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Angiofibromas of the postnasal space: A critical appraisal of various therapeutic modalities

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Abstract

Angiofibromas of the postnasal space are an enigma to the treating surgeon in view of their extensions around the skull base. The availability of modern investigative procedures has to some extent facilitated the decision making process in choosing a suitable surgical approach.

Proper tumour staging and the earliest and widest possible exposure tailored to the needs of the specific situation together with adequate blood replacement is the key to success in minimizing the chances of the recurrence.

The present study aims at an evaluation of the methodology adopted in 100 serial cases of angiofibromas of the postnasal space. After initial surgery, a further 31 procedures were needed for the management of recurrences.

Introduction

Angiofibromas of the postnasal space keep slowly creeping along the skull base recruiting an additional blood supply from the periosteum and destroying the underlying bone. It appears that those occurring during the peak physical growth period tend to show multidirectional invasion. It is, therefore, impractical to employ one standard and universal surgical technique in treating each and every tumour.

The transpalatal approach was adopted for the tumours which appeared to be beyond the realms of a *per via naturalis* excision. The lateral rhinotomy approach has been advocated to expose the pedicle rather than the fundus of the tumour (Harrison, 1976). At certain centres transzygomatic, transcervical and even transmandibular approaches have also been suggested. Each approach has been advocated as being superior to all others (Jones *et al.*, 1986) but each individual case needs an exposure suitably tailored to the particular types of extension. Accordingly, different types of approach (*e.g.* lateral, inferior, anterior) have been used to suit the individual case; on occasions, a combination of several approaches has been needed. In this study, an attempt has been made to rationalize the surgical procedures with regard to the classification of these tumours (Mishra *et al.*, 1989).

Material and methods

The present study is based on the last 100 serial cases of postnasal angiofibroma treated and followed at King George's Medical College Hospital, Lucknow. All the patients were male; age range 7 to 38 years with symptoms present from three to 48 months. The cases were assessed clinically and radiologically. Carotid angiography as well as computerized axial tomography were carried out to evaluate their origin and extensions in many of the cases.

The therapeutic pattern adopted in these 100 cases initially, as well as for 31 recurrences, was as follows:

(a) *Per via naturalis* removal was done in stage I or stage II cases and also for early recurrences localized to the nose and the postnasal space.

(b) Transpalatal approach was employed in stage II A and some stage II B cases. The localized tumours were excised under direct vision by nibbling the bone up to the desired extent of the palatine and maxilla.

(c) Transpalatal transpterygopalatine approach (Bhatia and Mishra, 1967) was used for stage II B and stage II C cases wherein the nasal and nasopharyngeal tumours were followed to expose their lateral or anterior extensions in continuity. Part of the pterygoid plates and the posterior wall of the maxilla were then excised. The sphenopalatine artery was identified and ligated while extending the incision in the upper vestibule curving behind the last molar tooth.

(d) Combined anterior, inferior and lateral approach which, at our centre, is recognized as the 'circum maxillary' approach and is used for stage III A and stage III B tumours. This procedure consists of using (i) standard transpalatal transpterygopalatine incision which is extended forward in the oral vestibule up to the mid-line, (ii) the facial incision commencing at about the middle of the zygomatic arch running medially along the lower lid to the medial canthus of the eye; thereupon it turns downwards in the nasolabial groove to curve medially below the floor of the nose up to the mid-line; (iii) the lip is then split in the mid-line to join the first incision. The anterolateral wall of the maxilla is exposed and excised and also the posterior and medial walls including the turbinates to leave only the palatine and orbital plates intact. The mobilization of the nasal mass proceeds by separating the tumour superiorly preserving the integrity of the skull base. Here the cribriform plate, pituitary fossa and

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the contiguous wing of the sphenoid are defined. The tumour is also mobilized from the opposite side of the nose and nasopharynx through the palatal exposure to remove it as far as possible in a single mass. Lastly, the tumour is dissected from the cheek and infratemporal fossa by retracting the temporalis muscle.

In relatively less extensive tumours, a limited part of this approach *i.e.* only extended lateral rhinotomy was used for the anterior extensions.

In some instances even the facial incision was avoided by using a Denker's-type sublabial approach and transantral excision of the tumour was achieved from the choanae and ethmoid-maxillary zones.

(e) Palatal fenestration, as reported earlier (Mishra and Bhatia, 1964), is justified in only those stage III C cases where a complete excision of the tumour is compromised in the presence of intracranial complications.

Observations

Of the 100 cases treated and included in this study, there were recurrences in 31 cases. The criteria for recurrence consisted of reappearance of symptoms after three months and a demonstrable lesion at the original or a different site. The primary site of the tumour and coexisting extensions were localized and this was analyzed retrospectively taking account of the recurrences (Table I). Recurrent tumour more often occurred in the cheek, orbit, maxillary antrum, intratemporal fossa and skull base.

(a) *'Per via naturalis'* approach was used initially in 22 cases and for recurrences in a further ten. It is a quick (average time—5 minutes) and relatively safer procedure for localized tumours; however, it is prone to unintentionally leave residual tumour along its base. There were ten recurrences after primary surgery using this procedure and four amongst those reoperated for a recurrence. Bleeding was on average 320 ml though those with ethmoidal extensions had more severe bleeding. Two of the cases operated by this approach a second time had further recurrences.

(b) Transpalatal procedure was employed for 46 cases (39 cases primary and seven recurrences). The procedure was specially considered for those having bilateral extensions in the nose and nasopharynx without cheek extensions. The mobilization usually took 4–8 minutes (average six minutes) and the blood loss was around 1400 ml. The recurrences following this procedure occurred at the ethmo-sphenoid complex and in the pterygopalatine fossa.

(c) Transpalatal transpterygoid approach appeared to be particularly suitable in the presence of demonstrable lateral extensions, especially thin pedicled tumours. In all, 28 cases (20 initial and eight recurrences) were operated with this approach. Three cases operated by this procedure had recurrence in the region of the sphenoid and skull base. The time taken for the tumour mobilization was 8–15 minutes (average 12 minutes) and the blood loss averaged 1000 ml. External carotid ligation was only found to be useful with this procedure in those with cheek extensions. The advantage with this procedure appears to be an *'en bloc'* removal of the tumour particularly the thick pedicled ones.

(d) Circum-maxillary approach, for very advanced tumours, was employed in six cases for removing all the anterior, superior and lateral extensions including opposite side of the nose, nasopharynx and ethmoid. In only two cases was the removal of the mass achieved in one piece, while in the other four it came out in two or three separate pieces. The procedure took about 14–20 minutes for the tumour mobilization and average bleeding was 1400 ml. It is extremely useful for detecting and separating even unexpected tumuor extensions along the periosteum, not localized pre-operatively.

With only anterior extensions in nine cases, a lateral rhinotomy, for the ethmosphenoidal part, and Denker's in five cases was used; a transpalatal incision was thereby avoided. However, recurrences were confined to the sphenoidal and vomerine region in nine of these 14 cases. This procedure usually takes 8–10 minutes for the mobilization of the tumour, and average bleeding was about 900 ml.

Palatal fenestration was carried out in five cases including three during the revision operation following recurrences (with initial transpterygoid in three and lateral rhinotomy in two cases). The purpose of this surgery was more to visualize the residual lesion at the skull base while the patient was undergoing radiotherapy or thermocoagulation.

Radiotherapy was not used in any case as the sole treatment. It was used pre-operatively in five cases and post-operatively in five. Tumour regression in post-operative skull base residues usually took six to eight months. However, poor regression in those in whom it was used pre-operatively necessitated surgical treatment. The average bleeding was more following radiation and tough adhesions took 15–25 minutes to separate from the periosteum. In case of separation from the soft tissues of the cheek, it was easy even after radiation.

A summary of the operative procedures along with the failures, in the form of incomplete removals or the recurrences, is as shown in Table II.

TABLE I
SHOWING THE PRESENCE OF TUMOUR IN VARIOUS REGIONS (N = 100)

Site	Recurrent cases	Non-recurrent cases	Total
Ipsilateral nose	30	70	100
Nose—contralateral	26	24	50
Ethmoid	17	4	21
Pterygopalatine fossa	10	10	20
Cheek	8	7	15
Orbit	7	1	8
Infratemporal fossa	5	1	6
Maxillary antrum	4	0	4
Skull base	5	0	5

Discussion

Postnasal angiofibromas are unusual tumours where surgical hazards are overwhelming and recurrences are not unexpected. The rate of recurrences has varied from 20 per cent (Jones *et al.*, 1986) and 22 per cent (Harrison, 1987) to 30 to 50 per cent (Harma, 1958). These reflect the unpredictable outcome of the surgical procedures (Mishra and Misra, 1974) and of unsuspected tumour extensions (Hiranandani, 1965; Sardana, 1965). Histological predisposition to recurrences has also been suspected (Harma, 1958). However, it is accepted that there is no

TABLE II
OPERATIVE PROCEDURES IN POSTNASAL ANGIOFIBROMAS

Approach (n = 131)	Initial surgery (n = 100)	Surgery for recurrences (n = 31)
'per via naturalis'	22 (10)	10 (4)
Transpalatal	39 (6)	7 (1)
Transterygoid	20 (3)	8 (0)
Facial incisions		
a. Circum maxillary	6 (0)	0 (0)
b. Lateral rhinotomy	6 (3)	3 (1)
c. Denker's	5 (5)	0 (0)
Palatal fenestration	2 (2)	3 (1)

Figures within parentheses indicate failures with the procedure. Two cases had multiple (more than two) recurrences.

single universal surgical approach to totally ablate these tumours from every nook and corner of this region. Recurrent tumours, unfortunately, are often reactivated residual tumours (Mishra *et al.*, 1981), which may be the result of piece-meal removal (Waldman *et al.*, 1981) and failure to excise *'en bloc'* as with cancer (Jones *et al.*, 1986).

The surgical techniques vary from the simplest *'per via naturalis'* to the complex procedures involving facial incisions. Each method has its limitations in relation to different situations and extensions of the tumour. Sometimes the tumours are so large as to be incapable of being pulled out either through a lateral rhinotomy or the sublabial route. Such tumours have to be delivered through the nasopharygeal route and often in more than a single piece unless the palate has been excised adequately.

Surgery has to be individualized for every case depending upon the type of extensions. Modern techniques of angiography, CT scanning and magnetic resonance imaging (Lloyd and Phelps, 1986) have helped in the exact tumour localization (Spector, 1988). Tumour staging has helped further in understanding the comparative value of the different surgical procedures. For very large tumours with intracranial extensions, medial labio-mandibuloglossectomy and medial labio-mandibulotomy along with lateral oral pharyngotomy have been employed (Spector, 1988). In general, however, there are three routes of exposure for postnasal angiofibromas:

(i) Inferior—*'per via naturalis'*, transpalatal (Wilson, 1957; Misra and Mishra, 1965; Sardana, 1965), suprahyoid (Bocca, 1971).

(ii) Anterior—Denker's, degloving (Conley and Price, 1979), transfacial, transmaxillary or transmandibular (Spector, 1988), lateral rhinotomy and medial maxillectomy (Harrison, 1976).

(iii) Lateral—transzygomatic (Samy and Girgis, 1965), fronto-temporal craniotomy (Patil *et al.*, 1982; Fisch, 1983; Spector, 1988) and lateral stair-step mandibulotomy (Pinsolle *et al.*, 1989).

Nasal and postnasal tumours could be treated successfully with transpalatal (39 cases) and even *'per via naturalis'* excision (18 cases) provided pre-operative localization has been perfect (Fig. 1). However, in pterygopalatine and paranasal sinus extensions wider exposures are needed. For lateral tumours, a combination of transpalatal and sublabial incisions is essential (Sardana, 1965). A modification of this procedure has been observed to be more logical and successful. At Lucknow, trans-pterygopalatine approach (Fig. 2) has been in use since 1964 and also palatal fenestration for intracranial extensions (Mishra and Bhatia, 1964; Bhatia and Mishra, 1967; Bhatia *et al.*, 1967). A similar approach has also been stressed by Chandler *et al.* (1984) who prefers to call it an 'S' shaped incision.

Failures in surgical procedures. While employing these procedures, primary failures were encountered most commonly with the *'per via naturalis'* method (16 cases). However, in spite of such a high failure rate, it is still the safest procedure to buy some time while handling poor risk patients. The severe post-haemorrhagic anaemia of 6.0–7.0 Gm per cent haemoglobin levels, hypoproteinemia and concurrent infections may be limiting factors for major surgery. This procedure provides relief from repeated and frequent nose bleeding thus giving adequate time for preparing the patient to undergo appropriate surgery at a later date.

Transpalatal excision had failures due to residual tumours at the primary site. Harrison (1987) also observed that in such unencapsulated lesions there is a high chance of a residual tumour.

Failures with the transpterygopalatine approaches were few (three cases) and were due to skull base extensions; they had to be converted to palatal fenestration.

Dominant anterior extensions (Fig. 3) like ethmoidal, orbital or anterior cranial fossa extensions, however, needed facial incisions including lateral rhinotomy and Denker's. The operation proved to be incomplete in most of these cases (nine out of 14). This may have been due to small residual lesions in relation to either the origin or the

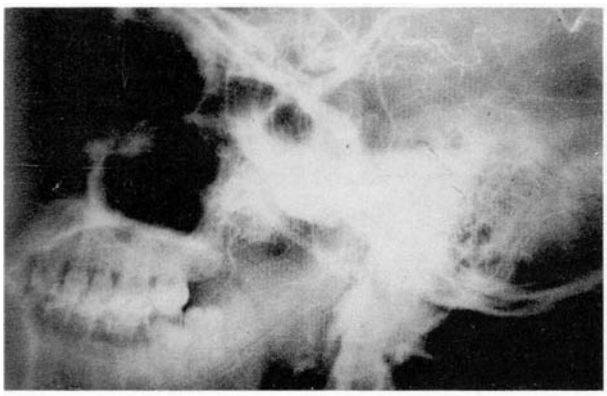

FIG. 1
Carotid angiogram of a small postnasal (stage I) angiofibroma showing localized tumour blush.

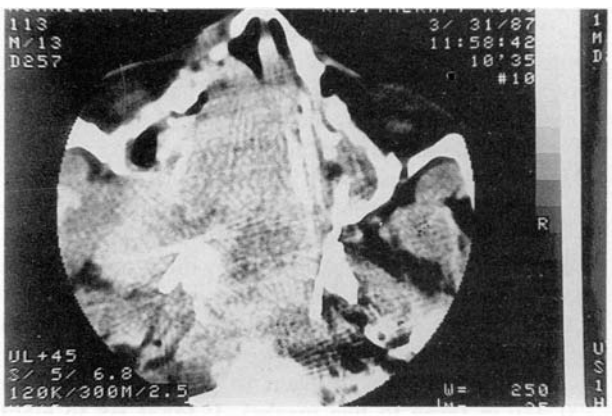

FIG. 2
CT scan showing massive postnasal angiofibroma (stage II B).

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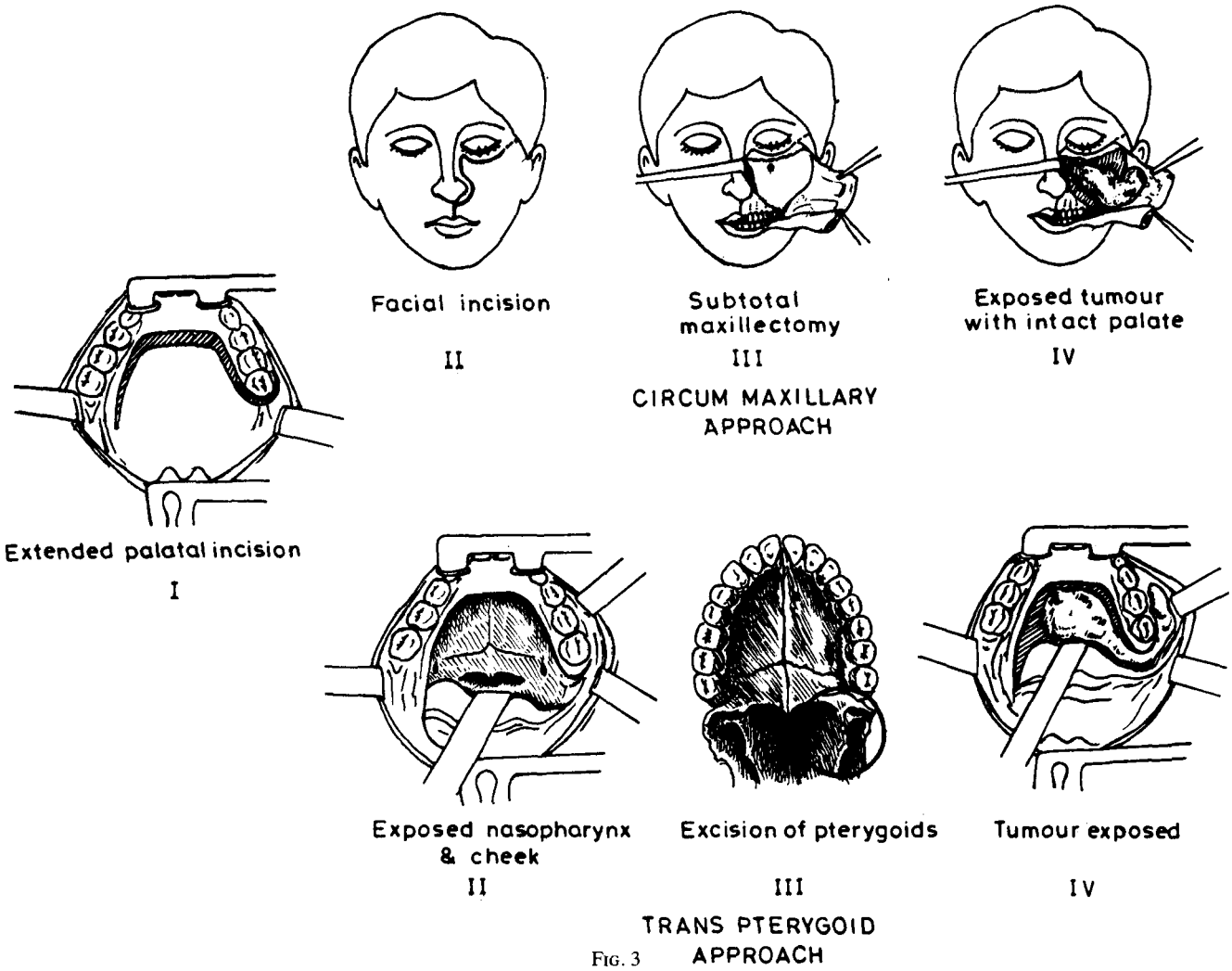

FIG. 3 Diagram showing the circum maxillary and transpterygoid approaches.

extensions of the tumour. It was, therefore, considered essential to have a still wider exposure of the tumour before its mobilization. A modified approach for these tumours has been in use since 1983 (Fig. 2), which can provide a suitable exposure for every small bit of unsuspected extensions in all possible sites around the primary lesion. It has been found to be useful and rational, not unduly risky or mutilating and has so far not been followed by any post-operative recurrence (Figs. 4, 5 & 6).

A combination of several approaches, however, appears to be essential in late stage II and stage III cases. This has also been realized by other contemporary workers. Spector (1988) incorporated frontolateral and frontotemporal craniotomy with transpalatal and lateral rhinotomy while a mid-facial degloving along with frontotemporal craniotomy was advocated by Antonelli *et al* (1987). For those cases with intracranial extensions, the circum maxillary approach provides direct access to the greater wing of the sphenoid and the roof of the nasopharynx. Erosion of the skull base by the tumour can be palpated digitally and localized.

Although surgery is considered to be the essential choice of treatment for excisable tumours, radiotherapy has been used as an adjuvant to palatal fenestration (300 cGy in three to five weeks). It takes six to eight months following irradiation before a substantial reduction in tumour size or bleeding is noticeable. Bhatia *et al.* (1967) have reported earlier that subtotal excision of intracranial extensions with palatal fenestration is compatible with survival. It leads to containment of the tumour resulting in subsequent cure following radiotherapy and repeated thermocoagulation. Sellar extensions were managed by radiotherapy rather than craniotomy in this series. Briant (1978), Patil *et al.* (1982), Chandler *et al.* (1984), Benghiat (1986), Harrison (1987), Cummings (1988) and Gudea *et al.* (1990) have also reported and accepted radiation as the method of treatment for such tumours.

All intracranial extensions except sellar, which are rare, are reported to be approachable by lateral rhinotomy (Jones *et al.*, 1986). In the case of massive involvement, sellar or dural extensions, the transcraniotomy approaches advocated by Fisch (1983), Antonelli *et al.* (1987), Spector (1988) and Tandon *et al.* (1988) may be justified.

Post-radiation complications. Barring osteitis of the nasal bones which was noticed during follow-up after radium implantation in old cases, in none of the others, even after a follow-up of five to 30 years, has any radiation cataract or thyroid cancer been noticed at our centre. Fears of such complications have, however, been mentioned by Waldman *et al.* (1981), Chen and Bauer (1983) and Cummings (1988). In contrast to the excellent results of Briant *et al.* (1978), Benghiat (1986) and Harrison (1987), the

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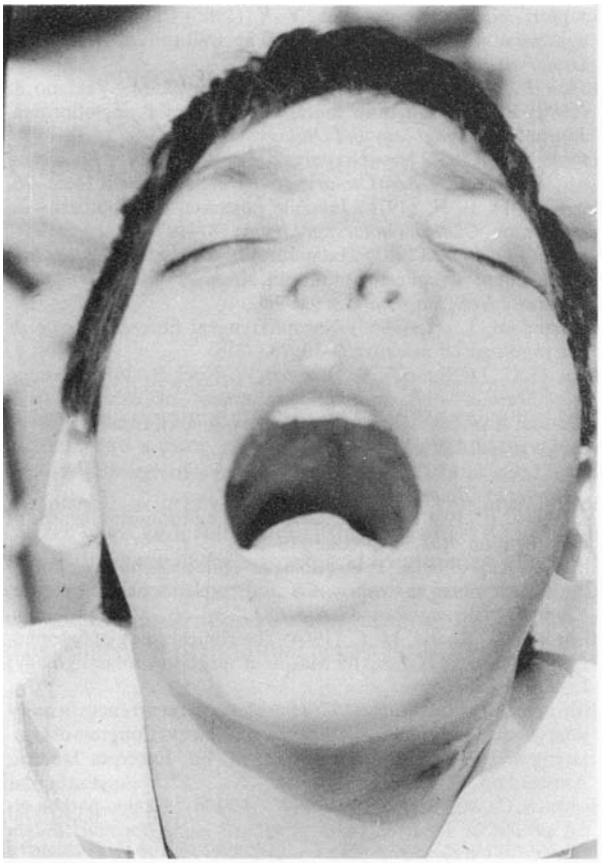

FIG. 4
Post-operative photograph after circum maxillary excision of postnasal angiofibroma.

reports of Patil *et al.* (1982) and Tandon *et al.* (1988) have not favoured radiation as the treatment of choice.

Blood loss. Bleeding in these cases ranged from 105 ml to 1400 ml as determined by the King and Story (1956) method. The loss depends upon the extentions and vascularity of the tumour, age of the patient, duration and the type of the surgery and obliteration of the feeding vessels. Even in the *'per via naturalis'* removal of the tumours with ethmoidal extensions, bleeding occurred up to 920 ml. A pre-operative external carotid ligation in such cases did make a substantial reduction in the blood loss (320 ml).

When employing a transpalatal approach for the cheek and infratemporal fossa extensions, the blood loss was reduced only marginally after external carotid ligation.

However, surgical excision on such cases by trans-pterygopalatine approach using an 'S' shaped incision resulted in a markedly reduced blood loss of about 1000 ml. This difference was irrespective of carotid artery occlusion and appears to be due to a better exposure and quicker dissection.

External carotid artery ligation was carried out in 17 cases sparing the superior thyroid branch which incidentally originates at the same level if not distal to the ascending pharyngeal. The part of the tumour in the choana and nasopharynx undoubtedly derives blood from the ascending pharyngeal as well as the terminal branches of the ipsilateral, and at times contralateral, external carotid artery. Ligation of the ipsilateral external carotid alone is, therefore, not likely to reduce the bleeding from a mass confined to this area. It does, however, do so for extensions to other sites *e.g.* infratemporal fossa and cheek. The cheek and infratemporal fossa masses get their vascular supply basically from the ipsilateral external carotid; for this reason they show reduced operative bleeding after external carotid ligation. Embolization of both internal maxillary artery system as well as the ascending pharyngeal as carried out by Spector (1988) was successful in reducing the bleeding from up to 7500 ml to only 1000 ml. Bilateral external carotid embolization may be useful in reducing blood loss (from 2000 ml to only 600 ml—Gay *et al.*, 1983) only. Antonelli *et al.* (1987) also reported reduced bleeding from 1800 ml to 650 ml following embolization. However, in view of the risk of complications following embolization (Lasjaunias, 1980; Spector, 1988) it was not attempted in this series. Harrison (1987) observed that following embolization, reduced bleeding may encourage a residue in the pterygoid musculature. The blood loss could perhaps be reduced by using a digital dissector worn over the index finger.

Post-irradiation recurrence when subjected to surgical excision was associated with extensive adhesions and required a longer time for tumour dissection and mobilization and, therefore, more bleeding (about 1400 ml).

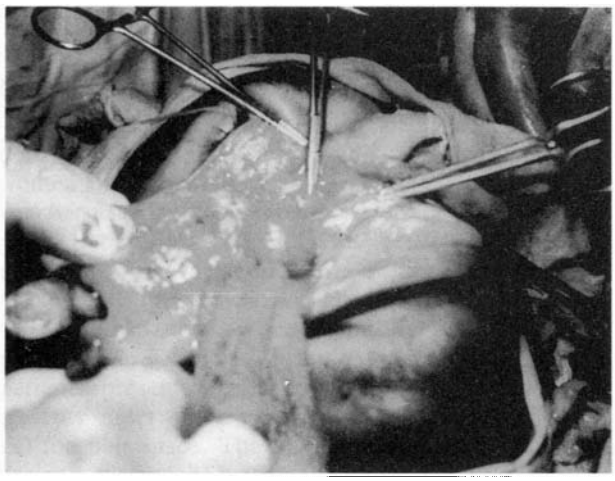

FIG. 5
Operative photograph of the tumour mobilized from infratemporal fossa, cheek and ethmomaxillary region.

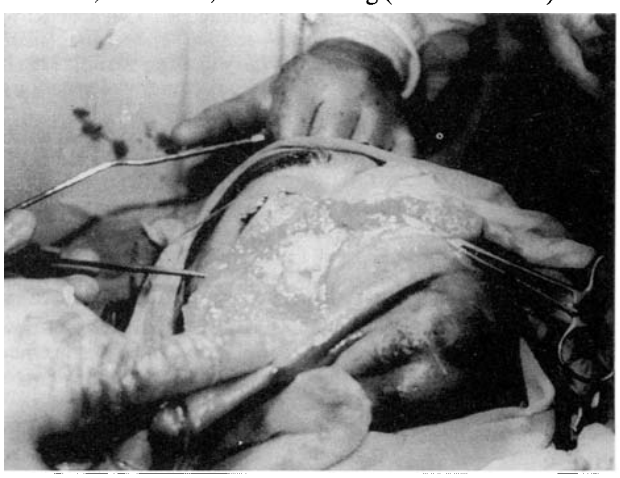

FIG. 6
Operative photograph showing subtotal maxillectomy.

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Extensions to the skull base, antrum, sphenoid, orbit and ethmoids render the patient more vulnerable to tumour recurrences. The cheek, nasal and pterygopalatien fossa extensions with a proper pre-operative tumour delineation and adequate surgical exposure very rarely lead to recurrence.

Often, high mortality and morbidity in very extensive tumours have been compelling factors in choosing the non-surgical methods of treatment, *viz* pre-operative radiation, thermocoagulation, cryotherapy, controlled hypotensive anaesthesia and embolization. Hormonal therapy has also not proved successful in our cases (Mishra and Bhatia, 1964). Antimitotics as suggested by Chandler *et al.* (1984) and Goepfert *et al.* (1985) have not been tried. Harrison (1987) observed no patient in his series of 44 cases in whom complete control could not be obtained with adequate surgical resection or carefully planned radiotherapy.

The surgery, therefore, planned according to the tumour extensions and staging, carried at the earliest with widest possible exposure and adequate blood replacement appears to be the key to success in the management of these tumours.

Note: In this article the transpterygoid approach implies a short form of transpalatal transpterygopalatine/transpterygopalatine approach.

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