

MANDIBULAR DISTRACTION WITH ANTERIOR DENTAL IMPLANTS; A CASE REPORT

Abeer Abdullah S Al-Sunbul^{1*}, Reem Aldhalaan², Muneera AlHaddab³, Fawzia AlZahrani⁴

¹Department of Restorative, Prince Sultan Medical City, Riyadh, Saudi Arabia. aalsunble@gmail.com

²Department of Restorative, Prince Mohammed Bin Abdulaziz Hospital, Riyadh, Saudi Arabia.

³Department of dentistry, Prince Abdulrahman Advanced Dental Institute, PAADI, Riyadh, Saudi Arabia.

⁴Department of Prosthodontics, Prince Sultan Medical City, Riyadh, Saudi Arabia.

<https://doi.org/10.51847/nCOZJ56SdU>

ABSTRACT

Mandibular Distraction osteogenesis (MDO) has several advantages, including simpler technology, reducing the Morbidity (e.g., infectious blood loss, surgery time), and the ability of the mandible to lengthen smaller. Poor growth can affect the mandible or specific parts such as the body, branch, condyle, symphysis, and alveolar segments in the three levels. Mandibular hypoplasia is a typical misalignment of the teeth and jawbone that depends on gravity. The combination of orthodontic treatment and surgical intervention may be required for best results. A 19-year-old Saudi female high school student visited the clinics with no significant medical problem or medication history. Past dental history indicated multiple extractions, multiple dental restorations; orthognathic surgery was done five years ago but was failed due to osseous infection. The patient was briefed about the preventive measures needed, the treatment plan was discussed, the time required and cost details were informed. Mandibular distraction with anterior implants provided excellent clinical outcomes and high patient satisfaction.

Key words: Mandibular distraction, Anterior implants, Distraction implant, FPD.

Introduction

Mandibular malformations can be developmental or acquired; however, the reasons are unclear. Sometimes that may be associated with Goldenhar syndrome and hemifacial malformation. Acquired defects may be a premature loss, teething, trauma, ankylosis of the temporomandibular joint (TMJ), and infections such as osteomyelitis. Poor growth can affect the mandible or specific parts such as the body, branch, condyle, symphysis, and alveolar segments in the three levels. Mandibular hypoplasia is a typical misalignment of the teeth and jawbone that depends on gravity. The combination of orthodontic treatment and surgical intervention may be required for best results [1, 2].

Mandibular Distraction osteogenesis (MDO) has several advantages, including simpler technology, reducing the Morbidity (e.g., infectious blood loss, surgery time), and the ability of the mandible to lengthen smaller. Successful MDO extended the mandible vertically, increased bone mass, and improved flexibility compared to bone grafts tissue asymmetry, allowing better vector control bone regeneration and associated with less repetition [3, 4].

Literature review

A 28-year-old Asian male was referred for examination of the radiolucent region on the right angle of the mandible. Throughout ≥ 5 months, the right mandibular region has increased in size. Marginal resection of the mandible and reduction of the inferior alveolar nerve was operated by an

oral surgeon, pursued by reconstruction of the excised mandible by distraction osteogenesis. Six years later, the sufferer developed inflammation at a similar site. Histopathological analysis indicated a recurrence of benign mandibular ameloblastoma. The dental implants were placed after the excision of the recurrent benign tumor. To facilitate regular check-ups and the maintenance of oral hygiene, a treatment plan has been developed which uses removable prostheses on implants instead of fixed prostheses. Treatment of edentulous areas with removable dental and implant-supported prostheses is required. Due to the lack of intermaxillary space, removable restorations are designed so that separate components provide support, support, and stability [5, 6].

The use of MDO to treat a 57-year-old woman with a Class I skeletal angle relationship and a severe Class II dental malocclusion is described, and the current state of knowledge about this treatment modality is discussed. Therefore, the use of MDO to establish a harmonious relationship between the maxillary and mandibular arches in patients with a Class I skeletal angle relationship and a severe class II malocclusion seems predictable and applicable in selected cases [7].

Mandibular osteogenic distraction and tongue-labial adhesions showed an all-around advantage regarding health-relevant excellence of life Robin sequence. No substantial difference was examined between mandibular distraction osteogenesis and lingual labial adhesions. The information helps compare mandibular distraction

osteogenesis Lingual adhesions as a surgical treatment by Robin, but studies to record the health-relevant integrity of life on more extensive Robin sequences. The queue is needed to determine which program is ideal for consequence babies [8].

A 22-year-old male was introduced with a bad front bite paired with a 1.3cm front bite. Increase the angle of the maxillary-mandibular plane and increase the height of the lower face. Multidisciplinary therapy uses the segmented mandibular distraction to flatten the curvature of Spee in front of the posterior maxilla of Le Fort I impact [9].

Case-report

History

A 19-year-old Saudi female high school student visited the clinics with no significant medical problem or medication history. Past dental history indicated multiple extractions, multiple dental restorations; orthognathic surgery was done five years ago but was failed due to osseous infection. However, no bleeding tendency was recorded after extraction/surgery. The chief complaint of the patient was to replace her lower missing teeth. Regarding the history of the chief complaint, her mandibular teeth were extracted due to a severe osseous infection following an orthognathic surgery 5 years ago. She was seen in the screening clinic two months before her initial SBARD visit.

Patient overview and examinations

As far as her attitude was concerned, she was an exacting patient according to the House classification. She was cooperative and showed a positive attitude towards improving her oral hygiene as well as diet. Moreover, she was willing to come regularly to her appointments. Regarding her oral hygiene, she did not use a toothbrush or any other cleaning method with her plaque, and the bleeding index is 50.22% and 44% respectively. Extra-oral examination showed the skin, lips, eyes, TMJ, mandibular movements to be within normal limits. Regarding her intra-oral examination, she was at moderate risk as far as generalized caries were concerned, the presence of yellow-brown stains in general, and the existence of generalized supra and subgingival calculus. Her periodontium showed generalized blunt interdental papilla, with swollen rolled edematous margins and bleeding upon probing. Generalized probing depth was 2-3mm with the absence of mobility and furcation involvement (**Figures 1a-1e**). Radiographs were also taken (**Figures 2a-2g**).

Occlusion was examined and resulted in Class I skeletal relationship with labially inclined #21 and rotated #22 alongside open-bite in the premolar region.



a) Lower arch



b) left lateral view



c) right lateral view



d) frontal view



e) palatal view

Figure 1. Pre-treatment photographs



a) Cephalometric



b) OPG



c) periapical 1



d) periapical 2



e) periapical 3



f) periapical 4



g) bitewing

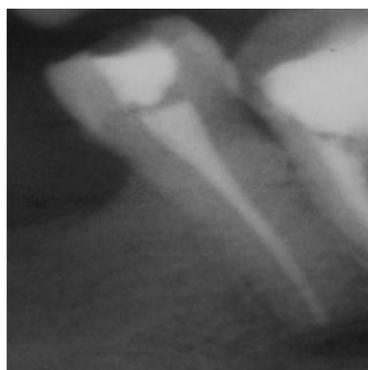
Figure 2. Pre-treatment radiographs

Phase I (Preventive treatment)

The patient was briefed about the preventive measures needed, the treatment plan was discussed, the time required and cost details were informed. Mounting of diagnostic casts was done and soft tissue management, which included patient motivation and education, oral hygiene instructions, dental scaling and polishing, and fluoride application. Finally, dietary advice was given by providing a healthy diet plan.

Phase II (Endodontic therapy)

Root canal therapy for tooth # 35, #36, and #46 were done (Figures 3a-3c).



a)



b)



c)

Figure 3. a) Post root canal radiograph of tooth # 35, b) Post root canal radiograph of #36, c) Post root canal radiograph of #46

Phase III (Pre-prosthetic phase)

Diagnostic wax-up was done to rebuild the occlusal scheme in CR=CO (Figures 4a-4c) and elimination all interferences. Fabrication of temporaries, templates and surgical implant stints was performed followed by temporization, composite post & core for tooth # 36, 46, and temporary mandibular RPD. As far as the surgical phase was concerned, mandibular distraction and implant fixture #33-43 (regular platform 4.4mm) were performed (Figures 5a-5c).



a) Wax up right side



b) Wax up frontal view



c) Wax up left side

Figure 4. Diagnostic wax-up



a) Extraoral view



b) frontal view 2



b) lower anterior view



c) impression 1



c) intraoral frontal view



d) frontal view 2

Figure 5. Temporary mandibular RPD and Distraction implant

Phase IV (Prosthetic therapy)

Definitive treatment plan included PFM crowns for #36, 46, Ceramic only for #37, 47, and 48, Implant-supported FPD #35-45 followed by clinical remount (**Figures 6a-6f**).



e) frontal view 3



a) Frontal view 1



f) impression 2

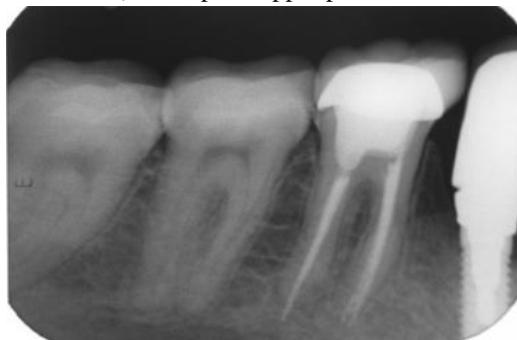
Figure 6. Prosthodontic therapy stages



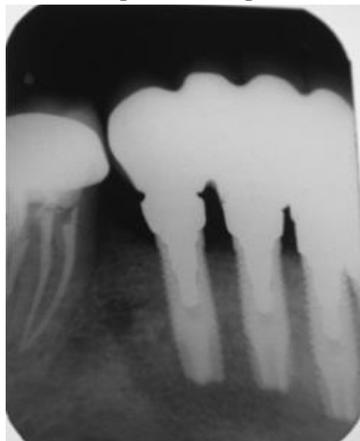
a) OPG



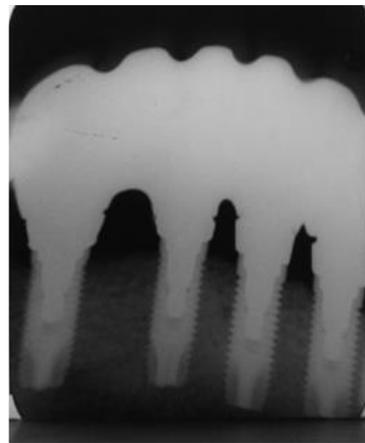
b) Peri-apical upper posterior



c) Peri-apical lower posterior



d) Peri-apical lower left anterior



e) Peri-apical lower right anterior



f) Bitewing left side



g) Bitewing right side

Figure 7. Post-treatment radiographs

Results and Discussion

This case was completed with mandibular distraction with anterior implants (**Figures 7a-7g**). Mandibular distraction osteogenesis has been used to correct mandibular anomalies since 1992, uncommon to get a skeletal movement greater than Orthognathic surgery. The technique includes progression separating the two pieces of cut bone to make easier bone filling and stretching. The ultimate form of the bone depends on the position of the retractor and distraction vector. Three-dimensional (3D) digital technology is used to plan these types of surgeries and predict the results through computed tomography (CT) scans and nuclear magnetic resonance (NMR) [10].

Another similar case of a 65-year-old man with no significant medical history complains of dissatisfaction with conventional care complete prosthetic treatment leading to severe atrophy alveolar ridge. He showed Grade 4 mandibular atrophy preoperative use according to the Atwood classification lateral transcranial X-ray. After clinical examination, the patient underwent anteroposterior tomography and cephalography before distraction and implant placement. The operation is performed under general anesthesia because of the risk of bleeding from the floor of the mouth. The fully vascularized osteotomy surface is optimal distraction osteogenesis and impairment dissected through the suprapariosteal segment of the osteotomy. Soft-tissue dissection is a modified Edlan-Mejchar technique. The only difference is to create a superior pedicled periosteal flap to cover the osteotomy space [11].

Distraction osteogenesis (DO) is an interesting surgical technique that uses the body's ability to heal itself. An osteotomy is performed in areas of reduced bone mass, and traction is applied daily by a distraction device to separate the bony margins, virtually simulating natural growth. Over time, the gap increases by 1 mm per day in mature bone and 2 mm per day in young children and infants. The space is ossified from the edge to the center by healing new bone distraction healing. In addition to the formation of new bone in the distraction space, all the tissue in the adjacent site is also generated by the tensile stress action of the overlying soft tissues. In this way, the site is reconstructed with all the local tissues, including bone, nerves, muscles, blood vessels, lymphatics, tendons, and fascia [12, 13].

Conclusion

Mandibular distraction with anterior implants provided excellent clinical outcomes and high patient satisfaction. Mandibular distraction osteogenesis is useful in managing craniofacial problems, however, more clinical trials are needed to evaluate the long-term success and to compare the treatment with conventional treatment procedures.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

References

- Sahoo NK, Issar Y, Thakral A. Mandibular distraction osteogenesis. *J Craniofac Surg.* 2019;30(8):e743-6.
- Michelinakis G, Apostolakis D, Kamposiora P, Papavasiliou G, Özcan M. The direct digital workflow in fixed implant prosthodontics: a narrative review. *BMC Oral Health.* 2021;21(1):1-24.
- Shakir S, Bartlett SP. Modern mandibular distraction applications in hemifacial microsomia. *Clin Plast Surg.* 2021;48(3):375-89.
- Liu W, Cai H, Zhang J, Wang J, Sui L. Effects of immediate and delayed loading protocols on marginal bone loss around implants in unsplinted mandibular implant-retained overdentures: a systematic review and meta-analysis. *BMC Oral Health.* 2021;21(1):1-14.
- Lee JH, Kim SH, Yoon HI, Yeo IS, Han JS. Implant-assisted removable prosthetic rehabilitation after distraction osteogenesis in a patient with ameloblastoma recurrence: a case report. *Medicine.* 2019;98(49).
- Makowiecki A, Hadzik J, Błaszczyzyn A, Gedrange T, Dominiak M. An evaluation of superhydrophilic surfaces of dental implants-a systematic review and meta-analysis. *BMC Oral Health.* 2019;19(1):1-13.
- Logjes RJ, Mermans JF, Paes EC, Muradin MS, Griot JP, Breugem CC. Assessment of health-related quality of life in robin sequence: a comparison of mandibular distraction osteogenesis and tongue-lip adhesion. *Plast Reconstr Surg.* 2019;143(5):1456-65.
- Altaweel AA, Baiomy AA, Shoshan HS, Abbas H, Abdel-Hafiz AA, Gaber AE, et al. Evaluation of osteogenic potential of *Cissus quadrangularis* on mandibular alveolar ridge distraction. *BMC Oral Health.* 2021;21(1):1-8.
- Fowler P, Haworth J, Steenberg L. Vertical segmental anterior mandibular distraction to aid closure of a severe anterior open bite associated with an accentuated reverse curve of Spee. *J Orthod.* 2021;48(4):444-50.
- Gonzalez Alvarez A, Dovgalski L, Evans PL, Key S. Development and surgical application of a custom implant that enables a vertical vector of mandibular distraction. *Proc Inst Mech Eng H.* 2020;234(10):1172-80.
- Sakka S, Al Rafedah A, Alqhtani N, Alenazi A. Distraction Osteogenesis of Severely Resorbed Mandible. *Case Rep Dent.* 2022;2022:7651439.
- Gassner R, editor. *Complications in cranio-maxillofacial and oral surgery.* Springer International Publishing; 2020.
- Korsch M, Walther W, Robra BP, Sahin A, Hannig M, Bartols A. Pre-implantological treatment routines for alveolar ridge atrophy—an investigation among maxillofacial and oral surgeons in southern Germany. *BMC Oral Health.* 2020;20(1):1-0.