

## **Non-surgical Approach to Correcting Severe Neglected Mandibular Deviation: Case Reports**

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**Aim:** The loss of mandibular continuity due to tumour ablative surgery can pose challenges at a functional and aesthetic level. The primary concern with rehabilitation is the management of mandibular deviation, which when not corrected surgically, would need prosthetic intervention. Mandibular guidance therapy works in principle by reprogramming the mandible and associated muscles into an acceptable occlusal relationship, conducive to rehabilitation.

**Case presentation:** This case report discusses two patients: one presenting two weeks post-surgery and the other twelve weeks post-surgery. The report highlights the initial condition of the stomatognathic system, the challenges encountered in managing mandibular deviation, and the outcomes achieved through interdisciplinary treatment planning.

**Conclusion:** The outcome of prosthetic intervention post-surgery and subsequent rehabilitation procedures is largely time dependent. In severe deviation with restricted mobility, a holistic approach that includes immediate prosthetic intervention and supportive therapy in the form of joint mobilization exercises is vital in improving mobility of the jaw.

**Keywords:** Mandibular prosthesis, Ameloblastoma, Fixed partial denture, hemimandibulectomy, physiotherapy.

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## Introduction

Ameloblastoma is a benign, locally invasive odontogenic tumour of epithelial origin that primarily affects the floor of the mouth, with radical resection of the mandible and surrounding structures being the preferred treatment option.<sup>1,2</sup> The loss of mandibular continuity due to tumour ablative surgery, especially those including condyle and angle cause deviation of the unaffected side towards the defect and rotation of the mandibular occlusal plane inferiorly. These changes are mainly influenced by scar tissue formation, tissue loss, gravity, and suprahyoid muscle traction on the remaining mandible. Many patients also suffer from tongue dysfunction and trismus, leading to speech impairment, chewing difficulties, and a significant decline in quality of life.<sup>3,4</sup>

The primary goal in management of acquired mandibular defects is the restoration of facial form, mandibular continuity and long-term function. The fibula osteocutaneous free flap is considered the gold standard for reconstructing large segmental mandibular defects, primarily due to its benefits of providing the longest available bone and causing minimal donor site morbidity.<sup>5,6,7</sup> When dealing with tumours having high recurrence rate, immediate reconstruction is not preferable till complete resolution, and when dealing with segmental mandibulectomy this will lead to mandibular deviation since continuity is not restored. A multi-disciplinary approach comprising primarily of prosthetic intervention and supportive care such as jaw mobilisation exercise is essential to improve the range of motion and medio-lateral stabilization of the mandible. Mandibular guidance flange (MGF) therapy typically begins around two weeks after surgery, once the immediate postoperative effects have subsided. The timing of the initiation of guidance therapy is very crucial in the prognosis of deviation correction, as once the cicatricial tissues have formed and consolidated, it becomes

increasingly difficult to manipulate the mandible to the correct relationship.<sup>1</sup> With loss of stabilizing musculature as part of hemi mandibulectomy, the ipsilateral temporalis is shown to be capable of compensating for the missing lateral pterygoid in a left sided defect.<sup>8</sup> Neuromuscular reprogramming using MGF and jaw exercise such as Rocabado exercise is essential in achieving this. In severe cases where deviation cannot be entirely corrected with guidance appliance, restorations over remaining teeth can be planned to improve occlusal contacts and masticatory efficiency.<sup>7</sup>

This case report entails two scenarios, one with mandibular guidance therapy engaged within 2 weeks of surgery and one with management of severe mandibular deviation in a patient who reported after 12 weeks of surgery.

## Case Reports

### Case report - 1

The first case report presents an interdisciplinary approach to managing a mandibulectomy. A 19-year-old patient diagnosed with ameloblastoma was scheduled for surgical resection of the right mandible and surrounding structures. The patient was referred for fabrication of a MGF appliance prior to surgery. Fabricating the guiding flange pre-surgically will prevent deviation of the mandible after surgery. Impressions were made, and MGF was fabricated in acrylic with wrought wire clasp for retention. Following surgery, the patient presented with a Brown's class IIc defect.<sup>9</sup> The resting position of the mandible was deviated towards the defect side accompanied by rotation due to muscle imbalance. The guiding flange appliance was inserted after two weeks (Figure 1). Since scar tissue contracture had not yet developed, the patient could achieve maximal intercuspation with minimal effort using the MFG appliance. The patient was instructed to wear the appliance for a minimum of 16 hours a day for 3 to 6

months. Review was done after 24 hours and every 15 days for the first month, following which a monthly review was scheduled. After four months, the patient was able to bite into intercuspal position without needing the MGF appliance, thereby successfully preventing deviation. A temporary removable partial denture was fabricated and delivered to the patient as an interim solution, providing both functional and aesthetic support. This provisional appliance ensured that the patient's oral function and appearance were maintained till definitive surgical reconstruction.



**Figure 1: Pre and post insertion of mandibular guiding flange appliance.**

### Case report - 2

The second case report describes a situation where insufficient interdisciplinary coordination and inadequate communication with the patient led to significant functional, aesthetic, and speech challenges, greatly affecting the patient's overall health and mental well-being. A 35-year-old patient presented with a history of left mandibulectomy performed 12 weeks prior, resulting in a Brown's class IIc defect. No rehabilitative procedures or MFG appliance had been provided following the surgery. The patient exhibited severe mandibular deviation towards the left side, with a collapse in facial vertical dimension due to the absence of occlusal contact between the remaining natural teeth. Mouth opening was restricted to 14 mm (Figure 2). The mandibulectomy extended mesial to tooth 43, involving the contralateral angle and part of the ramus. A soft tissue graft had been used for primary wound closure, leading to marked restriction in tongue mobility. Severe trismus and dense fibrotic changes in the buccal mucosa were observed. The patient's speech was notably incoherent,

accompanied by difficulties with salivary control. Initially, the patient was evaluated and treated by the Department of Oral and Maxillofacial Surgery, where an intermaxillary fixation (IMF) was attempted to maintain the jaw in a fixed position to achieve proper alignment and function. Arch bars with hooks were applied to the external surface of the teeth on the first and fourth quadrant under local anaesthesia. Arch bars were fixed by passing 24-gauge steel wires through the necks of the teeth and twisting them around the teeth to hold the arch bars securely against the dental arch. Though IMF was planned for 4 to 6 weeks, after 10 days it was discontinued due to discomfort and pain, and the patient was referred to the Department of Prosthodontics.



**Figure 2: A -Pre-operative presentation with collapsed vertical height of face and restricted mouth opening. B -Pre-operative presentation of convex facial profile.**

### Week 1-4

Our treatment plan aimed to gradually deprogram the mandible and improve range of motion in stages using MGF appliance and jaw exercises and reprogram it into an acceptable functional occlusal position. While full correction of the deviation may not be possible, the expected improvement in mouth opening and deviation will support successful definitive rehabilitation.

An acrylic MGF appliance was fabricated and relined to achieve minimal contact between opposing second molars

by externally manipulating the mandible. Patient was advised to use the appliance for 4 weeks. Rocabado's joint mobilization exercise was initiated to improve joint mobility, muscle length limitation and masticatory muscle function. The patient was taught functional jaw opening, distraction with anterior/ lateral range of motion, self-stretch into opening and self-distraction mobilization exercises.<sup>10</sup> After two weeks of Rocabado's regime and four weeks of guidance appliance, an improvement in mandibular deviation and mouth opening was observed. With the guidance flange in place, the patient could now achieve minimal occlusal contact independently, without the need for external manipulation.

### Week 5 - 10

A second MGF appliance was fabricated to guide the mandible further and increase contact between as many occluding units as possible. Mouth opening improved by 7 mm over four weeks. To enable effective chewing, the guiding flange was extended till the maxillary buccal sulcus, ensuring continuous contact with the maxillary molar during mastication. The patient was recalled weekly over a 6-week period to monitor progress and make necessary adjustments. By the end of six weeks, the patient demonstrated increased mouth opening and achieved greater occlusal contact between the first and second molars, without the use of the guidance appliance. Patient was referred to speech therapy to improve speech intelligibility, correct misarticulation and improve bolus preparation and swallowing with the help of oro-motor exercises.

### Week 11 - 13

To maximize chewing efficiency and improve facial aesthetics, splinted crowns were planned for the remaining mandibular natural teeth. These crowns would feature a broader occlusal table, greater occlusal contact, and help re-

establish the occlusal vertical dimension. Full metal crowns were planned for the posterior teeth, with metal-ceramic crowns for the incisors, including a cantilever for teeth 41 and 42 to support the lower lip. After tooth preparation, a bite registration at increased vertical dimension was taken with alu wax and the guidance flange in place. An initial acrylic fixed partial denture (FPD) was made to assess and adjust the vertical dimension of occlusion (VDO) and occlusal contacts. The final FPD replicated the acrylic design with shallow occlusal morphology and a wide bucco-lingual width at the established VDO. Occlusal equilibration was carried out as needed, and a new MGF appliance was fabricated after the splinted crowns were cemented (Figure 3). By the end of treatment, the mouth opening increased to 35 mm, and while some correction in mandibular deviation was achieved, full occlusal contact remained dependent on the MGF appliance. After 13 weeks of treatment, the results were promising. Occlusal contact was successfully re-established for up to four occlusal units and patient profile improved notably (Figure 4). Supportive care in the form of physiotherapy and speech therapy contributed to improved speech intelligibility.

To assess the effectiveness of the treatment, we adopted the Gothenburg Trismus Questionnaire before commencement and post completion of prosthetic phase.<sup>11</sup> A marked improvement in jaw mobility, mastication and reduction in stiffness and pain was noted.



**Figure 3: A-Fixed partial denture with cantilever of 41 and 42 at the established vertical dimension. B-Improved mouth opening at the end of the treatment with guidance flange preventing deviation.**



**Figure 4:** Post-operative presentation showing improved facial aesthetics by re-establishing vertical dimension, correction of mandibular deviation and providing support to the lower lip through the cantilevered FPD.

## Discussion

The mandible plays a crucial role in maintaining the structural integrity of the lower face and is essential for various functions, including chewing, speaking, and swallowing. Following mandibulectomy, the increased tension in the contralateral medial and lateral pterygoid muscle causes the mandible to rotate toward the side of the resection, impacting both mastication and mandibular movements.<sup>12</sup> This results in significant changes that can lead to psychosocial disability, affecting the patient's quality of life.<sup>13</sup>

Though reconstructive surgery is considered as primary treatment modality, their viability during the first year is questionable due to the high recurrence rate or metastasis of tumours following ablative surgery. A study by Garrett et al<sup>14</sup>, comparing treatment by conventional prosthesis, and implant-supported prosthesis with reconstructive surgery in 46 patients following mandibulectomy showed that 72% of the patients were able and willing to complete treatment with conventional prosthesis and only 35 % completed treatment with implant prosthesis. Recurrence/ metastasis, radiation therapy to implant site, refusal of implant treatment due to financial constraints were among the reasons for non-completion.

In the initial phase following surgery, early intervention is crucial because it helps to prevent scar formation, muscle imbalance and minimize mandibular deviation. In the first case report, a multidisciplinary approach to treatment planning prioritized immediate prosthetic intervention following surgery, which was instrumental in preventing neuromuscular dysfunction.<sup>15</sup> Introducing a guiding appliance early on helped prevent the shifting and improper positioning that occur when the mandible loses structural continuity, preventing muscle imbalance, stiffness and maintaining the range of motion.

In the second case, the patient presented with trismus and an acute, rigid deviation of the mandible due to long term negligence in initiating mandibular guidance therapy. The initial examination indicated that complete reversal of the deviation was unlikely. Inadequate communication and education about the post-mandibulectomy phase had led to serious consequences for the patient. The role of guidance appliance is not only limited to function but also improves the overall quality of life.<sup>13</sup> A holistic approach involving multi-stage acrylic guidance appliance, Rocabado's joint mobilization exercises, speech therapy and occlusal table modification with a fixed partial denture, proved successful in improving the patients QoL.

Research has demonstrated that mandibular mobility can be enhanced through targeted jaw exercises or the application of low-level laser therapy (LLLT). Exercises improve flexibility, condylar-disk-eminence congruency and muscle strength, and LLLT promote anti-inflammatory responses, tissue regeneration, and increased cellular metabolism. In the second case we adopted the Rocabado's TMJ exercise which has been shown to promote neuro-muscular relaxation of elevator muscles of the mandible, improve mobility of hypomobile joints by loosening the adhesions, maintain the extensibility and tensile strength of

articular tissues and provide soft tissue relaxation.<sup>16, 17</sup> The synergistic effect of multi-stage guiding flange prosthesis and Rocabado's exercise in deprogramming, reducing muscle stiffness and improving range of motion including mouth opening cannot be emphasized enough.

The GTQ 2<sup>11</sup> allowed us to evaluate the multi-disciplinary treatment outcome and showed that jaw fatigue, stiffness and mouth opening had improved three-fold by the end of the treatment. A drastic improvement in social interaction and work opportunities because of greater range of jaw motion revealed the widespread impact of regaining oral functions.

Mandibular asymmetry caused by tumor ablation, trauma, or congenital deformities can lead to joint ankylosis. Such asymmetries can be effectively managed using distraction osteogenesis (DO), either intra-orally or extra-orally. In a clinical trial, Elhadidi et al<sup>18</sup> demonstrated that computer guided DO produced superior results compared to conventional methods. Furthermore, a finite element analysis by the same author revealed that internal distractors offer better stress shielding and reduced strain on the bone.<sup>19</sup> However, discontinuity defects of the mandible typically require surgical reconstruction for definitive management, aiming to restore function and return the patient to a pre-disease state. Computer-assisted surgeries utilizing osseous free flaps have been shown to significantly enhance both functional and aesthetic outcomes, establishing them as the gold standard in treatment.<sup>20</sup>

Though our non-surgical approach improved the overall quality of life, the patient was advised on the necessity of surgical reconstruction as the definitive treatment option due to its long-term benefits in preserving the integrity of the stomatognathic system.

## Conclusion

The lack of coordinated care between surgical and rehabilitative phase can have

catastrophic effects, leaving the patient without a structured plan for recovery. A holistic team-based approach that prioritizes both the surgical outcome and the critical rehabilitation phase is an essential when treating mandibulectomy patients, as the lack of which can affect their physical, psychological and social wellbeing. Non-surgical management serves as a practical and effective alternative, particularly when surgery is not feasible or desired, and plays a vital role in the rehabilitation process post-mandibulectomy, due to its minimized risk, cost effectiveness and gradual but definite improvement in quality of life.

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## Data Availability

The GTQ2 data that support the assessment of the non-surgical management is available with the corresponding author upon reasonable request.

## Ethics approval and consent to participate

Patient consent for publication of images for educational purpose has been obtained.

## Competing interests

The authors declare no competing interests.

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