RGe ISSN: 2177-3246

SUPERNUMERARY HEADS OF THE STERNOCLEIDOMASTOID MUSCLE AND THEIR IMPLICATIONS FOR INTERNAL JUGULAR VEIN VENOUS ACCESS: AN ANATOMICAL CASE REPORT

CABEÇAS SUPRANUMERÁRIAS DO MÚSCULO ESTERNOCLEIDOMASTOIDEO E SUAS IMPLICAÇÕES PARA O ACESSO VENOSO DA VEIA JUGULAR INTERNA: RELATO ANATÔMICO DE CASO

CABEZAS SUPERNUMERARIAS DEL MÚSCULO ESTERNOCLEIDOMASTOIDEO Y SUS IMPLICACIONES PARA EL ACCESO VENOSO DE LA VENA YUGULAR INTERNA: REPORTE ANATÓMICO DE CASO

10.56238/revgeov17n5-147

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ABSTRACT

The sternocleidomastoid muscle (SCM) is an important anatomical landmark for cervical procedures, particularly internal jugular vein cannulation. Variations involving supernumerary heads may alter cervical neurovascular relationships and increase procedural complexity. This study reports an anatomical variation identified during routine cadaveric dissection at the Human Anatomy Laboratory of the Universidade do Estado do Amazonas. In a formalin-fixed adult male cadaver, the right SCM presented four heads of origin, consisting of one sternal head and three independent clavicular heads. The variation resulted in narrowing of the lesser supraclavicular triangle and greater muscular coverage over the presumed course

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of the internal jugular vein. No associated vascular alterations were identified. These findings demonstrate the potential impact of SCM variants on landmark-guided internal jugular vein access, as additional muscular heads may distort conventional anatomical references and increase the risk of technical difficulty and iatrogenic complications. Furthermore, such variations are relevant in surgical planning and imaging interpretation. This report reinforces the importance of anatomical knowledge and cadaveric studies for safer cervical procedures and improved diagnostic accuracy.

Keywords: Sternocleidomastoid Muscle. Anatomical Variation. Internal Jugular Vein. Central Venous Access.

RESUMO

O músculo esternocleidomastoideo (ECM) é um importante marco anatômico para procedimentos cervicais, particularmente para a canulação da veia jugular interna. Variações envolvendo cabeças supranumerárias podem alterar as relações neurovasculares cervicais e aumentar a complexidade dos procedimentos. Este estudo relata uma variação anatômica identificada durante dissecação cadavérica de rotina no Laboratório de Anatomia Humana da Universidade do Estado do Amazonas. Em um cadáver masculino adulto fixado em formol, o ECM direito apresentou quatro cabeças de origem, consistindo em uma cabeça esternal e três cabeças claviculares independentes. A variação resultou no estreitamento do trígono supraclavicular menor e em maior cobertura muscular sobre o trajeto presumido da veia jugular interna. Não foram identificadas alterações vasculares associadas. Esses achados demonstram o potencial impacto das variantes do ECM sobre o acesso à veia jugular interna guiado por referências anatômicas, uma vez que cabeças musculares adicionais podem distorcer os referenciais anatômicos convencionais e aumentar o risco de dificuldade técnica e complicações iatrogênicas. Além disso, tais variações são relevantes para o planejamento cirúrgico e a interpretação de exames de imagem. Este relato reforça a importância do conhecimento anatômico e dos estudos cadavéricos para procedimentos cervicais mais seguros e maior precisão diagnóstica.

Palavras-chave: Músculo Esternocleidomastoideo. Variação Anatômica. Veia Jugular Interna. Acesso Venoso Central.

RESUMEN

El músculo esternocleidomastoideo (ECM) es un importante punto de referencia anatómico para los procedimientos cervicales, particularmente para la canalización de la vena yugular interna. Las variaciones que involucran cabezas supernumerarias pueden alterar las relaciones neurovasculares cervicales y aumentar la complejidad de los procedimientos. Este estudio reporta una variación anatómica identificada durante una disección cadavérica de rutina en el Laboratorio de Anatomía Humana de la Universidade do Estado do Amazonas. En un cadáver masculino adulto fijado en formalina, el ECM derecho presentó cuatro cabezas de origen, consistentes en una cabeza esternal y tres cabezas claviculares independientes. La variación resultó en el estrechamiento del triángulo supraclavicular menor y en una mayor cobertura muscular sobre el trayecto presumido de la vena yugular interna. No se identificaron alteraciones vasculares asociadas. Estos hallazgos demuestran el impacto potencial de las variantes del ECM sobre el acceso a la vena yugular interna guiado por referencias anatómicas, ya que las cabezas musculares adicionales pueden distorsionar las referencias anatómicas convencionales y aumentar el riesgo de dificultad técnica y complicaciones iatrogénicas. Además, dichas variaciones son relevantes para la planificación quirúrgica y la interpretación de estudios de imagen. Este reporte refuerza la importancia del conocimiento anatómico y de los estudios cadavéricos para procedimientos cervicales más seguros y una mayor precisión diagnóstica.

Palabras clave: Músculo Esternocleidomastoideo. Variación Anatómica. Vena Yugular Interna. Acceso Venoso Central.

1 INTRODUCTION

The sternocleidomastoid muscle (SCM) represents one of the most relevant anatomical structures of the cervical region, both due to its functional importance in head movement and cervical stabilization and its applicability as a topographic landmark in clinical and surgical procedures. Traditionally, the SCM originates from two distinct heads, sternal and clavicular, delimiting the lesser supraclavicular triangle, a region classically used as an anatomical landmark for central venous access through the internal jugular vein (YANG et al., 2022).

Internal jugular vein cannulation is a routine procedure in intensive care units, surgical centers, and emergency departments, being employed for hemodynamic monitoring, administration of vasoactive drugs, hemodialysis, and parenteral nutritional therapy. Despite the increasing use of ultrasound-guided techniques, the landmark-based approach remains widely utilized, especially in emergency settings and in environments with technological limitations. In this context, comprehensive knowledge of cervical anatomy and its variations plays a fundamental role in procedural safety.

Anatomical variations of the SCM include alterations in the number of muscular heads, clavicular expansions, muscular duplications, and aberrant insertion patterns. Although often considered rare, such variants have relevant clinical impact because they modify the spatial arrangement of deep cervical neurovascular structures (RAIKOS et al., 2016). The presence of supernumerary heads may reduce or obliterate the anatomical spaces normally used as references for venous puncture, altering the topographic relationship among the internal jugular vein, the common carotid artery, and the spinal accessory nerve.

In addition to their implications for central venous access, these muscular variants have significant surgical importance in cervical procedures, lymph node dissections, head and neck oncologic surgeries, regional anesthetic blocks, and imaging interpretation (MOMBO AMUTI et al., 2019). Furthermore, SCM variants may contribute to misinterpretation in radiological examinations, simulating cervical masses or distorting usual anatomical planes.

From an embryological perspective, supernumerary heads are believed to result from failures in the differentiation or fusion of cervical muscular blastemas derived from the paraxial mesoderm. These alterations during embryonic development may generate multiple morphological patterns, whose actual prevalence remains underestimated due to limited identification in imaging studies and the scarcity of systematic cadaveric investigations.

Despite the anatomical and clinical relevance of these variations, reports involving multiple SCM heads remain limited in contemporary literature, particularly those directly

correlating morphological findings with practical repercussions for internal jugular vein access. Therefore, the present study reports a case of a sternocleidomastoid muscle with four heads of origin, emphasizing its anatomical implications and potential clinical repercussions in invasive cervical procedures.

2 CASE REPORT

During a routine anatomical dissection activity at the Human Anatomy Laboratory of the Universidade do Estado do Amazonas, a unilateral muscular variation of the sternocleidomastoid muscle was observed in a formalin-fixed adult male cadaver.

On the right side, the SCM presented four distinct heads of origin, consisting of one sternal head and three independent clavicular heads. The muscular fibers originated separately along the medial third of the clavicle, forming additional anatomical intervals between the muscular bellies. Superiorly, the four portions converged toward the usual insertion at the mastoid process and superior nuchal line.

The presence of the supernumerary heads substantially modified the anatomical configuration of the anterior cervical region, reducing the anatomical space classically used as a landmark for internal jugular vein access. Narrowing of the lesser supraclavicular triangle was observed, in addition to greater muscular coverage over the presumed course of the internal jugular vein, similar to that described by Raikos et al. (2016)(Figure 1).

No associated vascular alterations were macroscopically identified. The contralateral side presented usual anatomy, with only two heads of origin of the SCM.

Figure 1

Left cervical region showing the sternocleidomastoid muscle and its anatomical relationships in the lateral neck



3 DISCUSSION

Anatomical variations of the sternocleidomastoid muscle represent morphological findings of considerable clinical relevance due to the intimate relationship of this muscle with the major cervical neurovascular bundles. In the present report, the identification of four muscular heads on the right side promoted a significant alteration of the anterior cervical anatomical configuration, particularly through reduction of the lesser supraclavicular space and increased muscular coverage over the presumed course of the internal jugular vein.

Previous anatomical studies have demonstrated that supernumerary variants of the SCM may occur under different morphological patterns, including sternal duplications, multiple clavicular expansions, and aberrant occipital insertions (TUBBS et al., 2018). Raikos et al. (2016) described a bilateral case with multiple clavicular heads associated with critical narrowing of the supraclavicular fossae, emphasizing the potential surgical and interventional impact of these alterations. The findings observed in the present study corroborate these observations, especially regarding the modification of superficial anatomical landmarks used for invasive cervical procedures.

The clinical relevance of this variant becomes particularly evident in the context of internal jugular vein cannulation. Traditionally, the anatomical puncture technique uses the triangle delimited by the sternal and clavicular heads of the SCM as the principal landmark. However, the presence of supernumerary heads may substantially alter the examiner's anatomical perception, making identification of the apex of the lesser supraclavicular fossa more difficult and promoting deviation from the expected needle trajectory.

In addition to technical difficulty, muscular variants may increase the depth of the internal jugular vein and modify its spatial relationship with the common carotid artery. Such alterations potentially increase the risk of iatrogenic complications, including inadvertent arterial puncture, cervical hematomas, pneumothorax, hemothorax, and catheterization failure. Although ultrasonography has significantly reduced these complications, landmark-guided access is still frequently employed in several medical services, particularly in emergency settings and locations with limited resources (YANG et al., 2022).

Another relevant aspect concerns the relationship between the SCM and the spinal accessory nerve. Alterations in muscular arrangement may modify usual neural pathways, increasing the risk of iatrogenic injuries during cervical procedures. Mombo Amuti et al. (2019) demonstrated considerable anatomical variability among the accessory nerve, the internal jugular vein, and the SCM, reinforcing the need for preoperative recognition of these variants.

From an embryological perspective, the occurrence of multiple muscular heads probably results from alterations in the segmentation and fusion of cervical muscular blastemas during fetal development. Persistence of independent muscular components may explain the formation of additional clavicular bands and complex variant patterns. Although considered rare, these alterations likely present a higher prevalence than currently reported, considering underreporting in clinical and radiological studies.

In addition to interventional repercussions, supernumerary heads of the SCM also possess diagnostic relevance. In imaging examinations, especially computed tomography and magnetic resonance imaging, accessory muscular bands may be mistaken for lymphadenopathy, cervical masses, or fibrotic alterations, particularly when not recognized by the radiologist. Therefore, familiarity with these anatomical variants contributes to greater diagnostic accuracy and safer surgical planning.

The present report reinforces the importance of cadaveric anatomical study as an indispensable tool for understanding human morphological variations. In a contemporary scenario characterized by increasing adoption of minimally invasive and image-guided procedures, comprehensive knowledge of anatomical variants remains essential for reducing complications, improving technical performance, and enhancing patient safety.

4 CONCLUSION

The present anatomical case report demonstrates that supernumerary heads of the sternocleidomastoid muscle may significantly alter the topographic anatomy of the anterior cervical region, particularly affecting the anatomical landmarks traditionally used for internal jugular vein cannulation. The presence of additional muscular heads can reduce the supraclavicular space, increase muscular coverage over deep neurovascular structures, and potentially elevate the risk of technical difficulties and iatrogenic complications during invasive cervical procedures. Furthermore, these variations possess important surgical and radiological implications, reinforcing the necessity for detailed anatomical knowledge and careful preprocedural evaluation. Therefore, recognition of sternocleidomastoid muscular variants remains essential for improving procedural safety, diagnostic accuracy, and surgical planning in clinical practice.

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