International Journal of Pediatric Otorhinolaryngology, 20 (1990) 169–179
Elsevier

PEDOT 00676

The use of biopsy in the evaluation of pediatric nasopharyngeal masses *

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(Received 8 June 1990)
(Accepted 16 August 1990)

Key words: Juvenile nasopharyngeal angiofibroma; Embryonal rhabdomyosarcoma; Biopsy; Nasopharyngeal neoplasm

Abstract

Pediatric nasopharyngeal tumors are rare, and few clinicians possess more than anecdotal experience. The differential diagnosis includes a diverse group of benign and malignant tumors, but can be narrowed further based on the clinical and radiographic appearance of the mass. Nasopharyngeal angiofibroma has such characteristic angiographic and CT imaging that many authors suggest biopsy is not essential in the evaluation of this lesion. We present a case of a pediatric nasopharyngeal neoplasm with angiographic, CT, and clinical findings consistent with angiofibroma. We then discuss the preoperative evaluation of, operative approach to, and postoperative staging and treatment of the biopsy-proven embryonal rhabdomyosarcoma. A review of the literature pertinent to this case is presented, and recommendations made concerning biopsy of lesions resembling juvenile nasopharyngeal angiofibroma. We believe this report reaffirms the use of histologic study whenever possible, in addition to radiographic imaging, in the diagnosis of pediatric nasopharyngeal masses.

Introduction

Pediatric nasopharyngeal tumors are rare, and few clinicians possess more than anecdotal experience. The differential diagnosis includes a relatively small, yet diverse group of benign and malignant tumors.

* Presented at the SENTAC meeting, Santa Monica, U.S.A., CA, December 3, 1989.

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Angiofibroma is the most common benign tumor of the nasopharynx [18] but accounts for only 0.05% of all neoplasms of the head and neck [1]. The antral choanal polyp is an equally common nasopharyngeal mass [13], but has its origin in the nose and paranasal sinuses. Teratomas, the most common of which are dermoid cysts, are next in order of frequency and often diagnosed in the neonatal or infancy periods. Pedunculate fibromas [10] and hemangiomas are less frequent primary tumors with characteristic appearances. Gliomas, fibrous dysplasia, chondromas, chordomas, and rhabdomyomas have been reported in the nasopharynx, but only sporadically.

In addition, the differential diagnosis must include two reactive vascular proliferations. Longstanding polyps in the nasopharynx may undergo neovascularization as a result of hemorrhagic infarctions and develop prominent blood vessels which have led to their assignment as angiomatous polyps. Pyogenic granulomas also may occur in the nasopharynx, and develop to considerable size. Malignancies of the pediatric nasopharynx include (in order of frequency): rhabdomyosarcoma, squamous cell carcinoma, and lymphoma [13].

Management of the benign tumors is usually surgical, but the approach may vary dramatically depending on the histology, and the anatomic pattern of involvement. The malignant tumors are generally treated with radiation therapy and/or chemotherapy, after histologic confirmation. The necessity of biopsy in the evaluation of pediatric nasopharyngeal masses then should be evident, as it is the histology which will most influence the physician's choice of therapy. The exception to this traditional surgical concept has been the juvenile nasopharyngeal angiofibroma.

Nasopharyngeal angiofibroma is a highly vascular, locally invasive, non-encapsulated tumor with its origin on the posterolateral wall of the nasopharynx. The tumor has a variable proportion of a stromal component, composed of spindle-shaped fibroblasts in a connective tissue matrix, and a vascular component, with wide, thin-walled blood vessels [2]. It typically presents in adolescent males with a chronic history of progressive epistaxis and nasal obstruction, and exam reveals a deep red to pale blue submucosal mass in the nasopharynx (Fig. 1).

The growth pattern of the angiofibroma has been well-described by Neel, and involves extension through the sphenopalatine foramen into the pterygopalatine fossa, with subsequent expansion in this area and spread to the infratemporal fossa and/or the inferior and thence superior orbital fissures [12]. It is this anatomy that allows for its characteristic CT appearance of an enhancing nasopharyngeal mass associated with widening of the pterygopalatine fossa, anterior bowing of the posterior wall of the maxillary sinus (Holman-Miller sign) and erosion of the pterygoid process of the sphenoid bone [9]. A probable diagnosis of nasopharyngeal angiofibroma often leads to carotid angiography on order to: (1) delineate the blood supply of the tumor, in preparation for embolization or surgical ligation, (2) delineate the extent of the tumor, and (3) help clarify the diagnosis, as the angiographic appearance of JNA has been considered diagnostic. At angiography, the blood supply is usually the ipsilateral internal maxillary artery which is displaced anteriorly by the mass. At the small vessel level, there is a dense, homoge-

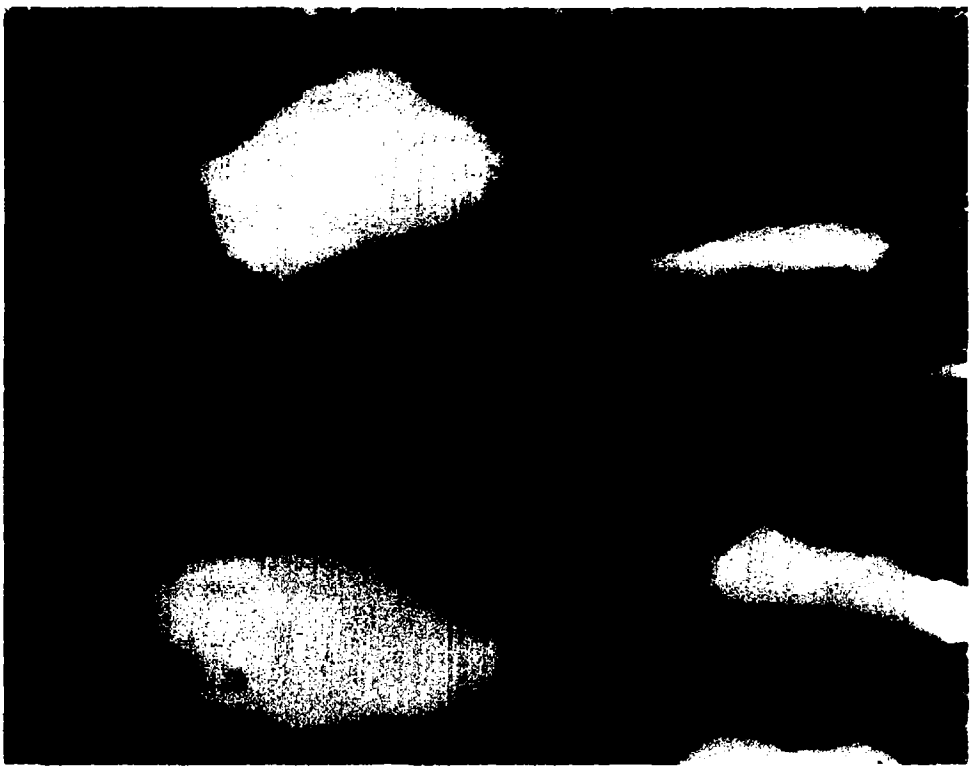


Fig. 1. The typical microscopic appearance of nasopharyngeal angiofibroma showing its stromal and vascular components. Note the wide, thin-walled blood vessels that occupy a significant proportion of the section (H + E).

nous contrast staining of the tumor during the capillary phase [14], and a reticulated pattern during the arterial phase [5].

Nasopharyngeal angiofibroma has such characteristic clinical findings and angiographic and CT images that many authors suggest biopsy is not essential in the evaluation of this lesion [6,7,17]. Most cite troublesome, and even life-threatening, bleeding as the main reason for avoiding routine histologic confirmation of their clinical and radiographic diagnosis. Chandler [4] and Bremer [3] however, still rely on preoperative or intra-operative verification of the diagnosis before surgical resection. Many would argue whether this is necessary given the hazards of biopsy, i.e. hemorrhage and general anesthesia, and the advanced neuroradiologic tools available to the modern otolaryngologist. We present a case of a pediatric nasopharyngeal neoplasm which supports the use of biopsy in the diagnosis of some nasopharyngeal masses.

Case presentation

A 6 years and 9 month old male presented to his local physician with complaints of headache. He was healthy except for seasonal rhinitis and intermittent epistaxis for two years. Sinus films were reportedly abnormal and he was begun on antimicrobial therapy for sinusitis. He then noted diplopia on therapy, and ophthalmologic consultation revealed complete left ophthalmoplegia.

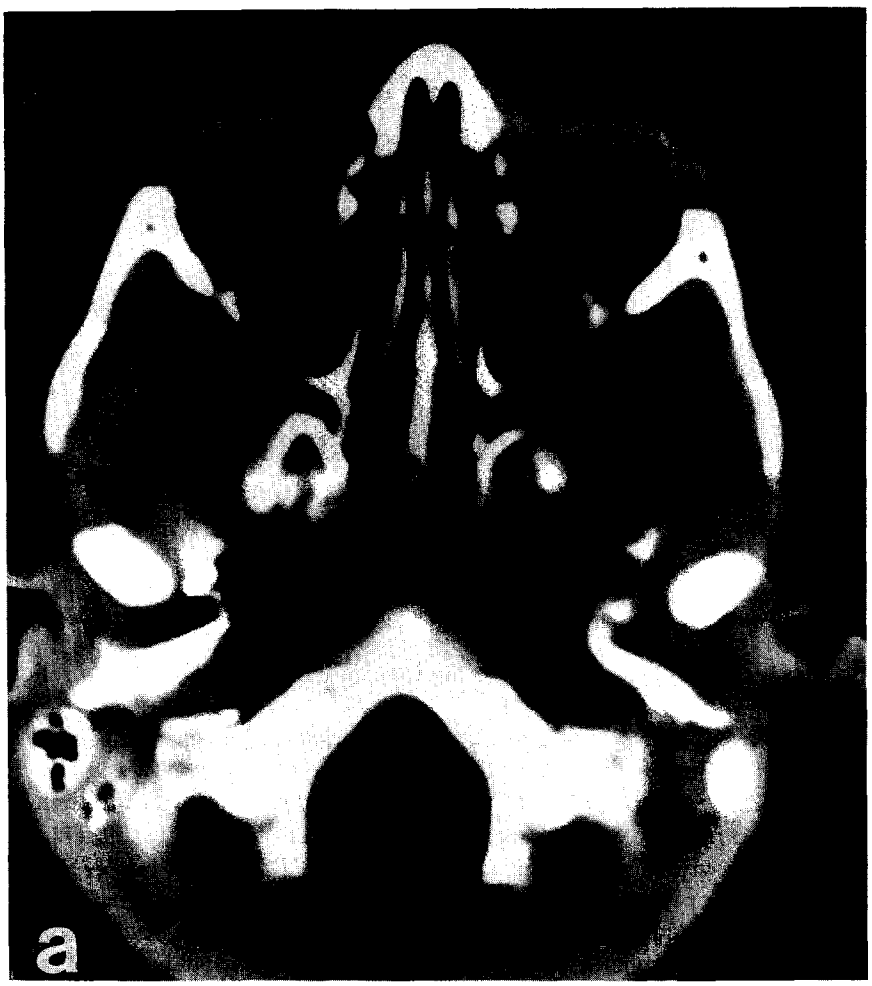


Fig. 2. Axial and coronal contrast enhanced CT images. a: soft tissue is seen to fill a widened pterygopalatine fossa. There is a destruction of the posterior wall of the left maxillary sinus and base of the left pterygoid bone. The mass fills the masticator space and effaces fat planes that surround the pterygoid muscles. There is effacement of fat within the parapharyngeal space and extension of the mass into the nasopharynx. b: coronal image demonstrates destructive extension of the mass into the middle cranial fossa with possible involvement of the left cavernous sinus.

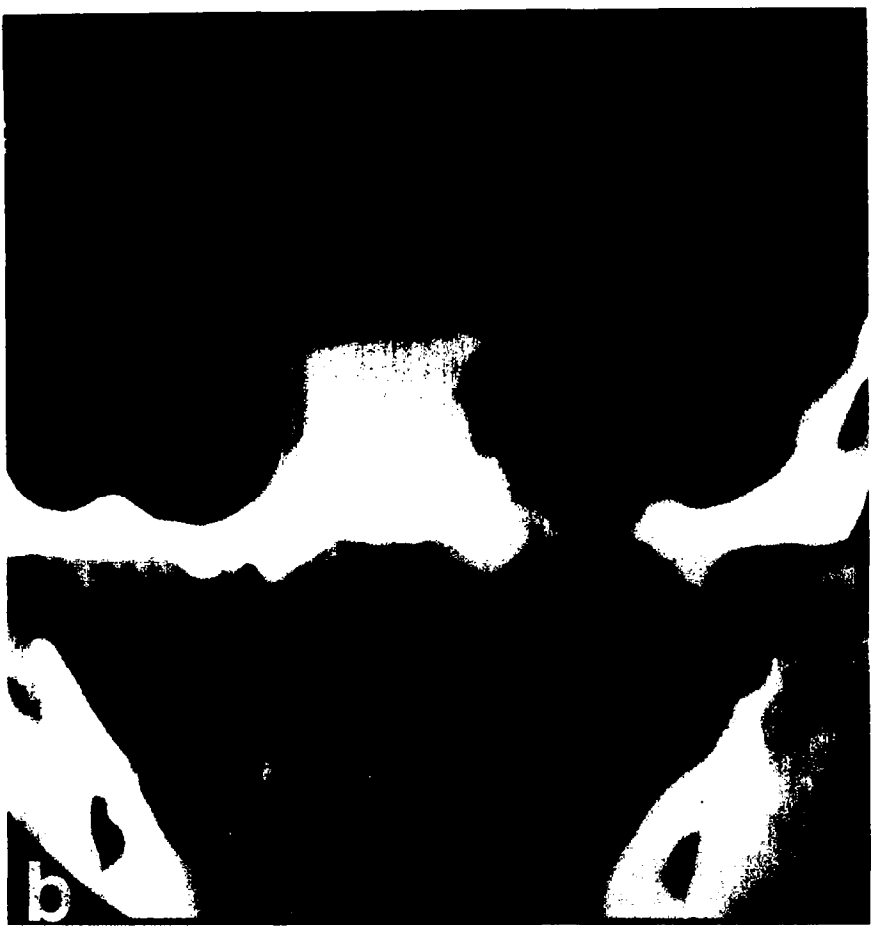


Fig. 2 (continued).

He was referred to the University of Michigan Hospitals, where examination revealed a deep red submucosal nasopharyngeal mass on the left side. There was complete left ophthalmoplegia as well as decreased left visual acuity at 20/400, while the right was normal. Hypesthesia in the left trigeminal nerve distribution was noted, as was a 20 dB conductive hearing loss of the left ear with an ipsilateral middle ear effusion. CT scan revealed an enhancing mass in the left nasopharynx, pterygopalatine fossa, and infratemporal fossa with destruction of the posterior wall of the maxillary sinus and lateral pterygoid plate. Extension into the middle cranial fossa and parasellar region was noted. (Fig. 2)

Angiography showed a hypervascular lesion with a dense, prolonged stain. The main vascular supply were the left ascending pharyngeal and internal maxillary arteries. MRI confirmed the CT results, and showed extension through foramen ovale, as well as into the left inferior orbital fissure and orbital apex. The cavernous sinus was involved as was the intracavernous carotid artery. (Figs. 3, 4)

The differential diagnosis was angiofibroma versus a malignant neoplasm, most likely rhabdomyosarcoma. The neuroradiologists agreed that both were possible given the above studies. Preoperative embolization was carried out using a transfemoral catherization, and a superselective technique with Gelfoam particles. This resulted in an 80% decrease of the tumor blush on angiography, without untoward sequelae.

A left transantral biopsy of the tumor was carried out under general anesthesia 48 h after embolization. The periosteum and bone of the posterior wall of the maxillary sinus was thinned but intact. Generous biopsies were taken with minimal

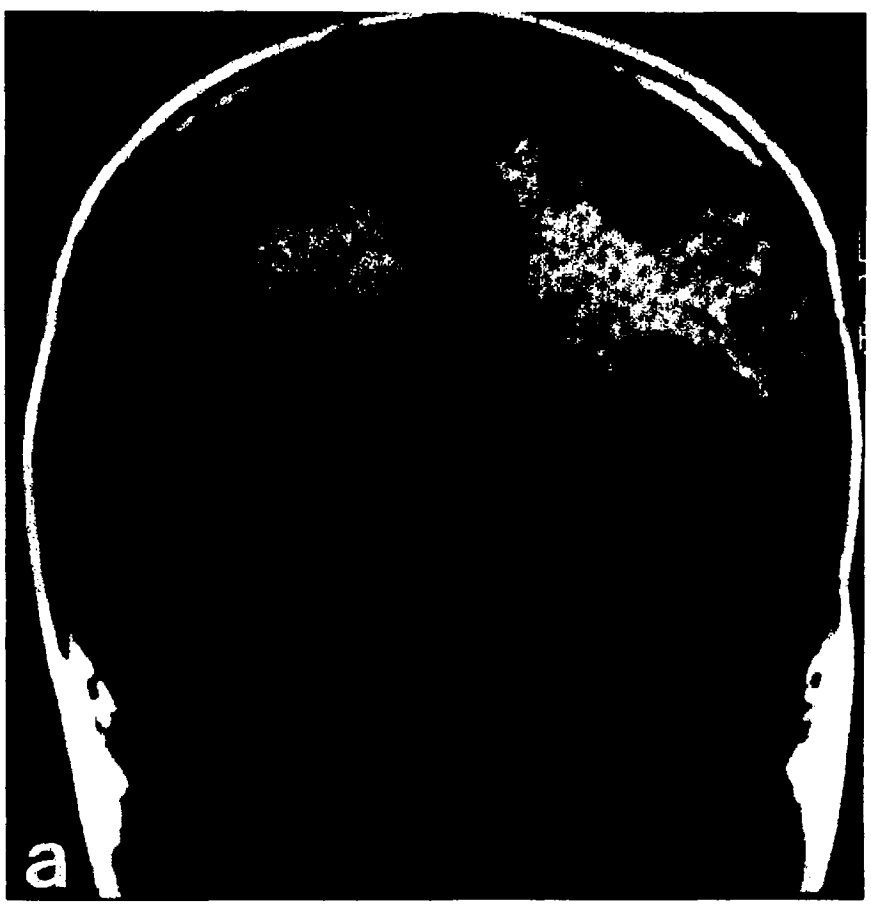


Fig. 3. Coronal T_1-weighted MR images (TR 600 ms/TE 20 ms). a: the soft tissue mass extends through a defect in the greater wing of the sphenoid. The left internal carotid is surrounded by soft tissue consistent with cavernous sinus involvement. b: following Gd-DTPA infusion the mass is of high signal intensity. Extension of tumor into the region of the left temporalis muscle is more evident. Areas of signal void in the subtemporal portion of the mass are consistent with angiographic findings of prominent vascularity. c: axial Gd-DTPA enhanced image demonstrates the tumor within the middle cranial fossa, extension of tumor into the left orbital apex, and involvement of the temporalis muscle. Mucous and inflammatory reaction is seen in the left mastoid secondary to Eustachian tube obstruction.

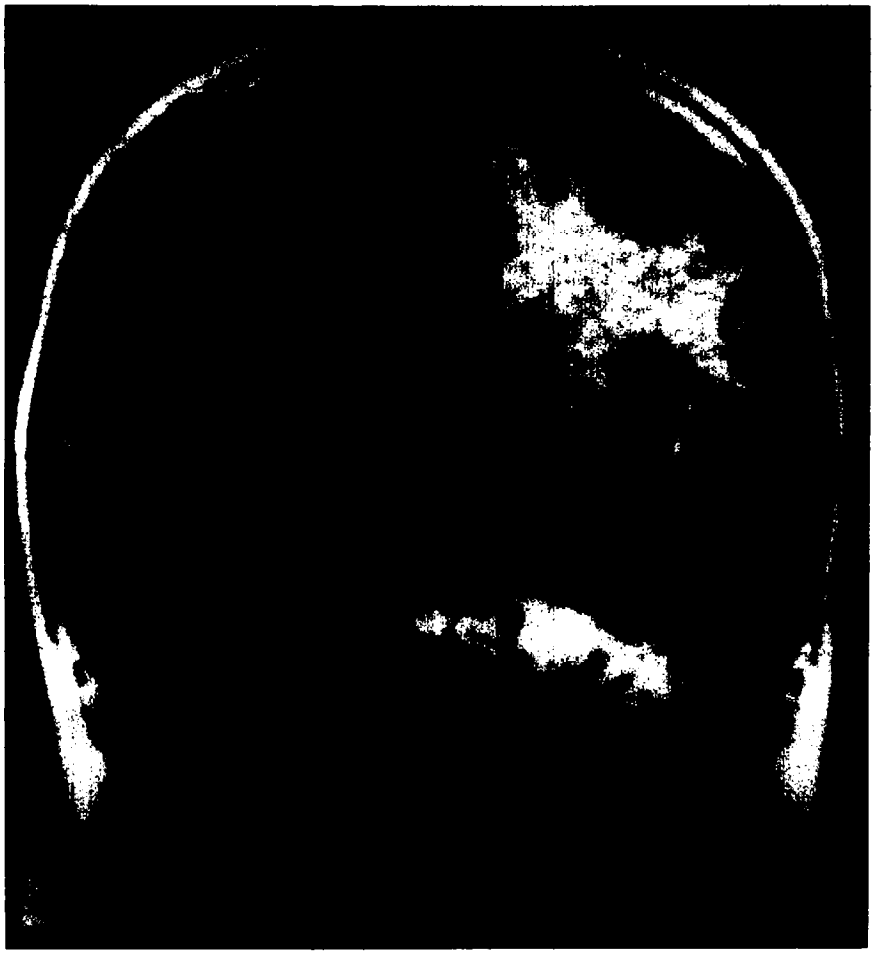


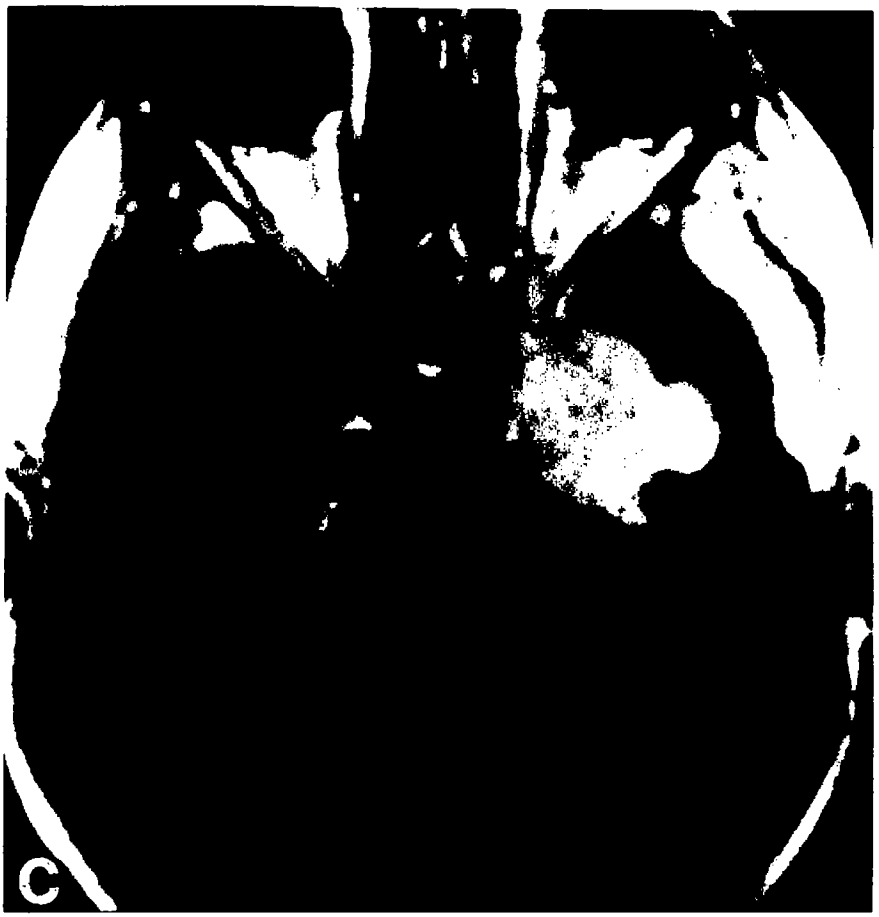
Fig. 3 (continued).

bleeding. Packing was placed in the antrum and brought our through a nasoantral window. This was removed 48 h postoperatively without bleeding.

Final pathology revealed embryonal rhabdomyosarcoma (Fig. 5). Bone scan and abdominal CT were negative as was lumbar puncture, but chest CT revealed multiple pulmonary metastases bilaterally. The patient was staged as a stage IV, parameningeal rhabdomyosarcoma and begun on intrathecal and intravenous chemotherapy, and radiation therapy to the whole brain and primary site.

Discussion

The rarity of pediatric nasopharyngeal masses and the diversity of possible pathology makes clinical diagnosis of the lesions difficult at best. For this reason,



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radiographic studies such as plain films, tomography and angiography have been used to help differentiate between tumors. The advent of computerized axial tomography in the 1970's led to vastly improved soft tissue imaging of skull base neoplasms and an increase in diagnostic capabilities.

Juvenile nasopharyngeal angiofibroma (JNA) is the most common pediatric nasopharyngeal tumor, with plain film, CT and angiographic imaging characteristics which are described as pathognomonic. However, errors in the diagnosis of lesions clinically and radiographically resembling JNA have been reported. Mani published the first case of a malignant nasopharyngeal mass mistakenly diagnosed as an angiofibroma, and resected with pathology revealing embryonal rhabdomyosarcoma [11]. Harrison reported on his personal experience with 44 patients treated surgically for presumed JNA, all with classic radiographic changes, of which one was later histologically shown to be embryonal rhabdomyosarcoma [8]. Shaffer et al. reported cases of lymphoepithelioma and fibrous dysplasia, also angiographically simulating

Fig. 4. A late arterial phase image from a left common carotid angiogram, prior to embolization with Gelfoam particles, demonstrates the highly vascular intracranial and subtemporal portions of the lesion.

JNA, with diagnoses made after surgical excision, and suggested the use of biopsy prior to definitive treatment on patients with any atypical element of the normal clinical presentation of JNA [15].

Conversely, a normal angiographic study may not rule out angiofibroma if there is prior hormonal treatment or an anomalous arterial supply to the tumor [16]. These papers support the proposition that there is no CT or angiographic image pathognomonic for JNA. Indeed, any relatively slow-growing nasopharyngeal tumor with enhanced vasculature may mimic JNA, particularly if its growth extends into the pterygopalatine fossa.

The case presented fits the classical presentation of juvenile nasopharyngeal angiofibroma as an obstructing, hemorrhagic, unilateral nasopharyngeal mass in an adolescent male. The cranial nerve involvement and relatively young age of the

Fig. 5. The microscopic appearance of the open biopsy of the patient presented. Note the dense, uniform cellularity of the section as compared to that in Fig. 1. The cells have small nuclei with scant cytoplasm, creating a differential diagnosis of lymphoma, embryonal rhabdomyosarcoma and neuroblastoma. Special stains confirmed the immunohistochemical assignment of embryonal rhabdomyosarcoma (H + E).

patient is slightly atypical, but certainly consistent with the diagnosis of an extensive JNA. The CT, MRI, and angiographic images obtained, while again slightly atypical of JNA, could not be used to reliably differentiate between angiofibroma and other aggressive pediatric nasopharyngeal neoplasms. Because of the atypical features, pretreatment biopsy of the mass was felt indicated, and undertaken after neuroradiologic embolization of the tumor. Histologic study proved the mass in this patient to be a parameningeal embryonal rhabdomyosarcoma, and averted inappropriate treatment of this highly malignant and metastatic neoplasm with deforming and possibly morbid surgical excision, or undertreatment with inadequate doses of radiation therapy alone.

Conclusion

We believe that this case presentation and review of the literature supports the use of histologic study, in addition to radiographic imaging, in the diagnosis of

pediatric nasopharyngeal masses. The authors recommend pretreatment biopsy of lesions clinically and radiographically resembling JNA whenever possible, particularly if the presentation is atypical or if treatment will delay or preclude obtaining tissue for definitive histologic diagnosis, e.g., presurgical hormonal or primary radiation therapy.

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