Ultrasound-guided platelet-rich plasma injection for a high-grade sternocleidomastoid tear in a professional football player

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INTRODUCTION

The sternocleidomastoid (SCM) muscles are important for neck stabilization by providing control of the head position through a series of reflexes.[1] Contraction of the sternocleidomastoid muscles bilaterally results in flexion of the head while unilateral contraction results in ipsilateral deviation of the head and rotation of the head towards the opposite side. Several reports are found in the literature describing injury to the SCM and its association with high-velocity trauma, including motor vehicle collisions, epileptic seizures, and suicidal hangings.[2–4] These injuries are attributed to forced hyperextension or axial traction and radial shearing forces on the neck musculature. Treatment of SCM injury must be initiated early because delay may lead to development of torticollis resulting in physical restriction.[4] Nonsurgical treatment options including aggressive physical therapy can be effective, but when conservative measures fail, surgical interventions have been described.[3]

There is limited literature describing SCM injury during athletic activity despite the significant high-velocity trauma in various collision sports. For instance, peak translational acceleration g-forces during helmet-to-helmet collisions in professional football players have been estimated to be as high as 138 g.[5] To the best of our knowledge, this study is the first report of a case of SCM injury in a professional football player treated with a platelet-rich plasma (PRP) injection. The patient provided written informed consent for print and electronic publication of this case report.

CASE REPORT

A 22-year-old offensive lineman in the National Football League presented with a 3-week history of acute onset left-sided anterior neck pain after an injury while blocking a defender during a late season game. This was accompanied by a sense of weakness and numbness in his left arm. He continued having intermittent 10-minute episodes of pain throughout the remainder of the game but was able to continue playing. These symptoms continued through the following week into the next game. Pain was exacerbated by rightward rotation and active flexion of the head. He was started in physical therapy, which focused on modalities including ultrasound, heat, and ice to the left supraclavicular area and shoulder. He played in the next game but was removed from play during the fourth quarter because of worsening symptoms and localized anterolateral neck pain. An MRI demonstrated a high-grade tear of the left SCM with mild retraction, predominately involving the origins at the superior medial clavicle and, to a much lesser extent, manubrium (Figure 1A and B). At his clinical visit, he complained that his neck was painful with any pushing or strenuous activity and rated the pain as fairly severe. Physical examination revealed ecchymosis over the distal aspect of the SCM. He had tenderness to palpation over the muscle belly of the left SCM, greatest over the clavicular attachment. Additionally, the patient had full but painful range of motion, specifically with resisted neck flexion to the left side. He had a normal neurovascular examination. He reported headaches, sleep disturbance, limitations in his recreational and daily activities, inability to lift heavy weights, and ultimately an inability to work with a Neck Disability Index[6] questionnaire score of 16/50 points. With persistent pain despite conservative treatment, the patient elected to proceed with a PRP injection. Musculoskeletal ultrasound examination demonstrated a grade 3 degloving tear of the clavicular head of the SCM belly, with no other irregularity seen (Figure 2A).

PRP Treatment

Whole blood (60 mL) was harvested from the antecubital fossa. This blood was then processed on location in a platelet concentrating system (EmCyte, Fort Meyers, FL), and approximately 6 cc of buffy coat blood components

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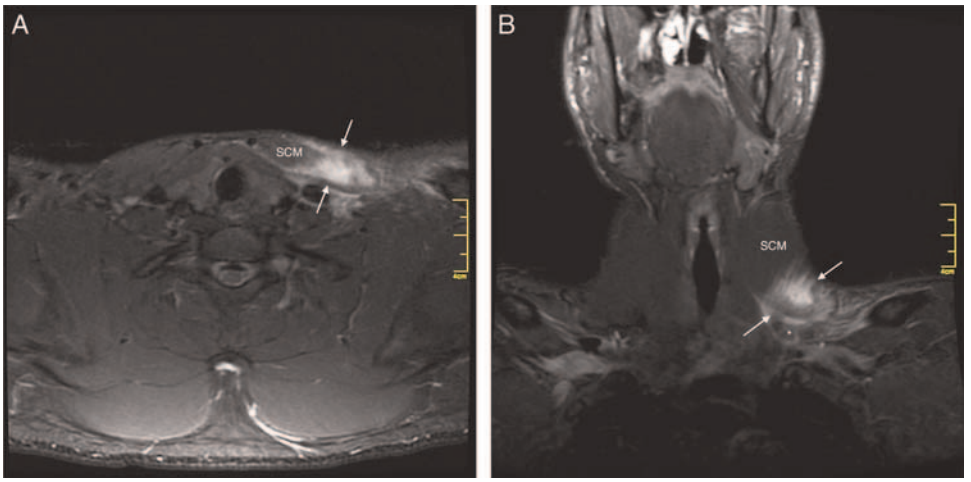

FIGURE 1. T2 MRI axial (A) and coronal (B) images demonstrating a high-grade tear of the left sternocleidomastoid with mild retraction, predominately involving the origins at the superior medial clavicle and, to a much lesser extent, manubrium.

were prepared. He was placed supine, and the neck was prepped in sterile fashion. The skin overlying the left SCM was anesthetized with ethyl chloride spray and local anesthetic. Under ultrasound-guidance, the PRP was injected into the left SCM muscle at the site of the tear (Figure 2B). The patient tolerated the procedure well without complication and started a progressive range of motion and strengthening program 1 wk after his injection. He missed the final two games of the season but went on to participate in offseason organized team activities and returned to play the following season without symptoms.

At 14 mo after the procedure, the patient was revaluated and reported being completely free of symptoms during play and without any physical evidence of prior injury to the SCM (Figure 3A and B). His posttreatment Neck Disability Index score was 2/50 points, a 28% improvement compared to his pretreatment score. Repeat musculoskeletal ultrasound examination of the left sternocleidomastoid showed restoration of the normal pennate sonographic appearance of the muscle fibers, without evidence of significant scar tissue formation (Figure 4).

DISCUSSION

Although PRP has been used in surgery for over 2 decades,[7] its biological therapeutic use has been an emerging tool in musculoskeletal medicine over the last several years.[8] PRP contains bioactive proteins and growth factors that influence the healing of muscle, tendon, ligament, and bone.[7] The majority of studies have investigated the therapeutic effects of PRP on injured tendons, but few have been done on muscle tissue. In a mouse model, conditioned serum injected after gastrocnemius contusion injury resulted in accelerated satellite cell activation and increased diameter of regenerating myofibers.[9] As the body of research pertaining to the therapeutic use of PRP continues to grow, it appears that its use may be advantageous in sports medicine.[7]

The superficial anatomic location of the SCM makes for an easy target using ultrasound guidance; however, the critical structures coursing in close proximity to this muscle give this procedure higher risk. The phrenic nerve arises in the posterior triangle of the neck at the middle of the posterior border of the sternocleidomastoid muscle.[10] Judicious use of local anesthetic should be considered to avoid extravasation

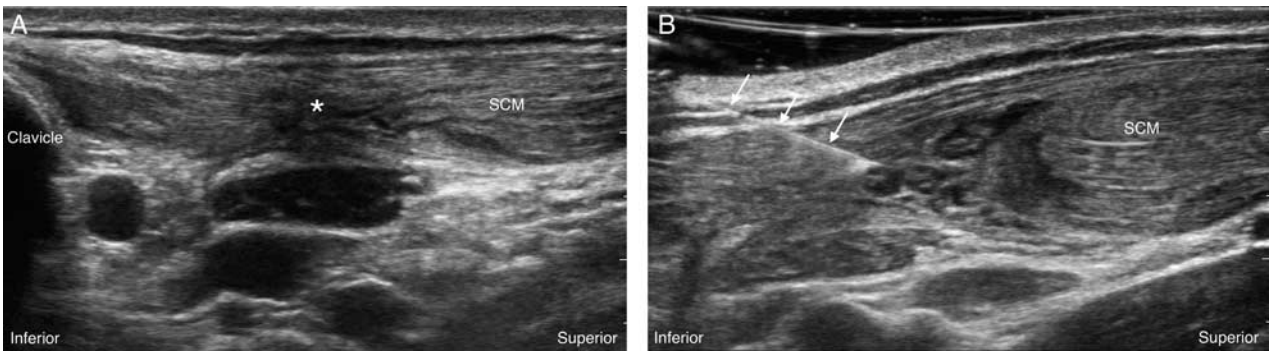

FIGURE 2. (A) Musculoskeletal ultrasound image of the clavicular head of the sternocleidomastoid muscle in long axis with a high-grade tear (*) seen as a hypoechoic defect disrupting the normal pennate sonographic appearance of the muscle fibers. (B) Ultrasound-guided platelet-rich plasma injection into the defect with white arrows indicating needle.

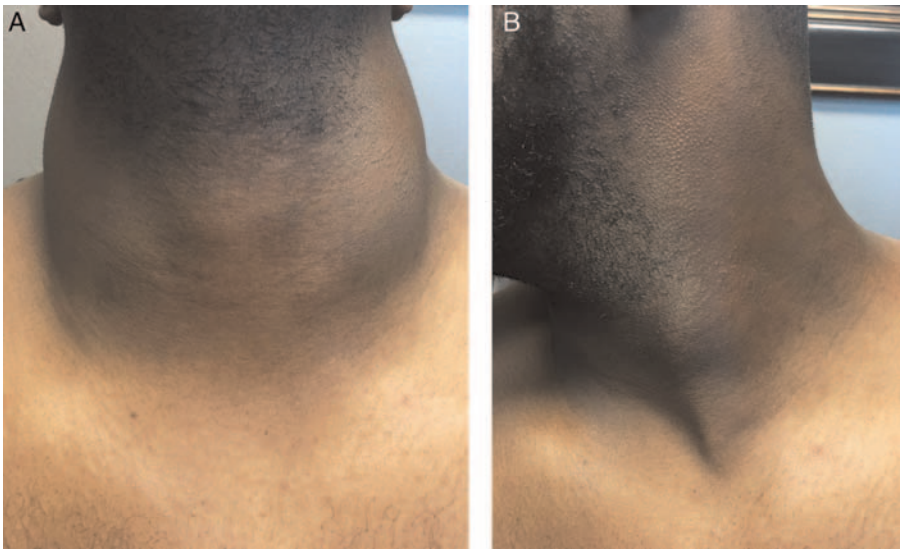

FIGURE 3. (A and B) Clinical photographs 14 mo after the procedure showing no evidence of deformity or torticollis.

of this anesthetic into surrounding nervous tissue, particularly the phrenic nerve. Phrenic nerve palsies are a known complication to interscalene blocks and may result in hemidiaphragm paresis, which may be discomforting and life-threatening for the patient undergoing the procedure.[11] Practitioners should be aware of the potential complications and consider the aforementioned treatment methodology for direction to assist them in performing this procedure in a safe and effective manner.

Management of SCM injuries should proceed according to basic soft-tissue injury-care practices. Initial care should include thorough physical examination and advanced diagnostic imaging evaluations. Upon its diagnosis, aggressive physical therapy should be instituted to relieve pain and inflammation, followed by pain-free range of motion exercises, progressive strengthening, and functional progression to sport-specific exercises. When conservative treatment fails to alleviate symptoms, minimally invasive procedures such as PRP injection can be helpful.

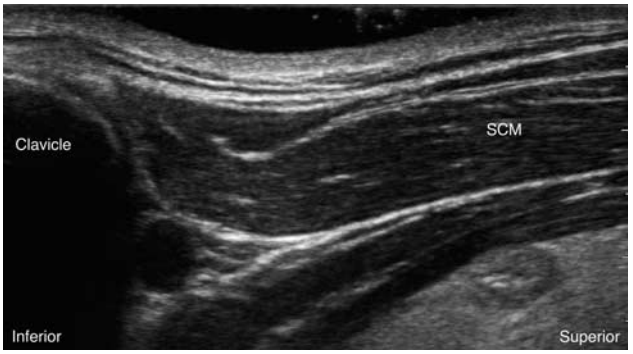

FIGURE 4. Musculoskeletal ultrasound image of the clavicular head of the sternocleidomastoid muscle in long axis, showing restoration of the normal pennate sonographic appearance of the muscle fibers, without evidence of significant scar-tissue formation.

Our case report was intended to provide an awareness of the occurrence of SCM injury in the setting of contact sports participation and may aid clinicians in its diagnosis. These muscular injuries may go undiagnosed in some patients because clinicians may be unfamiliar with the anatomy of the region. Additionally, for athletes in whom conservative therapy fails, the aforementoned treatment may be offered as an adjunct to care.

REFERENCES

1. Uludag B, Ertekin C. The head stabilization reflex by stimulation of accessory nerve. *J Neurol Sci*. 1999; 167:68–72.
2. Advenier A-S, de la Grandmaison GL. Traumatic rupture of deep neck structures in hanging: two case reports. *Am J Forensic Med Pathol*. 2014; 35:189–192.
3. Schuyler-Hacker H, Green R, Wingate L, *et al*. Acute torticollis secondary to rupture of the sternocleidomastoid. *Arch Phys Med Rehabil*. 1989; 70:851–853.
4. Wooles NR, Bell PR, Korda M. Traumatic rupture of sternocleidomastoid muscle following an epileptic seizure. *BMJ Case Rep*. 2014; 2014:bcr2014205531.
5. Tagliabue P. Tackling concussions in sports. *Neurosurgery*. 2003; 53:796.
6. Vernon H, Mior S. The Neck Disability Index: a study of reliability and validity. *J Manipulative Physiol Ther*. 1991; 14:409–415.
7. Foster TE, Puskas BL, Mandelbaum BR, *et al*. Platelet-rich plasma: from basic science to clinical applications. *Am J Sports Med*. 2009; 37:2259–2272.
8. Salamanna F, Veronesi F, Maglio M, *et al*. New and emerging strategies in platelet-rich plasma application in musculoskeletal regenerative procedures: general overview on still open questions and outlook. *BioMed Res Int*. 2015; 2015:1–24.
9. Wright-Carpenter T, Opolon P, Appell HJ, *et al*. Treatment of muscle injuries by local administration of autologous conditioned serum: animal experiments using a muscle contusion model. *Int J Sports Med*. 2004; 25:582–587.
10. Hamada T, Usami A, Kishi A, *et al*. Anatomical study of phrenic nerve course in relation to neck dissection. *Surg Radiol Anat*. 2015; 37:255–258.
11. Buise MP, Bouwman RA, van der Gaag A, *et al*. Phrenic nerve palsy following interscalene brachial plexus block; a long lasting serious complication. *Acta Anaesthesiol Belg*. 2015; 66:91–94.