Intraoperative blood loss in juvenile angiofibroma resection; Endoscopic approach vs. Open approach

Meta-Analysis Study

For partial fulfillment of Master degree in Otorhinolaryngology

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Introduction

Juvenile nasopharyngeal angiofibroma (JNA) is a benign vascular tumor typically affecting young adolescents. The reported incidence is 3.7 new cases per million males per year. [1] Macroscopically, JNA is a soft multilobular tumor with a well-defined capsule. [2] It consists of fibrotic and vascular elements, the latter being more prominent at the periphery. The larger the tumor, the greater the fibrotic element. [3]

The tumor originates from the superior edge of the sphenopalatine foramen and advances submucosally, through natural ostia, along canals and nerves and by bone erosion to the infratemporal fossa, pterygoid canal, parasellar region, sphenoid basis and the orbit.[3]

The natural history of JNA is that of progression despite some reported cases of spontaneous involution .[4] Facial deformity, reduced vision, exopthalmos and opthalmoplegia may develop. Therefore, despite its benign nature, JNA should be treated as radically as possible to prevent recurrence.[1,5]

Surgical excision is still recognized to be the first choice of treatment for JNA, especially when there is no intracranial involvement. Traditional open surgical approaches are comprised of transpalatal, transmaxillary (lateral rhinotomy or midfacial degloving), LeFort 1 osteotomy, and infratemporal fossa craniotomy.[6] During the past 2 decades, the surgical approach to JNA has

been evolving in relation to the improvement of endoscopic techniques. Compared to open surgery, transnasal endoscopic surgery has less morbidity, better magnified visualization in identifying residual tumor behind corners or other inaccessible locations, lower intraoperative blood loss, less need for blood transfusion, less hospitalization, and a lower rate of recurrence.[7,8]

Aim of study:

The aim of this study is to compare between the endoscopic and open approaches to the resection of Angiofibroma in terms of the total intraoperative blood loss.

Review of the literature

Chapter 1

Anatomy

In order to completely grasp the concept of surgical intervention in the treatment of JNA, a fundamental understanding of the anatomy of the Pterygopalatine fossa, which is the origin of JNA, is a must.

Bony Anatomy [9-12]

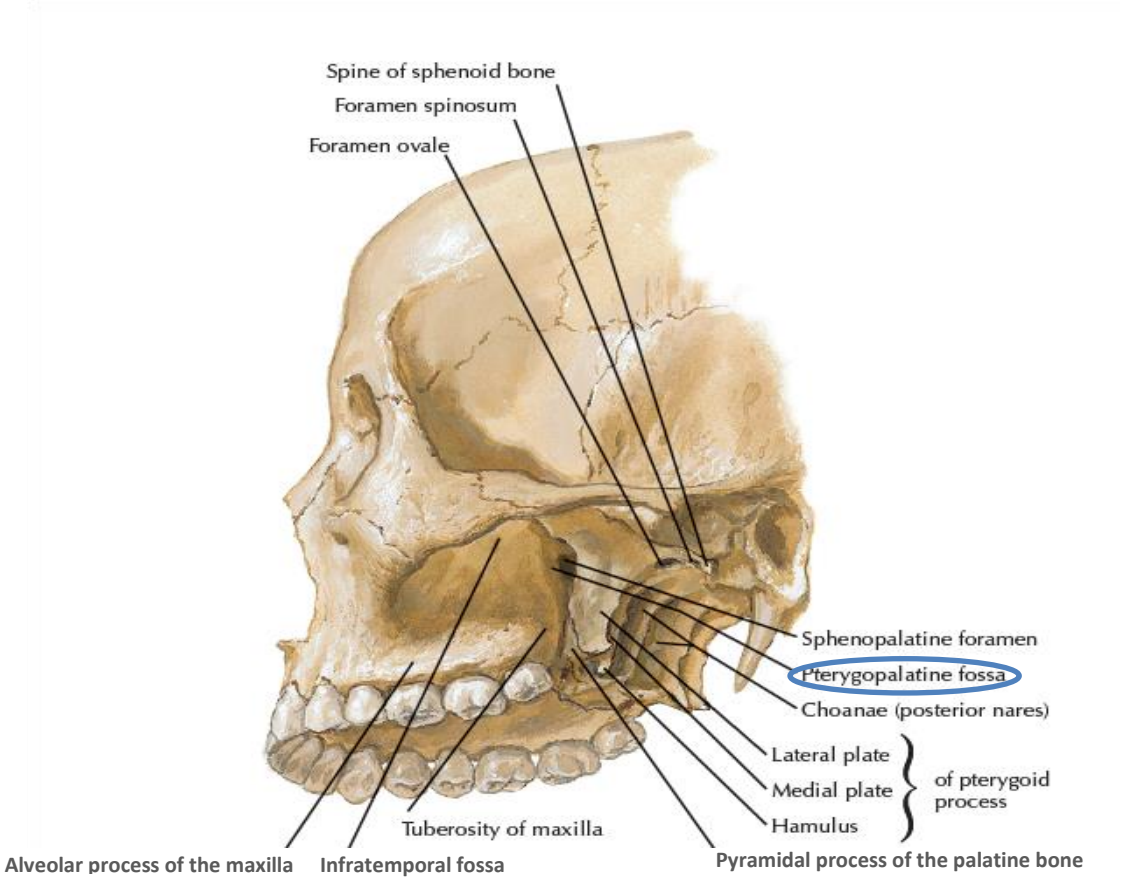

Figure 1; lateral view of the skull showing the position of the pterygopalatine fossa (Blue circle) [72]

The pterygopalatine fossa is located immediately behind the thin posterior wall of the maxillary sinus. It serves as a gateway of tumors and infection to the nasal and oral cavities, infra-temporal fossa, orbit, pharynx, and middle cranial fossa through eight foramina; the orbital apex, the inferior orbital fissure, the foramen rotundum (which allows access to the cavernous sinus), the vidian canal (leading to the foramen lacerum), the pterygomaxillary fissure (which communicates with the masticator space), the greater and lesser palatine canals and foramina, and the sphenopalatine foramen (providing access to the postero-superior part of the nasal fossa). Being able to determine the exact margins of the PPF is not an easy task because they are not strictly definite even in the anatomic literature. The obliquely oriented upper part of the perpendicular plate of the palatine bone and the pterygoid process form a small pyramidal-shaped fossa that probably was called the Pterygo-palatine fossa because it contains the pterygopalatine ganglion. However, axial CT studies define a larger fossa, which incorporates the pyramidal-shaped fossa and has its postero-lateral margin at the lateral edges of the base of the pterygoid process and the fused pterygoid plates. This larger fossa is now defined as the Pterygopalatine fossa(PPF).

PPF is bounded posteriorly by the fused pterygoid plates

and the base of the sphenoid bone, medially and more superiorly antero-medially by the palatine bone, and anteriorly by the maxillary bone.

When viewed laterally, the PPF appears as a narrow and inferiorly tapering space contiguous with the more anteriorly positioned inferior orbital fissure and formed by the gap between the curving margins of the maxillary and sphenoid bones. (Figure 1) This gap is bridged inferiorly and medially by the palatine bone.

The horizontal plates of each palatine bone unite in the midline to form the posterior third of the hard palate, which fuses with the palatine processes of the maxillary bones to form the complete hard palate. The perpendicular plate fuses anteriorly with the rough posterior surface of the medial wall of the maxillary bone, covering part of the maxillary hiatus of the maxillary sinus. Posteriorly, the perpendicular plate is variably contoured and fuses with the medial surface of the medial pterygoid plate.

At the upper part of the perpendicular plate, processes are present that fuse with the maxillary and sphenoid bones. The orbital process extends superolaterally to attach to the posterior margin of the orbital surface of the maxillary bone and partly to the inferior surface of the body of the sphenoid bone. The sphenoidal process extends superomedially to attach to the base of the medial pterygoid plate. At the junction of the

perpendicular and horizontal plates, the pyramidal process attaches to the maxillary bone and extends posterolaterally to attach to the angled inferior margins of the pterygoid plates.

The sphenoid bone, as well, has a unique configuration. The pterygoid process of the sphenoid bone, positioned inferior to the body and greater wing, consists of the base and the medial and lateral pterygoid plates. The anterior surface of the base forms a shallow recess whose medial margin follows the curve of the medial pterygoid plate. This recess forms most of the posterior wall of the PPF and contains the anterior openings of the foramen rotundum superiorly and the vidian (pterygoid) canal medially. More inferiorly, the separated pterygoid plates attach to the pyramidal process of the palatine bone.

The pterygomaxillary fissure, the lateral opening of the PPF, has a well-defined posterior margin formed superiorly by the lateral margin of the anterior surface of the base of the pterygoid process and inferiorly by the fused pterygoid plates, and a not as well-defined anterior margin, owing to the curving contour of the posterior wall of the maxillary sinus. The greater palatine canal is formed by the apposition of an obliquely descending groove at the posteroinferior aspect of the medial wall of the maxillary bone and the greater palatine groove deep to the lateral surface of the perpendicular plate of the palatine bone. This canal opens inferiorly at the greater

palatine foramen located at the lateral margin of the horizontal plate. The lesser palatine canal(s) extend through the pyramidal process of the palatine bone to open at the lesser palatine foramina at the anterior aspect of the inferior surface of the pyramidal process. The sphenopalatine foramen forms when the sphenopalatine notch between the orbital and sphenoidal processes is closed by the anteroinferior margin of the body of the sphenoid bone. The sphenopalatine foramen, the orbital and sphenoidal processes, and the upper part of the perpendicular plate form an acute angle with the anterior surface of the sphenoid bone such that the sphenopalatine foramen can be recognized on CT scans by its angled contour and location just anterior to the vidian canal.

Contents of the PPF

- ***Fat***
- ***Vascular contents***

1. Sphenopalatine artery
2. Infraorbital artery
3. Descending palatine artery

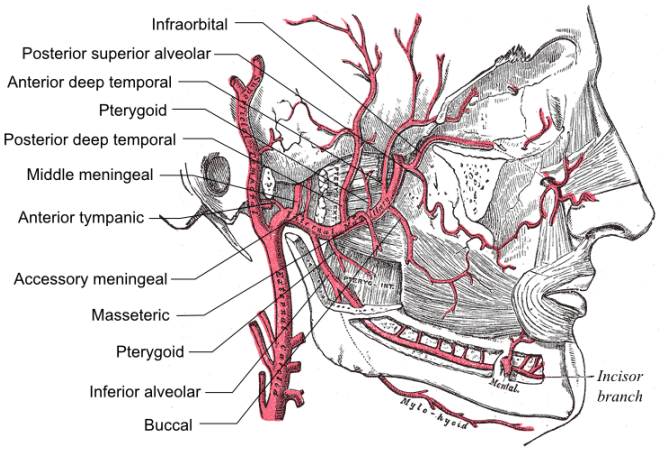

Figure2 ; Internal maxillary artery entering pterygopalatine fossa through pterygo-maxillary fissure (mandible removed) [73]

The internal maxillary artery branches off the external carotid artery (Figures 2, 3).

The sphenopalatine artery, which is a terminal branch of the internal maxillary artery, usually contains two or more branches. JNAs typically arise from the spheno-palatine artery.

Larger tumours can however have arterial supply from the ascending pharyngeal, contralateral internal maxillary artery, and be supplied by the cavernous portion of the internal carotid artery.

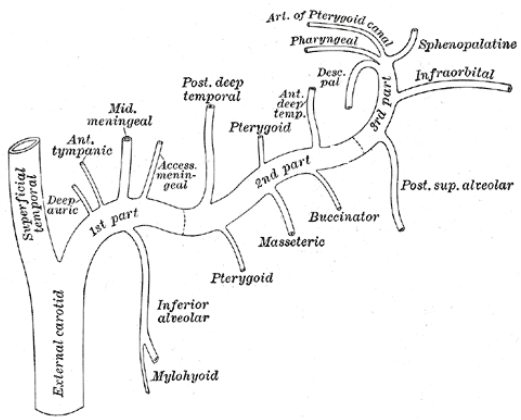

Figure3 ; Branches of the internal maxillary artery [73]

- ***Nerves (figure 4)***

1. <u>Sphenopalatine or pterygopalatine ganglion</u>, which provides parasympathetic innervation to: pharynx,