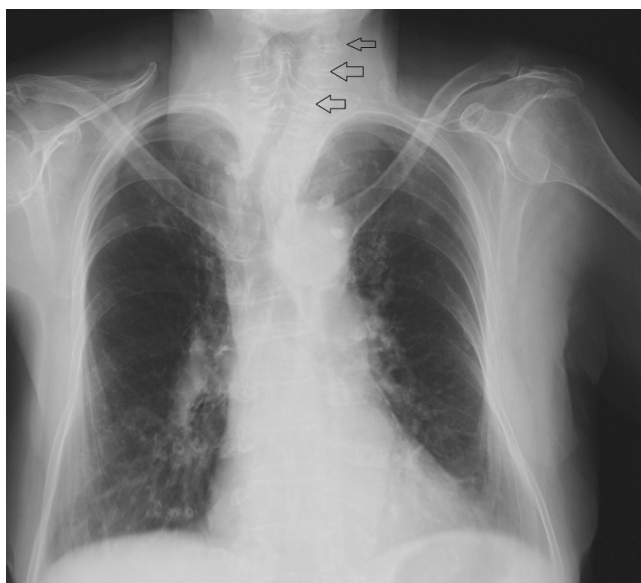


Figure 2: Marked tracheal deviation secondary to the enlarged thyroid gland

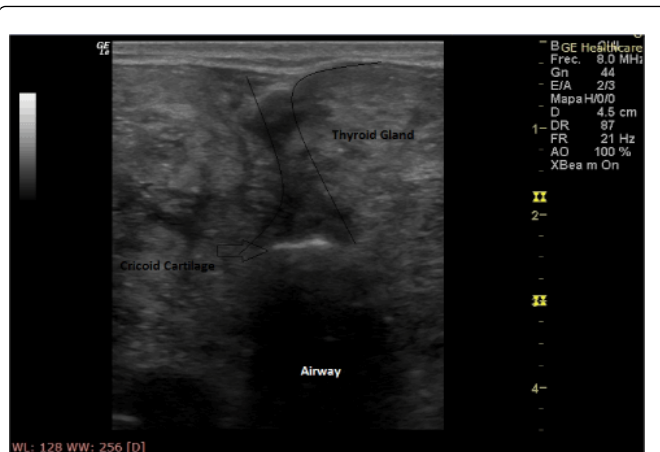


Figure 3: Bi-lobular enlargement of the thyroid gland with a hyperechoic central zone in the antero-posterior axis that corresponds to the cartilage

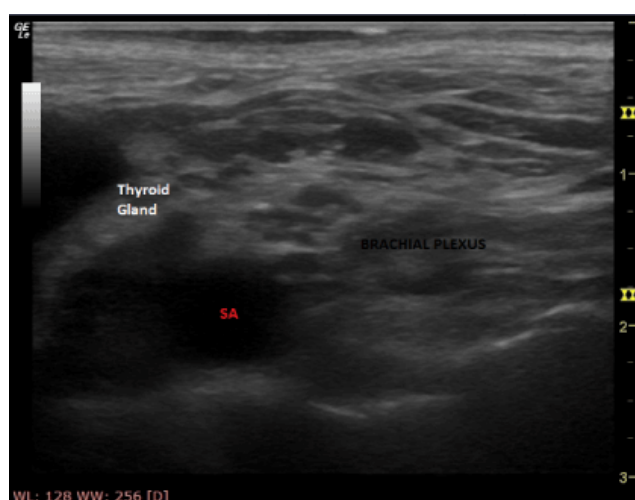


Figure 4: USG visualization of the supraclavicular plexus

Discussion

The most common cause of simple diffuse goiter and multinodular goiter is idiopathic; the second cause is iodine deficiency, known as endemic goiter. Nowadays, this is a health problem in poor countries without the necessary economic resources to reinforce food and water with this element. It is generally symptomless, but it may present itself producing hoarseness or tracheal deviation and/or compression. The lobular enlargement of the gland may alter the cervical anatomy, as seen in this case [6].

Ultrasound-guided regional anesthesia may facilitate brachial plexus blockade in several ways including enhanced visualization of the neural target and surrounding structures, assessment of proper needle-tip position and spread of local anesthetic, plus identification of anomalous anatomy or pathology. Traditional “blind” nerve-

localization techniques, based on surface anatomical landmarks and surrogate endpoints such as peripheral nerve stimulation (PNS), or the mechanical elicitation of paresthesia can be hazardous in patients with aberrant anatomy or unsuspected pathology like this case. Motor responses to PNS can be variable when the needle tip is on the surface or even within the nerve [7].

Due to the fact that the enlarged thyroid gland displaced the trachea, we assumed that it would also displace the adjacent structures such as the subclavian artery and we would encounter a modified sonoanatomy with a difficult approach. However this did not occur and for that reason the other options, infraclavicular or axillary approach, were dismissed; furthermore these approaches require the administration of larger volumes of LA which for this particular case was not recommended. Some reports have shown arterial vascular variations enhancing the technical difficulties of the supraclavicular approach while mixed vascular anomalies (venous and arterial), have influenced the sonoanatomy of the brachial plexus.

The spread of the local anesthetic has also been shown to be affected by muscular anatomic variations, while cervical bone anomalies may difficult supraclavicular access of the needle to the brachial plexus [8-9].

This case report shows that such findings provide support for the recommendations of a pre-block ultrasound scan which incorporates a directed search of the adjacent vasculature.

Anesthesiologists should be aware that cervical anatomy is complex and has anatomical variations. Thus, careful ultrasound screening of the anatomical structures, especially when we encounter an enlarged thyroid gland or any other cervical mass, will be devoid of failures when performing a brachial plexus block in a supraclavicular approach.

In conclusion, this case illustrates the capacity of the US to identify anatomic variations and its relevance in the performance of different approaches.

The utilization of US-guided supraclavicular plexus block with an in plane technique, in patients with cervical anatomical alterations (such as the case we have reported), is highly recommended to be performed by anesthesiologists already trained in this technique.

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