Juvenile Nasopharyngeal Angiofibroma with Skull Base Involvement: Single-Institution Experience at a Latin American High-Volume Referral Center

Marina Pizarro M[1], Jose Manuel Zuñiga G[1], Cristian Naudy M[2], Francisca Montoya S[3], Matías Gómez G[4,5]
[1]Servicio de Otorrinolaringología, Hospital del Salvador, Santiago, Chile
[2]Servicio de Neurocirugía, Instituto de Neurocirugía Dr. Alfonso Asenjo, Santiago, Chile.
[3]Servicio de Imagenología, Hospital de Villarrica, Villarrica, Chile.
[4]Servicio de Otorrinolaringología, Instituto de Neurocirugía Dr. Alfonso Asenjo, Santiago, Chile.
[5]Servicio de Otorrinolaringologia Clinica Alemana de Santiago - UDD

Instituto Neurocirugía Dr. Asenjo

Background

Juvenile nasopharyngeal angiofibromas (JNA) are benign but locally aggressive fibrovascular tumors that predominantly affects adolescent males. Although histologically non-malignant, advanced stages often present with skull base involvement and intracranial extension, posing a significant surgical challenge due to complex anatomical extension, significant vascularity, and potential morbidity. Advances in surgical techniques, particularly the endoscopic endonasal approach (EEA), have broadened treatment options, yet controversy persists regarding the optimal management of tumors with extensive skull base and intracranial invasion.

Objective

This study aims to describe the surgical experience of a Latin American high-volume referral center in managing advanced-stage JNA with skull base involvement while highlighting the most common anatomical routes of tumor dissemination relevant for surgical planning.

Methods

A retrospective review was conducted of patients with histologically confirmed JNA treated surgically between January 2017 and January 2022 at the Instituto de Neurocirugía Dr. Alfonso Asenjo (INCA), Chile. Inclusion criteria were patients with advanced disease (Radkowsky stages IIIA and IIIB) with evidence of skull base involvement. Clinical records preoperative imaging (CT and MRI), surgical approach, intraoperative findings, complications, and postoperative outcomes were analyzed. Early postoperative MRI (within 24-48 hours) was used to assess the extent of resection and presence of residual disease. Descriptive statistical analysis was performed.

Patient No.	1	2	3	4	5	6	7	8	9
Age	15	13	11	13	14	14	28	17	10
Radkowski Stage	IIIB	IIIB	IIIB	IIIA	IIIA	IIIA	IIIB	IIIA	IIIA
Skull Base Involvement									
Infratemporal Fossa	+	+	+	-	-	-	+	+	-
Foramen Ovale	-	-	-	-	-	-	-	-	-
Foramen Rotundum	+	+	+	-	-	-	+	-	+
Sphenoid Sinus	+	+	+	+	+	+	+	+	+
Clivus	+	-	-	-	-	-	-	-	+
Middle Cranial Fossa	+	+	-	-	-	-	+	-	-
Inferior Orbital Fissure	+	-	+	-	-	-	+	-	-
Orbital Apex	+	-	+	-	-	-	+	-	-
Superior Orbital Fissure	+	-	+	-	-	-	+	-	-
Cavernous Sinus	+	-	+	-	-	-	+	-	-
Foramen Lacerum	-	-	-	-	-	-	-	-	-
Cribriform Plate	-	-	-	-	-	-	-	-	-
Vidian Canal	+	+	+	+	-	-	+	+	+
Palatovaginal Canal	+	+	+	+	+	+	+	+	+

Table 1. Characteristics of JNA skull base involvement in patient cohort according to the Radkowski classification, 5 patients (55.5%) were classified as stage IIIA and 4 patients (44.4%) as stage IIIB. The erosive involvement of the skull base and intracranial extension was detailed for each patient based on their preoperative CT and MRI images.

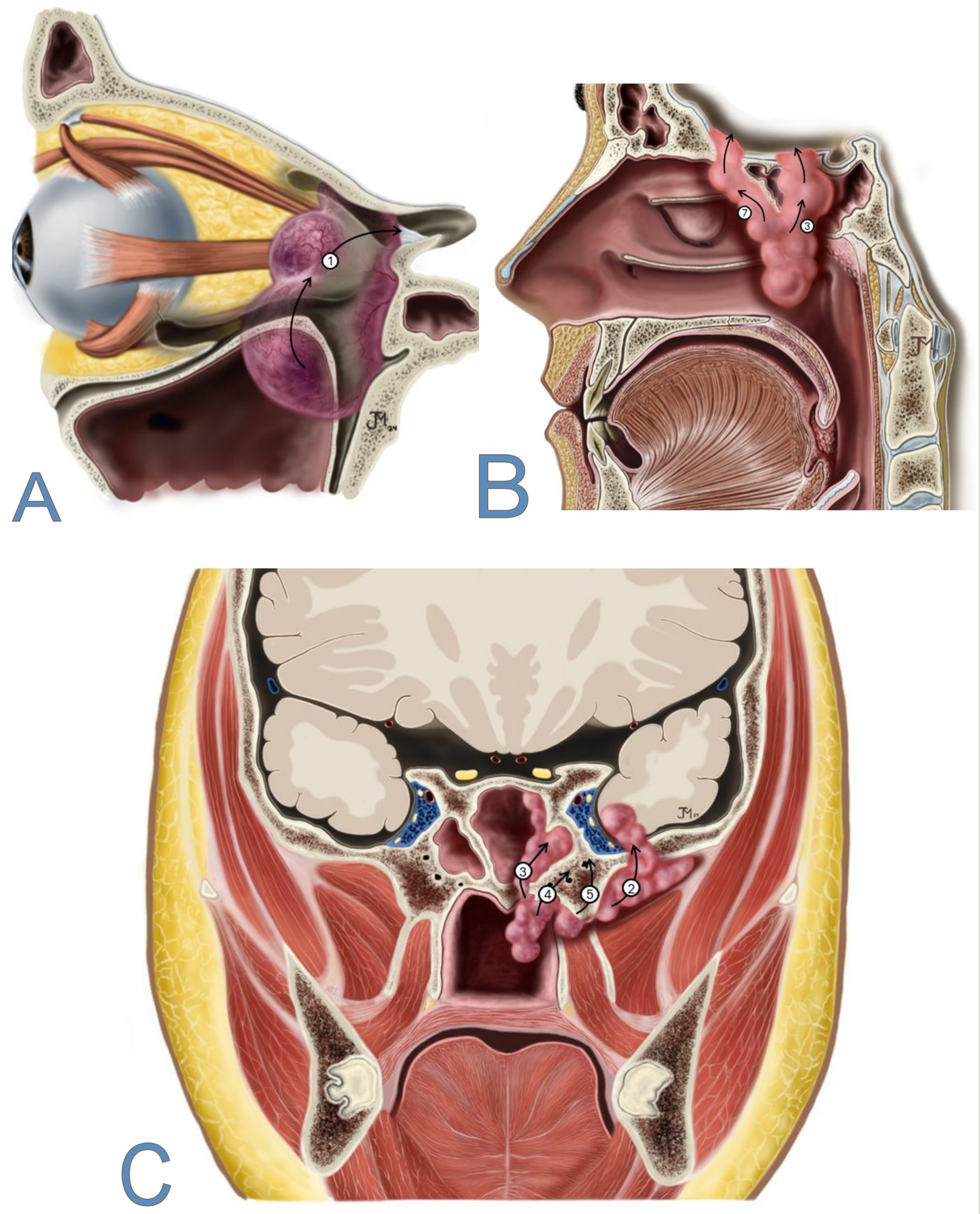

Figure 1. Routes of Intracranial Dissemination. (A) Route of dissemination through inferior orbital fissure, orbital apex and superior orbital fissure to middle cranial fossa (1). (B) Route of dissemination from the pterygopalatine fossa to the middle cranial fossa (2), through the walls of the sphenoid sinus (3), natural foramina to the middle cranial fossa (4), and the pterygoid canal to the middle cranial fossa (5). (C) Route of dissemination through the walls of the sphenoid sinus (3) and through the cribriform plate to the anterior cranial fossa (7). Source: Original illustration from the authors.

Results

Nine male patients were included, with a mean age of 14.8 years (range of 10 to 28 years). Five patients were staged as Radkowski IIIA (55.5%) and four as IIIB (44.4%). All patients demonstrated skull base involvement, most frequently via the sphenoid sinus (100%) and palatovaginal canal (100%), followed by the by the vidian canal (88.8%). Intracranial dissemination through the superior orbital fissure and middle cranial fossa occurred in 33% of cases each. All patients underwent preoperative embolization. Eight patients were treated using an exclusive EEA, while one required a combined endoscopic and transoral approach. Intraoperative blood loss ranged from 100 to 1300 ml. Early postoperative MRA revealed residual disease in 4 patients, all staged IIIB. Two of these underwent staged resection through open approaches, one was lost to follow-up, and one remains under surveillance. No late postoperative complications were reported.

Conclusions

Advanced JNA with skull base and intracranial involvement presents significant surgical challenges. Detailed preoperative imaging is essential to identify dissemination routes and tailor the surgical approach. While EEA enables safe and effective resection in most cases, combined or open techniques remain necessary in patients with extensive intracranial disease. Multidisciplinary collaboration and precise anatomical knowledge are critical for optimizing outcomes in this complex patient population.

Contact

Matias Gomez, Otorhinolaryngologist
Instituto de Neurocirugía
José Manuel Infante 553, Santiago, Chile
drmatiasgomez@gmail.com
+569 85004196

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