Total rehabilitation of maxilla using a tooth-to-implant restoration: case report

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Dental implants in partially edentulous patients are a predictable therapeutic option. However, using tooth-to-implant restorations to rehabilitate partially edentulous patients involves highly complex biomechanical aspects. This type of prosthesis utilizes different kinds of support that react distinctly to the functional forces developed in the oral cavity. In some cases, a tooth-to-implant restoration is a treatment option for difficulties related to reduced bone volume, inadequate interdental space, or an implant's failure to osseointegrate.

This case report describes the rehabilitation of a patient whose partially edentulous maxilla was treated with a tooth-to-implant restoration. In this case, telescopic crowns were used to better match the tooth-implant union. No biomechanical or functional problems were found 8 years post-treatment, indicating that the combination of implant and tooth support is a possible treatment option with an improved long-term prognosis.

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Dental implants are used to support fixed and removable prostheses for completely and partially edentulous patients. However, when there is inadequate bone for the placing of an implant, or inadequate interdental space, or when an implant fails to osseointegrate, a combined tooth-implant support is a good option for prosthetic rehabilitation.[1-4]

The success of rehabilitation depends on the number, arrangement, and status of the remaining teeth, including periodontal health and tooth structure.[1] The teeth must be in good periodontal health when a tooth-to-implant restoration is planned.[2,5] The advantages of combining natural teeth and dental implants include additional support for the total load of the dentition, reduced cost for tooth replacement, and the avoidance of cantilevers.[6]

However, because of the differences between an osseointegrated implant and a natural tooth's connection to the alveolar bone through periodontal ligament fibers, the tooth-to-implant restoration behaves very differently in response to both natural and pathological masticatory forces.[7] The significance of this difference should be analyzed from a clinical perspective, as the correct selection of the natural teeth and their periodontal condition is essential for the success of the rehabilitation.[2] This article describes the case of a patient with a partially edentulous maxillary area, who was treated with a tooth-to-implant restoration.

Case report

A 61-year-old man in good general health sought treatment at the prosthodontic clinic at the Institute for the Study of Health at Minas Gerais. The patient's maxillary arch included provisional resin crowns on the remaining teeth and a temporary removable partial denture. The patient also had a removable partial denture in the mandibular arch (Fig. 1).

The evaluation of natural teeth included examination of their clinical status (based on endodontic treatment, fracture, and intrusion). To verify the periodontal health of the teeth, tooth stability, pocket depth, plaque and bleeding indices, and calculus status were evaluated as well. The patient had healthy gingival tissues, and no mobility was observed. However, there was evidence of an invasion of the biological space and a need to increase the clinical crowns on the maxillary teeth.

The patient needed crown replacement and a fixed restoration, with implants placed in the edentulous posterior areas of the maxillary arch, and teeth placed in the posterior region of the mandibular arch.

Treatment options were discussed with the patient. In response to the patient's request for a fixed restoration in the maxilla, it was decided to start with a radiographic evaluation in order to properly place implants and fabricate a fixed partial denture and implant-supported prostheses. The patient also wanted a new removable partial denture for the mandibular arch.

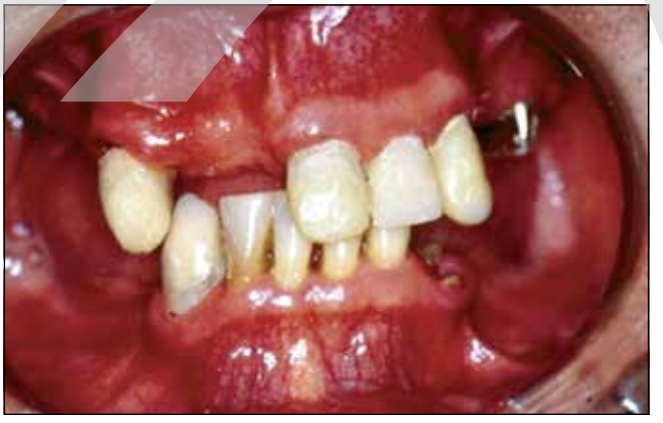

Fig. 1. An anterior view of provisional resin crowns on remaining maxillary teeth.

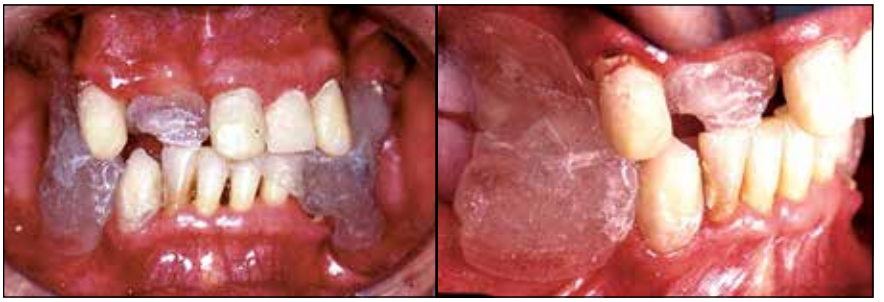

Fig. 2. *Left.* Upper and lower records made with an autopolymerizing methyl methacrylate polyacrylic. *Right.* Indentation in the posterior maxillary region.

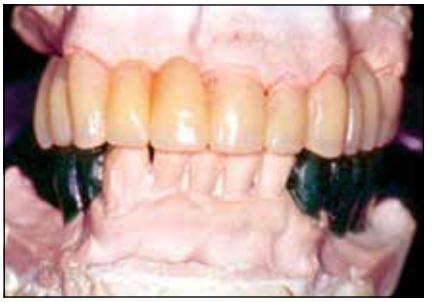

Fig. 3. A diagnostic wax-up and provisional maxillary restorations.

The patient had decreased vertical dimension. To help restore it, maxillary and mandibular records were made using an autopolymerizing polyacrylic (VIPIFlash, VIPI Industria, Comercio, Exportacao e Importacao de Produtos Odontologicos Ltda.). Metric, esthetic, phonetic, and physiological tests were performed to verify that the vertical dimension of occlusion was correct. To restore the horizontal position of the mandible, indentations were made in the posterior region of the upper register and acrylic resin was added to the lower register, causing the patient to occlude in a centric relationship (Fig. 2).

A study cast was fabricated and mounted on a semi-adjustable articulator with a facebow. The diagnostic wax-up was done in the established vertical dimension of occlusion, re-establishing the mutually protected occlusion; in addition, provisional maxillary restorations were fabricated (Fig. 3). A removable partial denture was made per the patient's request. Later, the clinical crowns of the maxillary teeth were increased to restore the biological space, surgery was performed for maxillary sinus lifting, and a lyophilized bone graft was performed using a bone substitute (Geistlich Bio-Oss, Geistlich Pharma North America, Inc.). An implant was placed in the area corresponding to the right first premolar.

After the postsurgical healing following the clinical crown surgery, the maxillary teeth were prepared for metalloceramic crown restorations. At that point, the provisional restorations were relined. Eight months after surgery for maxillary sinus lifting, an implant was placed in the area corresponding to the right first molar.

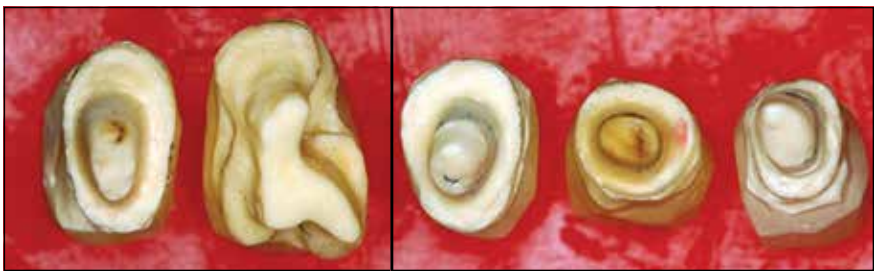

Fig. 4. *Left.* Details of the stone dies of the maxillary right premolar and first molar. *Right.* Stone dies of the other prepared teeth.

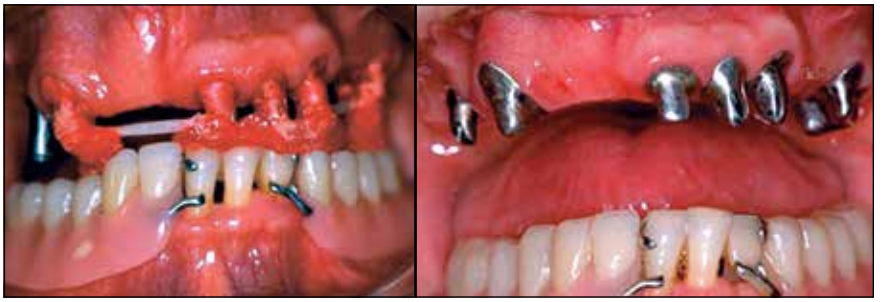

Fig. 5. *Left.* Resin transfer copings. *Right.* The patient after telescopic crowns were cemented into the maxilla and a pillar (in preparation for the cemented crown) was screwed onto the maxillary right first molar.

During the implant osseointegration period, the stone dies of the prepared teeth and transfer copings were made with Duralay resin (Reliance Dental Mfg. Co.) (Fig. 4). The transfer copings were used to move the intraoral teeth and implant positions to the cast, position the abutments intraorally, and facilitate the fabrication of the fixed partial denture and implant-supported prostheses. However, during the transfer molding, it was discovered that the implant in the right first premolar area had failed to osseointegrate and was removed.

Since the patient did not want to undergo surgery to install the new implants at that time, a revised treatment plan was discussed. Taking into account the possibility of installing new implants in the future, a reversible treatment was planned, with the patient opting for a combination of natural teeth and dental implants. Telescopic crowns were cemented into the maxilla and a pillar prepared for a cemented crown was screwed onto the right maxillary first molar. Using a porcelain framework (Noritake Super Porcelain

Fig. 6. *Left.* The metal-ceramic fixed tooth/implant-supported denture. *Right.* Anterior view of the metal-ceramic fixed tooth/implant-supported denture and a new removable partial mandibular denture.

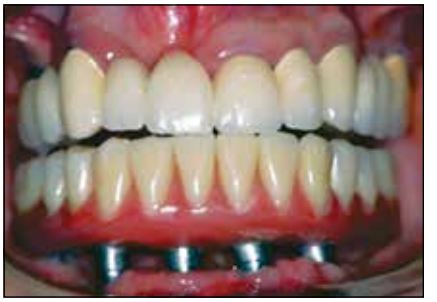

Fig. 7. The patient at a 4-year follow-up visit, as the mandibular removable partial denture is replaced.

EX-3, Kuraray America, Inc.) and a bonding alloy (Wiron 99, BEGO USA), a metalloceramic fixed tooth/implant-supported denture was made (Fig. 5).

All-ceramic crowns were tried-in to verify marginal adaptation as well as the interproximal and centric contacts; at that point, the prosthesis was installed. Two teeth were lost in the mandibular arch due to caries, so a new removable partial denture was made (Fig. 6). After 4 years of follow-up evaluations, the patient opted to replace the mandibular removable partial denture (Fig. 7).

During the follow-up period, maintenance of both natural teeth and implants was evaluated; for natural teeth, maintenance included tooth fracture, caries, endodontic treatment, extraction, and intrusion, and for implants, it included implant loss/fracture, abutment/screw loosening, and abutment fracture.

A follow-up evaluation was performed 8 years post-treatment. An oral health examination revealed no problems; phonetic characteristics were unaltered, and the patient was pleased with the prosthesis.

Discussion

This report describes how a tooth-to-implant restoration was used to treat a patient with multiple missing maxillary teeth. This restoration made it possible to rehabilitate the maxillary with a reversible treatment, thus making it possible to install new implants in the future without affecting the crowns of the remaining teeth.

However, whether a tooth with only its periodontal ligament can efficiently provide support in tooth-implant restoration is questionable. When comparing the movement of a tooth in good periodontal health vs an osseointegrated implant, the movement can be 5-20 times greater in the natural tooth. Nonrigid connectors are associated with dental intrusion, which occurs in 20% of tooth-implant connections.[8,9]

Several studies preferred rigid connections in order to avoid dental intrusion.[10-12] Rigidity is not considered to be detrimental because it is thought that prostheses and implants possess the flexibility to accommodate different levels of mobility.[13] In cases involving rigid connections, telescopic crowns can be used to better match the tooth-implant union. In such cases, metal copings are cemented permanently to the abutment tooth, and the superstructure of the prosthesis is attached with temporary cement. This makes it possible to recover the prosthesis later, both to perform oral hygiene and to assess the implant.[4]

In the present case, a telescopic restoration was used to connect the tooth to the implant. With the great variety of treatment modalities offered by tooth-implant support for telescopic prostheses, successful function over a prolonged period and a minor complication rate can be expected, making this a useful treatment option for treating the maxilla.[2]

Intrusion is a major complication that has been reported in the literature; however, no intrusion (or any other complication) was detected in the present case over an 8-year period, indicating that the treatment was successful.

A 2004 case report by Wang et al proposed that placing a natural tooth with a fixed prosthesis next to implant-supported prostheses could result in intrusion, even when no tooth-implant connection is involved.[14] According to the authors, the problem had to do with poor adjustment of the tooth-supported prosthesis' interproximal and occlusal contact points with the adjacent implant-supported prosthesis.[14] When good interproximal and occlusal contacts are achieved, intrusion will be reversed. According to Lin et al, the magnitude and position of occlusal force are more important than connector design in terms of the mechanical response (stress values and distribution) for implant systems and alveolar bone.[8]

An implant and tooth-supported prosthesis is a viable alternative in some specific clinical conditions, as it allows the patient to have additional implants installed in the future. In addition, the whole structure of the prosthesis can be removed for implant installation without interfering with the cementation of crowns on the remaining teeth. A correctly planned and fabricated prosthesis can lead to satisfactory esthetic and functional long-term results.

Summary

The combination of an implant and tooth support from telescopic crowns is a treatment option for some partially edentulous patients. This system should be considered when an implant-supported fixed prosthesis cannot be used. Patients in this situation should be aware of possible complications and limitations, and know that follow-up treatment is required. The patient in the present case was fully satisfied because his functional and esthetic expectations were met.

Author information

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Manufacturers

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