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MAIN ARTICLE

Modified midfacial translocation for access to ventral skull base tumours

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Abstract

Objective: To describe our technical modifications of midfacial translocation for access to the nasopharynx, and anterior, central and lateral skull base.

Design: Retrospective chart review of a prospective case series.

Setting: Department of Otolaryngology-Head and Neck Surgery, Aberdeen Royal Infirmary, Scotland, UK.

Methods: Along with demographics, other parameters studied were adequacy of exposure, completeness of resection, aesthetic outcome and complications. Our main outcome measures included adequacy of exposure, partial or total resection of tumour, aesthetic outcome, and complications related to surgical technique.

Results: A total of 48 patients underwent modified midfacial translocation at our institution for nasopharyngeal, parapharyngeal, and anterior, central and lateral skull base tumours. In all cases, the exposure was deemed to be adequate. Two patients developed wound dehiscence in previously irradiated fields. Other incisions healed very well and the aesthetic outcome was regarded as satisfactory.

Conclusion: Modified midfacial translocation is based on the principle of temporary craniofacial disassembly for access to the skull base. Our modifications offer adequate access and a better aesthetic outcome. All incisions are placed through the aesthetic sub units of the nose with preservation of the lip. Preservation of the bony piriform aperture prevents airway compromise.

Key words: Base Of Skull; Facial Translocation; Surgical Approach; Esthetic Outcome

Introduction

Skull base surgery is a well-established surgical discipline. The principle of skull base surgery is to minimise brain retraction without restricting the access. Endoscopic skull base surgery has come of age, and is being increasingly and widely employed for the resection of tumours that were previously deemed to be unsuitable for a minimally invasive technique. However, not all tumours are suitable for endoscopic resection; therefore, there is still a role for conventional transfacial techniques, either as a sole procedure or endoscopic-assisted.

A variety of external transfacial techniques have been described for access to the anterior, anterolateral and lateral skull base. Each technique offers some advantages, but they also have significant inherent disadvantages. Lateral rhinotomy, used to provide access to the nose and nasopharynx, has been around for over 150 years. The senior author has demonstrated and published on a modified lateral rhinotomy incision, which is used to enhance the aesthetic outcome by incorporating the principle of incision between the aesthetic subunits of the nose.[1] We have employed the modified lateral rhinotomy incision in all our patients to achieve a better incisional aesthetic outcome.

The principles and classification of facial translocation were originally described by Janecka and colleagues,[2,3] and modified by other authors.[4,5] Both standard and modified facial translocation techniques provide excellent access to most of the skull base; however, bone necrosis and associated morbidity can occur in up to 30 per cent of patients.[6] Other inherent disadvantages include suboptimal cosmetic outcomes as a result of the standard lateral rhinotomy incision in the nasofacial groove, a lip split scar, puckering of the incision site, medial canthal webbing, vestibular stenosis, ectropion and prolonged lower lid oedema.

Midfacial translocation has been described by de Mello-Filho *et al.*[7] as a variation of the facial translocation approach reported by Janecka *et al.*[2] The authors

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claim an improved outcome with their modification. However, the midfacial translocation technique, and the modified facial translocation technique described by Hao,[4] still incorporate the lip split and the nasofacial groove incisions. Although this method of midfacial translocation provides adequate access to the skull base, it is handicapped by a less than optimal aesthetic outcome because of the placement of the incisions.

Our modifications are based on the principle of incisions placed between the aesthetic subunits of the nose; this avoids incisions across the intersections, providing a better aesthetic outcome. The lip split is not critical to the adequacy of exposure, as the sublabial incision can be extended posteriorly to the maxillary tuberosity. We also leave midfacial soft tissue attached to the underlying bone with the potential for less devascularisation of midfacial bony skeleton. The subciliary incision with minimal lateral extension has permitted zygomatic arch osteotomy without sacrifice of the frontal branch of the facial nerve.

Objectives

This paper aims to describe our technical modifications of the midfacial translocation technique for access to the nasopharynx, and anterior, central and lateral skull base tumours. In addition, it enables us to share our clinical experience, and demonstrate the utility and safety of this technique relative to the standard midfacial translocation technique.

Materials and methods

Along with demographics, other parameters studied were: tumour location, extent and histopathology findings; adequacy of exposure; completeness of resection; aesthetic outcome; and complications. Disease-specific control and overall survival are not part of this technique-oriented communication.

Technique

All procedures are performed under general anaesthesia. Temporary tarsorrhaphy is performed before the incisions are made. The incision line is marked out and locally infiltrated with 2 per cent Xylocaine with 1:80 000 adrenaline (Figure 1). The following incisions are made: (1) paranasal incision between the dorsal and the side wall aesthetic subunits of the nose, which follows the natural curvature of the alar groove; (2) orbital extension superiorly is broken, incorporating the principle of W-plasty; (3) subciliary incision with 1.5 cm extension over the zygoma; (4) sublabial incision extending from the philtrum to the maxillary tuberosity; and (5) additional hemicoronal or bicoronal incision if craniotomy and cranio-orbital osteotomies are required for intracranial tumour extension.

An incision is made down to the periosteum, and a composite subperiosteal flap is elevated in a limited fashion that still permits bony osteotomies. The infraorbital vessels and nerve are sacrificed, but the facial artery is always preserved. The medial canthal tendon



FIG. 1

Pre-operative view showing the standard modified midfacial translocation incision line with a paranasal, para-alar, subciliary and lateral orbital component. The lateral extent of the incision is medial to the frontal branch of the facial nerve. If superior extension is required, W-plasty can be incorporated into the incision. Published with patient's permission.

is detached, and a suture is placed through the tendon for later identification and re-approximation. The lacrimal sac is transected and the face of the maxilla is exposed in the subperiosteal plane. The following osteotomies are performed in a standard fashion (Figures 2 and 3): nasomaxillary, frontonasal, orbital rim or floor, frontozygomatic, zygomatic arch, anterior maxillary, maxillary tuberosity, and pterygoid.

The bony piriform aperture is preserved by placing the osteotomies 5 mm above the rim (Figure 4). The plates are sized and screw holes are pre-drilled to facilitate precise re-approximation at the completion of the procedure. At this stage, the osteotomised midfacial skeleton with attached soft tissue can be safely and freely mobilised and displaced laterally (Figure 5). This provides excellent exposure of the nose, nasopharynx, anterior skull base, orbit and infratemporal fossa



FIG. 2

Intra-operative view showing the incision deepened to the periosteum with minimal soft tissue elevation. The nasomaxillary osteotomy is also shown. Published with patient's permission.

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FIG. 3
Intra-operative view showing the frontozygomatic osteotomy. Published with patient's permission.

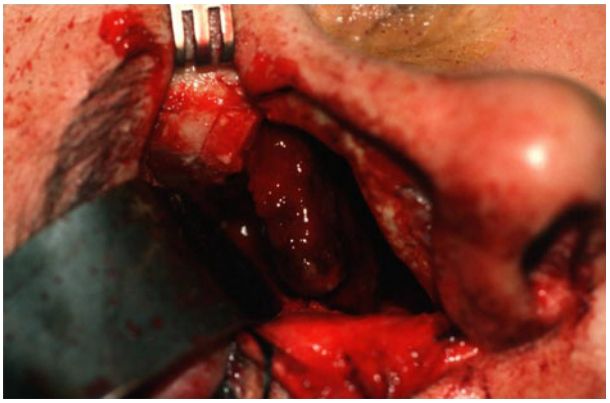


FIG. 4
Intra-operative view showing the midfacial skeleton completely osteotomised and laterally displaced, with preservation of the sinus mucoperiosteum.



FIG. 5
Intra-operative view demonstrating that preservation of the bony piriform aperture does not limit exposure of the skull base. Published with patient's permission.

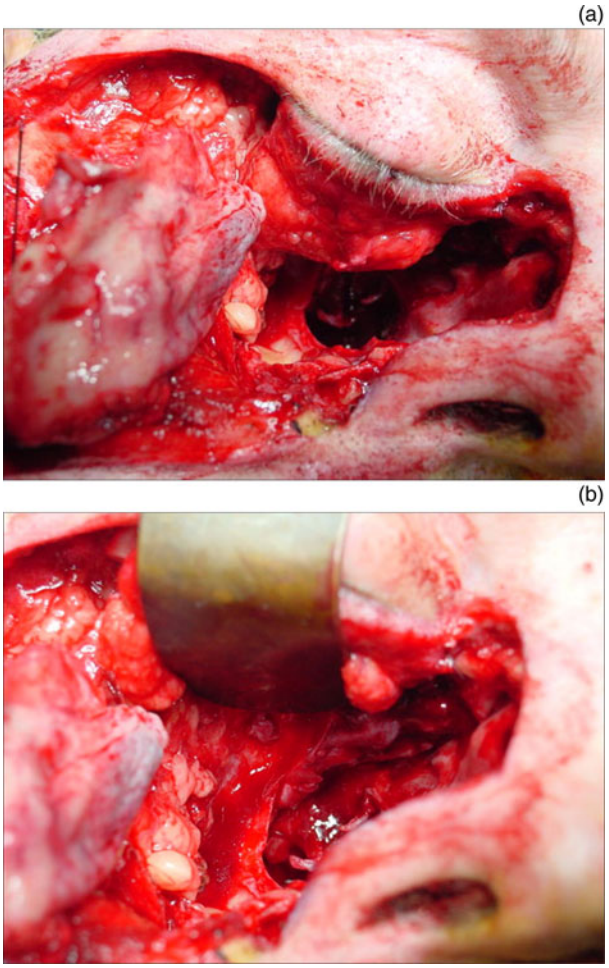


FIG. 6
Intra-operative view showing adequate exposure of the (a) nasal cavity, and (b) nasopharynx, anterior skull base, orbit and infratemporal fossa.

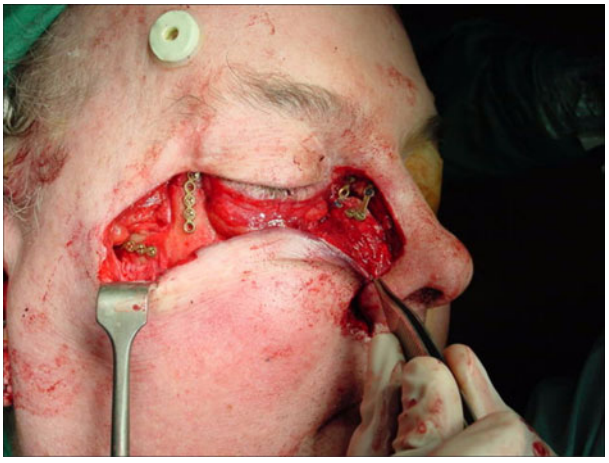


FIG. 7
Intra-operative view showing osteotomies fixed with miniplates. Published with patient's permission.

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FIG. 8
Intra-operative view showing the multilayer closure technique used. Published with patient's permission.

(Figure 6a and 6b), and tumour resection can be accomplished.

The repair is achieved as follows. The facial skeleton is fixed rigidly using the miniplates (Figure 7). Multilayer closure is performed with biodegradable sutures in the periosteum, subcutaneous tissue and skin (Figure 8). The nasal cavity is packed with Nasopore® and Merocel® packs.

A nasopharyngeal airway is inserted through the contralateral nasal cavity and sutured to the columella for 24 hours. The nasopharyngeal airway obviates the need for tracheostomy. The only patient who required tracheostomy had previously undergone oropharyngectomy and reconstruction with a bulky pectoralis major myocutaneous flap.

Results

A total of 48 patients underwent modified midfacial translocation for nasopharyngeal, parapharyngeal, and anterior, central and lateral skull base tumours at our institution over a 10-year period (from 2000 to 2010), performed by the senior author (AH). In all cases, the exposure was deemed to be adequate. There were no cases where incomplete excision could be attributed to inadequate exposure.

There were minimal complications. Two patients developed wound dehiscence in previously irradiated fields. All other incisions healed very well, and aesthetic outcomes were regarded as satisfactory by the surgeon and the patients (Figure 9). One patient developed partial sequestrum of the frontal process of the maxilla, which required local debridement pursuant to post-operative radiotherapy.

Case summaries

Case one. A 14-year-old Caucasian male was referred to our department with a 4-month history of left-sided nasal obstruction. Clinical examination showed congested nasal mucosa and an ipsilateral polypoidal mass. The computed tomography (CT) scan confirmed clinical findings of a mass centred in the left nasal cavity with extension into the nasopharynx. Magnetic resonance imaging (MRI) with contrast confirmed a soft tissue mass occluding the posterior portion of the left nasal cavity, and extending laterally into the left



FIG. 9
(a) – (e) Post-operative views of three of the patients who have undergone our modified midfacial translocation technique, showing the aesthetic outcomes of the procedure. Published with patients' permission.

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FIG. 9
(Continued)

masticator and parapharyngeal spaces.

The lesion measured 3.5 cm (longitudinal) × 4 cm (transverse) × 4 cm (antero-posterior) in diameter. Superiorly, the mass was noted extending to the orbital apex and left sphenoid sinus, with suspected involvement of the left cavernous sinus, and slight elevation of the left internal carotid artery. The mass also extended to the posterior nasopharyngeal wall and across to the contralateral side.

A clinical and radiological diagnosis of juvenile angiofibroma was made. Pre-operative embolisation was attempted, but the procedure had to be abandoned because of multiple feeding vessels. The patient underwent left modified midfacial translocation and excision of the tumour. He made a good recovery and was discharged home after 7 days. There were no significant sequelae and he remains satisfied with the aesthetic outcome. During 10 years' follow up, there has been no evidence of recurrence.

Case two. A 60-year-old Caucasian male with advanced oropharyngeal squamous cell carcinoma underwent combined surgery and radiotherapy as a primary treatment. Six months after treatment he complained of right-sided pharyngodynia with ipsilateral temporal headache.

Clinically, no recurrence was seen, but the MRI scan showed a 2 cm oval mass in the right posterior nasopharynx medial to the pterygoid muscles in the parapharyngeal space. The mass seemed to extend to the clivus with its expansion, with further lateral extension to the cavernous sinus. Anteriorly, it was noted to abut the posterior wall of the sphenoid sinus.

The patient was made aware of the fact that involvement of the cavernous sinus is regarded as a contraindication for surgical intervention as complete resection is not possible. The patient was also advised that any significant local control was unlikely and that the surgical endeavour was palliative in nature. However, the patient elected to undergo surgery because of the ongoing severe pharyngodynia.

He underwent right modified midfacial translocation with planned partial resection of the tumour. The exposure provided was deemed adequate. The oncologist elected to re-radiate the residual tumour. The intervention did provide relief of pharyngodynia, which was difficult to control with standard analgesia.

Case three. A 49-year-old Caucasian male with panhypopituitarism was referred to us with a 6-month history of constant tiredness and dull headache. Two years previously, he underwent resection of a craniopharyngioma through a microscopic transsphenoidal and transcranial route on two occasions, which was followed by post-operative stereotactic radiotherapy. Other co-morbidities included morbid obesity, sleep apnoea, diabetes mellitus, post-operative seizure and complete visual loss in the right eye.

Clinical examination findings were suggestive of a recurrent tumour in the nasopharynx and right sphenoid sinus. This was confirmed by biopsy of the mass under general anaesthetic. The MRI scan showed an enhancing mass within the sphenoid sinus, with anterior extension into the ethmoid and nasal cavity.

The patient underwent complete excision of the recurrent craniopharyngioma via a right modified midfacial translocation approach, and he remained disease-free.

Case four. A 73-year-old Caucasian male presented with a recent onset of left eye proptosis, left midface numbness and left-sided nasal obstruction. The endoscopic examination revealed bilateral polypoidal sinusitis and a neoplastic mass in the left nasal cavity. There was complete left-sided ophthalmoplegia with loss of vision. The patient also had hypoaesthesia in the distribution of the left infraorbital nerve.

The CT and MRI scans confirmed a large mass filling the left nasal cavity, left maxillary antrum, left

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ethmoid sinuses and sphenoid sinus, with intraorbital extension. Superiorly, the mass extended into the middle cranial fossa. The tumour also involved the hard palate, with extension into the pterygoid plate. Anteriorly, it extended into the midfacial subcutaneous tissue. The histology indicated squamous cell carcinoma.

The tumour was resected via the left modified midfacial translocation approach. Gross tumour removal was achieved, including left orbital exenteration. The patient completed post-operative radical radiotherapy uneventfully. He remained disease-free until his sudden death, which was a result of gastrointestinal bleeding.

Case five. A 34-year-old Chinese male was diagnosed with advanced, undifferentiated nasopharyngeal carcinoma. He underwent a radical course of radiotherapy to the primary site and both sides of neck, with an excellent response. A check biopsy of the nasopharynx showed no evidence of residual or recurrent tumour at 3 months and 12 months post-treatment.

At 18 months post-radiotherapy, the patient developed left lateral rectus palsy and hypoaesthesia of the maxillary division of the left trigeminal nerve. Repeat biopsy showed recurrence of the tumour in the left nasopharynx.

The patient underwent chemotherapy for treatment of the recurrence. The MRI scan showed an incomplete response to chemotherapy. He underwent resection of the residual tumour via the left modified midfacial translocation technique. The nasopharynx remained disease-free until his death from systemic metastasis two years post-resection.

Discussion

The principles of skull base surgery are well established, and include wide exposure, minimal brain retraction, complete surgical excision, restoration of critical barriers, and reconstruction for restoration of form and function.

In the last two decades, transnasal endoscopic resection of skull base tumours has been increasingly employed, with comparable control rates. However, there is still a role for conventional skull base approaches as not all skull base tumours are amenable to endoscopic resection. On occasions, the endoscopic technique is converted to an open approach to enhance exposure and aid resection.

The transfacial approach has stood the test of time. It is based on the principle of median or paramedian fusion of nasofrontal, maxillary and mandibular processes, permitting the least traumatic displacement of the facial skeleton for surgical access. Blood supply to the face is primarily through the external carotid system with lateral to medial blood flow.

The pneumatised facial skeleton permits osteotomies and lateral displacement for access to the skull base. Reconstruction entails the replacement of osteotomised bony skeleton. Facial translocation provides intracranial access from below, thereby minimising brain retraction. Most patients undergoing skull base tumour excision require post-operative radiation therapy for malignant tumours, with the potential for osteoradionecrosis.

The conventional facial translocation technique has inherent limitations, including: facial incisions with resultant scars across relaxed skin tension lines, and facial troughs and crests; contamination of the surgical field with nasal and oral bacterial flora; the possible need for a supplemental airway; and the emotional sequelae of aesthetic deficits, particularly a lip split.

Many modifications of the facial translocation approach reported by Janecka and colleagues[2,3] have been described, including mini-facial translocation, midfacial translocation, extended facial translocation and bilateral facial translocation. Another modification described is the preservation of soft tissue attachment to the midfacial skeleton. Modifications reported by Hao[4] include a lateral nasal flap on the medial side of the repositioned midfacial skeleton.

- **Skull base surgery is a well-established surgical discipline**
- **Temporary craniofacial disassembly is an established technique for access to the skull base**
- **Endoscopic skull base surgery is being increasingly employed, but facial translocation and various modifications remain useful in modern day practice**
- **Our modified midfacial translocation technique for access to ventral skull base tumours places incisions through aesthetic subunits of the nose**
- **This improves aesthetic outcome, preserves bony piriform aperture to improve functional outcome and preserves translocated midfacial bony skeleton blood supply to minimise vascular complications**

Midfacial degloving is a versatile approach and does have the advantage of no obvious facial scar. It provides good exposure of the nasal cavity, middle-third of the face and central skull base. The standard midfacial degloving approach does not allow easy access to the frontal sinus and infratemporal fossa. Modified midfacial translocation allows much better exposure of the orbit, pterygopalatine fossa and infratemporal fossa by virtue of the lateral displacement of the zygoma and zygomatic arch. In comparison with our modified midfacial translocation technique, there is a greater likelihood of vestibular stenosis with the midfacial degloving approach. The modified midfacial degloving approach described by Krausse and Jafek

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allows greater visualisation of the posterior nasal cavity, nasopharynx, frontal recess and cribriform plate.[8] The midfacial degloving approach may be combined with the bicoronal flap for a two-pronged approach; however, there is often some hair loss at the site of coronal incision.

Our modifications follow the same principles as facial translocation, but attempt to limit the disadvantages whilst providing adequate access. The placement of incisions between the aesthetic subunits of the nose, without a lip split, minimises the scars. The lip split incision is not critical to the exposure. The extension of the subciliary incision lateral to the orbit allows subperiosteal dissection over the zygoma and zygomatic arch with appropriate osteotomies. The subperiosteal dissection over the zygoma and zygomatic arch also permit osteotomy without jeopardising the frontal branch of the facial nerve. Minimal elevation of the midfacial soft tissue from the underlying bone and en bloc lateral displacement of composite tissue seems to maintain circulation to the facial bony skeleton.

In addition, we believe that preservation of the bony piriform aperture maintains the integrity of the internal nasal valve and therefore the airway. It also provides rigid support for the overlying soft tissues, thereby preventing a depression due to tumour resection.

Conclusion

The modified midfacial translocation technique is based on the fundamental principle of temporary craniofacial disassembly for access to the skull base. We have modified previously described techniques. Our modifications offer adequate access and a better aesthetic outcome. All incisions are placed through the aesthetic subunits of the nose, with preservation of the lip, and an additional incision is made in the sublabial mucosa. This significantly enhances the aesthetic outcome. Preservation of midfacial soft tissue attachment to the underlying bones seems to enhance vascularity and minimise complications. Preservation of the bony piriform aperture seems to prevent airway compromise by providing rigid support to the overlying soft tissue, which often contracts and becomes depressed pursuant to post-operative radiation therapy, leading to airway obstruction.

References

1 Hussain A, Hilmi OJ, Murray DP. Lateral rhinotomy through nasal aesthetic subunits. Improved cosmetic outcome. *J Laryngol Otol* 2002;**116**:703–6
2 Janecka IP, Sen CN, Sekhar LN, Arriaga M. Facial translocation: a new approach to the cranial base. *Otolaryngol Head Neck Surg* 1990;**103**:413–19
3 Janecka IP. Classification of facial translocation approach to the skull base. *Otolaryngol Head Neck Surg* 1995;**112**:579–85
4 Hao SP. Modified facial translocation technique to prevent necrosis of bone graft. *Laryngoscope* 2002;**112**:1691–5
5 Suárez C, Llorente JL, Muñoz C, García LA, Rodrigo JP. Facial translocation approach in the management of central skull base and infratemporal tumors. *Laryngoscope* 2004;**114**:1047–51
6 Hao SP, Pan WL, Chang CN, Hsu YS. The use of the facial translocation technique in the management of tumors of the paranasal sinuses and skull base. *Otolaryngol Head Neck Surg* 2003;**128**:571–5
7 de Mello-Filho FV, Mamede RC, Ricz HM, Susi RR, Colli BO. Midfacial translocation, a variation of the approach to the rhinopharynx, clivus and upper odontoid process. *J Craniomaxillofac Surg* 2006;**34**:400–4
8 Krause GE, Jafek BW. A modification of the midface degloving technique. *Laryngoscope* 1999;**109**:1781–4

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