Endovascular Management for Head and Neck Tumors

Paula Klurfan and Seon Kyu Lee

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Head and neck tumors consist of primary tumors arising from various regional tissues including lymph nodes and metastatic lesions. Most of these lesions are highly vascularized due to both abundant vascularity of the head and neck region and their histological types.

Magnetic resonance imaging (MRI) is the most useful imaging study for the initial evaluation of head and neck tumors. Computed tomography (CT) is also helpful in defining the anatomical disposition of these lesions. In addition, the CT can provide important complementary information such as the presence of calcifications and the extent of bony involvement. Diagnostic angiography is hardly used as a diagnostic purpose. In fact, its main role is a carrier for the endovascular procedures for head and neck tumor managements. Endovascular procedures for head and neck tumors consist of (1) selective devascularization procedures of the feeding arteries such as transcatheater arterial embolization and (2) adjunctive embolotherapy including intraarterial chemoembolization. Functional vascular embolization such as intra-arterial chemotherapy for malignant head and neck cancers to maximize local concentration with minimized toxic effect has also been studied, however, further investigations are necessary for its clinical application.

19.1 Nasopharyngeal Tumors

Juvenile angiofibroma (JAF) represents 0.5% of the head and neck tumors [1] and 15% of nonepithelial tumors of the nasal and paranasal cavities [2]. It is the most common benign tumor of the nasopharynx and is typically diagnosed on adolescent males, with a peak age of 14–17 years. However, up to 20% of these tumors are diagnosed after the age of 20 [3]. The most frequent clinical presentations of juvenile angiofibroma are nasal obstruction and recurrent nose bleeding. These symptoms can be followed by sinusitis, otitis, hearing loss, or anosmia. Life-threatening massive nose bleeding can occur and is often difficult to control with nasal packing. In these cases, it requires urgent endovascular treatment after blood transfusion and establishment of diagnosis. The growth of JAF seems to be influenced by hormonal activity, although tumor samples fail to show the presence of estrogen, progesterone, or androgen receptors.

Tumors developing in the nasopharyngeal region in the adult population are most likely to be malig-
nant. Intra-arterial embolization may play a significant role when performed prior to diagnostic biopsy, radical excision or palliative treatment.

The angiographic and therapeutic protocols described for JAFs are applicable to other hyper-vascular tumors of this region. Percutaneous embolization has also been described to be effective in the treatment of severe or recurrent epistaxis from nasopharyngeal carcinomas previously irradiated.

Benign tumors including paragangliomas, neuroblastosomas, esthesioneuroblastosomas, hemangio-pericytomas, and hemangioendotheliomas (most of them are considered malignant) may be diagnosed in the nasopharyngeal region. These tumors are all generally highly vascularized and have a relatively benign course. The treatment strategy for these lesions is a radical surgery whenever possible and therefore they will also be benefited from presurgical embolization.

Extracranial meningiomas are very rare (1%). In some cases they may be located in the parapharyngeal space even though most of the tumors within this location are benign salivary grand tumors or neurogenic tumors like schwannomas.

19.2
Juvenile Angiofibroma

19.2.1
Classification

Several grading systems of JAF have been presented but the Fisch classification [1] is the most extensively used one. Fisch classifies JAF into four types. Fisch type 1 is when the tumor is limited to the nasopharynx and nasal cavity without bony erosion. Fisch type 2 defines a JAF that invades the pterygomaxillary fossa and the maxillary, ethmoid and parasellar region but remains lateral to the cavernous sinus. Type 3 is defined as JAF tumors that invade the infratemporal fossa, orbit and parasellar region but remain lateral to the cavernous sinus. Finally, the type 4 tumors are those that show massive invasion of the cavernous sinus, the optic chiasmal region, or the pituitary fossa.

19.2.2
Anatomic Features

JAF is a highly vascular and locally invasive tumor. It is usually originated from the superolateral aspect of the choana, near the sphenopalatine foramen, but may also arise more medially, near the vomer, from the pharyngeal roof where it involves the body of the sphenoid bone, or from the adjacent pterygoid plates.

Regardless the uncertain histological origin, this tumor has a significant vascularity and proliferative activity. It may cause significant bone erosion, even though the JAF does not invade the bone tissues directly. Attached to the neighboring osseous structures, it extends through the submucosal space into the adjacent open spaces. Macroscopically, JAF is reddish-gray or red purple in color and has a firm rubbery consistency with a lobulated shape. Multifocal tumors have never been reported.

19.2.3
Imaging Features

Imaging (CT, MRI) studies usually show the presence of an expansible lobulated lesion located at the nasopharynx. Due to the local extension of the JAF, it can show significant bony erosion expanding into the surrounding nasopharyngeal cavities, maxillary sinus, and sphenoid sinus and infrequently to the anterior skull base and the orbit (extra-capsular and extraconal). MRI is an excellent complementary study for JAF evaluation. Intracranial invasion and intradural tumor extension can be evaluated and certainly is a decisive factor to determine radical treatment. MRI is also useful to differentiate tumor extension into the sinuses from sinusitis. The contrast enhanced MRI also shows extensive enhancement of tumor due to its hypervascularity (Fig. 19.1a). Contrast enhancement is essential for the JAF CT examination. Reviewing CT scans with both soft tissue and bone window setting is necessary to evaluate the extent of the tumor as well as bony erosions. Coronal and axial views provide good anatomical information regarding the relationships among tumor, nasopharyngeal soft tissues and osseous structures of skull base. On CT, the JAF usually shows displacement and thinning of bony structures without definite bony destructions considering the size of main mass (Fig. 19.1b). These are useful radiologic findings to differentiate the JAF from other malignant tumors in children.