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Research Article

Maxillary Swing Approach - Sri Lankan Experience

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Abstract

Introduction:
The maxillary swing approach is one of the trans maxillary surgical approach techniques used in otorhinolaryngology. It gives wide exposure to the nasopharynx, orbital apex, sphenoid sinus pterygopalatine fossa, infra temporal fossa and middle cranial base. This enables en bloc resections of tumour and proper visualization.

Objectives:
1. To study patients who underwent this procedure during the last five years with regard to indication, technique, and complications.
2. To compare our patient outcomes with the published literature.
3. To identify the factors leading to complications with recommendations to reduce them in the future.

Methods:
Retrospective analytical study was done on patients operated from 2015 to 2020 at the ENT Unit C of the National Hospital of Sri Lanka (NHSL).

Results:
A total of 14 patients underwent maxillary swing approach during the study period. The most common indication was angiofibroma. About 28% had an unacceptable scar following the surgery, which was the most occurring complication while 2 patients had recurrences during this period.

Conclusion:
Maxillary swing is a useful surgical approach with no major complications in our series. Commonest complication was an unacceptable scar (28%). Other complications were palatal fistula and nasal speech. It is postulated that further refinement of the technique will reduce these complications.

Key Words: Maxillary swing, Angiofibroma, Skull base approach

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Introduction

Maxillary swing approach is one of the trans maxillary surgical techniques used in otorhinolaryngology, which gives wide exposure to the nasopharynx, orbital apex, sphenoid sinus pterygopalatine fossa, infra temporal fossa and middle cranial base[1,2]. This approach was first described by Professor William I. Wei in 1991[1]. We have used this approach in several complex lesions in this region.

Nasopharynx, orbital apex, lateral and middle cranial base harbours diseases that require surgical intervention[2]. Surgical approaches can be endoscopic or open surgical methods with or without microscopic assistance but, in most described approaches, the nasopharynx and the para-nasopharyngeal space are not adequately exposed to allow oncological resection carried out in an en bloc fashion[2,7]. Furthermore, this approach will provide covering for an exposed internal carotid artery with a pedicle or free flap following radio-necrosis of the nasopharynx after radiotherapy for a nasopharyngeal malignancy [2,3].

Maxillary swing procedure is not free of complications. It has risk of potential damage to vital structures including lacrimal duct, palate, orbit, jaw, eustachian tube and the maxilla itself. Other reported complications include palatal fistula, ugly or unacceptable scar, nasal speech, regurgitations of food or swallowing problems and recurrence of the primary pathology[17]. This article describes our experience with maxillary swing procedure with some alterations to the originally described procedure, patient outcome and future recommendations.

Objectives

1. To study patients who underwent this procedure during the last five years (2015 – 2020) with regard to indication, technique, and complications.
2. To compare our patient outcomes with published literature.
3. To identify the factors leading to complications with recommendations to reduce them in future.

Material and Methods

Descriptive analytical study was conducted during the period of 2015 to 2020 in unit C of the National Hospital of Sri Lanka on patients who underwent a maxillary swing procedure. All verbally consented patients were included in the study. Our exclusion criteria were all those who did not give the consent.

Pre-operative consent

Consent of the patient included facial incisions, numbness over the infraorbital nerve distribution, wound dehiscence and breakdown, oro-nasal and oro-nasopharyngeal fistulae, ectropion and also about recurrences.

Surgical technique

Although the original description to this technique recommends preoperative tracheotomy, which is kept for one week after surgery[1,2], tracheostomy was not performed in patients included in this study as we felt the risk to the upper airway is minimal once the maxilla is fixed with mini plates.

This surgical procedure was subdivided in to 3 stages [1,2,5,6].

1. Soft tissue exposure
2. Preparation for the plating and the osteotomy
3. Closure

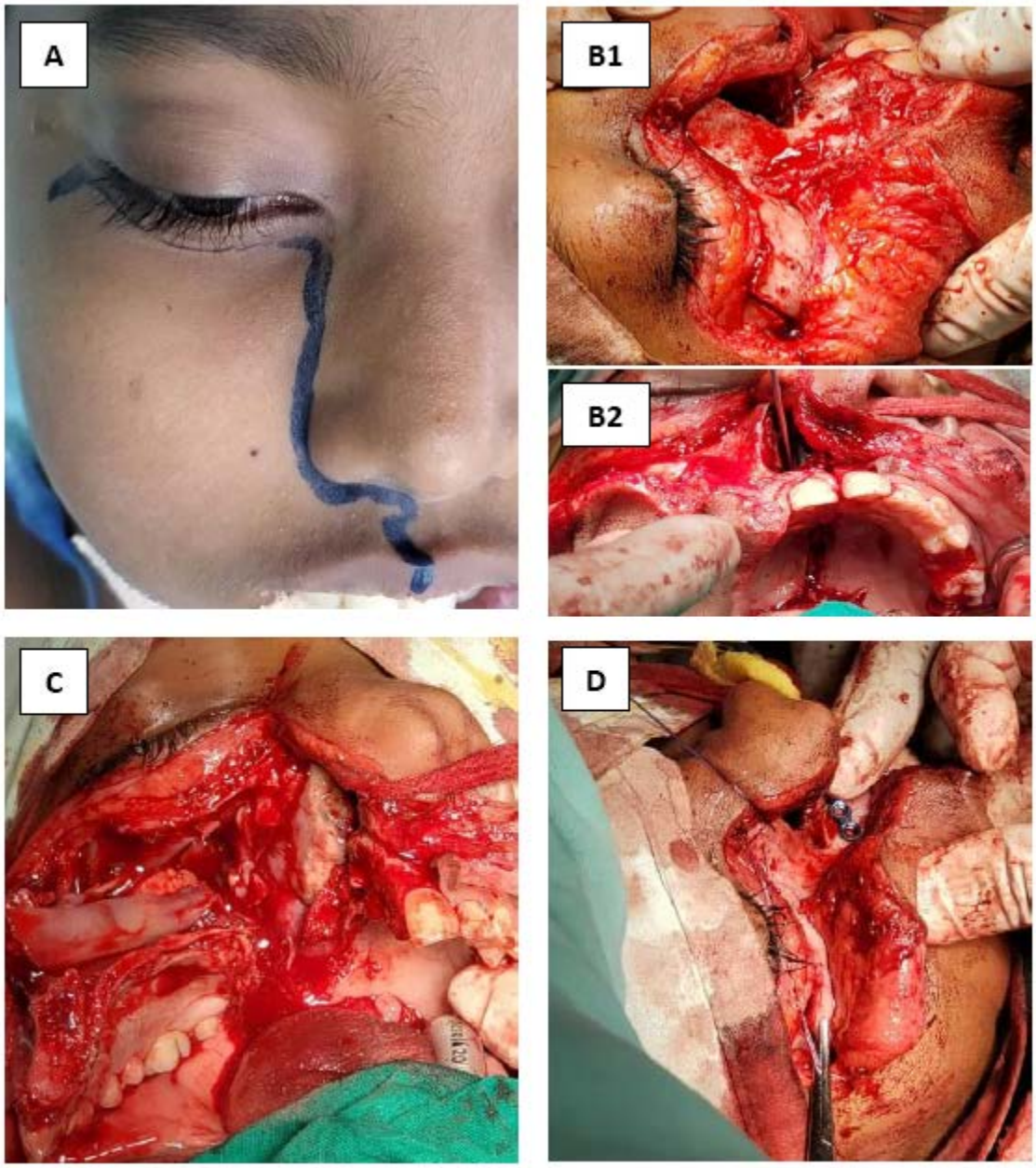

Figure 1: Surgical procedure

Incision for maxillary swing starts 2 cm lateral to the lateral canthus of the eye with view of adequate exposure to the zygomatic arch (Figure 1-A). It lies 3 mm inferior to palpebral fissure to prevent lymph oedema or ectropion. At the medal canthus, the incision is made more obtusely to prevent ischemia and wound dehiscence. To prevent contracture and there by upward retraction of the lip, the incision in the vermilion border area was made with an angle. Palatal incision was made very close to the midline in the hard palate up to the hard and soft palate border, but little away from the centre. Form this point, incision was lateralized through the soft palate to the posterior end of the maxillary tuberosity. Facial incision was deepened down to the periosteum. However, periosteum was only lifted just enough for the osteotomies, thereby keeping the cheek flap attached to the anterior wall of the maxilla and keeping the periosteum intact. Before performing osteotomies, holes were drilled for anchoring the miniplates, which are used to stabilize the maxilla after the procedure. The palates were positioned over the zygomatic arch, over the bony area under the nasal spine, anterior wall of the maxilla and the adjacent frontal process. Osteotomies were made over the maxilla using the osteotome and fissure burs. Osteotomy begins at lower border of the zygomatic arch separating the maxilla and

then it runs medially just below the orbital rim to the piriform aperture (Figure 1-B1). The inferior orbital wall was not disturbed during the process.

Hard palate mucoperiosteum was elevated and osteotomy was made using ether gigli saw or osteotomes (Figure 1-B2). Medial wall of the maxilla was divided at the level of middle turbinate. Final osteotomy was made between the maxillary tuberosity and the pterygoid plates using the curved osteotome. Keeping the masseter and the cheek flap free, the maxilla was swung laterally by exposing the nasopharynx, including the roof, posterior wall, and lateral walls with the orifices and cushions of the Eustachian tube (Figure 1-C). Then tumour resection was carried out accordingly.

After the resection was completed, the laterally swung maxilla, which is attached to the cheek flap, was returned. Miniplates and screws were used for fixing to the zygoma and the opposite maxilla (Figure 1-D). The facial wound was closed in layers, and the palatal incision was closed in 2 layers. The nasal cavity was then packed after soft tissue repair. Postoperatively, no special care was required, and oral feeding usually restarted once the palate is healed. Until then, nasogastric feeding was continued.

Results

The total number of patients who underwent maxillary swing procedure was 14 out of which juvenile angiofbroma is the commonest (8/14). It included 2 females and 12 male patients. Although mean age of the patients were 30.2 years, there were 2 groups: angiofibroma patients and patients with other aetiologies. Average age of angiofibroma patients was 17.3 years whereas for patients with other aetiologies, it was 47.3 years.

Table 1: Aetiopathology

Aetiopathology	**No of patients**
Angiofibroma	8
Nasopharyngeal carcinoma	3
Sphenoid bone cyst	1
Ethmoid carcinoma	1
Adenocystic carcinoma of the nasal cavity	1

The facial scar was graded as acceptable, prominent or disfiguring. If the scar is acceptable to the patient and it has minimal cosmetic disfigurement, it was graded as an acceptable scar. Whereas it is prominently visible to others, but if the patient is not bothered, it was classified as a prominent scar. When the scar shows unacceptable cosmetic deformity, it was graded as disfiguring.

Facial scar was found to be disfiguring in 2 patients out of 14, and 4 of them had prominent scars from which 3 patients underwent postoperative radiotherapy following the surgery. However, facial scar was barely visible in all other patients.

Figure 2: Unacceptable scar

If patient demonstrates nasal quality speech oblivious to patient as well as to the outside observer it's categorized as prominent nasal speech where as if it's only detected by the examiner it categorized as mild nasal quality speech. Out of the 14 patients, one patient had prominent nasal speech and 3 patients had mild nasal speech (all were found to have sinonasal carcinomas.) Two of the angiofibroma patients also noted to have mild nasal quality speech initially, but it resolved after two months. Both of these patents had palatal fistula initially.

Significant feeding problems were not noted in this study, regurgitation was categorized to mild and severe depending on its effect on quality of life and type of food that regurgitates. One patent had mild nasal regurgitation due to persistent fistula. 4 out of 14 patients had palatal fistulas initially, two of them were surgically repaired. Another two were having persistent fistulas for which one was wearing prosthesis.

Furthermore, ophthalmoplegia, jaw malocclusion and trismus were not detected in our study, though they are known to occur following this procedure.

Figure 3: Persistent palatal fistula

In this study, maximum and minimum follow up periods were five years and nine months respectively and the average follow up duration was 3.5 years. One patient with angiofibroma had recurrence one year after the initial surgery and the two patients having sinonasal malignancies deceased during this period. Another patient who underwent maxillary swing for nasopharyngeal squamous cell carcinoma, was reported with a recurrence of disease. Recurrences were noted in the follow-up clinic visits.

Table 2: Post-operative complications

State of Facial Scar	Acceptable N =10(71%)	Prominent N=2(14%)	Disfiguring N=2(14%)
State of the speech	Normal N=10(71%)	Mild nasal quality N=3(21%)	Significant nasal speech N=1(7%)
Feeding problems	No abnormality N=13(93%)	Mild nasal regurgitation N=1(7%)	Severe nasal regurgitation
State of the palate	Normal N=10(71%)	Fistula repaired N=2(14%)	Persistent fistula N=2(14%)
Current state of the patient a) Disease free b) Living with residual disease c) Recurrent disease d) Undergoing further treatment e) Quality of life affected by the surgical complications f) Deceased	 N=11(78%) N=1(7%) N =1(7%) N=1(7%) N=2(14%) N=2(14%)		

Discussion

Surgical approaches to nasopharynx, orbital apex, sphenoid sinus pterygopalatine fossa, infra temporal fossa and middle cranial base can be broadly classified as open and endoscopic methods. Advancement of endoscopic technology and instruments enable transnasal approaches even to pterygopalatine fossa, infratemporal fossa and skull base[9], but it is best suited for lesions confined to nasopharynx, the nasal cavity, the ethmoid and the sphenoid sinuses, and slight ex-tensions to the pterygopalatine fossa[8].

A study done by the Pryor et al[9] reported less complications, less recurrence rates, and less intra-operative blood loss and shorter duration of hospital stay compared to the conventional open surgical methods. However, most agree that open surgical methods give wider exposure and better control of bleeding during the surgery. Open surgical methods to nasal cavity nasopharynx, infratemporal fossa, pterygopalatine fossa and mid skull base are divided into infratemporal, transfacial, and transpalatal approaches. Usual transfacial approaches include transnasal, transeptal, and intraoral Le Fort 1 osteotomy approach[10]. These approaches provide limited surgical exposure with a narrow window, whereas infra temporal approach gives better view, but it is a complex approach with high post-operative morbidity such as facial nerve damage and trismus. Transpalatal approach has better cosmetic outcome, but it has limited exposure to above mentioned regions.

Major determinants of complex surgical approach for a tumour excision includes degree and quality of exposure to find out anatomical location of the tumour and its extension and then to obtain vascular control of the tumour bed[11,12].

Maxillary swing approach initially described by Wei et al[1] maximizes access and increases flexibility of tissue dissection with minimal morbidity. It provides extension of the dissection superiorly as well as inferiorly, further enabling to approach extradural and intradural lesions in this compartment[11,12]. It

is also an excellent approach to the mid cranial base by providing short distance to the target and precise excision of the tumor[12]. If the lesion involves both sides, upper part of the nasal septum can be resected to get access to the opposite side.

Compared to the original description by Wei et al, changes were made in the surgical procedure in this series. Firstly, tracheostomy was not done on any patient; secondly division of the infraorbital nerve was not done in every patient[1]. However, infraorbital nerve was divided in situations where it was involved by the tumour.

Although maxillary swing procedure provides greater exposure and feasibility of better resection of the tumour, it is not without complications. In our study, scar disfigurement was noted only in 2 out of 14 patients (14%), which is similar to research done by Roy Chowdhury et al[14]. In 8 patients (57%), scar was barely seen.

In relation to speech, one patient had severe nasal quality of speech, whereas 10 patients had normal voice which is more than 71%. Three patients had mild nasal quality. In studies done on maxillary swing procedure complications with regard to speech was not evaluated[14,17]. All four patients who had speech problems were treated with radiotherapy for carcinoma. Feeding problems were not noted in this study, but one patient had mild nasal regurgitation due to a persistent fistula. In a study done by Wei et al it ranges from 5.1% to 18.7%, but it was a study carried out for patients with nasopharyngeal carcinoma whereas our study included both the benign and malignant diseases. Furthermore, they have noted that post-operative radiotherapy increases swallowing problems.

Palatal fistula is another well-known complication following maxillary swing procedure. In our series 2 patients (14%) had a persistent fistula, which is less than that depicted by studies done by Mathur and Vashishthet al[8] (n =2/5) and Roy Chowdhury et al[14] (n=3/14). During post-surgical follow-up visits, rigid nasal endoscopic examination was done in every patient to detect local recurrence or residual disease. Suspected patients were subjected to imaging (contrast enhanced CT) to confirm the recurrences.

Recurrence rates were discussed in two groups. Out of 8 patients who had angiofibroma, only one developed recurrence after 1 year, which is less compared to study done by Roy Chowdhury et al (n=5/14). Camilo R et al has done a meta-analysis on angiofibroma in 362 patients from 1981 to 2015, with a mean follow-up of 49.4 months, where a total of 89 patients (24.5%) had recurrence. When analysing tumour by stage (Radkowski's IA–IIIB $n = 299$), the endoscopic approach proved to be superior independent of tumour stage (2% vs. 17% for tumour stage IA–IIA, and 26% vs. 32% for tumour stage IIB–IIIB for endoscopic and open approaches respectively; $p < 0.05$). But in our study that is 12%, which is less than 26% noted in high grade angiofibromas reported in above meta analysis[16].
Out of four carcinoma patients, one died from metastatic disease and one patient developed a recurrence. According to the study done by Amin et al (n=3)[18] and Abishek B (n=5), did not find any recurrence following surgery. This could be related to the extent of the tumour at the time of diagnosis. However, this operation has provided a favourable outcome to those patients with malignant disease.

Commonest complications following maxillary swing procedure in our study were palatal fistula and cosmetically unacceptable scar. With relevance to scar we have not done any scar revision procedures or referred for plastic surgical input during the procedure regarding wound closure. Furthermore, the wound closure of some patients were done using 3/0 suture with a continuous suturing. Osteotomies were difficult to align properly in some patients due to damaged edges. Meticulous alignment of osteotomies and finer suture material (5/0, 6/0) with interrupted sutures could minimize this complication.

Palatal fistula can be due to the use of diathermy for mucosal incision, difficulty in approximating the mucosal edges, mucosal incision superimposed on the palatal osteotomy and salivary contamination.

This complication was not seen in more recently operated patients. We suggest that the use of scalpel for mucosal incision, making mucosal incision slightly away from the midline, closure of soft palate hard palate junction in 2 layers and postoperative use of a dental plate could be helpful in preventing this complication.

Conclusions

Maxillary swing has been a useful approach in our setting to surgically remove some of the deep seated large tumours. This operation preserves most of the normal tissues of the patient compared to endoscopic techniques where normal tissues are removed to improve access. We believe that tracheostomy need not be performed routinely as we had no airway issues. Our complication rate is comparable with other studies. We need to refine this technique to improve cosmesis and minimize other complications as this operation can be used in many of the combined surgical procedures to get access to the cranial cavity.

References

1. Wei, W., Lam, K. and Sham, J., 1991. New approach to the nasopharynx: The maxillary swing approach. Head & Neck, 13(3), pp.200-207.
2. [Internet]. Ent.cuhk.edu.hk. 2020 [cited 1 November 2020]. Available from: http://www.ent.cuhk.edu.hk/images/publication/head-and-neck-dissection-and-reconstruction-manual/10_MAXILLARY-SWING-APPROACH-TO-THE-NASOPHARYNX.pdf]
3. Nomura T, Kishimoto M, Iwaki H, Ochi A, Kishimoto S. Maxillary Swing Approach for Removal of Palatal Carcinoma: A Modified Procedure. Case Reports in Otolaryngology. 2018;2018:1-4.
4. Midya M, Kalra G, Bedi M. Access to the skull base - Maxillary swing procedure - Long term analysis. Annals of Maxillofacial Surgery. 2018;8(1):86.
5. Shuman AG, Shah JP. Maxillary swing approach for removal of recurrent nasopharyngeal carcinoma. Operative Techniques in Otolaryngology-Head and Neck Surgery. 2014;25(3):248–53.
6. [Internet]. Vula.uct.ac.za. 2020 [cited 1 November 2020]. Available from: https://vula.uct.ac.za/access/content/group/ba5fb1bd-be95-48e5-81be-586fbaeba29d/Maxillary%20Swing%20approach%20to%20the%20nasopharynx.pdf
7. [Internet]. Sites.google.com. 2020 [cited 1 November 2020]. Available from: https://sites.google.com/site/drtbalusotolaryngology/rhinology/total-maxillary-swing-approach
8. Otremba M, Adam S, Omay S, Lowlicht R, Bulsara K, Judson B. Maxillary swing approach for extended infra temporal fossa tumors. The Laryngoscope. 2013;123(7):1607-1611.
9. Fagan JJ, Snyderman CH, Carrau RL, Janecka IP. Naso-pharyngeal angiofibromas: selecting a surgical approach. Head Neck 1997;19:391-9.
10. Pryor SG, Moore EJ, Kasperbauer JL. Endoscopic versus traditional approaches for excision of juvenile nasopharyngeal angiofibroma. Laryngoscope 2005;115:1201-7.
11. Gurudayal Singh Kalra, ManojitMidya, MiteshBedi, Access to the Skull Base - Maxillary Swing Procedure - Long Term Analysis, Department of Burns, Plastic and Reconstructive Surgery, SMS Medical College, Jaipur, Rajasthan, India.
12. Ammirati M, Bernardo A., Analytical evaluation of complex anterior approaches to the cranial base: An anatomic study. Neurosurgery 1998;43:1398-407.
13. Ammirati M, Ma J, Cheatham ML, Mei ZT, Bloch J, Becker DP, et al. The mandibular swing-transcervical approach to the skull base: Anatomical study. Technical note. J Neurosurg 1993;78:673-81.
14. Roy Chowdhury S, Rajkumar K, Deshmukh T (2017) Complications of midface swing for management of juvenile nasopharyngeal angiofibroma. J Maxillofac Oral Surg 16(1):96–100.
15. Mathur NN, Vashishth A (2014) Extensive nasopharyngeal angiofibromas: the maxillary swing approach. Eur Arch Otorhi-nolaryngol 271(11):3035–3040.
16. Reyes C, Bentley H, Gelves J, Solares C, Byrd J. Recurrence Rate after Endoscopic vs. Open Approaches for Juvenile Nasopharyngeal Angiofibroma: A Meta-analysis. Journal of Neurological Surgery Part B: Skull Base. 2018;80(06):577-585**.**.
17. Bhardwaj A, Priya M, Malhotra M, Varshney S, Tyagi A, Singh A. Novel Modifications to Total Maxillary Swing Approach in Extensive Nasopharyngeal Angiofibroma to Minimize Complications. Indian Journal of Otolaryngology and Head & Neck Surgery. 2020**;.**.
18. Amin AA (2007) Maxillary swing approach for surgical resection of recurrent nasopharyngeal tumors. J Egypt Natl Canc Inst19(3):219–223.