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Case Report

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Case Study: Iatrogenic Hematoma as a Complication of the Trapezius Squeeze Test

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Abstract

Clinicians often use noxious stimuli to assess consciousness in patients with impaired levels. The sternal rub and trapezius squeeze test (TST) induce nociceptive signals, with the sternal rub being more commonly used. However, due to its risk of causing abrasive injury, the TST has become the preferred technique. This case report presents the first documented iatrogenic hematoma from the TST, successfully managed through embolization of the left suprascapular artery. Though generally considered safe, the trapezius squeeze test may carry a risk of vascular injury. Potential risk factors are discussed.

Keywords

Trapezius squeeze test, Hematoma, Embolization, Suprascapular artery, Iatrogenic injury

Introduction

The TST and sternal rub are both clinical methods used to assess consciousness, commonly applied before laryngeal mask insertion to evaluate anesthetic depth or during glasgow coma scale (GCS) scoring to assess pain response [1, 2]. The sternal rub involves applying firm pressure in a rubbing motion to the sternum, while the TST involves squeezing 1 to 2 inches of full-thickness trapezius muscle for up to 15 seconds to generate a central noxious stimulus. Evaluation is based on the response: movement away from or toward the stimulus. While either technique has the benefit of providing an adequate noxious stimulus, only the sternal rub has thus far been implicated in iatrogenic injuries, including skin tears, abrasions, and diffuse sternal ecchymosis referred to as the "coma sign" by Lucke-Wold and Robinson [3]. Due to the documented risk of injury from the sternal rub, the TST is now recommended as it carries a lower risk of local damage [2]. However, with the lack of adverse events documented regarding the TST, it can be difficult to determine the cause of associated iatrogenic injuries and potentially delay management. Here, we present the first reported case of injury caused by the TST maneuver.

Case Report

A 62-year-old previously healthy male presented to the emergency department with a three-day history of left lower quadrant abdominal pain. On presentation, he was tachycardic, febrile, tachypneic, and hypotensive, with signs of end-organ dysfunction, including elevated creatinine and lactate levels. Early management for septic shock was initiated with intravenous fluids

and Piperacillin/Tazobactam. An abdominal computed tomography (CT) scan revealed pneumoperitoneum, strongly suggestive of bowel perforation. Subsequent exploratory laparotomy confirmed perforated sigmoid diverticulitis and a Hartmann's procedure was performed. Intraoperatively, crystalloid fluids and vasopressors, including norepinephrine, vasopressin, and phenylephrine, were administered. Following a tenuous intraoperative period, postoperative care and monitoring continued in the critical care unit. Sedation was maintained with propofol, and vasopressor needs remained stable.

Approximately one week into the postoperative period, the patient developed an acute kidney injury and significant swelling at the base of the left neck. The differential diagnosis for the hematoma included trauma secondary to catheterization, spontaneous rupture of a thyroid or parathyroid cyst or adenoma, a ruptured aneurysm, or cervical epidural hematoma in the setting of an underlying coagulopathy. There were no recent attempts at central venous catheterization or external signs of trauma; however, bilateral TSTs were performed on the patient to assess their level of consciousness during an earlier episode of low responsiveness. Contrast-enhanced CT demonstrated bilateral fluid collections in the lower neck, interpreted as a small intramuscular hematoma on the right and an enlarged trapezius on the left, with an associated large (6.7 × 9.2 × 7.5 cm) heterogenous hematoma with active arterial bleeding (Figure 1), prompting consultation by interventional radiology for embolization. Embolization followed a pre-procedural transfusion of platelets to raise levels from 40 × 10^9/L to 50 × 10^9/L. Intra-procedural CT angiogram localized the bleeding vessel (Figure 2), a truncated acromial branch of the suprascapular artery. Homeostasis was achieved using 3 × 3 mm and 2 × 5 mm pushable coils and intermittent large particle polyvinyl alcohol (PVA) to embolize the proximal acromial artery. No expansion of the hematoma was observed after embolization and the patient stabilized upon return to the critical care unit (Figure 3).

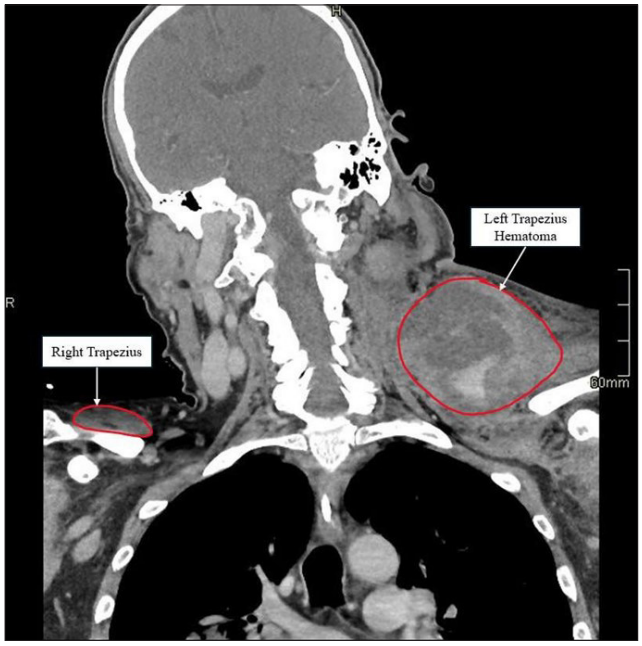

Figure 1: Computed tomography of the neck with contrast enhancement. Coronal slice demonstrating a large heterogenous collection measuring at least 6.7 × 9.2 × 7.5 cm arising from the left trapezius muscle. There is significant enlargement of the trapezius muscle and a layering high density within the collection, in keeping with an active bleed.

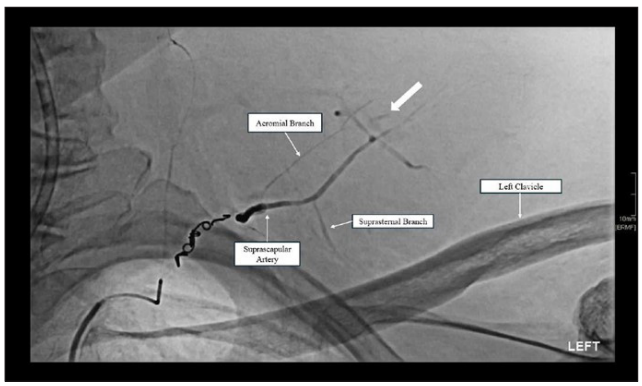

Figure 2: Angiogram of the suprascapular artery obtained during embolization. A truncated vessel is depicted arising from the acromial branch of the suprascapular artery (white arrow). Microcoil embolization was performed at the origin of the truncated vessel with 3 × 3 mm and 2 × 5 mm pushable coils and intermittent large particle PVA embolization until hemostasis was achieved.

Discussion

Here we report the first documented instance of TST-associated arterial injury, observed in a patient with septic shock and low platelet count. The TST works by stimulating the spinal accessory nerve, primarily its spinal component, which enters the cranium via the foramen magnum and exits through the jugular foramen to innervate the trapezius and sternocleidomastoid muscles [4-6]. This causes trapezius contraction, elevating the scapula. While the spinal accessory nerve is primarily motor in function, it also has a sensory feedback mechanism via the cervical plexus. Pressure applied during the TST activates sensory endings, processed by the brain and spinal cord, resulting in trapezius motor response, which helps assess spinal cord function in trauma patients and GCS evaluation.

The suprascapular artery originates from the thyrocervical trunk as a branch of the subclavian artery. Although it does not directly vascularize the trapezius muscle, it traverses deep to the inferior border of the trapezius muscle, in parallel with the suprascapular nerve [7, 8]. Branches of the suprascapular artery include the acromial branch, the muscular branches to the supraspinatus and infraspinatus muscles, the cutaneous branches supplying the skin overlying the shoulder, and the articular branches supplying the shoulder joints [9, 10]. In this case, the acromial branch of the suprascapular artery was associated with a large neck hematoma, which given the above mentioned anatomical relationship of the suprascapular artery with the trapezius muscle, increases the plausibility of this being caused by the TST. Although the TST is generally regarded as safe, our report raises concern that it may pose risk, particularly in the context of sepsis and thrombocytopenia. This is supported by findings in a study by Péju et al. who retrospectively investigated the mortality and bleeding risk of

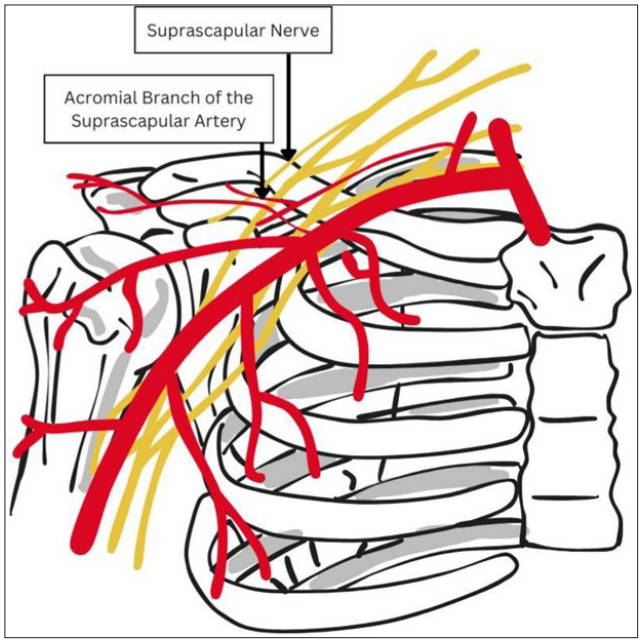

Figure 3: Illustration of the suprascapular artery and suprascapular nerve. The truncated vessel in figure 2 corresponds to the acromial branch of the suprascapular artery labelled in the illustration.

1024 septic patients with thrombocytopenia [11]. In patients with a platelet count below 50 × 10^9/L, the ICU mortality rate increased from 17.4% to 40.6% and the incidence of bleeding events rose from 3.6% to 22.3% when compared to patients without thrombocytopenia. Other high-risk factors for bleeding include those outlined by the HAS-BLED criteria; hypertension, abnormal renal or liver function, prior stroke, history or predisposition to bleeding, labile INR, age over 65, antiplatelet or non-steroidal anti-inflammatory drugs (NSAIDs) use, and history of alcohol or drug use [12]. While the HAS-BLED score is not designed to assess bleeding risk in the general population, the risk factors outlined can aid in recognizing patients with elevated bleeding risk. While in the general population the TST technique may have a lower risk as compared to the sternal rub, which has documented cases of abrasive injury [13], caution should be exercised when selecting the most appropriate technique based on risk factors for vascular complications including sepsis state or the presence of thrombocytopenia. Due to the anatomical association of the trapezius muscle with vessels including the suprascapular artery, the TST may result in vessel injury in high-risk patients as in this case. In cases where patients may have an elevated risk of bleeding, alternative techniques including supraorbital pressure or submandibular pressure may be considered [14].

Conclusion

In conclusion, although it remains unclear whether this applies to all patients or is associated with patient specific factors, the TST maneuver is not without risk. In patients with a low risk of bleeding, the TST is considered a safe technique for assessing consciousness, however caution should be exercised when using this technique on patients with elevated bleeding risk. Particularly in septic patients with concurrent thrombocytopenia, TST-associated vascular injury may manifest as serious bleeding, requiring invasive management to prevent harmful complications.

Acknowledgments

None.

Conflicts of Interest

None.

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