Turn it in PREOPERATIVE EMBOLIZATION FOR NASOPHARYNGEAL ANGIOFIBROMA

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CASE REPORTS

PREOPERATIVE EMBOLIZATION FOR NASOPHARYNGEAL ANGIOFIBROMA

EMBOLISASI PRA OPERATIF UNTUK ANGIOFIBROMA NASOFARINGEAL

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ABSTRACT

Background: Juvenile nasopharyngeal angiofibroma (JNA) is a rare benign vascular tumor that almost exclusively affects adolescent males. Despite its benign nature, JNA demonstrates locally aggressive behavior and is associated with significant intraoperative bleeding. Preoperative embolization has become an important modality to reduce tumor vascularization and minimize intraoperative blood loss. The Objective of this case report is to discuss the role of preoperative embolization in the management of JNA, including relevant vascular anatomy, embolic materials, benefits and limitations, as well as local case experiences in Indonesia.

Methods: A literature review was conducted on the external carotid artery anatomy, etiology, epidemiology, histopathology, tumor spread and staging, and preoperative embolization techniques using various materials such as gelfoam, polyvinyl alcohol, ethanol, and microspheres. Additionally, two cases of JNA at Cipto Mangunkusumo Hospital were reported, both treated with preoperative embolization using gelfoam prior to transpalatal tumor resection.

Results: In both cases, embolization successfully reduced tumor vascularity. However, due to surgical delay beyond 48 hours after embolization, intraoperative bleeding remained significant (800–1000 mL). Both patients recovered uneventfully without postoperative complications, and histopathological findings confirmed JNA.

Conclusion: Preoperative embolization is effective in reducing intraoperative blood loss during JNA surgery and should ideally be performed within 24–48 hours before resection. This approach facilitates safer tumor removal, although its optimal success depends on timing, embolization technique, and operator expertise.

Keywords: Gelfoam, intraoperative bleeding, juvenile nasopharyngeal angiofibroma, preoperative embolization, , transpalatal approach

ABSTRAK

Latar Belakang: Angiofibroma nasofaring juvenil (ANJ) adalah tumor vaskular jinak langka yang hampir secara eksklusif menyerang pria remaja. Meskipun sifatnya jinak, ANJ menunjukkan perilaku agresif lokal dan berhubungan dengan perdarahan intraoperatif yang signifikan. Embolisasi praoperatif telah menjadi modalitas penting untuk mengurangi vaskularisasi tumor dan meminimalkan kehilangan darah intraoperatif. Tujuan laporan kasus ini adalah untuk membahas peran embolisasi praoperatif dalam penatalaksanaan ANJ, termasuk anatomi vaskular yang relevan, bahan emboli, manfaat dan keterbatasannya, serta pengalaman kasus lokal di Indonesia.

Metode: Tinjauan pustaka dilakukan mengenai anatomi arteri karotis eksterna, etiologi, epidemiologi, histopatologi, penyebaran dan stadium tumor, serta teknik embolisasi praoperatif menggunakan berbagai bahan seperti gelfoam, polivinil alkohol, etanol, dan mikrosfer. Selain itu, dua kasus ANJ di Rumah Sakit Cipto Mangunkusumo telah dilaporkan, keduanya ditangani dengan embolisasi praoperatif menggunakan gelfoam sebelum reseksi tumor transpalatal.

Hasil: Pada kedua kasus, embolisasi berhasil mengurangi vaskularitas tumor. Namun, karena penundaan pembedahan lebih dari 48 jam setelah embolisasi, perdarahan intraoperatif tetap signifikan (800–1000 mL). Kedua pasien pulih tanpa komplikasi pascaoperasi, dan temuan histopatologi mengonfirmasi adanya JNA.

Kesimpulan: Embolisasi praoperatif efektif dalam mengurangi kehilangan darah intraoperatif selama operasi JNA dan idealnya dilakukan dalam 24–48 jam sebelum reseksi. Pendekatan ini memfasilitasi pengangkatan tumor yang lebih aman, meskipun keberhasilan optimalnya bergantung pada waktu, teknik embolisasi, dan keahlian operator.

Kata kunci: Angiofibroma nasofaring juvenil, embolisasi praoperatif, gelfoam, perdarahan intraoperatif, pendekatan transpalatal

INTRODUCTION

Juvenile nasopharyngeal angiofibroma (JNA) is a rare, benign, vascular neoplasm that accounts for less than 0,5% of all head and neck tumors.[1-3] Hippocrates described the tumor in the 5th century BC, and Chelius associated the tumor with adolescent males in 1847. The term angiofibroma was first described by Friedberg in 1940. Other terms (eg, nasopharyngeal fibroma, bleeding fibroma of adolescence, fibroangioma) have also been used.[4]

Different suggestions have been made regarding the anatomical point of origin of JNA, e.g., the pharynx, pterygoid plates, and sphenopalatine region. A recent study suggests that the tumor arises in the pterygopalatine fossa at the pterygoid canal aperture.[5]

JNAs are slow-growing and initially expand intranasally into the nasopharynx and nasal cavity and then into the pterygomaxillary space. Over time, JNAs will eventually erode bone and invade the infratemporal fossa, orbit, and middle cranial fossa. Although JNA is a benign tumor, intracranial extension has been reported in 10–20% of cases, characterized by local aggressive growth.[6,7]

The vascular supply of the JNA depends on the tumor's size and extent. In the initial stages, when the tumor grows in the anterior nasopharynx and the posterior portion of the nasal cavity,

there is a constant vascular supply from the distal internal maxillary artery and its distal branches extending to the nasopharynx and the nasal cavity (sphenopalatine and pterygopalatinal artery). As the tumor grows and involves more regions (sphenoid sinus, parapharyngeal space, etc.), other vessels from both the external and internal arteries will contribute to its vascular supply.[8]

Treatment options for JNAs include surgery, radiation therapy, chemotherapy, and hormone therapy. Surgical resection is the gold standard of treatment.[1-3]

Preoperative selective endovascular embolization of feeding vessels from the external carotid artery has significantly reduced intraoperative blood loss and aided in the resection of larger tumors. Embolization is usually performed 24-72 hours before resection. Commonly used materials include Gelfoam and polyvinyl alcohol foam. Gelfoam lasts about two weeks, while polyvinyl alcohol foam is more permanent. Gelfoam is widely used as an embolic material at Cipto Mangunkusumo Hospital because it is cost-effective and causes minimal tissue reactions.[9-11]

The goal of preoperative endovascular embolization is to achieve tumor devascularization while preserving a normal vascular supply to the surrounding tissue. The selective obliteration of the intratumoral vascular net may accomplish this. Reduction in preoperative blood loss after embolization may facilitate tumor exposure and the anatomical identification of important structures during surgery, increasing the likelihood of achieving radical tumor removal and, in turn, reducing the recurrence rate.[11-14]

This case report presents two cases of juvenile nasopharyngeal angiofibroma managed with preoperative embolization and surgical resection, emphasizing the benefits and timing of preoperative embolization.

External Carotid Artery (ECA) Anatomy

Understanding the anatomy of the ECA is essential for safe and effective endovascular therapy. The ECA originates from the bifurcation of the common carotid artery and lies anterior to the internal carotid artery (ICA) in 94% patients. The ECA gives eight small branches, and the last branch is the largest, known as the internal maxillary artery (IMA).[15-17]

The first branch of the ECA is the superior thyroidal artery, which arises anteriorly and courses inferiorly to supply the larynx and thyroid gland. The second artery branch is the lingual artery, which arises anteriorly and consists of two portions: a posterior carotid segment and an anterior lingual segment. The former supplies the hypoglossal region, which is important in endovascular terms for tumors bleeding from the floor of the mouth. The more distal anterior lingual segment also supplies the floor of the mouth and, most importantly, the tongue via the sublingual and deep branches.[18-20]

Superior to the lingual artery is the facial artery, which is divided into two segments. The horizontal segment provides a branch to the lateral pharynx and the tonsillar region, as well as the hard and soft palate, before continuing in the submandibular region, where it supplies the submandibular gland and the floor of the mouth. The superficial segment crosses the mandible before passing superiorly, supplying branches to the chin and lower lips.[18]

The next branch is the ascending pharyngeal artery. This artery is divided into two divisions. The first is the anterior division, which supplies pharyngeal tissues, which are important in the

endovascular realm in the embolization of tympanicum and jugulare paragangliomas. The last is the posterior division, which supplies the paravertebral muscles and also contributes the arterial branches to the ninth, 10th, 11th, and 12th cranial nerves. [18]

The occipital artery usually arises from the posterior to the ascending pharyngeal artery. Three segments have been variably described as the ascending, horizontal, and the second ascending segments. The first ascending segment provides the muscular branches and branches to the 12th cranial nerve. The horizontal segment of the occipital artery provides muscular and meningeal branches. The last ascending segment of the occipital artery, for the most part, provides only to the skin and tissues of the posterior cranium.[18]

The posterior auricular artery arises from the posterior ECA just above the occipital artery. This artery supplies the medial surface the pinna, the post auricular scalp, and the parotid gland. The superficial temporal artery arises from the ECA superiorly and gives branches to the parotid gland before coursing superiorly to supply the muscular and cutaneous tissues of the posterior face, anterior pinna, and a large portion of the scalp.[18]

The internal maxillary artery is the terminal branch of the ECA. It arises at the neck of the mandible, past the origin of the superficial temporal artery, where it supplies the parotid gland. The initial segment of the maxillary artery courses anteriorly, becoming the second segment over the pterigoid muscle and giving rise to the middle meningeal artery (MMA) and the accessory meningeal artery. The third segment courses around the maxilla, lying in the pterygopalatine fossa, and is therefore better seen in the anteroposterior projection angiographically. There are three small branches, but important vessels arise near the termination of the IMA and course posteriorly: the vidian artery, the pharyngeal branch, and the artery of the foramen rotundum, all of which represent potential collateral supply to the cavernosus ICA. The terminal branch of the IMA is the sphenopalatine artery, which supplies the medial and lateral walls of the nasal cavity, as well as the sphenoid, ethmoid, and maxillary paranasal sinuses. It characteristically divides into two terminal branches, the posterior nasal and posterior septal arteries. Here, there is an extensive collateral network involving small vessels, including the ethmoidal collateral pathway, which offers a route to the internal carotid circulation via the ophthalmic artery. The sphenopalatine artery is of the greatest interest in the performance of embolotherapy for epistaxis and for tumors of the nasopharynx, most notably JNA. [18]

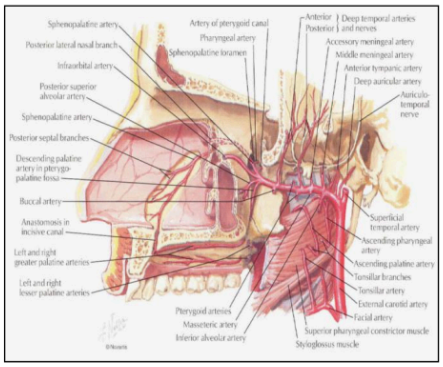

Figure 1. Anatomy of internal maxillary artery. Adapted from Sobbota[21]

Etiology

The etiological background of this tumor remains unresolved. Over decades, several authors have investigated the possibility of a tumor site in the nasopharynx whose growth patterns are under the influence of fluxes in the circulating levels of sexual hormones.[3,4,22]

Martin, in 1987, as described by Carroll, suggested that tumor growth was due to a relative overproduction of estrogens or a lack of androgens. Wallike and Mackay demonstrated that ethylstilbestrol decreases endothelial cell growth potential and stimulates fibrous tissue growth. Maurice and Milad, as adapted by Carroll, further support this theory in 1981. They concluded that the JNA arose from ectopic genital tissue, which grew under the influence of male sex hormones during puberty. Farag and coworkers studied tumor samples from seven males and presented their findings in 1987. The results of their analyses led to the following observations: that the angiofibromatous tissue was not, in fact, ectopic sequestered genital tissue, but normal nasal mucosa with an excess of androgen receptors that grew during puberty as a result of fluctuations in circulating levels of male sex hormones. [22]

The investigators then hypothesized that growth of this vascular tissue was secondary to hormonal fluctuations in the male during puberty, but no definitive study is available that has quantified angiofibroma growth rates in relation to changes in estrogen and androgen levels.[22]

Epidemiology

JNA is a rare tumor — reportedly accounting for ~0.05–0.5% of all head-neck tumors and almost exclusively found in adolescent males (mean age of modern reports ≈ 15–17 years). Some studies/reviews report that intracranial extension occurs in a wide reported range — often cited as approximately 10–36% (varies between series and definitions of intracranial extension). Modern review studies and case series/review studies confirm the above clinical/epidemiological picture (mean age ≈ 15–17 years; almost exclusively male; rare but possible intracranial extension).[23-26]

Histopathology

Grossly, the JNA is a lobulated, firm, non-encapsulated mass, usually pink-gray or purple-red. The tumor base may be sessile or pedunculated, but the tumor often has numerous secondary attachments, complicating resection in continuity.[4]

Microscopically, the tumor is composed of thin-walled vessels of varying caliber in a mature connective tissue stroma. The vessels typically have a single endothelial cell lining without a muscularis layer, which probably explains the tumor's propensity for hemorrhage.[1,4]

Tumor Spread and Staging

The origin of JNA is usually broad-based on the posterolateral wall of the nasal cavity, where the sphenoidal process of the palatine bone meets the horizontal ala of the vomer and the root of the pterygoid process of the sphenoid. This area forms the upper part of the sphenopalatine foramen and the posterior part of the middle turbinate. From its origin, the tumor spreads into the nasal cavity and nasopharynx, displacing the soft palate downward and sometimes becoming visible through the mouth. At the same time, the tumor extends laterally through the sphenopalatine foramen into the pterygomaxillary fossa. From there, the JNA exerts pressure on

the surrounding bony walls. Anteriorly, it pushes the posterior wall of the maxillary sinus forward, creating the classic "antral bowing sign" visible on x-ray. Posteriorly, it disrupts the root of the pterygoid plates. Superiorly, the tumor expands into the orbit via the inferior orbital fissure, eventually continuing into the superior orbital fissure and middle cranial fossa. As the tumor traverses the superior fissure, it widens its lower lateral margin, another radiographic sign. With further lateral expansion, the tumor passes through the pterygomaxillary fissure into the infratemporal fossa, often causing a bulge in the cheek. If it reaches the temporal fossa, the tumor can create a bulge above the zygoma. The greatest risk of uncontrolled JNA growth is intracranial extension. The tumor reaches the cranial vault via three pathways. The two lateral pathways are through the superior orbital fissure and directly through the greater wing of the sphenoid bone from the pterygomaxillary and infratemporal fossa. These pathways position the JNA lateral to the carotid artery and cavernous sinus. The medial pathway, which can bring the tumor into contact with the pituitary and optic chiasm, leads straight through the sphenoid sinus and sella turcica, medial to the carotid and cavernous sinus. A tumor in this area can be extremely difficult or impossible to resect without unacceptable morbidity. Fortunately, this pathway is less common than the lateral pathways.[4,16]

In accordance with Chandler's criteria, adapted from Petruson [17], the staging is based on physical examination and radiological imaging (CT scan or MRI). Stage I indicates the tumor is confined to the nasopharynx. Stage II indicates tumor extension into the nasal cavity and/or sphenoid sinus. Stage III indicates tumor extension into the antrum, ethmoid sinus, pterygomaxillary or infratemporal fossa, orbit, cheek, or any combination of these. Stage IV indicates tumor extension into the intracranial region.

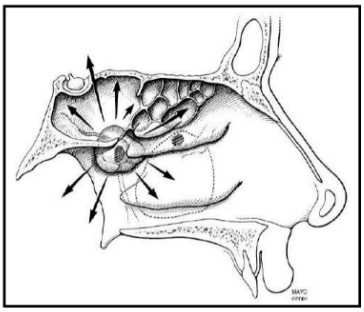

Figure 2. Tumor expansions adapted from Hauptmann.[21]

Preoperative Embolization

The preoperative embolization of vascular tumors theoretically makes them smaller, softer, less bloody, and therefore easier to manipulate and remove surgically. This should shorten operative time, reduce blood loss, and lessen the potential for injury to surrounding tissues from retraction and manipulation, thereby enhancing more precise tumor resection. The goal of tumor embolization, particularly in the preoperative setting, is to obliterate the capillary bed as nearly as

possible while preserving normal tissue, particularly in the brain, cranial nerves, and skin. Embolization that occludes only the feeding arteries affords little advantage over surgical ligation at the time of surgery.[27,28]

The vascular supply to the neoplasm can be predictable in the early stage of the disease when the ipsilateral internal maxillary artery is the main feeding vessel. With progressive enlargement of the tumor, other arteries, such as the ascending pharyngeal artery, greater palatine artery, and, occasionally, the occipital artery, may also contribute to the blood supply. With further tumor growth into the infratemporal fossa, the superficial temporal artery and the external facial artery can also participate in the tumor supply. When a tumor enters the inferior orbital fissure or the central nervous system (CNS), it is also fed by branches from the internal carotid system. In JNA crossing the midline, a bilateral supply from the external carotid arteries is common. Branches from the internal carotid system can join the neoplasm even in the absence of intracranial extension.[27]

The most useful angiographic view of the ECA is the lateral view, which profiles nearly all vessels. Only distal portions of the occipital and internal maxillary arteries are best seen on the frontal projection. Angiography for proposed embolization of the ECA must include views of the extracranial and intracranial ICA and the ECA, as well as super selective views of each ECA branch before embolotherapy. Injection of the common carotid artery is usually adequate for visualization of important ICA anatomy, particularly vessel occlusion and the origin of the ophthalmic artery. The two most important aspects of ECA angiography are to completely visualize the abnormality in question and to identify intracranial and ophthalmic artery connections.[27, 28]

Recognition of occlusion of the extracranial ICA or its intracranial branches is of utmost importance before embolization because of the presence of potential ECA-to-ICA collateral vessels. Although one may not always be aware of the exact anatomic names for these connections, careful angiography with adequate contrast medium injections and high-quality imaging over the cranium will identify the presence of intracranial circulation. When one is embolizing posteriorly, particularly in the ascending pharyngeal and occipital arteries, the integrity of the vertebrobasilar system must also be assessed to prevent inadvertent embolization via muscular collaterals. [27, 28]

Superselective catheterization of the feeding vessels using a microcatheter system yields better results, based on blood loss and operative time, and is associated with fewer complications than subselective placement of a diagnostic catheter into the proximal ECA. The choice of a microcatheter should be based on the proposed embolic agent and the interventionist's preference. [27]

Diagnosis

The diagnosis of JNA can usually be made from history and physical examination. Presenting signs and symptoms are determined by the tumor's location, size, and extent. The initial complaint is progressive nasal obstruction with rhinorrhea. The patient then develops recurrent epistaxis, which is usually the reason for seeking medical advice. Eustachian tube obstruction can produce a conductive hearing loss. Extension of the tumor into surrounding areas can produce facial swelling and sinusitis. Further extension into the orbit and intracranial fossae may produce cranial nerve deficits. Patients are frequently followed with an initial diagnosis of sinusitis, rhinitis, or antral choanal polyps before the correct diagnosis is obtained. The duration of symptoms before

treatment has declined from 20 months in the past two decades to 6 months presently. This is attributed to the increased availability of the Computer Tomography scan (CT scan).[29,31]

Additional studies are needed to confirm the diagnosis and determine the best treatment. The first diagnostic study following a complete history and physical is a CT scan with contrast in both axial and coronal planes. JNA has several characteristic radiographic features; the location, pattern of spread, and enhancement allow for accurate diagnosis. Two findings on CT considered by many to be pathognomonic are: 1) anterior bowing of the posterior wall of the maxillary sinus and 2) a dense homogeneous enhancement with contrast. Other frequent findings include erosion of the sphenoid bone, erosion of the hard palate, erosion of the medial wall of the maxillary sinus, and displacement of the nasal septum. [31]

Since 1987, in some institutions, Magnetic Resonance Imaging (MRI) has replaced contrast-enhanced CT as the diagnostic procedure of choice for JNA. The advantages of MRI include multiplanar imaging and enhanced three-dimensional assessment of the tumor, improved definition at the cribiform plate and cavernous sinus, improved differentiation of tumor from inflamed mucosa and fluid in the paranasal sinuses, and avoidance of diagnostic radiation in young patients who require serial follow-up studies. Recent articles have explored the merits of MRI, and some authors consider it superior to CT in delineating tumor margins and revealing tumor vascularity. [29,30]

Therapy

Surgery

Primary surgical removal of an angiofibroma is generally regarded as the primary treatment. The surgical approach chosen will depend on the stage of the disease as determined by clinical and radiological assessments. The approach must allow for adequate exposure to visualize and remove the tumor. However, other factors should also influence the surgical plan, such as the patient's age, potential growth of the facial skeleton, and the need to minimize functional and aesthetic deformities of the craniofacial structure.[32, 33]

Type I or II tumors are approached through a transpalatal or lateral rhinotomy procedure. The transpalatal procedure is used for the smaller lesion. It avoids a facial incision, but the exposure provided is more limited.[34, 35]

Tumors involving the nasal cavity and extending anteriorly and inferiorly into the maxillary sinus can be approached through a midfacial degloving incision. Tumors that extend to involve the ethmoid sinus and the nasopharynx can be approached using a lateral rhinotomy incision with a mono or bilateral reflection of the nasal pyramid, depending on the extent of the tumor.[36,37]

A tumor that extends to involve the entire nasal cavity and the maxillary sinus with erosion of the posterior wall of the sinus is best approached through a Weber–Fergusson incision. Tumors where the main ethmoidal-sphenoidal extension involves the anterior skull base are approached through a bicoronal incision and an anterior craniofacial resection. [37]

The infratemporal fossa approach is best suited to tumors that extend to the infratemporal fossa and to tumors with involvement of the middle cranial fossa and the lateral part of the cavernous sinus. When the pterygopalatine space widens due to the tumor, adequate visualization of the contralateral nasopharynx may be achieved following partial tumor removal. Additional

exposure of the nasopharynx can be achieved by removal of the outer cortex of the infratemporal skull base at the base of the pterygoid plates. [36, 37]

Radiation

External beam radiation is generally reserved for larger and/or unresectable tumors, as well as those that are life-threatening due to their location. The reason for the limited use of radiation as a treatment modality is due to the potential carcinogenic side effects of radiation. Local control and recurrence rates are comparable to those of surgery. [31]

Princess Margaret Hospital, as described by Carroll in Toronto, has the largest experience in treating JNA with primary radiotherapy. They suggest that primary radiotherapy is as effective as primary surgery and poses no greater threat of serious morbidity. They state that with accurate CT imaging of the disease extent and adequate radiation fields, control rates in excess of 80% could be achieved. Their treatment protocol consists of external beam radiation of 3000-3500 cGy delivered over 3 weeks. Tumor regression following radiation treatment takes place slowly, over a period of 12-20 months.[9]

However, in this modality, severe complications are encountered, including growth retardation, temporal lobe radionecrosis, panhypopituitarism, cataracts, and radiation-induced keratopathy. Tumor recurrence after radiation therapy may be very slow.[38]

Chemotherapy

Chemotherapeutic agents have been used by one center. Goepfert, as reported by Carroll 10 and Ungkanont 5 in 1985, treated five patients with two chemotherapeutic regimens. The first regimen was a combination of doxorubicin 60 mg/sq m administered intravenously (IV) on day 1 and dacarbazine, 250 mg/sq m, administered IV for 5 days and repeated every 3 or 4 weeks. The second regimen included vincristine sulfate at 2 mg/sq m given IV once a week for 12 weeks, dactinomycin at 0.015 mg/kg/day administered IV for 5 days every 3 months, and cyclophosphamide at 10 mg/kg/day administered IV.[5]

Then he suggested that chemotherapeutic agents should be used in the management of residual disease when surgery or radiotherapy were not indicated. [37]

Hormonal therapy

Because of the presumed hormonal dependency of JNA, many investigators have attempted to treat the tumor with hormonal therapy. Although many authors have reported a reduction in tumor size and intraoperative blood loss with estrogen therapy, the results have not always been consistent. Most studies of JNA hormonal receptors have demonstrated the presence of cytosolic androgen receptors but the absence of estrogen or progesterone receptors, suggesting that the action of estrogen on these tumors is indirect, possibly through hypothalamic suppression and reduced secretion of luteinizing hormone, and subsequently reduced secretion of testosterone. Currently, preoperative estrogen therapy is not used routinely because of 1. the variable effect of estrogen upon the tumor's growth; 2. the delay in carrying out definitive removal; 3. the undesirable feminizing side effects and the risk of cardiovascular complications; and 4. the widespread availability of angiographic embolization for vascular control. [36, 37]

According to Schiff's study, administering 15 mg of oral estrogen once daily to JNA for 4-6 weeks before surgery can reduce tumor size and promote the development of fibrous tissue, thereby reducing blood volume during the operation. [36]

CASE REPORT

Case Report I

On January 9, 2018, a nineteen-year-old male patient presented to the Sub-Department of Oncology with a chief complaint of headache associated with nasal stuffiness for the last three months. He also mentioned his massive, hard-to-stop nosebleed. However, he explained the absent of the symptoms of hearing and vision impairments. Neither did he have any complaint about swallowing difficulty or hard-to-breathe symptoms. In 2002, the patient was diagnosed with nasopharyngeal angiofibroma, followed by surgery and then by 28 sessions of radiation therapy. His pathology anatomy showed nasopharyngeal angiofibroma. However, 3 years after the surgery, he started to suffer from nasal obstruction and epistaxis.

Upon ENT examination, a smooth, pink, lobulated mass was found in his left nasal cavity, partially covered by mucous and a blood clot. His right nasal cavity was found to be wide, and no mass was detected. Septal deviation was not found. Nasoendoscopic examination revealed a smooth, pink-colored mass occupying 1/3 of the anterior left nasal cavity. No abnormality was found in the right nasal cavity. Ear and mouth examinations revealed no abnormalities. His neck examination showed no evidence of lymph node enlargement.

CT scan examination in February 2017 concluded that a mass in the left nasal cavity was enhanced on contrast, extending to the left parapharyngeal space, the pterygoid muscle, and the left ethmoid and sphenoid sinuses. Chest X-ray and laboratory tests were within normal limits.

A follow-up meeting was then confirmed to establish a working diagnosis of recurrent JNA stage III (Chandler's classification). He was then planned to undergo a tumor extirpation surgery through a transpapillary approach preceded by an embolization.

On March 29, 2018, arteriography and embolization with Gelfoam were performed, leading to the conclusion that embolization was successful for a hypervascular mass supplied by both the right and left maxillary arteries. It was suggested that the patient undergo a follow-up surgery within 48 hours of the embolization.

On April 2, 2018, a surgery was conducted, leaving the following reports: After the patient had been put into narcosis, antiseptic actions were conducted in the face, soft, and hard palate areas. Mouth gauge was placed, and incision was conducted from the left soft palate lateral up to the palatum durum edges. The tumor base originates from the superior aspect of the sphenopalatine foramen. The Respatorium device was placed inside the tumor. The tumor was then gently released and pulled out through the palate. Bleeding was handled with posterior nasal packing and NGT no. 14 insertions. After surgery, wounds were stitched 3 times with absorbable sutures. Bleeding volume was $\pm$ 800 mL. Patient was then hospitalized in the ENT ward and received therapies of ceftriaxon 1 X 2 gr, tramadol 3 X 1 gr, ranitidine 2 X 1 amp, and diet per NGT.

After the surgery, the patient did not develop a fever or any bleeding from his nose or throat. He has complained of a little throat pain. After surgery, the wound has remained calm. Hemoglobin check after the surgery showed 11,8 g/dL. Five days after surgery, the posterior nasal packing was removed in the operating room, and no bleeding occurred.

On day 7 after surgery, the NGT was removed, and the wound was evaluated as healed. The patient was then permitted to go home and was advised to perform a self-reexamination one week later. Histopathology results were consistent with nasopharyngeal angiofibroma.

Case Report II

A fourteen-year-old male patient presented to the ENT Oncology Sub-Department with the chief complaint of a mass in the bilateral nasal cavity for 8 months. There was a bleeding mass, with difficulty in spontaneously stopping the bleeding. The patient had frequent headaches and rhinitis. There was no hearing impairment nor any visual function impairment. There was no discomfort nor difficulty in swallowing function.

On ENT examination, there was a red mass filling both of the nasal cavities, smooth and lobulated in shape, and covered by clothing. On ear and throat evaluation, there was no abnormality detected. There was no enlargement of neck lymph nodes.

The result of the CT scan examination revealed a mass enhanced with contrast in the oropharynx, both sides of the nasal cavities, bilateral maxillary and ethmoid sinuses, and the sphenoid sinus.

The patient was discussed in the oncology sub-department and classified as JNA stage III (Chandler's classification). The patient planned to undergo surgery after carotid angiography, preceded by embolization.

On 27 April 18, the patient underwent arteriography with the result a hypervascularized lesion with vascular feeding from bilateral external maxillary arteries, and then the patient underwent embolization using Gelfoam in both arteries. Evaluation after embolization revealed no hypervascular area and contrast pooling from bilateral external maxillary arteries.

Surgery was performed on 30 April 2018 with the following reports was: After the patient in general anesthesia, asepsis and antiseptic procedure were done in the face and palate area. The mouth gag was inserted, and the incision started from the left lateral soft palate to fill the borderline of the hard palate. Identification of the tumor's base. There was a mass on the top of the nasopharynx that extended to both sides of the nasal cavity. The respatorium device was inserted until the peduncle of the mass. Next, the mass was released as gently as possible and pulled out through the oropharynx. The second evaluation revealed that there was a remnant tumor in the left nasal cavity. The mass was released by a respatorium device gently and extracted by tumor forceps. Bleeding was handled with posterior nasal packing and NGT no. 14 insertions. After surgery, wounds were stitched 3 times with absorbable sutures. Bleeding volume was ± 1000 mL. Patient was then hospitalized in the ENT ward and received therapies of ceftriaxon 1 X 2 gr, tramadol 3 X 1 gr, ranitidine 2 X 1 amp, and diet per NGT.

After surgery, the patient didn't have a fever or bleeding from the nose and throat. There was no infection at the operative site, and the laboratory examination showed normal limits. Seven days after the operation, posterior nasal packing was removed in the operating theatre, and there was no bleeding. On day nine, the NGT was removed, and the palatal wound was good. Histopathologic results were consistent with nasopharyngeal angiofibroma.

Patient was discharged and suggested having control periodically to the Oncology Sub-Department.

DISCUSSION

The diagnosis of JNA was based on anamnesis, physical examination, and supporting examinations. According to the literature, JNA is most often found in adolescent men.

Based from anamnesis of these patients, they complained of a mass in the nasal cavity that bleed easily, nasal blockage and chronic rhinitis. In the literature, we will find triad symptoms of JNA that include nasal blockage, epistaxis that won't resolve easily, and chronic rhinorea. Appearance of a red mass and easy bleeding in adolescent males can be suspected as JNA. Biopsy was not performed in these cases because of the risk of massive hemorrhage that is difficult to overcome.

Computer tomography with contrast, in axial and coronal planes, should be performed to visualize the tumor's location, expansion into adjacent tissues, and bone erosion caused by compression of the mass. In these cases, CT scans showed an enhanced mass in the nasal cavity, ethmoid sinus, and sphenoid sinus. There was no sign of bone destruction and intracranial infiltration. According to the Chandler criteria, these patients were classified as juvenile angiofibroma fibroma stage III.

Preoperative arteriography and embolization were performed to reduce vascularization of the tumor. Arteriography was performed in both right and left external carotid arteries due to the size of the tumor that crossed the midline. In accordance with the literature, tumors that cross the midline receive blood supply from the right and left internal maxillary arteries and the internal carotid artery, even though there is no intracranial infiltration.

Preoperative embolization should be prioritized over ligation of the external carotid artery because it can selectively occlude the tumor's feeding artery. For optimal results, preoperative embolization should be followed by surgery within 48 hours; however, in these cases, due to the complexity of the hospital's administrative system, surgery was delayed. Both patients underwent surgery on day 4 after embolization. This was explained by the fact that the intraoperative blood volume reached 1000 mL in the second patient. This could be due to collateral blood supply in the area around the tumor or to the mass crossing the midline receiving blood supply from the internal carotid artery. Additionally, intraoperative blood volume is affected by the stage of the tumor and the embolic material used. Ungkanont, in his retrospective study of 18 patients who received embolization, reported intraoperative blood loss of only 675 cc. In these patients, no complications occurred after carotid embolization.[5]

The transpalatal approach was chosen in these cases because it provides good visualization of the nasopharyngeal tumor and extends into the posterior nasal, ethmoid, and sphenoid sinuses. Previous studies have stated that the transpalatal approach provides good access to tumors in the nasopharynx that extend to the choana, ethmoid, and sphenoid sinuses. Two weeks after surgery, there is no residual tumor in both patients in the nasoendoscopic examination. [39-41]

CONCLUSIONS

Preoperative embolization can significantly reduce blood volume during JNA surgery; therefore, it is advisable to perform embolization as a preoperative treatment option. Because of the high recurrence rate of this tumor, examination should be performed periodically by a rigid nasoendoscopic instrument to visualize the recurrence of the tumor.

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CONFLICT OF INTEREST

Competing interests: No relevant disclosures.

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