Introduction

The jugular foramen is located between the occipital and temporal bones. The jugular foramen has a close relationship to important anatomical structures. Many approaches from posteriorly or laterally have been reported. Despite numerous reports, a few groups have emphasized the importance of the jugular process. The jugular process has been known to be one of the landmarks for access to the jugular foramen. This process has a close relationship to the surrounding venous network, muscles, and fascia. However, the microsurgical anatomy of this structure has not been described well in most modern texts. The objective of this study is to elucidate the microsurgical anatomy of the jugular process with cadaveric dissections and to investigate the radiological feature of it.

Materials and Methods

Cadaveric and radiological study - five adult cadaveric specimens and a dry skull were dissected. Thirty computed tomography angiography images (62 sides) were examined to investigate the relationships between the course of the sigmoid sinus and the morphological features of the jugular process. Images were examined with Osirix ver 5.8.5. On the sagittal plane including the bottom of the jugular bulb and the bottom of the sigmoid sinus, we measured the angle with a line between these two points (line A) and the axial plane (line B).

Results 1:Fig.2-3

The jugular process is located between the mastoid process of the temporal bone and the jugular tubercle/occipital condyle of the occipital bone. This process extends laterally from the posterior half of the occipital condyle, forming the posterior margin of the jugular foramen. Our cadaveric dissection shows views of the jugular process from below (Fig.3), the lateral (Fig.4), and behind (Fig.5) and the relationship between this process and surrounding structures. The rectus capitis lateralis is the only muscle that attaches to the jugular process. This process has a close relationship to the venous networks around the jugular foramen. Drilling the jugular process and occipital condyle, leaving the surrounding cortical bone of the occipital condyle, exposes the relationship of the jugular bulb and the venous networks. Specifically, the jugular process is forming the inferior and posterior border of the jugular bulb and inferior border of the sigmoid sinus. (Fig.2)

Results 2 : Cadaveric study Fig.4-5

The rectus muscle laterally covers the rectus capitis lateralis and the jugular process. The removal of the mastoid tip and digastric muscle exposes the insertion of the rectus capitis lateralis into the inferior surface of the jugular process. (Fig.4) From behind, the relationship between the jugular process (yellow dotted line) and jugular bulb can be clearly shown.(Fig.5) The removal of the condyle does not expose the jugular bulb. Removal of the jugular process exposes the inferoposterior surface of the jugular bulb.(Fig.4B and 5B) Our radiographic study shows a protrusion of the sigmoid sinuses into the jugular process was found in 9 out of 62 sides. (14.5%, Yellow arrow in Fig.1) An angle of greater than 45 degrees between the line A and B was found in 23 of 62 sides (37.1%). The jugular bulb is categorized into two types: the sloped type and the morphologically bulbed type. The process located below the sigmoid sinus in the latter tends to have a steeper angle. (Table)

Conclusion

The jugular process forms the infero-posterior border of the jugular foramen. The resection of the jugular process is crucial to opening the jugular foramen from the posterior and lateral aspect. A detailed knowledge of this structure, including the microsurgical anatomy and morphological variations, is essential for access to the jugular foramen. A precise understanding of the microsurgical anatomy of this process and preoperative evaluation of the relationships between the process and the sigmoid sinus makes surgical access to the jugular foramen safer.

References

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