

## Severely resorbed mandible treatment: a 12-years follow-up case report

Tratamento de mandíbula severamente reabsorvida: relato de caso de acompanhamento de 12 anos

Tratamiento de mandíbula severamente reabsorbida: un informe de un caso de seguimiento de 12 años

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### Abstract

Rehabilitation of severely atrophic jaws has been a major problem for elderly patients and dentists. When conventional rehabilitation treatments are not possible, bone intervention is deemed necessary. Mandibles with less than 12 millimeters (mm) in height imply insufficient retention of the prosthesis, intolerance to mucosal load, pain and, consequently, incapacity of oral functions and decreased facial aesthetics. Endosseous implants are a widely accepted therapy for SRM rehabilitation, but it depends on the amount of bone available for a good prognosis. The Tent Pole technique is based on the addition of bone graft and expansion of the soft tissue matrix, mainly for cases of SRM with 6 mm or less of bone height available for rehabilitative treatments with endosseous dental implants. The objective of this report is to present and update a previously published clinical case of SRM reconstruction and rehabilitation using the tent pole technique, with 12 years of follow-up. The female patient, who underwent treatment at 63 years of age, received treatment using the Tent Pole surgical technique for mandibular reconstruction with cranial autogenous particulate bone graft. The treatment was favorable during the 12 years of control, the CT scan showed that the grafted bone was stable in volume and the mandible was enlarged in three dimensions.

**Keywords:** Dental implants; Resorbed mandible; Dental prosthesis implant-supported; Tent pole technique.

### Resumo

A reabilitação de mandíbulas severamente atroficas tem sido um grande problema para os pacientes idosos e cirurgiões-dentistas. Quando não há possibilidade de tratamentos convencionais de reabilitação, julga-se necessária uma intervenção óssea. Mandíbulas com menos de 12 milímetros (mm) de altura implicam em retenção insuficiente da prótese, intolerância à carga mucosa, dor e, conseqüentemente, incapacidade das funções orais e diminuição da estética facial. Implantes endósseos são uma terapia amplamente aceita para a reabilitação do MRE, porém depende da quantidade de osso disponível para um bom prognóstico. A técnica Tent Pole baseia-se na adição de enxerto ósseo e expansão da matriz de tecido mole, principalmente para casos de MRE com 6 mm ou menos de altura óssea disponível para tratamentos reabilitadores com implantes dentários endósseos. O objetivo deste reporte é apresentar e atualizar um caso clínico, já publicado anteriormente de reconstrução e reabilitação de MRE através da técnica de tent pole, com 12 de anos de acompanhamento. Paciente do gênero feminino, realizou seu tratamento aos 63 anos de idade, recebeu tratamento por meio da realização da técnica cirúrgica Tent Pole para reconstrução mandibular com

enxerto ósseo particulado autógeno craniano. O tratamento mostrou-se favorável durante os 12 anos de controle, a tomografia computadorizada mostrou que o osso enxertado estava estável em volume e a mandíbula estava aumentada em três dimensões.

**Palavras-chave:** Implantes dentários; Mandíbula reabsorvida; Prótese dentária fixada por implante; Técnica tent pole.

### Resumen

La rehabilitación de mandíbulas severamente reabsorbidas (SRM) ha sido un problema importante para los pacientes de edad avanzada y los dentistas. Cuando los tratamientos de rehabilitación convencionales no son posibles, se considera necesaria la intervención ósea. Las mandíbulas con menos de 12 milímetros (mm) de altura implican retención insuficiente de la prótesis, intolerancia a la carga mucosa, dolor y, en consecuencia, incapacidad de las funciones orales y disminución de la estética facial. Los implantes endoóseos son una terapia ampliamente aceptada para la rehabilitación de SRM, pero depende de la cantidad de hueso disponible para un buen pronóstico. La técnica Tent Pole se basa en la adición de injerto óseo y la expansión de la matriz de tejido blando, principalmente para casos de SRM con 6 mm o menos de altura ósea disponible para tratamientos rehabilitadores con implantes dentales endoóseos. El objetivo de este reporte es presentar y actualizar un caso clínico previamente publicado de reconstrucción y rehabilitación de SRM mediante la técnica de la Tent Pole, con 12 años de seguimiento, paciente del sexo femenino, quien fue intervenida a los 63 años de edad y recibió tratamiento mediante la técnica quirúrgica Tent Pole para reconstrucción mandibular con injerto óseo particulado autógeno craneal. El tratamiento fue favorable durante los 12 años de control, la tomografía computarizada mostró que el hueso injertado estaba estable en volumen y la mandíbula estaba agrandada en tres dimensiones.

**Palabras clave:** Implantes dentales, Mandíbula reabsorbida, Prótesis dental de soporte implantado; Técnica tent pole.

## 1. Introduction

The rehabilitation of severely resorbed mandibles (SRM) has been a great challenge for dentists. Mandibles with less than 12 millimeters (mm) in height imply insufficient prosthesis retention, mucosal load intolerance, pain, and consequently, oral functions disabilities and decreased facial aesthetics (Camps-Font O. et al, 2016). Endosseous implants are a widely accepted therapy for rehabilitation of SRM, yet it faces difficulties due to the amount of available bone which may result in unfavorable biomechanics and complications such as jaw fracture (Torsiglieri et al, 2015, Manfro et al, 2015). Before dental endosseous implants, the available treatment alternatives for SRM were based on pre-prosthetic surgeries, nevertheless, the nowadays treatment focuses in gain additional bone volume to allow dental implants to be installed, mainly through bone grafts and alveolar bone distraction (Chiapasco et al 2007, Marx et al ,2002). More recently, the use of short dental implants has been used with a similar success rate when compared to bone reconstructions, gaining indication over the second due to several advantages such as less morbidity and costs (Anitua et al ,2014).

In particular, according to Len Tolstunov's classification of edentulous ridges, areas with severe defects (residual ridge width of 2 to 4 mm) should undergo reconstruction before implant placement (Tolstunou et al, 2014). Adequate bone volume allows for proper implant position favorable for restorations and consequently leads to optimized function and esthetic results. A variety of reconstructive approaches have been introduced to obtain adequate bone volume prior to implant placement, such as guided bone regeneration (GBR) (Hämmerle CHF et al ,2008), ridge splitting/expansion (Blus C.et al, 2009), block grafting (Chiapaco et al,1999) and distraction osteogenesis (Yamauki et al ,2013). Marx et al (2002) first described the tent pole technique, which is based on bone graft and expansion of the soft tissue matrix, mainly for cases of SRM with 6 mm or less of available bone height and endosseous dental implants. This case report aims to update a previous published case of reconstruction and rehabilitation of SRM through the tent pole technique (Manfro et al, 2008), which now reached 12 years of follow-up.

## 2. Methodology

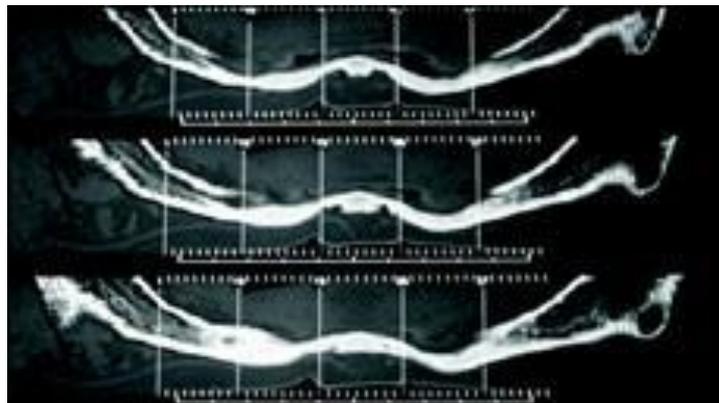
This is a descriptive, qualitative study, carried out using the direct observation technique (Pereira et al., 2018), which was approved by the research ethics committee and through the signing of a free and informed consent form. The patient

consented to the disclosure of data and exposure of images referring to his clinical case for academic and scientific purposes. The patient was followed up for 12 years to verify the effectiveness of the treatment, which is described below.

### 3. Case Report

The initial clinical information of this case report can be recapitulated in Manfro et al (2008), however, it is also briefly described below. A 63-year-old female patient was clinically diagnosed with severe atrophy of the mandible, confirmed by imaging, computed tomography and conventional dental radiographs. The measurements of the mandibular anterior interforaminal region ranged from 4 to 5 mm in height and 4 to 8 mm in thickness (Figure 1).

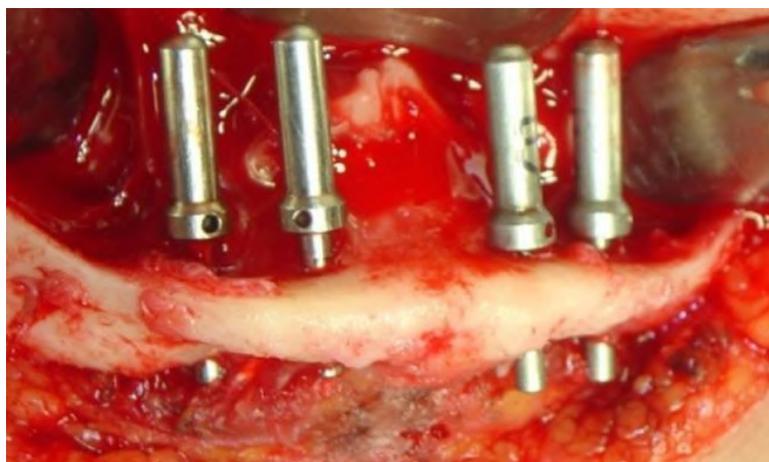
**Figure 1:** Axial computed tomography (CT) scan showing the height of the anterior mandible.



Source: Manfro R. et al (2008).

The treatment plan performed was the tent pole technique, expansion of the soft tissue matrix filled with cranial autogenous particulate bone graft. The procedure was performed under general anesthesia, with submandibular access. Bone defects were lightly harmonized with drills and four  $3.5 \times 1.5$  mm internal hexagonal implants (SIN, São Paulo/Brazil) were fixed traditionally, regarding the amount of bone available (Figure 2).

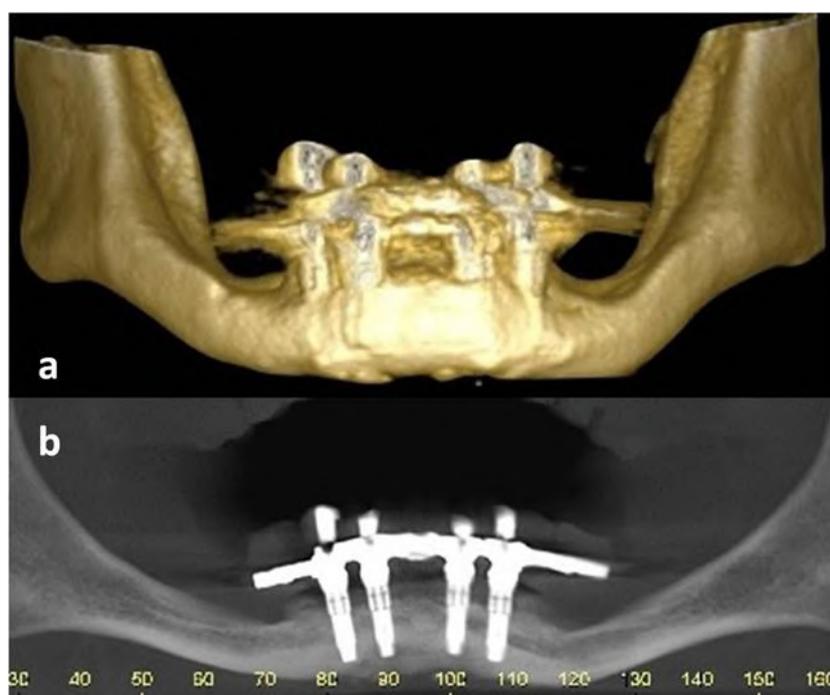
**Figure 2:** Initial anterior mandible surgical view with installed implant positioners.



Source: Manfro R. et al (2008).

The procedure resulted in an extra-osseous implant of around 6 to 8 mm. Autogenous bone was harvested from the external lamina of the parietal bone on the right side of the skull through a hemicoronal incision in the region. The bone was particulate and grafted around the implants and in the posterior region of the mandible. After eight months, the healers were installed, showing excellent bone formation and osseointegration of the implants. The first report included 2 years of follow-up, where there was a report that the prosthesis is in function with no problems or complaints reported. From then on, the patient attended for controls annually until 2018, when she died of natural causes in 2019. In addition to no prosthetic problems being observed in the period, the prosthesis screws were preventively replaced after 3 years and 7 years of function. During the 12 years of follow-up, computed tomography showed that the grafted bone was stable in volume and the mandible was enlarged in three dimensions, even inferior to the pre-existing ridge (Figure 3).

**Figure 3:** Mandibular Cone Bean view (a) and axial slice computed tomography (b) showing the prosthesis structure and bone maintenance and gain of the anterior mandible after 12 years in function.



Source: Authors.

#### 4. Discussion

The selection of a reconstructive surgical procedure to facilitate the reliable placement of dental implants in SRM is still an object of discussion in the literature, especially in mandibles classified as classes V and VI (Torsigleire et al,2015). What turned this case presented here into a considerable difficult one, was the severe mandibular bone atrophy, the lack of soft tissue, the facial profile considering the patient's age, and the risk of mandibular fracture. The technique proposed by Marx et. (Marx R.E. et al,2002) used in this report, promoting a tent supported by implants, proved to be viable. The tent technique was an effective approach to obtain sufficient horizontal ridge dimension in any edentulous (Tu Lam Doan et al,2020). The choice for cranial bone harvest remained in the fact that this donor site is suitable, with easy access, safe, and generates low morbidity when compared to bone harvested from the iliac crest (Chiapasco M et al,2007, Nkenke E et al,2004). Considering rehabilitation, the prosthesis' progressive loading first obtained by a short temporary fixation, without distal cantilevers, was an option to observe if this new bone was able to resist the mastication impact, as well as, to progressively

reestablish proprioception and allow the masticatory muscles to adapt. This protocol allowed the final prosthesis to be made with the extension of distal cantilevers, ensuring that the implants and bone were strong enough to support the functional masticatory load (Zurdo et al,2004). In these 12 years of a follow-up, no complications were observed. Promoting early replacements of the prosthetic retention screws is routine and prevents its progressive wear which may lead to the lack of prosthesis retention and especially, prevent the screws fractures. The additional observation in this case and technique was the increase of mandible volume, where the natural course should be the loosing of its bone volume. This fact may be due to the protocol-type prostheses, which better distribute the forces over its area allowing maintenance and even increasing bone volume due to a balanced function (Nakai et al,2000).

## 5. Conclusion

This case report with 12 years of follow-up shows that the tent pole technique, besides its difficulties, time-consuming, and hospital costs, can be feasible, predictable, and reliable for treating cases of great complexity due to the severely resorbed mandible.

## References

- Anitua, E, Piñas, L, Begoña, L & Orive, G. (2014). Long-term retrospective evaluation of short implants in the posterior areas: clinical results after 10-12 years. *J Clin Periodontol*; 41(4):404-11. 10.1111/jcpe.12222.
- Blus, C, Szmukler-Moncler, S. S (2006) Crest and immediate implant placement with ultra-sonic bone surgery: a 3-year life-table analysis with 230 treated sites. *Clin Oral Implants Res*; 17(6):700-7. <https://doi.org/10.1111/j.1600-0501.2006.01206>.
- Camps-Font, O, Burgueño-Barris, G, Figueiredo, R, Jung, R. E, Gay-Escoda, C & Valmaseda-Castellón, E. (2016). Interventions for Dental Implant Placement in Atrophic Edentulous Mandibles: Vertical Bone Augmentation and Alternative Treatments. A Meta-Analysis of Randomized Clinical Trials. *J Periodontol*; 87(12):1444-1457. 10.1902/jop.2016.160226.
- Chiapasco, M, Abati, S, Romeo, E & Vogel G. (1999) Clinical outcome of autogenous bone blocks or guided bone regeneration with e-PTFE membranes for the reconstruction of narrow edentulous ridges. *Clin Oral Implants Res*; 10(4):278-88. <https://doi.org/10.1034/j.1600-0501.1999.100404>.
- Chiapasco, M, Gatti, C & Gatti, F (2007). Immediate loading of dental implants placed in severely resorbed edentulous mandibles reconstructed with autogenous calvarial grafts. *Clin Oral Implants Res*; 18(1):13-20. 10.1111/j.1600-0501.2006.01293. x.
- Hämmerle, C.H.F., Jung, R.E, Yaman, D.& Lang N.P. (2008) Ridge augmentation by applying bioresorbable membranes and deproteinized bovine bone mineral: a report of twelve consecutive cases. *Clin Oral Implants Res*; 19(1):19-25. <https://doi.org/10.1111/j.1600-0501.2007.01407>.
- Manfro, R, Batassini, F. & Bortoluzzi, M.C. (2008). Severely resorbed mandible treated by soft tissue matrix expansion (tent pole) grafts: case report. *Implant Dent*; 17(4):408-13. 10.1097/ID.0b013e31818c6ba5.
- Manfro, R, Fabris, V, Garcia, G.F, Derech, E, Felipe A.F & Bortoluzzi MC (2015). Mandibular Fracture in A Patient Treated with A Protocol Prosthesis after 3 Years of Function due to Biomechanical Complications - Clinical Case Report. *Int J Dent Oral Health*; 1(2): 10.16966/2378- 7090.112
- Marx, R.E, Shellenberger, T, Wimsatt, J & Correa, P (2002). Severely resorbed mandible: predictable reconstruction with soft tissue matrix expansion (tent pole) grafts. *J Oral Maxillofac Surg*.;60(8):878-88; discussion 888-9. 10.1053/joms.2002.33856.
- Nakai, H, Niimi, A & Ueda M. (2000) Osseous proliferation of the mandible after placement of endosseous implants. *Int J Oral Maxillofac Implants*.; 15(3):419-24.
- Nkenke, E, Weisbach, V, Winckler, E, Kessler, P, Schultze-Mosgau, S, Wiltfang, J & Neukam FW (2004) Morbidity of harvesting of bone grafts from the iliac crest for preprosthetic augmentation procedures: a prospective study. *Int J Oral Maxillofac Surg*; 33(2):157-63. 10.1054/ijom.2003.0465.
- Pereira A. S. et al. (2018). Metodologia da pesquisa científica. [free e-book]. Santa Maria/RS. Ed. UAB/NTE/UFSM.
- Tolstunov, L. (2014) Classification of the alveolar ridge width: implant-driven treatment considerations for the horizontally deficient alveolar ridges. *J Oral Implantol* 2014; 40(Spec No):365-70. <https://doi.org/10.1563/aaid-joi-D-14-00023>
- Torsiglieri, T, Raith, S, Rau, A, Deppe, H, Hölzle, F & Steiner, T. (2015). Stability of edentulous, atrophic mandibles after insertion of different dental implants. A biomechanical study. *J Craniomaxillofac Surg*; 43(5):616-23. 10.1016/j.jcms.2015.03.001.
- Tu, Lam, Doan, Lanh, Duc, Le(2020) Efficacy of the Tent-Pole Technique in Horizontal Ridge Augmentation, *Pesquisa Brasileira em Odontopediatria e Clínica Integrada*; 20:e5643 <https://doi.org/10.1590/pboci.2020.109> ISSN 1519-0501 / eISSN 1983-4632.
- Yamauchi, K, Takahashi, T, Nogami, S, Kataoka, Y, Miyamoto, I & Funaki, K. (2013). Horizontal alveolar distraction osteogenesis for dental implant: long-term results. *Clin Oral Implants Res*; 24(5):563-8. <https://doi.org/10.1111/j.16000501.2011.02417>
- Zurdo, J, Romão, C & Wennström J.L (2009). Survival and complication rates of implant-supported fixed partial dentures with cantilevers: a systematic review. *Clin Oral Implants Res*; 20 Suppl 4:59-66. 10.1111/j.1600-0501.2009.01773.