

The Subatlantic Triangle: Gateway to Early Localization of the Atlantoaxial Vertebral Artery

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Introduction

- Exposure of the vertebral artery (VA) between C1 and C2 vertebrae (atlantoaxial VA) may be necessary in a variety of pathologies of the craniovertebral junction.
- Current methods to expose this segment of the VA entail sharp dissection of muscles close to the internal jugular vein and the spinal accessory nerve.
- The present study assesses the technique of exposing the atlantoaxial VA through a newly defined muscular triangle at the craniovertebral junction.

Methods

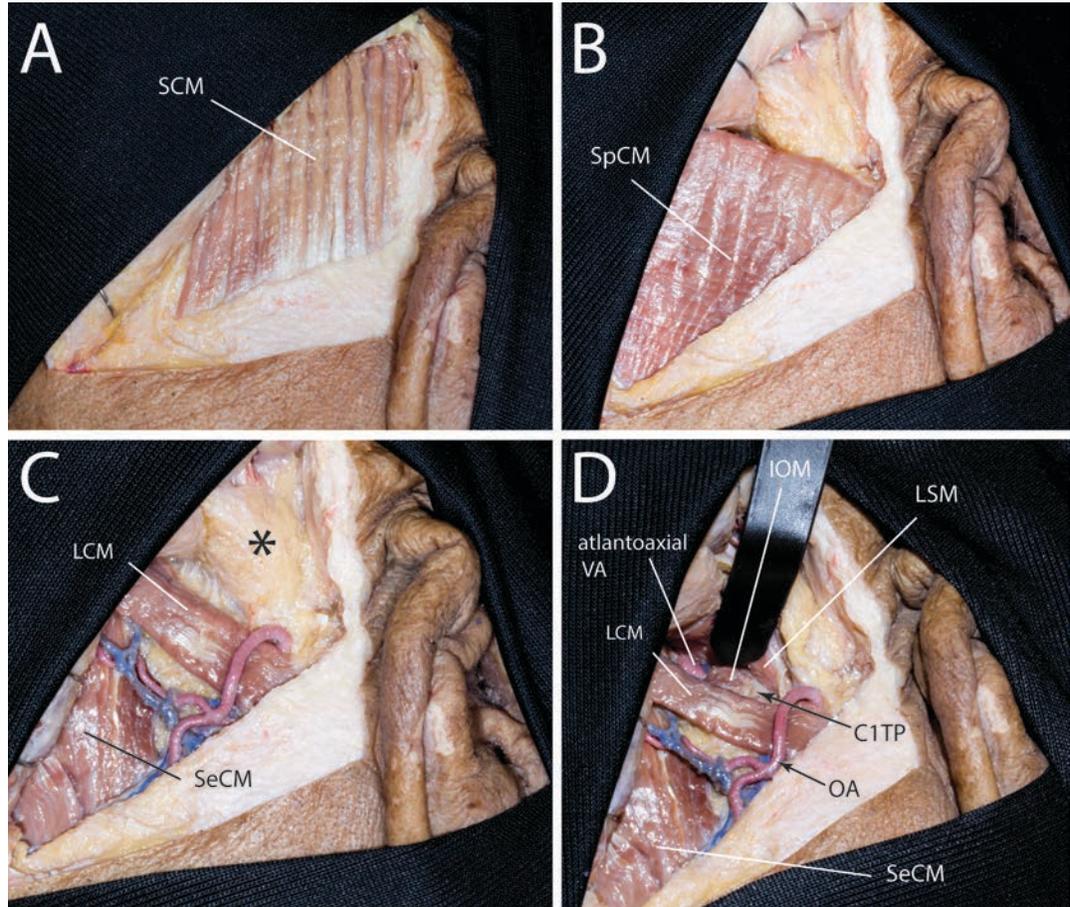
- Five cadaveric heads were prepared for surgical simulation in prone position, turned 30-45 degrees towards the side of exposure.
- The atlantoaxial VA was exposed through the subatlantic triangle after reflecting the sternocleidomastoid and splenius capitis muscles inferiorly.
- The subatlantic triangle was formed between three groups of muscles: (1) the levator scapulae and splenius cervicis muscles inferiorly and laterally, (2) the longissimus capitis muscle inferiorly and medially, and (3) the inferior oblique capitis superiorly.
- The lengths of the VA exposed through the triangle before and after unroofing C2 transverse foramen were measured.

Results

- The subatlantic triangle consistently provided access to the whole length of atlantoaxial VA.
- The average length of the VA exposed via the subatlantic triangle was 19.5mm.
- This average increased to 31.5 mm after the VA was released at the C2 transverse foramen.

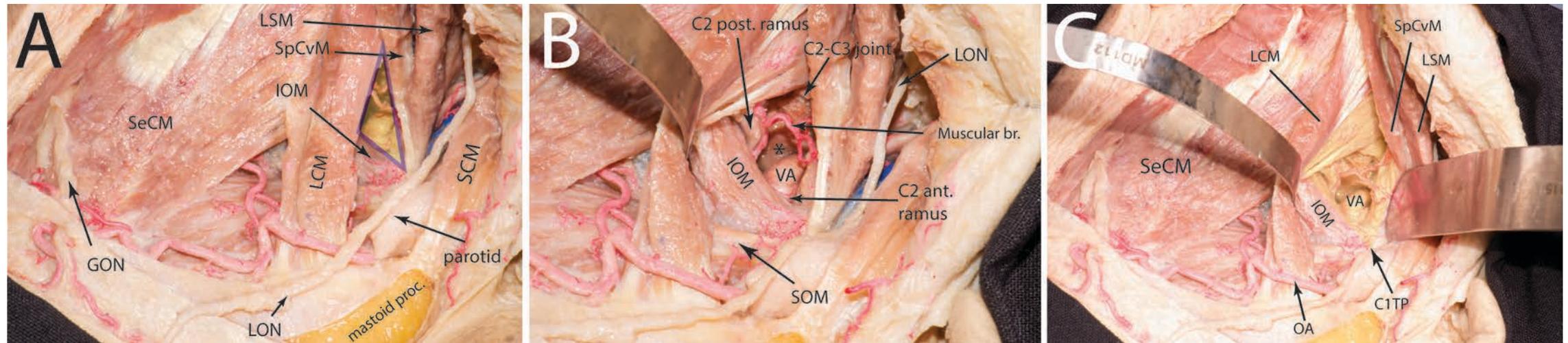
Results- stepwise exposure of subatlantic triangle

- A– skin reflection and exposure of SCM
- B– reflection of SCM and exposure of SpCM
- C reflection of SpCM and exposure of subatlantic fat pad (*) lateral to the LCM
- D–the VA is exposed between LCM and levator scapulae muscle (LSM)



C1TP = C1 transverse process; IOM = inferior oblique muscle; LCM = longissimus capitis muscle; OA = occipital artery; SCM = sternocleidomastoid; SeCM = semispinalis capitis muscle; SpCM = splenius capitis muscle; VA = vertebral artery

Results- Anatomical basis of exposure of VA in subatlantic triangle



A, the subatlantic triangle is exposed between the LCM and LSM below the IOM (shown in purple).

B and C, medial retraction of LSM exposes the C1-C2 segment of VA and C2/C3 facet joint.!

Ant. = anterior; C1TP = C1 transverse process; GON = greater occipital nerve; IOM = inferior oblique muscle; LCM = longissimus capitis muscle; OA = occipital artery; Post. = posterior; proc. = process; SCM = sternocleidomastoid; SeCM = semispinalis capitis muscle; SpCM = splenius capitis muscle; SpCvM = splenius cervicis muscle; VA = vertebral artery

Conclusion

- The subatlantic triangle provides a simple and straightforward pathway to expose the atlantoaxial VA.
- The proposed method may be useful during posterior approaches to the craniovertebral junction should early exposure and control of the atlantoaxial VA become necessary.