

## CASE REPORT / ПРИКАЗ БОЛЕСНИКА

# Preoperative embolization of juvenile nasopharyngeal angiofibroma using medium to large size particles

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**Introduction** Juvenile nasopharyngeal angiofibroma are benign tumors, with locally aggressive behavior. Preoperative tumor embolization with polyvinyl alcohol particles can reduce intraoperative blood loss and facilitate surgical resection.

**Case outline** A 16-year-old male was admitted to hospital due to profuse epistaxis and sense of nose fullness. Multidetector computed tomographic angiography examination showed a tumor mass in the right nasal cavity with extension to the right maxillary sinus and ethmoidal cells on the right, and in the left nasal cavity. It rested on the nasal septum, but without bone destruction. After application of contrast agent, described mass became intensely opacified. Preprocedural digital subtraction angiography of external and internal carotid arteries of both sides showed extensive pathological vascularization, which received main contribution from branches of maxillary artery on right and, to a lesser extent, on left side. Due to danger of penetration of a particle embolization agent of smaller diameter into orbital branches and possible retrograde migration into carotid artery, we decided to apply particle embolization agent of larger diameter (500–700 μm) than prescribed by modern standards. Tumor was completely surgically removed third day after embolization, and patient was discharged without any neurological deficit. Control contrast enhanced multidetector computed tomographic angiographies were performed at third and seventh month after surgery and showed no tumor residue or recurrence.

**Conclusion** The use of particles of larger diameter gave satisfactory results during operation – surgical excision of tumor, when dangerous anastomoses do not allow use of particles of smaller diameter and can be safely performed without significant neurological nor systemic complications.

**Keywords:** juvenile nasopharyngeal angiofibroma; embolization; large size particles

**INTRODUCTION**

Juvenile nasopharyngeal angiofibromas (JNA) are benign tumors, that grow from the posterior nasopharynx, typically along the sphenopalatine opening and are locally aggressive with extension into the pterygopalatine fossa, maxillary sinus, anterior nasal cavity, orbit, sphenoid sinus, base of the skull, and possibly, the intracranial compartment and cavernous sinus [1–5].

Preoperative tumor embolization with polyvinyl alcohol (PVA) particles has been adopted as routine protocol, and can significantly reduce intraoperative blood loss and thus, facilitate surgical resection in tumors vascularized predominantly from external carotid artery branches [2, 6, 7].

**CASE REPORT**

A 16-year-old male, was admitted to the hospital due to profuse epistaxis and sense of fullness in the nose. Multidetector computed tomographic angiography (MDCT) examination showed a tumor mass in the right nasal cavity, measuring

54 × 42 × 21 mm (antero-posterior × caudo-cranial × latero-lateral diameter; AP × CC × LL) with extension to the right maxillary sinus and ethmoidal cells on the right, and posterior parts of the left nasal cavity. The described mass rested on the nasal septum, but without bone destruction. After application of the contrast agent, tumor became intensely opacified (Radkowski IIb) [8] (Figure 1A and 1B).

In the angio-suite, under conditions of analgosedation and subcutaneous anesthesia in the region of the right groin, the 6F sheath was positioned in the femoral artery, through which the guiding catheter Envoy 6F (Cerenovus, Irvine, CA, USA) was introduced. Preprocedural digital subtraction angiography of the external carotid arteries (ECA) and internal carotid arteries (ICA) of both sides showed extensive pathological vascularization, which received the main contribution from the branches of the maxillary artery on the right, and, to a lesser extent, on the left side. We positioned the guide catheter in the right maxillary artery, through which, microcatheter Prowler 21 (Codman Neurovascular, Raynham, MA, USA) was advanced in the distal third of the

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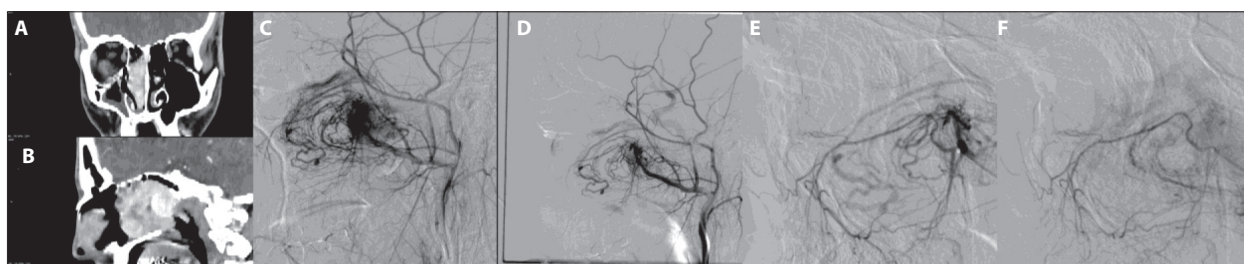
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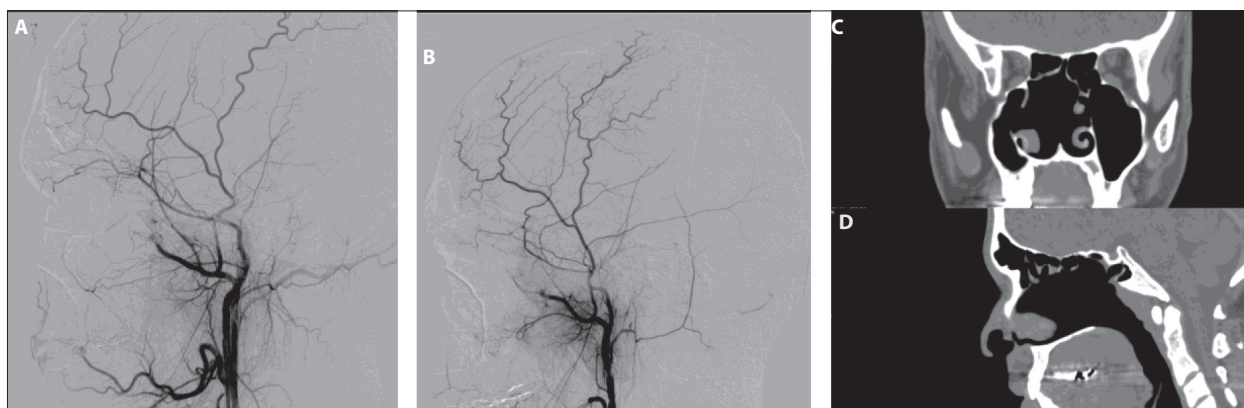
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**Figure 1.** A – coronal and B – sagittal contrast-enhanced computed tomography showed tumor mass in the right nasal cavity; C – right and D – left external carotid artery digital subtraction angiography demonstrated pathological vascular network; E and F represent superselective angiograms



**Figure 2.** A – right and B – left external carotid artery post-procedural digital subtraction angiography showed maximal reduction of tumor vascularization; C – coronal and D – sagittal contrast-enhanced computed tomography after seven months showed no tumor residue nor recurrence

maxillary artery. Superselective angiograms showed the communication between the right sphenopalatine artery and the right orbital arteries. Due to danger of penetration of a particle embolization agent of smaller diameter into the orbital branches and possible retrograde migration into the ICA, we decided to apply a particle embolization agent of larger diameter than prescribed by modern standards, 500–700  $\mu\text{m}$  Embosphere® (Microspheres, Merit Medical, South Jordan, UT, USA). When an angiographically satisfactory degree of occlusion of the tumor from the right maxillary artery was achieved, same procedure was performed at the contralateral side (Figure 1C–F).

Tumor was surgically removed third day after embolization. Complete resection was achieved with a total of two units of blood used intraoperatively (550 ml). He left the clinic in good general condition, without neurological deficit (modified Rankin scale 0).

Control MDCT examinations, with and without contrast agent application, were performed at third and seventh month after surgery and showed no tumor residue or recurrence (Figure 2).

This case report was approved by the institutional ethics committee, and written consent was obtained from the patient for the publication of this case report and any accompanying images.

## DISCUSSION

Management of JNA is challenging because of its rich vasculature, complex anatomy of the affected region, and the young age of the population [9, 10].

The modern approach of a combination of preoperative angiography, embolization, and endoscopic surgery has facilitated and made the surgical treatment of JNA much safer [8, 9, 11–18]. Recommended mean particle size for this type of tumor should be 200  $\mu\text{m}$  [19]. In a series of 19 patients, Ballah et al. [20] reported a mean intraoperative blood loss of an average of 655 mL (range 50–2000 mL). Chan et al. [11] in a series of 37 patients described an average blood loss of 2660 mL in the group where open surgery or endoscopic surgery was performed, while an average of 2029 mL was lost in the group where patients underwent a combination of open and endoscopic surgery. Overdevest et al. [1] in a series of 26 patients reported that the mean value of intraoperative JNA blood loss vascularized exclusively from ECA branches was 762 mL. The mean value in 14 cases with bilateral vascularization was as much as 2146 mL compared to unilateral in which this value was 617 mL of blood. It also states that post-embolizing tumor blush was not associated with expected blood loss [1]. Meher et al. [14] in his series had 1163 ml mean blood loss (range 500–1900 ml) during surgery and in 7/22 (31.81%) subjects required intraoperative blood transfusion. In his analysis of the group of patients who were preoperatively embolized and those who were not, Diaz et al. [15] found that in those who were embolized, the average blood loss was reduced by 798 ml. Pamuk et al. [2] in his 11 experiences with 48 patients indicate that pre-operative embolization particles PVA reduces intraoperative hemorrhage in patients with JNA lower grade (vascularization exclusively from the ECA). Lv et al. [21] state that the preoperative embolization JNA liquid embolizing agent in a series of 22 patients with Radkowski IIc,

IIIa and IIIb classified tumors enabled surgical dissection of the tumor without blood loss.

Regardless of the type of procedure, it is evident that the frequency and severity of postoperative complications are directly related to the volume of intraoperative blood loss during resection [8, 9, 11].

The use of particles of larger diameter gave satisfactory results during the operation – surgical excision of the tumor, when dangerous anastomoses do not allow application of smaller diameter particles and can be safely performed without significant neurological nor systemic complications.

**Conflict of interest:** None declared.

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## Преоперативна емболизација јувенилног назофарингеалног ангиофиброма коришћењем партикула средњег и великог промера

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### САЖЕТАК

**Увод** Јувенилни назофарингеални ангиофиброми су бенигни тумори са локално агресивним понашањем. Преоперативна емболизација тумора честицама поливинил-алкохола може смањити интраоперативни губитак крви и олакшати хируршку ресекцију.

**Приказ болесника** Шеснаестогодишњи мушкарац примљен је у болницу због обилне епистаксе и осећаја пуноће у носу. Преглед мултидетекторском компјутеризованом томографском ангиографијом показао је туморску масу у десном носном ходнику са инвазијом десног максиларног синуса и етмоидних ћелија у десни и у леви носни ходник. У контакту је са носним септумом, али без разарања костију. После примене контрастног средства описана маса се интензивно опацификовала. Препроцедурална дигитална суптракциона ангиографија спољашњих и унутрашњих каротидних артерија обострано показала је екстензивну патолошку васкуларизацију, у већој мери прокрвљену гранама максиларне артерије на десној и, у мањој мери,

на левој страни. Због опасности од продора честичног емболизационог средства мањег дијаметра у орбиталне гране и могуће ретроградне миграције у каротидну артерију, одлучили смо се за примену честица већег пречника (500–700  $\mu\text{m}$ ) него што је прописано савременим стандардима. Тумор је комплетно хируршки уклоњен трећег дана после емболизације и пацијент је отпуштен без неуролошког дефицита. Контролни прегледи мултидетекторском компјутеризованом томографском ангиографијом са апликацијом контраста урађени су у трећем и седмом месецу после операције и нису показали остатке тумора или рецидив. **Закључак** Употреба честица већег пречника дала је задовољавајуће резултате током операције – хируршке ексцизије тумора, када опасне анастомозе не дозвољавају примену честица мањег пречника и могу се безбедно извести без значајних неуролошких и системских компликација.

**Кључне речи:** јувенилни назофарингеални ангиофибром; емболизација; партикуле великог промера