The Journal of Laryngology and Otology
October 1996, Vol. **110,** pp. 962–968

Transnasal endoscopic surgery in juvenile nasopharyngeal angiofibroma

REDA H. KAMEL, M.D.

Abstract
A case of angiofibroma limited to the right posterior nasal cavity, nasopharynx, and pterygopalatine fossa was operated upon transnasally under endoscopic control. The tumour was completely excised without complications. Endoscopic follow-up for the next two years and contrast computed tomography (CT) excluded any residual tumour or recurrence. The advantages, limitations and possible complications of this approach are discussed. It seems that in limited lesions of angiofibroma, the option of a transnasal endoscopic approach could be cautiously considered by experienced surgeons.

Key words: Nasopharyngeal neoplasms; Angiofibroma

Introduction

Juvenile nasopharyngeal angiofibroma is a highly vascular and locally invasive tumour with a high incidence of persistence and recurrence (Batsakis, 1979). The specific point of origin of the angiofibroma is on the posterolateral wall of the roof of the nose, where the sphenoid process of the palatine bone meets the horizontal ala of the vomer and the root of the pterygoid process of the sphenoid. This junction forms the superior margin of the sphenopalatine foramen (Neel *et al.*, 1973).

The swelling migrates medially beneath the mucous membrane of the nasopharynx, displacing it downwards, and eventually grows to fill the post-nasal space. As the process of growth continues, the anterior face of the sphenoid sinus is encroached upon and eroded, and the sinus is invaded. The swelling then grows forwards into the nasal fossa and may expand the posterior end of the middle turbinate, which thereby becomes continuous with the mass of the tumour (Neel, 1985; Shaheen, 1987).

Growth in the lateral direction may take place in some cases. The pterygopalatine fossa is thus invaded and, once filled, causes bowing of the posterior wall of the antrum. Eventually the swelling comes to involve the infratemporal fossa, and then the orbital fissures and dura of the middle cranial fossa (Neel, 1985; Shaheen, 1987).

Surgery has been the most effective method of treatment for angiofibromas of the nasopharynx over the years, however, primary external beam radiation has been advocated as the preferred method of treatment by a few investigators (Fitzpatrick *et al.*, 1980; Lingeman and Shellhamer, 1986). Many surgical approaches were suggested including, the natural orifice, transpalatal, transzygomatic, transmandibular, transhyoid, transantral, lateral rhinotomy, and midface degloving, with or without extensions such as the upper lip split or concomitant craniotomy (Neel, 1985).

Every case is judged on its merits and the particular approach used depends on the pre-operative diagnostic assessment and the surgeon's experience with a given technique (Shaheen, 1987; Gustafson and Neel, 1991). Contrast CT reliably assesses tumour extent. Pre-operative arteriography is essential for the evaluation of the feeding vessels and embolisation (Economou, *et al.* 1988). Nowadays, the surgeon is able to plan a far more effective surgical attack for complete removal of the tumour (Lingeman and Shellhamer, 1986).

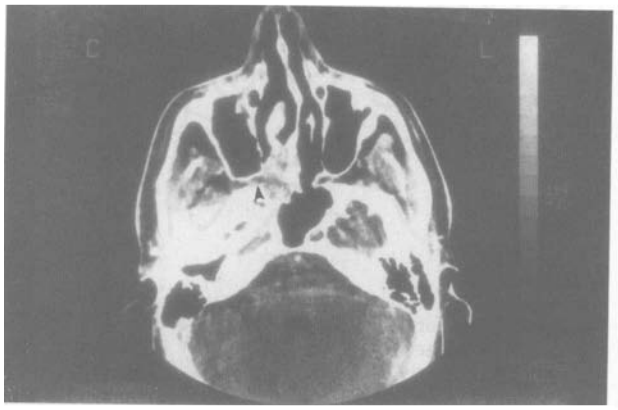
The experience of the author in handling the area of the sphenopalatine foramen and pterygopalatine fossa in the procedure of transnasal endoscopic vidian neurectomy, suggested the feasibility of a transnasal endoscopic approach in limited lesions of angiofibroma (Kamel and Zaher, 1991).

Case report

A 29-year-old man complained of recurrent spontaneous severe epistaxis for six years and right nasal obstruction for two years. Anterior rhinoscopy showed no abnormality. Posterior rhinoscopy revealed a nasopharyngeal swelling. Diagnostic nasal endoscopy revealed a right nasal mass attached to the lateral wall, posterior and superior to the posterior end of the middle turbinate, face of the sphenoid sinus, and posterior edge of the nasal septum. It extended downwards and posteriorly into the nasopharynx as a sessile mass. The lesion was pale pink, firm, and nodular. Contrast CT revealed a soft tissue density at the most posterior aspect of the right nasal fossa and nasopharynx with minimal extension into the pterygopalatine fossa. The floor of the sphenoid sinus was eroded and the posterior wall of the maxillary antrum was flattened (Figures 1a, b and c). External carotid arteriography revealed a vascular blush in the postnasal space and showed the internal maxillary artery as the feeding vessel. Although not advocated, a biopsy was taken under endoscopic visualisation in the operating theatre due to the relatively old age of the patient and small size of the lesion.

From the Department of Otolaryngology Head and Neck Surgery, Cairo University, Egypt.
This manuscript was presented at the International Advanced Sinus Symposium, July 22, 1993, Philadelphia, Pennsylvania, USA.
Accepted for publication: 25 July 1996.

(a)



(b)

(c)

FIG. 1

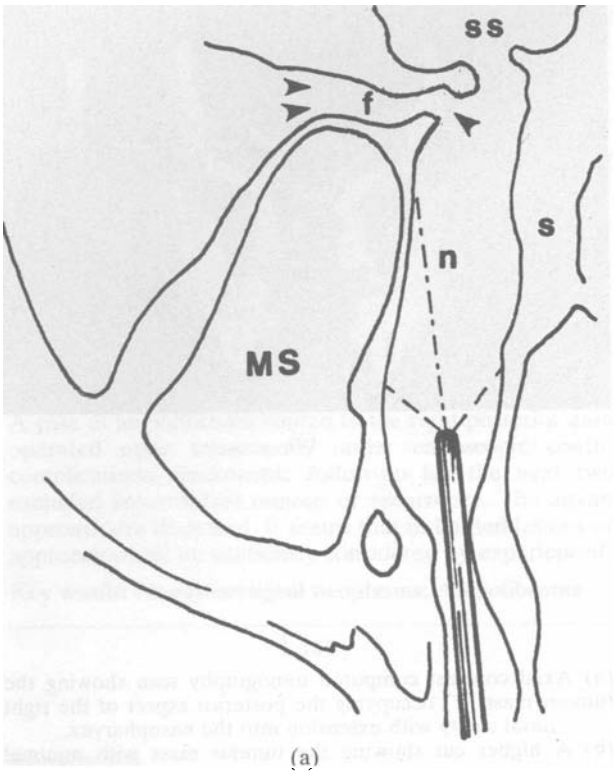
(a) Axial contrast computed tomography scan showing the tumour mass (T) occupying the posterior aspect of the right nasal cavity with extension into the nasopharynx.
(b) A higher cut showing the tumour mass with minimal extension into the pterygopalatine fossa (arrow head) through the sphenopalatine foramen with flattening of the posterior wall of the maxillary sinus.
(c) Coronal contrast computed tomography scan of the same case. The tumour (T) attached to the lateral nasal wall posteriorly at the area of the sphenopalatine foramen with erosion of the floor of the sphenoid sinus (s).

Histopathological evaluation revealed juvenile nasopharyngeal angiofibroma.

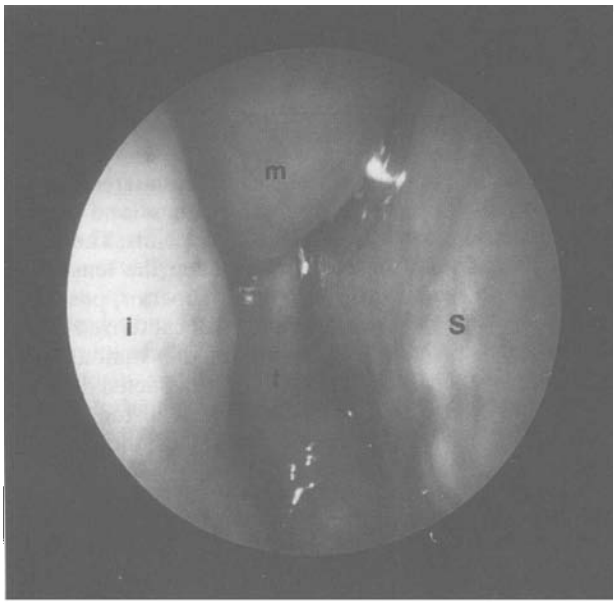
While in the supine position and head tilted towards the right side, the patient was operated upon under hypotensive general anaesthesia. Utilising the 0° 4 mm nasal endoscope, the nasal cavity was packed with cotton pledgets saturated with 1/1000 adrenaline solution and left in place for 10 minutes (Figures 2 a and b). The area anterior to the uncinate process and the anterior and posterior ends of the middle turbinate were infiltrated with Xylocaine adrenaline two per cent. To get a better exposure of the neck of the tumour, the posterior part of the middle turbinate was carefully excised flush with the neck of the tumour. The uncinate process was then incised and removed. Faced with a concha bullosa, as proved by the CT, the lateral part of the middle turbinate was excised. The maxillary sinus ostium was identified at the bullauncinate angle posteriorly, and widened superiorly until the orbital floor, inferiorly until the inferior turbinate, posteriorly until the posterior wall of the maxillary sinus, and anteriorly as required to clearly visualize the posterior wall of the maxillary sinus (Figure 3). The superior aspect of the posterior wall of the maxillary sinus was then removed from medial to lateral utilizing a large diamond burr on an angled hand piece. Care was taken during the removal of the thick medial buttress of the posterior maxillary wall. The periosteum of the pterygopalatine fossa and lateral extension of the tumour were accordingly exposed (Figures 4a and b). To uncap the neck of the swelling, the anterior rim of the sphenopalatine foramen was removed (Figures 5a and b). This is formed of the orbital process of the perpendicular plate of the palatine bone and is usually thick and may contain an air cell. The sphenopalatine vessels were not encountered, being obscured and included in the tumour mass and bipolar coagulation was used to secure bleeding points. There was no need for an irrigation sheath to keep the lens clear. Using suction diathermy, the mucosa superior, posterior, medial and inferior to the tumour was cauterized a few millimetres from the attachment of the tumour. The mucosa was then incised and gently dissected towards the pedicle utilizing a sucker dissector. The tumour was dissected off the floor of the sphenoid sinus, the posterior margin of the nasal septum, medial pterygoid plate and perpendicular plate of the palatine bone. The floor of the sphenoid sinus was noticed to be eroded. A bipolar coagulator was then used to dissect the tumour from the periosteum of the pterygopalatine fossa (Figure 6). The maxillary artery could not be identified to be ligated, clipped or coagulated. The tumour was then grasped and removed (Figure 7). A tight swab was immediately inserted into the cavity and left in place for 10 minutes. Meticulous endoscopic examination of the cavity insured complete removal of the tumour and all bleeding points were secured. The actual blood loss was 150 ml and surgery took two hours. A tight Vaseline-impregnated gauze packing was applied into the right nasal cavity. The patient was given an antibiotic for one week. The pack was removed after two days and the cavity was meticulously cleaned.

Histopathological evaluation of the removed mass revealed juvenile nasopharyngeal angiofibroma (Figure 8). Endoscopic follow-up for the next two years and contrast CT study excluded any residual or recurrence (Figures 9 and 10).

https://doi.org/10.1017/S0022215100135467 Published online by Cambridge University Press



(a)



(b)

FIG. 2

(a) Diagram of the axial cut of the right nasal cavity at the level of the sphenopalatine foramen demonstrating the maxillary sinus (MS), nasal cavity (n), sphenopalatine foramen (arrow head), pterygopalatine fossa (f), pterygomaxillary fissure (double arrow heads), nasal septum (s) and sphenoid sinus (ss). The 0° 4 mm telescope is utilized to visualize the posterior aspect of the nasal cavity.
(b) Endoscopic view of the right nasal cavity. The tumour mass (t) is attached to the lateral nasal wall posterior to the posterior end of the middle turbinate (m). Nasal septum (s), inferior turbinate (i).

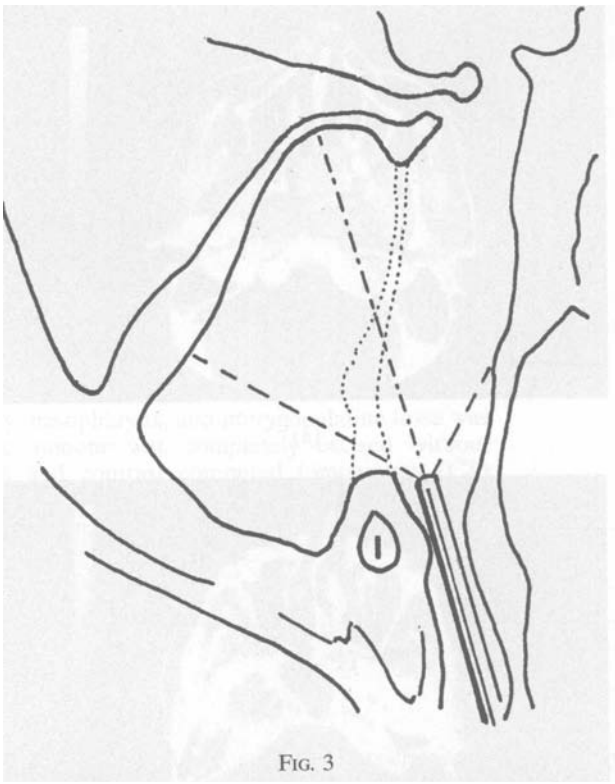


FIG. 3

The maxillary sinus ostium is identified and widened superiorly until the orbital floor, inferiorly until the inferior turbinate, posteriorly until the posterior wall of the maxillary sinus, and anteriorly as required. This offers good visualization of the posterior wall of the maxillary sinus. Nasolacrimal duct (1).

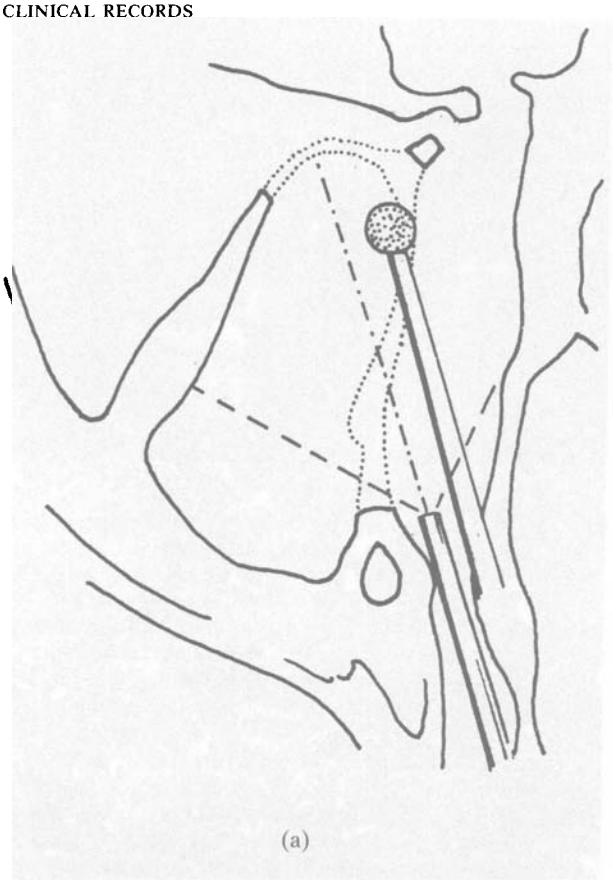
Discussion

Meticulous endoscopic examination of the nose and nasopharynx in patients suffering from epistaxis and/or nasal obstruction, aids early detection of angiofibroma. The area of the sphenopalatine foramen cannot be properly assessed by either anterior or posterior rhinoscopy even with the aid of the microscope. On the other hand, the angled vision of the rigid 30° nasal endoscope helps visualize this area precisely.

The approach planned to remove the angiofibroma must entail adequate access to the extensions in question and allow dissection between swelling and surrounding structures in such a way as to ensure that the tumour parenchyma is not breached in the process. It should also provide the surgeon with sufficient room to ligate the principal feeding vessel to the tumour and not compromise his ability to deal with major haemorrhage (Shaheen, 1987). Based on the previous experience of the author in intranasal endoscopic surgery in general, and in transnasal endoscopic vidian neurectomy, in particular, a transnasal endoscopic approach was suggested in this case of limited juvenile nasopharyngeal angiofibroma (Kamel, 1989; Kamel, 1990; Kamel and Ishak, 1990; Kamel and Zaher, 1991; Kamel, 1992; Kamel, 1994). The tumour was completely excised without excessive intra-operative blood loss or injury to any of the near by important structures.

The author believes that this approach is useful in limited lesions of angiofibroma arising from the sphenopalatine foramen and extending medially, and/or posteriorly to the posterior aspect of the nasal cavity, lateral compartment of the nasopharynx, and/or sphenoid sinus and laterally into the pterygopalatine fossa and stopping at the pterygomaxillary fissure (Figure 11). These are

https://doi.org/10.1017/S0022215100135467 Published online by Cambridge University Press



(a)

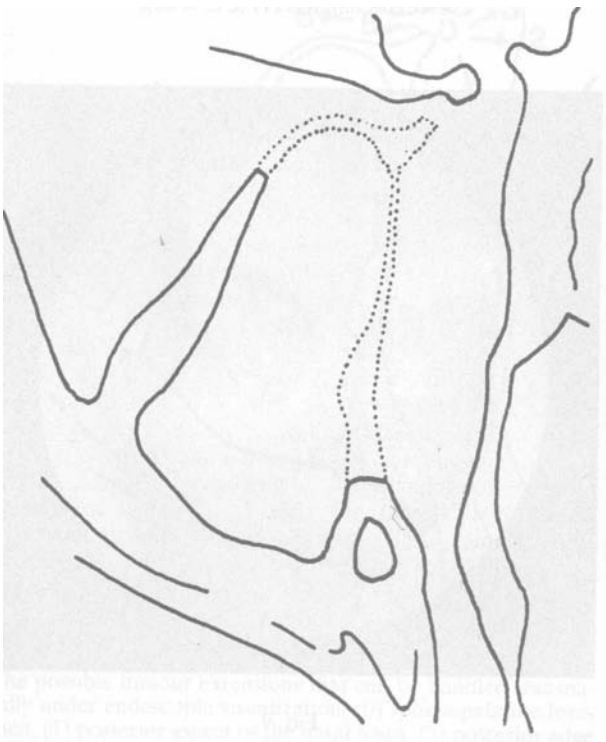
(b)

FIG. 4 a and b

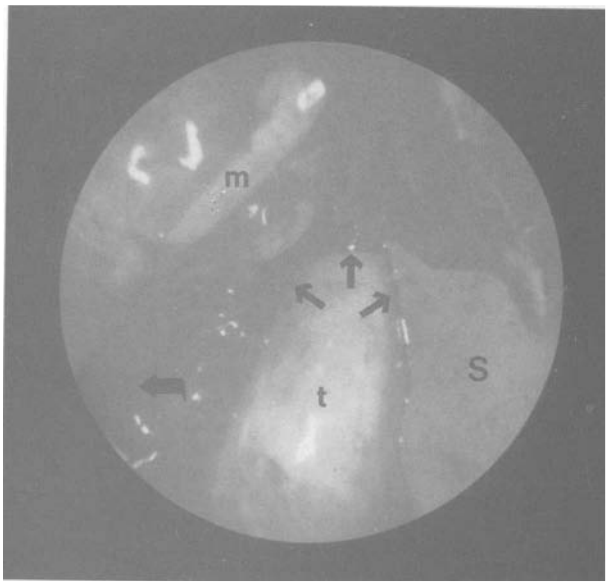
The superior aspect of the posterior wall of the maxillary sinus is then removed utilising a large diamond burr on an angled hand piece. Care is taken during removal of the thick medial buttress of the posterior maxillary wall. The periosteum of the pterygopalatine fossa and lateral tumour extension are exposed.

classified as stage Ia, Ib, IIa, and IIb according to Sessions *et al.* (1981), type I and II according to Fisch (1983), and stage I, II, and some of stage III according to Chandler *et al.* (1984).

This transnasal endoscopic approach avoids any external, palatal or sublabial incision. It allows careful dissection of the medial extension of the tumour to the nose, nasal septum, nasopharynx and/or sphenoid sinus. It offers strict removal of the anterior edge of the sphenopalatine foramen to ensure release of the tumour neck. Removal of the anterior wall of the pterygopalatine fossa allows dissection of the lateral extension of the tumour and



(a)



(b)

FIG. 5 a, b

To uncap the neck of the swelling, the anterior rim of the sphenopalatine foramen is removed. This is formed of the orbital process of the perpendicular plate of the palatine bone and is usually thick and may contain an air cell. Middle turbinate (m), nasal septum (s), tumour mass (t), neck of the tumour (arrows), middle meatal antrostomy (curved arrow).

https://doi.org/10.1017/S0022215100135467 Published online by Cambridge University Press

FIG. 6

The mucosa is incised a few millimeters from the medial attachments of the tumour and dissected towards the pedicle (arrowheads) utilising a sucker dissector. The tumour is dissected off the floor of the sphenoid sinus (ss), the posterior margin of the nasal septum (s), medial pterygoid plate and perpendicular plate of the palatine bone. A bipolar coagulator is used to dissect the tumour from the periosteum of the pterygopalatine fossa (p).

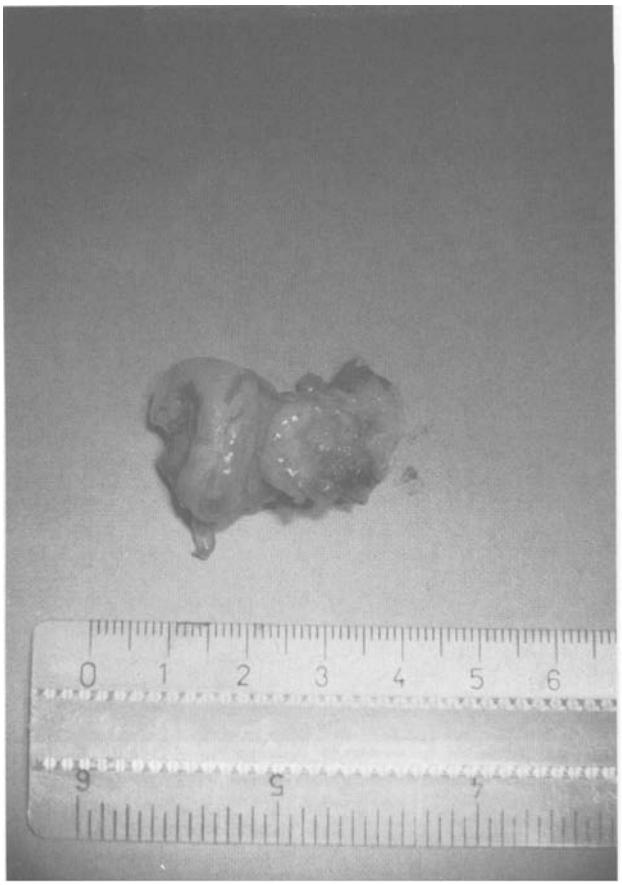


FIG. 7

The tumour mass after removal.

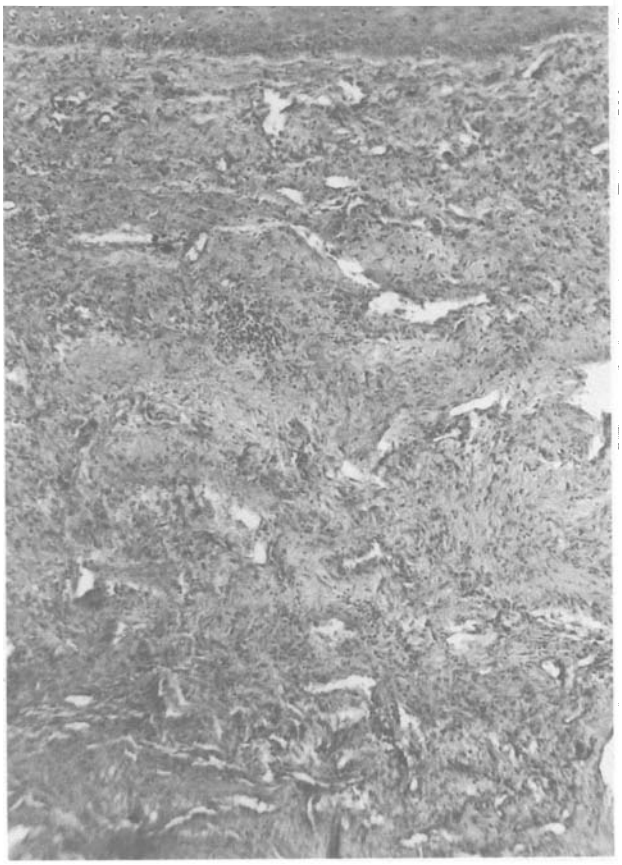


FIG. 8

Histopathological section of the removed mass showing stratified squamous covering overlying moderately cellular fibroblastic proliferation with many variable sized vascular spaces having flat endothelial lining. There are few branching vascular channels (H & E × 60).

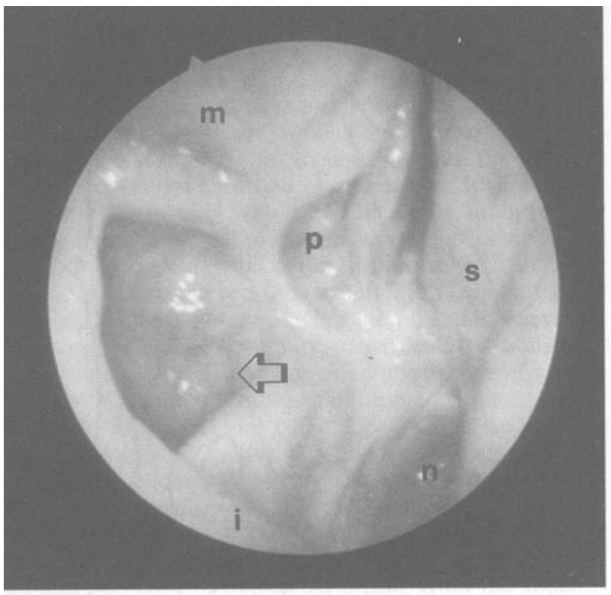


FIG. 9

The nasal cavity six months post-operatively. Nasal septum (s), nasopharynx (n), middle turbinate (m), inferior turbinate (i), wide middle meatal antrostomy (arrow).

https://doi.org/10.1017/S0022215100135467 Published online by Cambridge University Press

FIG. 10

Post-operative coronal contrast computed tomography scan showing no residual tumour.

handling of the feeding vessels when identified. Moreover, it helps ensure meticulous examination of the cavity at the end of surgery for any possible residual tumour. Lastly, post-operative endoscopic care and assessment are invaluable.

However, this approach is valid only in a selected group of limited lesions of angiofibroma. High skill in intranasal endoscopic surgery is mandatory. Possible serious complications should be borne in mind including haemorrhage. The surgeon should be ready to resort to an external approach under direct vision when access and/or visibility become limited during endoscopic surgery. The low number of cases of angiofibroma, especially limited ones, encountered render it hard to develop enough experience and report long-term results. Lastly, the unavailability of special delicate and curved instruments for endoscopic surgery of the pterygopalatine fossa make it a lengthy, tedious and technically difficult operation that needs a lot of experience, patience, caution and nerve.

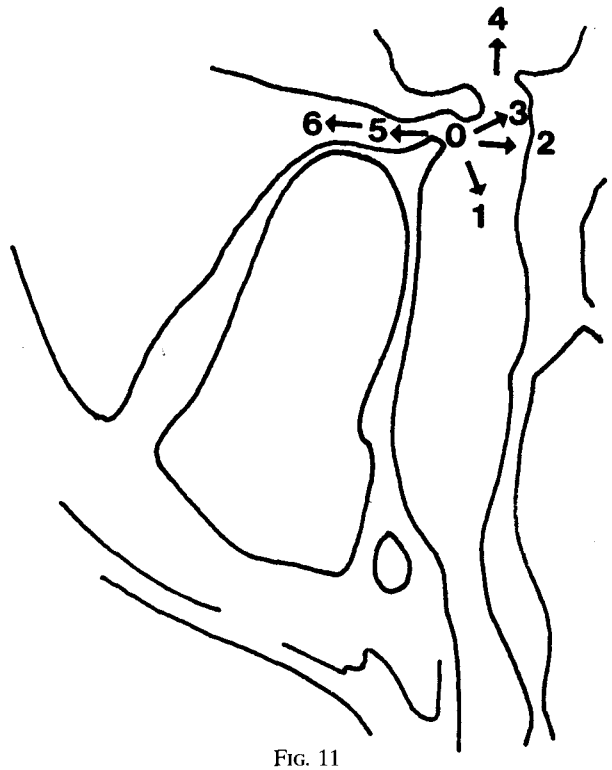


FIG. 11

The possible tumour extensions that can be handled transnasally under endoscopic visualization. (0) sphenopalatine foramen, (1) posterior aspect of the nasal fossa, (2) posterior edge of nasal septum, (3) lateral compartment of nasopharynx, (4) sphenoid sinus, (5) pterygopalatine fossa, (6) pterygomaxillary fissure.

Conclusion

It seems that the progress of the endonasal endoscopic surgery and radiology offers this transnasal endoscopic approach in limited lesions of angiofibroma. However, other well-established safe techniques which do not cause any cosmetic problems, such as mid-facial degloving, should be considered. Moreover, this endoscopic technique can not be advocated on the basis of one case report.

Acknowledgement

Telescopes, instruments, and photodocumentation equipment for this work were supplied by Karl Storz.

References

Batsakis, J. G. (1979) Vasoformative tumors. In *Tumors of the Head and Neck. Clinical and Pathological Considerations.* 2nd Edition. (Batsakis, J. G., ed.), Williams and Wilkins Co. Publ., Baltimore, London, pp 296–300.

Chandler, J. R., Goulding, R., Moskowitz, L., Quencer, R. M. (1984) Nasopharyngeal angiofibromas: staging and management. *Annals of Otology, Rhinology and Laryngology* **93:** 322–329.

Economou, T. S., Abemayor, E., Ward, P. H. (1988) Juvenile nasopharyngeal angiofibroma: an update of the UCLA experience, 1960-1985. *Laryngoscope* **98:** 170–175.

Fisch, U. (1983) The infratemporal fossa approach for nasopharyngeal tumors. *Laryngoscope* **93:** 36–44.

Fitzpatrick, P. J., Briant, T. D., Berman, J. M. (1980) The nasopharyngeal angiofibroma. *Archives of Otolaryngology* **106:** 234–236.

Gustafson, R. O., Neel, H. B. III. (1991) Cysts and tumors of the nasopharynx. In *Otolaryngology.* 3rd Edition, vol. III. (Paparella, M. M., Shumrick, D. A., Gluckman, J. L., Meyerhoff, W. L., eds.) W. B. Saunders Co., Philadelphia, London, pp 2190–2193.

Kamel, R. H. (1989) Endoscopic transnasal surgery in chronic maxillary sinusitis. *Journal of Laryngology and Otology* **103:** 492–501.

Kamel, R. (1990) Endoscopic transnasal surgery in antrochoanal polyp. *Archives of Otolaryngology, Head and Neck Surgery* **116:** 841–843.

Kamel, R. H. (1992) Conservative endoscopic surgery in inverted papilloma: Preliminary report. *Archives of Otolaryngology, Head and Neck Surgery* **118:** 649–653.

Kamel, R. (1994) Transnasal endoscopic approach in congenital choanal atresia. *Laryngoscope* **104:** 642–646.

Kamel, R. H., Ishak, E. A. (1990) Enlarged adenoid and adenoidectomy in adults: Endoscopic approach and histopathological study. *Journal of Laryngology and Otology* **104:** 965–967.

Kamel, R., Zaher, S. (1991) Transnasal endoscopic vidian neurectomy. *Laryngoscope* **101:** 316–319.

Lingeman, R. E., Shellhamer, R. H. (1986) Benign neoplasms of the nasopharynx. In *Otolaryngology, Head and Neck Surgery.* 1st Edition, vol. II. (Cummings, C. W., Schuller, D. E., eds.). C. V. Mosby, Co., St Louis, Toronto, pp 1269–1279.

Neel, H. B. III (1985) Juvenile angiofibroma. In *Surgery of the Paranasal Sinuses.* 1st Edition. (Blitzer, A., Lawson, W., Friedman, W. H., eds.), W. B. Saunders, Co., Philadelphia, London, pp 247–259.

Neel, H. B. III, Whicker, J. H., Devine, K. D., Weiland, L. H. (1973) Juvenile angiofibroma: Review of 120 cases. *American Journal of Surgery* **126:** 547–556.

Sessions, R. B., Bryan, R. N., Naclerio, R. M., Alford, B. R. (1981) Radiographic staging of juvenile angiofibroma. *Head and Neck Surgery* **3:** 279–283.
Shaheen, O. H. (1987) Angiofibroma. In *Scott-Brown's Otolaryngology.* 5th Edition, vol. IV. (Kerr, A. G., Groves, J., Evans, J., eds.) Butterworths, London, Boston, pp 291–296.

Address for correspondence:
Reda Kamel, M.D.,
Building 4 – Street 100,
Floor 8 – Flat 2,
Maadi – Cairo,
Egypt.

https://doi.org/10.1017/S0022215100135467 Published online by Cambridge University Press