INTRODUCTION

The jugular foramen can be approached from posteriorly during a far lateral approach, from laterally during a trans-mastoid approach. The intricacy of surgical anatomy of the upper cervical region and jugular foramen requires the identification of anatomical landmarks to help in protecting the neurovascular structures. The rectus capitis lateralis (RCL) muscle is a small deep muscle, located superolateral to the suboccipital triangle, that connects the transverse process of C1 (C1TP) with the jugular process of the occipital bone. The RCL is an excellent landmark aiding in localization of the UV within the carotid sheath, the contents of the jugular foramen as they exit the skull, and facial nerve as it exits the stylo mastoid foramen.

METHODS

A horseshoe shaped incision was made and the muscles of the suboccipital triangle were dissected on 3 preserved cadaveric specimens injected with colored latex into the arterial and venous systems. The incision was extended into the neck and a high cervical dissection of the facial nerve and contents of the carotid sheath was performed. The RCL was exposed anterior to the posterior belly of the digastic muscle. A mastoidectomy is performed, skeletonizing the sigmoid sinus, jugular bulb, and facial nerve within the fallopian canal. The mastoid tip is removed, exposing the jugular process and RCL. The jugular bulb is removed, exposing cranial nerves IX, X, and XI, which are dissected and exposed within the jugular foramen. The hypoglossal canal is exposed within the occipital condyle.

RESULTS

Musculoskeletal Relationships

The RCL courses superiorly and the interior oblique courses posteriorly from the C1TP, forming a right angle. The superior oblique bleeds this angle as it courses toward its insertion site (Figure 1A). A second triangle is formed by the RCL, the superior oblique, and a line connecting these two muscles along the occipital bone (Figure 1B). The occipital artery traverses along this line connecting the RCL and superior oblique in all specimens studied. The RCL originates along the superior and anterior portions of the C1TP and inserts on the jugular process of the occipital bone (Figure 2). The jugular process is an average of 17.3 mm (range 17 – 18 mm) superior from the C1TP. The stylod process lies 6.5 mm (range 6 – 7 mm) anterior to the posterior aspect of the RCL insertion site on the jugular process. The jugular process forms the floor of the jugular bulb and the posterior aspect of the jugular foramen meatus.

Vascular Relationships

The RCL lies directly posterior to the UV, separated only by the carotid sheath (Figure 3). The UV turns posteriorly as it ascends to form the jugular bulb, superior to the RCL and jugular process. Both the anterior and superior surfaces of the RCL are surrounded by the jugular venous system. The RCL origin covers the C1 transverse foramen, where the vertebral artery (VA) makes its posterior turn (Figure 5). The average distance from the medial turn of VA, just before piercing the dura, to the posterior border of the RCL is 20.3 mm (range 19 – 22 mm). The ICA ascends anteromedial to the RCL and UV to enter the carotid canal. The ICA is an average of 6.2 mm (range 5.5 – 7 mm) anterior to the top of the RCL.

Neural Relationships

The anterior aspect of the RCL insertion on the jugular process is an average of 1.8 mm (range 1.5 – 2 mm) from the facial nerve as it exits the stylo mastoid foramen (Figure 3A and 3B). The glossopharyngeal nerve travels anteriorly in isolation through the jugular foramen medial to the intrajugular septum. After crossing the plane of the RCL, it turns inferiorly to exit the jugular foramen medial to the stylohyoid process and lateral to the ICA (Figure 3D). The glossopharyngeal nerve is the furthest of the cranial nerves within the carotid sheath from the RCL, with an average distance of 9.2 mm (range 8.5 – 10 mm) at the top of the RCL. The vagus and accessory nerves enter the jugular foramen together, several millimeters inferior to the glossopharyngeal nerve. They wrap around the jugular process and RCL (Figure 3F), where the two nerves split. The accessory nerve descends in close proximity the RCL, just medial to the UV, whereas the vagus nerve crosses first lateral to and then medial to the hypoglossal nerve, as it descends into the neck. The hypoglossal nerve enters a bony canal through the occipital condyle, coursing anteriorly and superiorly, posterosmedially to the RCL, and joins the cranial nerves of the jugular foramen as they enter the carotid sheath together (Figure 3G).

CONCLUSION

The RCL muscle is an important anatomic landmark, separating the far lateral approach from the jugular foramen and facial nerve. A thorough understanding of the microsurgical anatomy of the RCL and its musculoskeletal, vascular, and neural relationships is necessary to safely perform combined approaches to the foramen magnum and jugular foramen.

REFERENCES