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Case Report

Template guided extra oral vertical ramus osteotomy for facial deformity correction - a technical note

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Abstract: Objective: To assess the efficacy of template as a guide in performing extra-oral vertical ramus osteotomy. Methods: A 21-year-old male patient, reported with complaints of facial asymmetry and restricted mouth opening due to ankylosis involving the right TMJ. Interpositional arthroplasty along with extra oral vertical ramus osteotomy and coronoidectomy was planned to correct the ankylosis of TMJ and facial asymmetry. An acrylic template was used as a guide for performing the osteotomy. Intra operative accuracy of the osteotomy and post-operative neurosensory functioning of inferior alveolar nerve was assessed subjectively and objectively by static two-point discrimination test. Results: In a follow up period of six months, no subjective and objective sings of neuro sensory impairment were reported. Conclusion: Using a template as guide in making vertical ramus osteotomy, avoids intra operative damage to the inferior alveolar nerve.

Keywords: Extra oral, vertical ramus osteotomy, template, facial deformity, TMJ ankylosis

Introduction

Vertical ramus osteotomy (VRO) is indicated for various clinical conditions such as TMJ ankylosis, dentofacial deformity particularly mandibular prognathism and hemifacial microsomia which require increase in facial height and correction of facial deformity [1]. VRO can be performed by either an extra oral (EVRO) or intra oral (IVRO) approach [2]. Endoscopic VRO requires adequate armamentarium and additional training while prolonging surgical time [3].

One of the technical difficulties involved in performing EVRO is achieving a perfect longitudinal osteotomy without injuring the inferior alveolar nerve and the vascular bundle. The surgical landmark commonly followed to avoid injury to the nerve is using the anti-lingula (AL) as a guide [4]. However, many authors have questioned the accuracy of this. Further, literature also demonstrates the absence of AL in a great percentage. Martone et al were able to identify the anti-lingula in only 42% (27 of 63) of human mandibles which preclude its use as a guide for osteotomy [5].

This technical note describes a simple method of performing the VRO in a quick manner without endangering the inferior alveolar nerve.

Case report

A 21-year-old male patient, reported with complaints of facial asymmetry and restricted mouth opening due to ankylosis involving the right TMJ (**Figure 1**). The surgical procedures planned for correction of facial asymmetry included Extra oral vertical ramus osteotomy and coronoidectomy. Informed consent and acceptance for publishing any relevant images were also obtained. Ethical committee approval was not needed as it is a regular surgical procedure with modification by using a template in performing the osteotomy.

Pre-operative planning was done with Stereolithography model. A template was designed on the STL model and fabricated with acrylic (**Figure 2**) along the posterior border of the ramus limiting its anterior extension behind the mandibular foramen on the medial aspect and anti-lingual prominence on the lateral surface (**Figure 3**). The fabricated template was

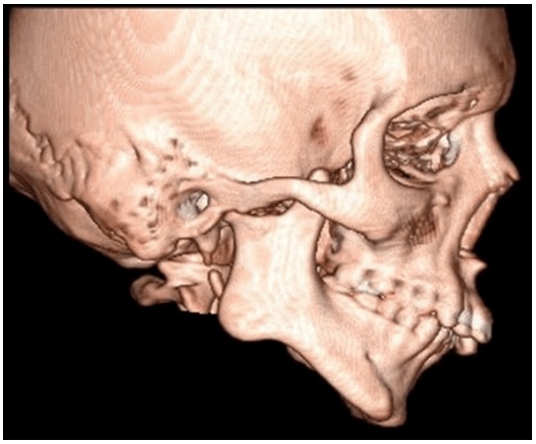

Figure 1. CT showing right unilateral TMJ ankylosis.

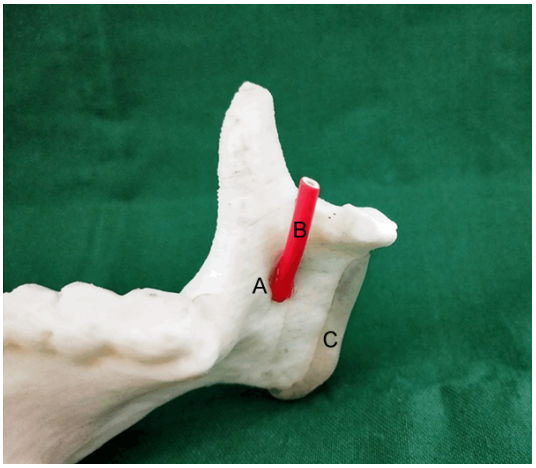

Figure 2. STL model. A. Mandibular foramen. B. Inferior alveolar nerve. C. Template on the medial surface of the ramus.

cold sterilized for 24 hours prior to the surgery [6].

Intraoperatively, after the submandibular incision and dissection, template was placed along the posterior border of the ramus. Holes were drilled and template was secured to the ramus by wires and screw. Sub sigmoid vertical ramus osteotomy was carried out using the template as a guide (**Figure 4**). The osteotomized proximal segment was repositioned and fixed with miniplates (2 mm system). The defect at the angle region that was formed after mobilizing the proximal and distal segments was augmented with Coronoid process graft. Intra-operative mouth opening of 32 mm was achieved.

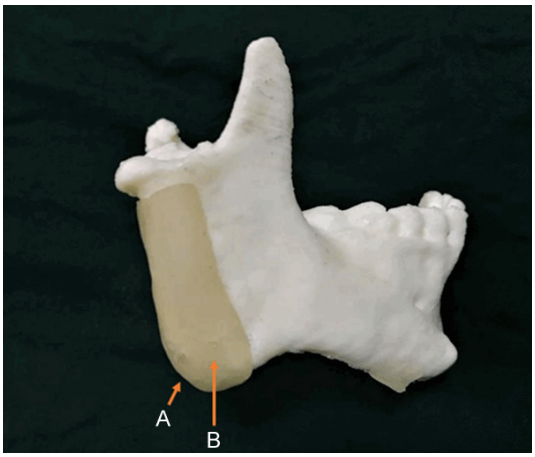

Figure 3. Template placed on STL model showing its anterior extension. A, B. Holes drilled to secure the template to the ramus intra-operatively.

Post-operative OPG (**Figure 5**) demonstrates the superiorly repositioned proximal segment after VRO. Patient was assessed for neurosensory functioning of inferior alveolar nerve, once in a week for six months post-operatively. Subjective assessment was done by visual analogue score [7] and objectively by static two-point discrimination test [8] and pinprick nociception test [9]. Gradual improvement in the mouth opening was also assessed.

No subjective signs and objective signs of neurosensory impairment were evident in any of the review appointments during the follow up period of 6 months (**Table 1**). Improvement in the facial asymmetry was observed. In all the follow up appointments, subjective evaluation by visual analogue score (VAS) was found to be "Fully normal sensation". In the objective evaluation, static two-point discrimination test resulted with 4 mm in the first two weeks, 3 mm from 3rd week to 17th week and 2 mm from 18th week to 24th week which was found to be with in the normal range of 2-3 mm [8]. The pinprick test showed presence of nociceptive perception from the first week postoperatively.

Discussion

Ideal positioning of the vertical osteotomy cut is a very important aspect of VRO. While performing the osteotomy, adequate care must be taken to protect the neurovascular bundle as it enters the mandibular foramen. McLeod

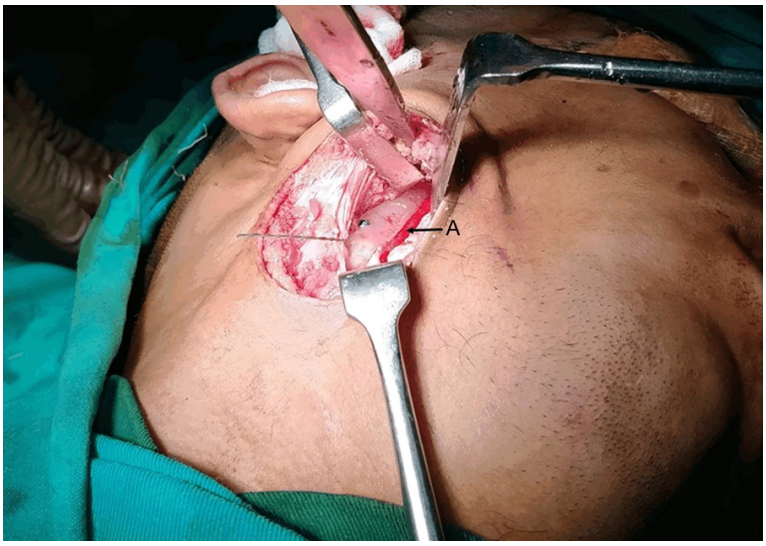

Figure 4. Template guided vertical ramus osteotomy. A. Arrow showing the osteotomy.

Figure 5. Post-operative OPG with coronoid process graft augmentation to restore the contour of right angle.

et al has reported a prevalence of 8.82 per 100 patients with inferior alveolar nerve injury undergoing extra oral vertical ramus osteotomy [10]. There are only few methods such as anti-lingual prominence and ramus measuring instrument exist till now for identifying mandibular foramen while performing EVRO. Each of these techniques has their own drawbacks. Locating the mandibular foramen by using the anti-lingual prominence as a guide is an arbitrary method [11]. Ramus measuring instrument is one other option for measuring the antero-posterior dimension of the ramus while placing the osteotomy [12, 13]. However, intra-operative technical errors in exact placement of the instrument can change the position of osteotomy.

To avoid the mishaps with improper placement of osteotomy, the authors had administered a new, reliable technique using a template as guide in making vertical ramus osteotomy. Template may be fabricated using CAD CAM technology too.

The noteworthy advantages of using the template are precision in osteotomy, reduction in time required for osteotomy and no risk of nerve damage.

The only limitation of this technique is the additional time needed for pre-operative planning and fabrication of template.

Further studies with adequate sample size may be conducted to validate the efficacy of the splint.

Conclusion

Template guided Extra oral vertical ramus osteotomy is an effective method to increase precision in performing osteotomy without injury to vital structures.

Disclosure of conflict of interest

None.

Abbreviations

TMJ, Temporomandibular joint; VRO, Vertical Ramus Osteotomy; IVRO, Intra oral Vertical Ramus Osteotomy; EVRO, Extra oral Vertical Ramus Osteotomy; CADCAM, Computer Aided Design Computer Aided Manufacturing; OPG, Orthopantomogram; AL, Anti-lingula.

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Table 1. Subjective and objective neurosensory evaluation in the 6 months (24 weeks) follow up period

Neuro sensory test	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Subjective (VAS)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Objective																								
Static two point discrimination in mm	4	4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2
Pinprick	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

VAS-Visual Analogue Score	Static two-point discrimination test	Pinprick test
Complete absence of sensation-1	2-3 mm-normal	Y-Presence of nociceptive perception
		N-Absence of nociceptive perception
Almost no sensation-2		
Reduced sensation-3		
Almost normal sensation-4		
Fully normal sensation-5		

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