A Result of Sublabial Transnasomaxillary Approach for Nasopharyngeal Angiofibroma - Retrospective Study

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Abstract

To evaluate the result of sublabial transnasomaxillary approach (STA) as a route for removal of juvenile nasopharyngeal angiofibroma (JNA). Eleven young male patients with angiofibroma underwent removal *via* the sublabial transnasomaxillary approach. This technique is described in detail. There was neither major operative nor postoperative complication. One patient developed dacryocystitis. Long term follow-up longer than 18 months in 5 patients, showed no recurrence. This technique is useful for removal of angiofibroma because it enables the surgeon to gain extensive exposure of maxillary, ethmoid and sphenoid sinuses and to control sphenopalatine and internal maxillary arteries, without risk of palatal dysfunction or of oronasal fistula. Other advantages comprise the lack of a facial scar, nasal septal scar and bilateral premaxillar numbness, and good postoperative assessment.

Key word : Nasopharyngeal Angiofibroma, Sublabial Transnasomaxillary Approach

Juvenile nasopharyngeal angiofibroma (JNA) is a highly vascularized neoplasm. Histopathologically JNA is composed of both myofibroblastic and vasogenic elements. Common symptoms are unilateral nasal obstruction and recurrent epistaxis in pre-pubescent or pubescent males.

Although JNA is histologically benign, the tumor has a tendency to be locally aggressive resulting in severe epistaxis, involvement of endocranial structures, and a high rate of recurrence. The most common site of origin of JNA is a broad area of 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 bone[1,2]. This junction forms the superior margin of the sphenopalatine foramen and is also the location at which the membranous viscerocranium meets the cartilaginous neurocranium. From this area, the tumor is able to grow easily into the sphenoid sinus, the pterygomaxillary fossa, the infratemporal fossa, cheek, orbit and intracranial cavity.

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Many routes of intracranial invasion are identified as follows: i) from infratemporal fossa eroding through of the floor of the middle cranial fossa, ii) from pterygomaxillary fissure along the inferior and superior orbital fissures, and iii) from sphenoid sinus via the superior wall into the cavernous sinus and/or pituitary fossa[3].

JNA accounts for 0.5 per cent of all neoplasms of the head and neck with an incidence of 1:6,000 to 1:55,000 among the population in the United States[4].

Macroscopically, JNA appears as a well-circumscribed, non-encapsulated mass covered by mucosa of the nasopharynx[5]. The tumor communicates with the veins in the surrounding tissue rather than with the nearby arteries[6]. Although JNA's main arterial supply is the internal maxillary artery, there may be additional vessels from branches of the ipsilateral internal carotid artery or the contralateral external carotid arterial system[7].

During angiography, the characteristic feature of dense, homogeneous blush is usually seen[5]. Histologically, the tumor consists of thin-walled vessels of variable size in a moderately cellular stroma. The vessel wall generally consists of only a single lining[3,5].

Sessions and Humphreys[8] suggested that biopsy before treatment is unnecessary.

Staging of JNA was recommended by Chandler et al[9] based on the system proposed for nasopharyngeal cancer by American Joint Committee. In 1981, Sessions et al[10] proposed a staging system that contained more details. This permits a systemic application and comparison of the various modes available. As a result of retrospective analysis by Radkowski et al[11], the staging of JNA was modified from that proposed by Sessions et al (Table 1).

Malignant transformation of JNA is a rare occurrence. To date, there are 6 reports of malignant transformation[12]. Five of these six patients had multiple surgical resections combined with radiation therapy (dosage above 3000 cGy). The interval from radiation treatment to the diagnosis of malignancy ranged from 11 months to 21 years. The histology in 5 out of 6 cases were a fibrosarcoma and that of the remaining case was a malignant fibrous histiocytoma. This implied that the therapy for JNAs should be a one-stage, complete surgical excision. Total removal of the lesion will prevent recurrence and the possibility of a malignant transformation.

In Thailand, various surgical approaches have been used to treat JNA[13-16]; these included sublabial midfacial degloving operations, transantral

Table 1. Staging systems for juvenile nasopharyngeal angiofibroma.

Chandler et al[9], 1984		Sessions et al[10], 1981		Radkowski et al[11], 1996	
I	Tumor confined to nasopharyngeal vault	IA	Limited to nose and/or nasopharyngeal vault	IA	Limited to nose and/or nasopharyngeal vault
II	Tumor extending into nasal cavity or sphenoid sinus	IB	Extension into ≥ 1 sinus	IB	Extension into ≥ 1 sinus
III	Tumor extending into antrum, ethmoid sinus,	IIA	Minimal extension into PMF	IIA	Minimal extension into PMF
P	MF, ITF, orbit, and/or cheek	IIB	Full occupation of PMF with or without erosion of orbital bones	IIB	Full occupation of PMF with or without erosion of orbital bones
IV	Intracranial tumor	IIC	Infratemporal fossa with or without cheek	IIC	Infratemporal fossa with or without cheek or posterior to pterygoid plates
		III	Intracranial extension	IIIA	Erosion of skull base -minimal intracranial
				IIIB	Erosion of skull base -extensive intracranial with or without cavernous sinus

PMF indicates pterygomaxillary fossa; ITF, infratemporal fossa

approach, lateral rhinotomy and transpalatal procedures.

In consideration of the importance of good visual and surgical access, a surgical approach that gives a very good visualization of the tumor should be regarded as an ideal procedure for JNA.

The retrospective report is based on the efficacy of sublabial transnasomaxillary approach (STA) as a route for resection of JNA.

PATIENTS AND METHOD

All patients with JNA underwent surgical resection via the STA at Ramathibodi Hospital between 1986 and 1996.

The diagnosis of JNA in all patients was verified histopathologically. Computed Tomography (CT) was performed in every case. The blood supply to the tumors was assessed by angiography of the external and internal carotid arteries and their branches. Seven of 11 cases underwent embolization of the internal maxillary arteries. Staging of the tumors was done according to the system suggested by Sessions et al[10].

Surgical Technique

Under general anesthesia, the patient was placed in the supine position. On the side which was ipsilateral to the tumor, the buccal gingival sulcus and canine fossa were infiltrated with 1 per cent Xylocaine with 1:100,000 epinephrine. After a standard surgical scrub, a head drape and split sheet were then positioned. Illumination with the head light was essential. At least 5 units of cross-matched packed red cells should be made available.

Sublabial incision extended from the midline to a location immediately above the first upper molar tooth on the same side as the tumor. The adjacent facial soft tissue was elevated over the anterior maxilla: in medial and lateral directions i.e. i) from the nasal bone medially to the lateral-most extent and ii) in a superior direction to the infraorbital rim. The contents of the infraorbital foramen should be preserved except in a situation in which the sacrifice of the neurovascular bundle was intended. The lacrimal sac may be displaced from its fossa and surgical exposure may be extended upwards to the medial canthal ligament. The pyriform margin was incised to expose the nasal fossa. (Fig. 1.)

Bone was resected to expose and improve access for the removal of the tumor. The maxillary antrum was entered and anterior maxillary bone was removed with the use of a rongeur and a burr. Bone removal was extended substantially onto the frontal process of the maxilla in order to provide access to the ethmoid. (Fig. 2.) Medial maxillectomy was completed by performing osteotomies. (Fig. 3.) These exposures provided good exposure for JNA and were important for the removal of JNA. (Fig. 4.) In addition, an enlarged exposure and access for posteriorly located nasopharyngeal JNA were able

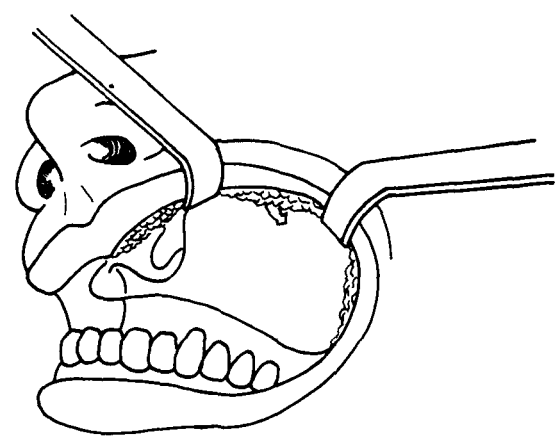

Fig. 1. Unilateral sublabial incision, exposing the anterior maxillary wall and nasal fossa.

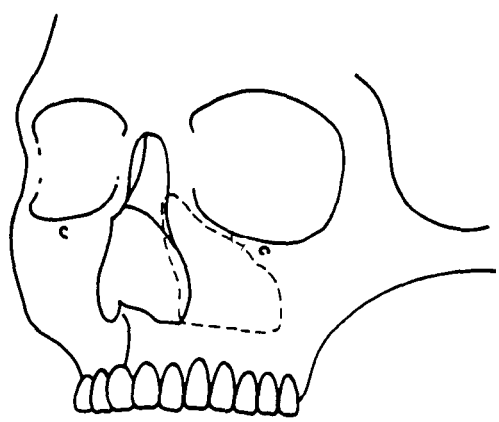

Fig. 2. Showing outline of external bony resection.

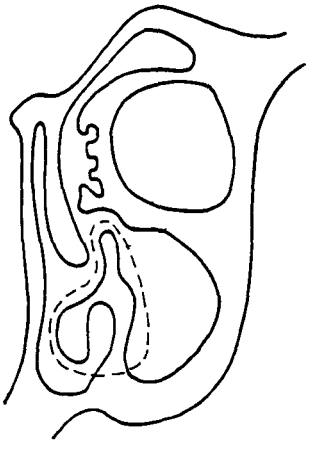

Fig. 3. Showing outline of medial maxillectomy in coronal view.

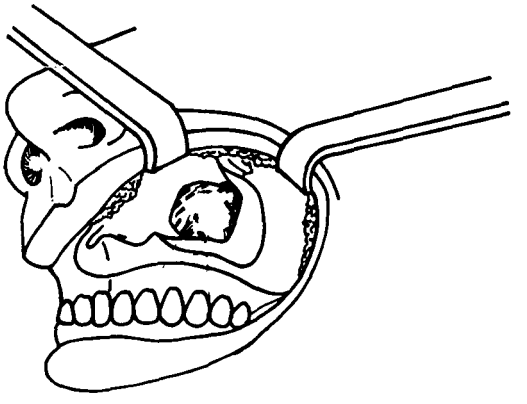

Fig. 4. Tumor exposure after bony resection.

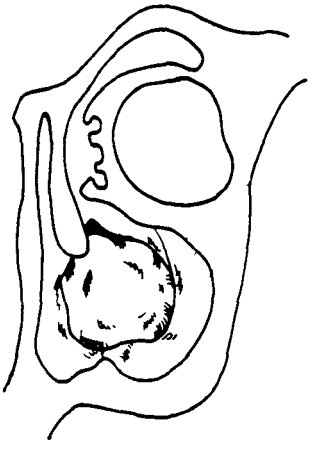

Fig. 5. Coronal view, demonstrating the tumor located in the pterygomaxillary fossa and nasal cavity.

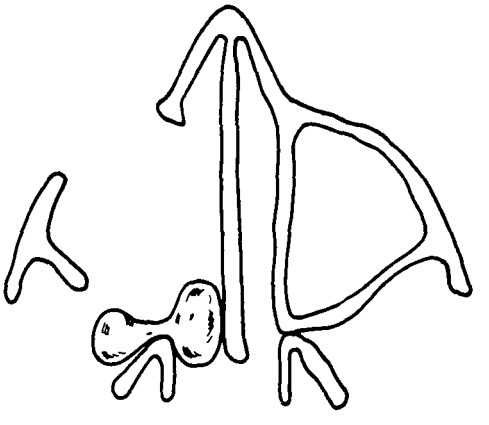

Fig. 6. Axial view of the Fig. 5.

to be attained by drilling the sphenopalatine foramen, identifying and cauterizing the feeding arteries. If the tumor extended into the pterygomaxillary space, the posterior wall of the maxillary antrum had to be removed. (Fig. 5. and 6.) Bone spicules and any rough surfaces were smoothened out carefully in order to prevent inadvertent injury to the surgeon's finger (because the surgeon's index finger was often used to palpate the tumor and nearby structures). The tumor was removed by using a tonsillar dissector together with the left index finger (for the right-handed surgeon). If there was tumor extension in any of the following structures i.e. sphenoid sinus, pterygomaxillary space, orbit, cheek, and intracranial cavity (only if it is a minor extension), it could be removed by using this technique.

Hemostasis was accomplished either by serial packs containing vasoconstrictive agents or by the use of electrocautery. Posterior nasal packing was required after the tumor removal. Vasaline

Table 2. The clinical details and surgical results.

No	Age	Staging	Embolization	EBL(ml)	Complication	Follow-up (month)	Recurrence
1	19	IA	yes	700	no	2	no
2	11	IA	yes	400	no	24	no
3	15	IA	yes	300	no	1	no
4	13	IA	no	2300	no	2	no
5	14	IIB	no	1200	no	8	no
6	17	IIB	no	1700	no	18	no
7	18	IIC	yes	2000	no	5	no
8	12	IIC	yes	700	dacryocystitis	34	no
9	13	IIC	no	2500	no	21	no
10	16	IIC	yes	600	no	4	no
11	12	IIIA	yes	1800	no	24	no

gauze in rubber glove was then inserted firmly into the postsurgical cavity and layered to the level of the anterior maxilla; also, and an extra length was passed through the nostril. The sublabial incision was closed with absorbable sutures.

The packing was removed between the fourth and seventh postoperative day depending on the severity of bleeding after tumor excision. The cavity wall should have a granulation tissue lining when the packing was removed. This lining became slowly covered by metaplastic epithelium. Frequent removal of crust was required in the early postoperative period. After the operation, twice-daily normal saline irrigations with a nasal bulb syringe had to be started as soon as possible and were essential for the first postoperative month.

Table 3. Operative complications.

Operative complications	n	% (N=11)
Early complications		
Major complications:		
Death	0	0
Intracranial complication	0	0
Blindness	0	0
Minor complications:		
Hemorrhage (more than 1,000 ml)	6	54
Wound infection	0	0
Late complication		
Dacryocystitis	1	9
Total	7	63

RESULTS

There were eleven patients in this study and they were all male. The clinical details and surgical results are summarized in Table 2.

Their ages at the time of diagnosis ranged from 11 to 19 years.

The patients were staged as follows: 4 patients in stage IA, 2 patients in stage IIB, 4 patients in stage IIC and 1 patient in stage III.

Operative complications i.e. early complications within 30 days of surgery and late complication are listed in Table 3.

The rate of operative complications was 63 per cent (7/11). The most common early complication was hemorrhage (54%). The average blood loss in embolized patients (7 patients) was 928 ml compared with 1,925 ml in non-embolized patients (4 patients). There was 1 case of late postoperative dacryocystitis and this patient was later treated by dacryocystorhinostomy.

The follow-up periods ranged from 1 to 34 months (average of 11 months). There was no recurrence of JNA during the follow-up periods.

DISCUSSION

In 1979, Conley and Price[17] presented sublabial degloving midfacial approach to the nasal vault and nasopharynx. This approach was able to accomplish wide-field access without external facial incisions and has been used to treat one Thai boy with JNA[16]. Maniglia[18] also emphasizes the efficacy of midfacial degloving in dealing with a variety of nasal, sinus, and nasopharyngeal conditions, including angiofibroma. Sofferman[19] presented the septal translocation procedure for management of these conditions.

There are several reports concerning the various surgical approaches in order to gain access for the excision of JNA e.g. transpalatal, transantral, lateral rhinotomy, Denker's, transmandibular or retromaxillary approaches[5], a combined intracranial and extracranial approach[20,21], external transsphenoid ethmoid approach[22], extended transcranial approach[23], transpalatal transpterygopalatine approach[24], and circummaxillary approach[25].

In this series, all tumors were removed by the STA, which required only unilateral exposure, and the surgeon was able to achieve complete removal of JNAs of stage I - III. The clinical diagnosis of JNA was based on the history and clinical findings. The CT scan was used for staging of JNAs. At Ramathibodi Hospital, angiography provided the information about the degree of blood supply to the tumor, the source of the blood supply and access for preoperative embolization. Khanjanathiti et al[26] studied bilateral carotid angiograms in 29 cases with JNA in Thailand and found the feeding vessels as follows: internal maxillary arteries in 24 cases, ascending pharyngeal arteries in 3 cases, and facial artery in 1 case.

Many papers have reported that embolization was able to reduce peri-operative blood loss[3, 27-31]. Sekorarith and Bhoopat reported treatment of 14 cases of JNAs by pre-operative Gelfoam embolization of internal maxillary, dissection and removal (shelling) of the tumor under hypotensive anesthesia[13]. Among our patients, the average blood loss in embolized patients (928 ml) was much less than the blood loss in non-embolized patients (1,925 ml). Furthermore, the severity of blood loss was related to the stage of the tumor and also to the difficulty in the tumor removal.

The rate of complications was very acceptable: 0 per cent (0/11) for major complication, 54 per cent (6/11) for minor early complication and 9 per cent (1/11) for late complication (1 dacryocystitis).

In this series, the recurrence of tumor was assessable in 5 patients with the follow-up time exceeding 18 months. No recurrence was evident among these patients.

In other series, the recurrence rate varied from 17-50 per cent depending on the stage and procedure[11,25,32].

Surgical therapy requiring multiple operations to control the tumor is not recommended as primary treatment. As for radiation therapy, this mode is not recommended as primary therapy for this tumor as it produces inconsistent results and can result in malignant transformation[32,33]. Exogenous estrogen therapy is currently not recommended in the standard treatment of JNA[11].

To date, the commonly used surgical approaches include lateral rhinotomy, transnasal-transmaxillary *via* midfacial degloving, Denker's sublabial transmaxillary, suprahyoid transpharyngeal and transpalatal. Several surgical approaches to nasopharyngeal angiofibroma are still in vogue, depending upon the personal preferences of the surgeon. According to Accuna[34] and Harbert and Harbert[35], the transpalatal approach gives a satisfactory result without impairment of palatal function. Handausa et al[36] and Pressman[37] advocated a modified Moure's lateral rhinotomy. Fisch (38) suggested the infratemporal fossa approach for JNA invading the infratemporal fossa, orbit, parasellar region remaining lateral to the cavernous sinus, cavernous sinus, optic chiasmal region and pituitary fossa. Price et al[39] advised the midfacial degloving procedure for managing a large variety of pathologic entities affecting the nasal cavity, paranasal sinuses and skull base.

In the experience of Antonelli et al[3], embolization reduced intraoperative blood loss from an average of 1,800 ml to an average of 650 ml, without significant side-effects. Therefore, ligature of the external carotid artery is unnecessary. Selection of the approach depends on tumor stage (JNA staging) i.e. stage I employing suprahyoid pharyngotomy, stage II and III employing midfacial degloving.

Only when the tumor invades deep vital structures like the cavernous sinus, optic chiasma or pituitary fossa can surgical excision be very dangerous. In these cases, it is advisable to perform a partial resection and treat the residual tumor with radiation therapy and/or hormonal therapy.

SUMMARY

From our experience, STA not only provides good exposure of the anatomical regions involved by JNA but also gives excellent cosmetic results. Extension of the tumor into the pterygomaxillary, infratemporal fossa, sphenoid sinus, cavernous sinus and minimal intracranium can be removed by this approach following adequate bone work. The advantages of STA procedure in com-

parison with those of the transpalatal, lateral rhinotomy and midfacial degloving techniques are:

1. provision extensive exposure of maxillary, ethmoid and sphenoid sinuses,

2. readily accessible control of sphenopalatine and internal maxillary arteries,

3. no risk of palatal dysfunction or of oronasal fistula,

4. lack of a facial scar,

5. lack of nasal septal scar and bilateral facial numbness,

6. easy postoperative assessment by anterior rhinoscopy and endoscopic examination because of the large sinonasal cavity.

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ผลการรักษาเนื้องอกแองจิโอไฟโบรมาด้วยวิธีผ่าตัดผ่านทางช่องจมูกและโพรงอากาศข้างจมูกแม็กซิล่า

*ชัย อยู่สวัสดิ์, พ.บ., อ.ว.โสตศอนาสิก**

การประเมินผลการรักษาเนื้องอกแองจิโอไฟโบรม่าด้วยวิธีผ่าตัดผ่านทางช่องจมูกและโพรงอากาศข้างจมูกแม็กซิล่า ในผู้ป่วย 11 ราย ไม่พบว่ามีภาวะแทรกซ้อนที่ร้ายแรงขณะผ่าตัดและหลังผ่าตัด มีเพียง 1 รายที่เกิดการอักเสบของถุงน้ำตา หลังการผ่าตัด ติดตามผลการรักษานานกว่า 18 เดือนในผู้ป่วย 5 รายไม่พบว่ามีเนื้องอกเกิดขึ้นมาอีก ข้อดีของการผ่าตัดด้วยวิธีนี้คือ สามารถเห็นขอบเขตการผ่าตัดที่กว้างพอที่โพรงอากาศข้างจมูกแม็กซิล่า, เอ็ธมอยด์และสฟีนอยด์ และยังควบคุมเส้นเลือดแดงสฟีโนพาลาทีนและแขนงในของเส้นเลือดแดงแม็กซิล่า ไม่เสี่ยงต่อการเกิดความผิดปกติของเพดานอ่อนหรือรูรั่วระหว่างจมูกและช่องปาก ไม่เกิดแผลเป็นที่ใบหน้า, ผนังกลางในจมูก และไม่เสี่ยงต่อการเกิดอาการชาของโหนกแก้ม 2 ข้าง

คำสำคัญ : เนโซฟาริงเจียล แองจิโอไฟโบรมา, การผ่าตัดผ่านทางช่องจมูกและโพรงอากาศแม็กซิล่า

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