

# Distraction Osteogenesis and Customized Temporomandibular Joint Prosthesis in the Reconstruction of a Large Mandibular Defect - A Case Report

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## Abstract

**The Rationale:** Mandibular resections involve esthetic and functional impairment and impose a challenge during the reconstruction. This case report is a successful reconstruction with distraction osteogenesis (DO) and customized temporomandibular joint (TMJ) prosthesis. **Patient Concerns:** A 51-year-old male patient presented with a complaint of facial asymmetry, mastication, and speech difficulties. **Diagnosis:** As the patient had undergone a hemimandibulectomy procedure 20 years ago, clinical examination showed facial asymmetry. Radiographic examination exhibited the defect and a radiopaque image representing Kirschner's wire. **Treatment:** DO by bone transport was performed, followed by dental implant and TMJ prosthesis placement. **Outcomes:** DO is a viable treatment option in resections, even when the defect was generated by an ancient injury. The follow-up is around 7 years after the osteogenic distraction, with no complaints and functional capacity. **Take-away Lessons:** The major challenge in mandibular reconstructions through DO is to reproduce the curve of the arch.

**Keywords:** Distraction osteogenesis, joint prosthesis, mandibular reconstruction

## INTRODUCTION

The reconstruction of mandibular bone defects presents a challenging process for oral and maxillofacial surgery.<sup>[1,2]</sup> There are several possible treatments such as alloplastic materials, bone transport, or distraction osteogenesis (DO).<sup>[3,4]</sup>

DO is a biological process associated with the installation of a mechanical device that permits the reconstruction of hard and soft tissues through osteotomies in regions adjacent to the defect. In this technique, the osteotomized bone part (transport disc) is slowly transported from the bone remainder, following the adapted plate installed, stimulating tissue neoformation.<sup>[1,5,6]</sup> Defects involving bone, teeth, and temporomandibular joint (TMJ) demand a laborious treatment plan; therefore, in addition to the need to restore facial contour, the restoration of the masticatory and speech functions should be considered.

## Purpose

The purpose of this study is to discuss the reconstruction

technique chosen for this case, with the advantages and disadvantages of the used procedures in combination. The patient has 07 years of postoperative follow-up.

## CASE REPORT

A 51-year-old male was referred to a clinic of oral and maxillofacial surgery in Salvador-Bahia, Brazil. His chief complaints were facial asymmetry, mastication, and phonation difficulties. The patient lived with these complaints and did not have adequate knowledge of treatment and rehabilitation options previously. Patient's consent was obtained [Figures 1 and 2].

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**Figure 1:** Clinical appearance during initial examination

On clinical examination, the patient presented a good general health status and had undergone a hemimandibulectomy procedure 20 years ago to treat a central giant cell lesion. An extraoral clinical examination showed facial asymmetry on the left side and a scar in the left submandibular region related to the first surgical procedure. A radiographic examination exhibited the defect, with a total absence of the left hemimandible, and a radiopaque image representing Kirschner's metallic wire, installed in the previous surgery to maintain mandibular contour.

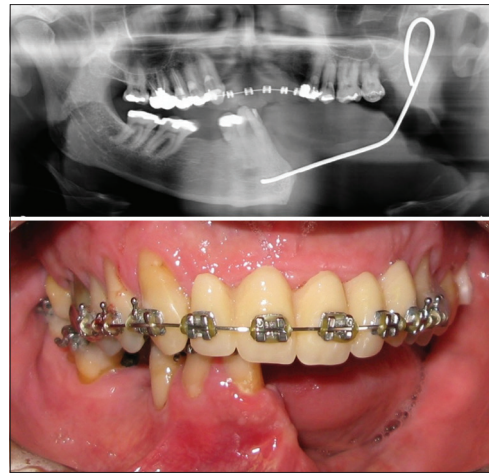
The patient and the surgical team chose to use DO by bone transport for the initial bone reconstruction followed by implant installation. A second surgical procedure was necessary for the installation of a customized TMJ prosthesis.

In 2012, the patient underwent the surgical procedure through submandibular access, for the installation of the 6-cm DO device, a plate-guided distraction device (KLS Martin, Jacksonville, FL, USA) for mandibular reconstruction [Figure 3].

After the 7-day latency period, the distractor activation was started twice a day, totaling 1.0 mm of daily movement. The DO was completed after 2 months and 1 week, reaching 6 cm of bone neoformation. The device was held in position for another 3 months to ensure greater stability of the newly formed bone and its maturation.

During the consolidation period, the distractor plate became exposed in the mandibular angle region, resulting in a mild infection that was resolved in 7 days by administration of 500 mg of cephalexin every 6 h for 15 days and local cleaning with 2 mg/ml chlorhexidine.

The distractor was removed 180 days after the first procedure. The distraction vector was not favorable in the reproduction of the contour of the mandibular symphysis, and its positioning made it impossible for future prosthetic rehabilitation. For correction, osteotomies were performed on the neoformed bone to obtain a better contour of the mandibular arch, fixed with reconstruction



**Figure 2:** Intraoral and radiographic appearance during initial examination

plate systems of 2.4 mm and 1.5 mm, followed immediately by the installation of five osseointegrated implants [Figure 4].

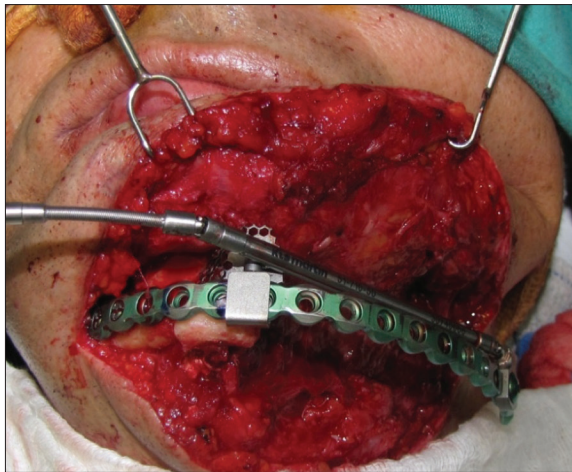
The patient's postoperative follow-up consisted of return visits for 4 months without complications, and the prosthesis was then installed on the inferior implants. The third operation to remove the osteosynthesis material was performed 6 months after the second surgery to enable the installation of the custom titanium prosthesis.

The installation of the condyle prosthesis was performed in a fourth operation. The left TMJ (TMJ Concepts, Inc., Ventura, CA, USA) was made with an anterior extension around the chin to the right mental foramen area to provide stability and re-establish the contour of the mandible. During its manufacture, a hole was drilled through the prosthesis just below the condylar head. In surgery, an Ethibond suture (Ethicon, Inc., Somerville, NJ, USA) was placed through the hole, and each end of the suture was passed through the polyethylene flange of the posterior fossa component and was tied to secure the condyle in position [Figures 5 and 6].

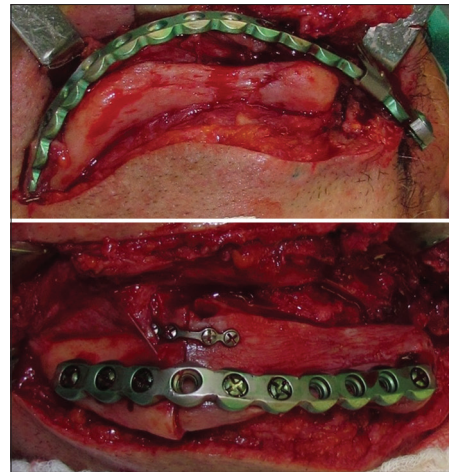
An endaural approach was used to insert the joint implant component and a submandibular approach to fix the prosthesis body extension. The mouth and nose were isolated using Tegaderm dressing, and the joint component was stabilized to the zygomatic arch with 4 2.0-mm screws. The mandible was placed into occlusion, and intermaxillary fixation was applied.

Because of significant deficiency in the soft tissue on the left side of the face, a fat graft was harvested and transplanted into the left side of the face. Fat grafts were harvested from the abdomen and packed around the articulating area of the prostheses to prevent postsurgical fibrosis and heterotopic or reactive bone formation.

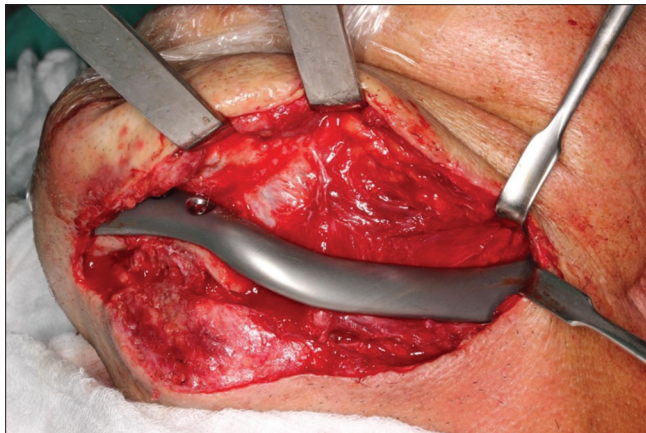
Postoperative follow-up showed good facial balance, stable occlusion, an interincisal opening of 44 mm, and favorable joint functioning [Figures 7 and 8]. The image provided through the panoramic radiograph showed both components in the proper position. The patient was satisfied with the results.



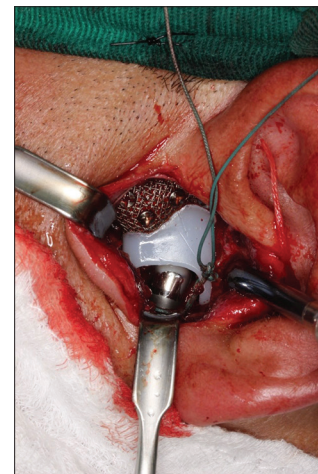
**Figure 3:** Intraoperative appearance of the placement of the transport distractor



**Figure 4:** Intraoperative appearance of the neoformed bone and the contour of the plate, and after the osteotomies and fixation with reconstruction plates



**Figure 5:** Intraoperative appearance during temporomandibular joint prosthesis placement (mandibular component)



**Figure 6:** Intraoperative appearance during temporomandibular joint prosthesis placement (joint component)



**Figure 7:** Intraoral and radiographic appearance postoperative



**Figure 8:** Clinical appearance postoperative

## DISCUSSION

The problem of mandibular reconstruction due to resections is directly related to the size of the resection.<sup>[3]</sup> The mandibular

resection in this case involved a hemimandible removal, meaning that the bone reconstruction involved reestablishing

a large facial contour, phonation, and masticatory function in both occlusal and joint aspects.

The DO technique was chosen because it has many advantages, such as being noninvasive, presenting a low incidence of complications, and not requiring surgery in a donor site. In addition, this procedure was considered well indicated due to having a short surgical time and providing good soft tissue and bone quality in both height and width. It also provides adequate bone tissue formation for the installation of osseointegrated implants and subsequent prosthetic rehabilitation.<sup>[7,8]</sup> There was no difficulty in performing the first surgical step with the distractor installation, and the surgical goal was achieved.

The latency time added to the time required to obtain the 6-cm distraction was 67 days, increasing the time necessary for the consolidation of the neofomed bone to 90 days, for a total of 5 months from the initial stage of the treatment. This was a complaint by the patient, who mentioned social prejudice, he encountered due to the dressing covering the transcutaneous screw activation nail.

The infection that occurred did not cause concern, because it was quickly resolved with local measures and oral antibiotic therapy.

Although a plate-guided distractor device was used in which newly formed bone could follow the curvature of the plate,<sup>[9]</sup> a curved shape was not totally achieved, leading to extra surgical time to perform an osteotomy that could give a more curvilinear contour in the symphysis region.<sup>[1]</sup> Although this time was used to install the implants and remove the distractor, it was considered an additional drawback.<sup>[10]</sup>

From the left TMJ reconstruction point of view, there was no doubt about the use of a customized joint prosthesis; several previous studies had demonstrated the advantages of its use in relation to the reestablishment of function, a low complication rate, and good longevity. Its use improved the facial contour due to the extension on the right side of the patient's mandible.<sup>[6,7,11]</sup>

At present, the patient follow-up is for approximately 4 years after the installation of the joint prosthesis and 7 years after the osteogenic distraction, with no complaints of any kind and an acceptable facial contour, masticatory, and functional capacity.

## CONCLUSION

DO by bone transport with the reconstruction of the TMJ using a customized prosthesis may be considered a good therapeutic modality for large mandibular reconstructions in patients who are aware of the requirement for additional operations to shape the curve in the area of the central arch of the mandible. It would be especially indicated for patients who can tolerate the treatment length of this therapeutic modality.

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## Conflicts of interest

There are no conflicts of interest.

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