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2TREATMENT OF MAXILLARY LATERAL INCISORS AGENESIS: BONE AUGMENTATION IMPLANT PLACEMENT AND IMMEDIATE LOADING

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ABSTRACT

Maxillary lateral incisors agenesis often creates an esthetic problem with specific orthodontic and prosthetic considerations. Multiple treatment options are proposed as implant-supported crowns or orthodontic treatment with space closure. Implants are commonly used for lateral incisors replacement after orthodontic treatment. However, the osseous ridge in the agenesis area is typically deficient. Several reconstructive procedures have been proposed with the aim of increasing alveolar bone dimensions for implant placement. Autogenous bone is still considered the gold standard among bone substitutes. The present study describes a case of a young patient with maxillary lateral incisors agenesis. To establish optimal esthetics, interdisciplinary approach was adopted during the diagnosis and treatment plan.

KEYWORDS: Agenesis, autogenous bone graft, dental implant, maxilla.

INTRODUCTION

Tooth agenesis is the most common developmental anomaly of human dentition, occurring in approximately 25% of the population.[1]

The third molar is the most affected tooth, showing a prevalence of 20.7%. The lower premolars represent the second commonly missing teeth, followed by maxillary lateral incisors.[2] Genetics represent the primary etiological factor of lateral tooth agenesis.

Patients with maxillary lateral incisors agenesis are frequently confronted with functional and esthetic problems at a young age, which may affect their social integration.

Establishing optimal esthetics, function, and periodontal health for these patients is a complex and challenging process, which demands a multi disciplinary approach.

The purpose of this paper was to report a case of bilateral agenesis of maxillary lateral incisor where collaboration between orthodontists, oral surgeon and prosthodontist allowed the resolution of the case.

OBSERVATION

A 25 year-old-patient was referred to our oral surgery and implantology department for maxillary lateral incisors replacement. The patient was diagnosed with congenitally lateral incisors agenesis and he was suffering from an aesthetic problem since his childhood.

Clinical exam showed face symmetry with a convex profile. Intra oral examination revealed an angle Class I relationship of molars and canines, 2 mm overjet, and normal overbite. Maxillary arch showed generalized diastema in the anterior region and lateral incisors agenesis confirmed by the panoramic radiograph.

In the mandible, complete permanent dentition was observed.

After collaborating with his orthodontist, the decision of space opening and implant placement was taken through movement of the canines and the posterior teeth.

After a two-year multiband treatment, the space required for restoring the two lateral incisors was created and maintained with a provisional removable prosthesis. “Fig 1“

Anterior maxillary CBCT showed a bilateral thin alveolar crest with buccal concavity accentuated in the

apical part compared to the coronal one. The 3mm bucco-palatal thickness was inappropriate for implant placement and the decision for bilateral bone augmentation was taken. “Fig 2”.

Bone reconstruction was performed with two onlay grafts. The blocks were harvested from the symphysis mandible as a greater bone volume could be obtained compared to the ramus site. “Fig 3” Piezosurgery inserts were used under irrigation and bone blocks were fixed in the recipient site with titanium screws. “Fig 4”

After six-month bone healing, a second surgery for implant placement was programmed. Bone graft showed only 1mm of resorption “Fig 5”. The bicortical screws were removed and 8 mm bone thickness in both sites was obtained allowing implant placement (Tri^{R} implant 3,3mm /13 mm). “Fig 6”

Immediate implant loading was performed as the primary stability was satisfying (45N insertion torque). Provisional abutment was adjusted and direct provisional prosthesis made with a pre-shaped polycarbonate crown. “Fig 7”

To avoid the occlusal overload disturbing implant’s stability, all dynamic contacts on the implant supported prosthesis were removed. “Fig 8”

Three months later, tissue modeling around the provisional crown allowed us to create a natural design of the emergence profile guaranteeing an aesthetic final restoration. “Fig 9”

Fig. 1: Space opening after orthodontic treatment.

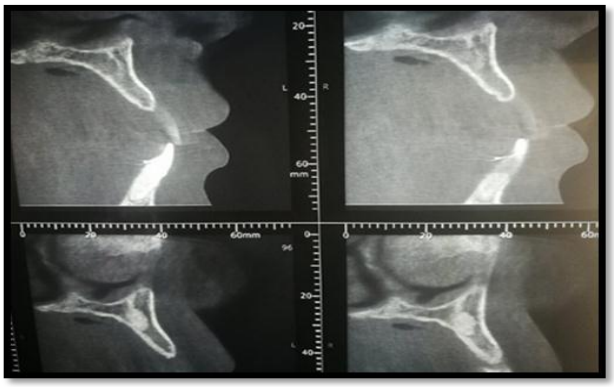

Fig. 2: CT scan showing bilateral thin alveolar crest with buccal concavity.

Fig. 3+4: blocks harvested from the symphysis mandible and fixed in the recipient site with titanium screws.

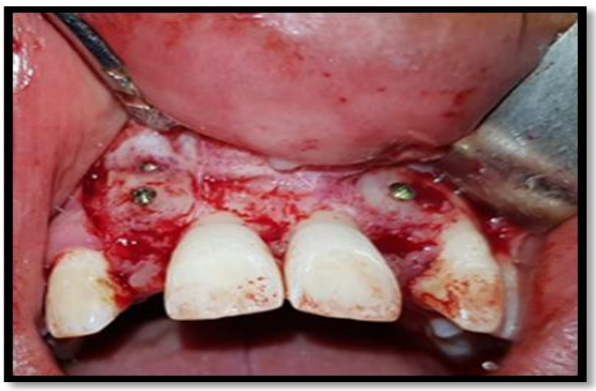

Fig. 5+ 6: six months after ridge augmentation: 8 mm bone thickness in both sites allowing implant placement.

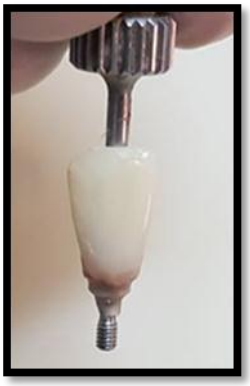

Fig. 7+8: direct provisional prosthesis made with a pre-shaped polycarbonate crown and immediate implant loading.

Fig. 9: tissue modeling around the provisional crown guaranteeing an aesthetic final restoration.

DISCUSSION

In cases of a missing maxillary lateral incisor, either due to agenesis or extraction, there are multiple treatment options: prosthetic solution like implant-supported crown or orthodontic treatment with space closure.[3]

The primary consideration when deciding which option to choose is the conservation of tooth structure without mutilating adjacent teeth if possible.[4]

Orthodontic treatment with mesial repositioning of canines followed by teeth recontouring; is generally indicated for young patients with malocclusions Class I or II without severe crowding. It also depends on facial profile type.[5]

Canines must have an adequate size and shape to be transformed into lateral incisors without excessive exposition of dentin during the reduction.[4]

Nevertheless, the lack of a canine-protected occlusion, could eventually lead to the occurrence of cervical abfractive lesions in premolars.[4]

Considering these reasons, a combination of space opening and implant supported restorations replacing the missing lateral incisor is an attractive option.[6]

Since implants are placed in the anterior region of the maxilla, the right positioning of implants, the contour of the gingival margin, papilla preservation, and the crown shape are significant factors for treatment success.

Furthermore, a specific amount of alveolar ridge bone volume is required, that is, 1.5 mm of mesio-distal space between the implant and the adjacent teeth and 2 mm from the implant to the buccal aspect of the alveolar ridge.[3]

Still yet, without the development and eruption of a permanent lateral incisor, the osseous ridge in the agenesis area is typically deficient.[4] A clinical research study published by Bertl and al in 2016 showed that the wider the mesio-distal gap, the thinner was the alveolar ridge, especially at its coronal aspect.[3]

In these cases, most implants used were of the narrow platform type.[7] though if the bone thickness is insufficient, implants can only be placed after grafting.

Several reconstructive procedures for the maxilla have been proposed with the aim of increasing alveolar bone dimensions in both vertical and horizontal directions such as guided bone regeneration, bone block grafting, distraction osteogenesis, alveolar ridge expansion.

Among these techniques, onlay grafting demonstrated high predictability for implant survival in spite of graft bone reduction during the healing period.[8]

Various studies have proven the benefits and appropriateness of bone substitutes such as allografts and xenografts for reconstructive bone block surgery. Nevertheless, systematic reviews have failed to find evidence that one particular grafting technique is superior to others.

Autogenous bone is still considered the gold standard as it is the only material to present osteoconductive, osteoinductive, and osteogenic properties compared to other grafting materials. It also presents immunogenic compatibility, and has great vascularization potential.[8]

To support this, a retrospective study was conducted on 279 patients who underwent 456 autologous

augmentation procedures showing an excellent graft survival and success rate (95.6%).[9]

However, some problems associated with the use of autogenous bone block technique could be their increased surgical morbidity like soft tissue dehiscence, graft exposure and wound infection. Necrosis of the block graft is the most undesired complication.[10]

To avoid such complications measures and precautions are advisable, including rounding off any sharp corners in the block, stabilization and intimate contact with the recipient area and providing a tension-free flap closure.

Furthermore, a decrease in the volume of the graft is reported,[11] with an average resorption of approximately 60% especially for bone blocks harvested from the iliac crest.[9]

A systematic review was conducted to analyze the morbidity, resorption and implant survival in different autogenous bone harvested from intra oral and extra oral sites.[12]

Mandibular ramus was preferred by patients. Bone grafts from the chin and ramus did not differ as far as resorption was concerned.

To prevent surface resorption, the use of a barrier membrane was proposed. Some authors suggested topical biphosphate application to the collagen membrane for further protection of the long-term graft integrity.[10]

Implants have to be placed 4 months after the onlay bone grafting procedure, as recommended in the literature, ensuring the stability of the reconstruction.

CONCLUSION

Maxillary lateral incisor agenesis is frequently associated to deficient osseous ridge requiring bone augmentation procedures to ensure proper implant placement and facilitate optimal esthetic outcomes. Autogenous onlay grafting is a reliable treatment option.

Multi-disciplinary approach is required to ensure the best esthetic and functional result for the patient.

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