CASE REPORT

Multidisciplinary treatment for a young patient with severe bone loss from a trauma: A case report

Travmaya bağlı ciddi kemik kaybı olan genç bir hastanın multidisipliner yaklaşımla tedavisi: Bir olgu sunumu

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SUMMARY

The maxillofacial area is one of the most injury susceptible regions through road accidents, interpersonal violence, sports and falls. Due to high survival rates for implant supported restorations, many clinicians prefer dental implants for replacing missing teeth. The final success of dental implants placed in the esthetic zone depends on the available volume of hard and soft tissues. Autogenous bone grafts for the alveolar bone deficiencies still be the gold standard. For many years, practitioners have been using symphysis, ramus, tuberosity or the iliac crest for the alveolar ridge reconstruction and enhancement. The advantageous of using mandibular ramus area, as donor site is that provides denser bone quality with minimal resorption, easy access, minimal morbidity and no need for hospitalization. Herein, the 17-year-old patient was presented with recurrent fistula over tooth number 11, which were traumatized during soccer game two years ago. This case reports describes multidisciplinary esthetic rehabilitation of trauma patient with excessive alveolar bone loss in the anterior maxilla utilizing autogenous ramus bone graft and connective tissue graft.

Keywords: Autogenous bone, dental implant, alveolar bone grafting, connective tissue.

ÖZET

Maksillofasiyal bölge, trafik kazaları, kişiler arası uygulanan şiddet, spor ve düşmeler neticesinde yaralanmaya karşı en hassas bölgelerden birisidir. İmplant destekli restorasyonların yüksek başarı oranından dolayı klinisyenlerin birçoğu kayıp dişlerin yerine dental implantları tercih etmektedirler. Estetik bölgeye yerleştirilen dental implantların başarısı, sert ve yumuşak dokuların uygun hacimde olmalarına bağlıdır. Alveolar kemik yetersizliklerinde kullanılan otojen kemik greftleri hala altın standart olarak kabul edilmektedir. Uzun yıllardır, hekimler alveolar kemiğin rekonstrüksiyonu ve arttırılması için iliak kemik, tuber, ramus ve simfiz bölgeleri kullanılmaktadır. Greft almak için mandibular ramus bölgesinin kullanılmasının amaçları, minimal morbidite olması, kolay erişilmesi, minimal rezorbsiyonla daha yoğun kalitede bir kemiğin elde edilmesi ve yatarak hasta takibi gerektirmemesidir. 17 yaşında erkek hasta, 2 sene önce futbol maçı sırasında oluşan travmaya bağlı olarak 11 no'lu dişin kök hizasında tekrarlayan bir fistül şikâyetiyle müracaat etti. Bu vaka raporunda, üst çene ön bölgede travmaya bağlı gelişen aşırı alveoler kemik kaybı olan hastanın, otojen ramus kemik grefti ve bağ dokusu grefti kullanılarak multidisipliner yaklaşımla estetik tedavisini sunulmaktadır.

Anahtar Kelimeler: Otojen kemik, dental implant, alveolar kemik grefitemesi, bağ doku.

INTRODUCTION

The maxillofacial region is the most unprotected part of the body, hence more vulnerable to trauma compared to the





other parts of the body.¹ Therefore, oral injuries (dental, soft tissue and alveolar process) are frequently occur.² Contrary to other injuries to body, dentofacial injuries are most frequently observed at ages between 15 to 25 and continuing to be seen throughout life.^{2, 3} Literature shows that the major causes for maxillofacial trauma are road traffic accidents, interpersonal violence falls and sports injuries.⁴

There are several treatment options available for reconstructing such areas including removable partial dentures, crown and bridges and implant-supported prostheses.⁵ Current literature show high long-term success and survival rates yield to higher acceptance of the dental implant as primary option for tooth replacement. Even though dental implants are used with high predictable success in various clinical situations, the esthetic rehabilitation of a lost anterior single tooth poses one of the most demanding and challenging situations in today's clinical practice.^{6,7}

Placement of a dental implant in an optimal three-dimensional position is an essential requirement for successful biologic integration and prosthetic restoration. Restoration driven implant procedures usually dictate insertion of a dental implant in certain localization that often involves bone augmentation procedures to obtain sufficient bone volume prior to implant surgery.^{8,9}

Even though different kinds of homogeneic, xenogeneic or synthetic bone graft materials have been instituted, autogenous bone still considered the gold standard.¹⁰ As a result, the use of autogenous bone is relatively common in reconstruction bone defects in maxillofacial region.¹¹ The choice of donor site is basically depends on quality, quantity and the form of bone required. The form of bone needed is dictated by the size and the shape of the defect.¹² When large volume of bone is required, various authors have proposed iliac or calvarial bone grafts. However, complication and morbidity rates at the extraoral donor sites are relatively high when compared to intraoral harvesting procedures.^{11, 13, 14} In pre-implant site development procedures, small grafts are often needed hence, harvesting from intraoral donor sites are recommended.¹⁵ To date, intraoral donor sites such as mandibular symphysis, body, ascending ramus and tuberosity for alveolar ridge reconstruction has been extensively documented.^{9, 16-19} Among them ascending ramus area is the most preferred donor site with certain advantages.16 This case report describes the utilizing of ascending ramus graft in the reconstruction of atrophied alveolar ridge for the implant site development. This article also tries to address a multidisciplinary approach to implant rehabilitation.

CASE REPORT Initial Presentation

A 17-year-old otherwise healthy male patient presented to our outpatient clinic with complaining of a recurrent swelling and pus drainage from his upper right central incisor area. The patient's story revealed that he got a kick to his face during soccer play and he had bruises, swelling and pain in his left nose and mouth area 2 years ago. He reported to family dentist's office and the dentist wanted wait for a while to observe the tooth's condition. Afterwards, even though he had a recurrent swellings and pus discharge in his mouth, he failed to revisit dentist's office. On intraoral examination, a sinus tract was noticed over the tooth number 11, however, at the initial examination there was no swelling or pus drainage was observed (Figure 1).



Figure 1: Patients presents to our outpatient clinic with slightly grayish tooth #11 and sinus tract over it

An OPG was taken and the OPG showed a large unilocular periapical lesion around the apex of the tooth # 11. Radiographic examination also showed that the radix of the tooth almost completely resorbed. (Figure 2).



Figure 2: Preoperative orthopantomography (OPG) of the patient

After treatment options consulted with the patient and patient's family, it was decided to take the tooth out and enucleate the radicular granuloma/cyst and wait for a while with temporary removable prostheses. Diagnostic impression was made for the preparation of the Roche bridge and delivered to the patient.

Surgical Procedures

Before surgery, the patient was given 2 gr prophylactic amoxicilline / clavulanate sodium (Augmentin 1gr BID[®]). Under local anesthesia, three-corner full thickness muco-



periosteal flap was raised until obtain adequate visibility of the underlying bone and the tooth #11 was extracted with forceps with easily. The wall of the radicular lesion was carefully dissected from residual alveolar bone with curettes as en-bloc and remaining bone copiously irrigated with saline (Figure 3).



Figure 3: Extracting the tooth and enucleating the cyst was done at the first surgery

After careful periosteal slit incision, full thickness flap sutured back. The healing period was uneventful.

After 3 months of healing period, the patient was admitted to our clinic second time (Figure 4).



Figure 4: Intraoral view 3 months after the cyst showing severe bone and soft tissue atrophy

A second OPG was taken to evaluate the healing. This radiograph showed significant bone atrophy, which prevents an implant placement that eventually achieves an esthetic result (Figure 5).



Figure 5: OPG taken on the day of the patient's second admission to clinic showing alveolar ridge atrophy

Since the patient and his family desired a fixed implant restoration, an autogenous bone augmentation to increase bone prior to implant placement was decided. We obtained a cone-beam computed tomography to assess the level of the atrophy, the anatomical limitations and planning for the surgery. As a result, utilizing ascending ramus graft was planned.

Under local anesthesia, surgical access to ascending ramus area was achieved as described by Misch.¹⁶ For harvesting a suitable amount of bone from ramus area four osteotomies were made using ultrasonic surgery device (Figure 6).



Figure 6: Clinical view of piezosurgery device with OT7 insert during making external oblique cut for harvesting ramus graft

After completed and connected each cut, ramus bone gently pry out with small chisel. Then, autogenous cortico-cancellous bone graft was harvested using disposable bone scraper (Figure 7).



Figure 7: Picture showing cortico-cancellous bone graft harvested from ramus area with disposable bone scraper (Safescraper, Osteogenics®)

The harvested ramus bone block graft was splitted horizontally using Frios[®] MicroSaw system to obtain thin cortical pieces as described earlier by Khoury¹⁰ (Figure 8).



Figure 8: The harvested ramus bone block graft was splitted horizontally via diamond disk (Left), picture showing splitted ramus pieces (Right)



Then, these pieces was placed recipient maxillary buccal and palatal site. Having obtained 6-7 mm gap between the buccal cortical-split bone graft and the palatal cortical-split bone, the cortical bone pieces were then secured to the each other with 1 miniscrew (12 X 1.1 mm) using Meisenger Bone Fixation system (Figure 9).



Figure 9: Full mucoperiosteal flap was raised and atrophic residual bone contour was displayed (Left), splitted ramus graft was placed in the buccal and palatal site, which attached to each other with bone screw, to augment the alveolar ridge (Right)

Also two small cortical pieces was placed and secured with 2 miniscrews apically to increase residual bone. The gap between 1 mm thick cortical ramus pieces and recipient alveolar crest was filled with autogenous cortico-cancellous bone graft that harvested from the same donor site using bone scraper (Figure 10).



Figure 10: Clinical pictures showing the enhancement of the defect with ramus graft (A,B), the corresponding OPG showing the grafting procedure right after surgery was done (C)

In order to achieve tension free wound closure, a gentle periosteal slit incision was also made and flap was sutured back in place. The patient received Amoxicilline/ Clavulanate Sodium (Augmentin® 1 gr BID Glaxo-Smith-Kline Turkey) for 5 days, nonsteroidal anti-inflammatory agent naproxen sodium (Apranax Forte® BilimIlac, Turkey) as needed and also advised to rinse his mouth two times per day with 0.2 clorhexidine gluconate (Klorhex® Drogsan, Turkey) mouthwash for 7 days posoperatively. The healing period was uneventful (Figure 11).



Figure 11: Frontal and occlusal views 4 months after the grafting surgery

Having waited 4 months after surgery, the patient underwent an implant placement surgery. The patient was given single dose 2 gr prophylactic Amoxicilline / clavulanate sodium (Augmentin 1gr BID[®]). Under local anesthesia, the full mucoperiosteal flap was raised and bone augmentation screws were removed and 3.3X 12 mm bone level ITI Straumann[®] dental implant were placed (Figure 12).



Figure 12: Clinical view of the implant placement surgery. Strauman[®] Bone Level (RC 3.3X12 mm) implant was placed in a proper bucco-lingual and mesio-distal position (Left), OPG shows the inserted implant right after the surgery (Right)

Again, postoperative period was uneventful. Three months of osseointegration period, the healing cap was placed. Two-week later, a custom abutment was placed and the case finished with full porcelain veneer crown. However, upon clinical examination, the esthetic result of the treatment was not satisfied the authors due to lack of lack of healthy soft tissue around implant (Figure 13).



Figure 13: Clinical view of bone level implant restoration three and half months later after the implant placement. Picture showing a custom zirconia abutment was placed and the case finished with full porcelain veneer crown. One can note that the esthetic of the final result is not acceptable

After consulted with the patient, the connective tissue grafting procedure was decided to improve soft tissue around the implant.

The crown was removed and temporary healing abutment was placed and customized. Before a partial-thickness flap was prepared, the epithelium layer was scraped using blade perpendicularly to the mucosal surface to achieve smooth keratinized tissue. The donor site was chosen between maxillary first premolar to maxillary first molar, 2 mm apical to the gingival crestal margin. Then the connective tissue graft (CTG) harvested from this site. The CTG was trimmed and appropriately placed to the recipient site and secured with 4-O resorbable sutures and flap was sutured back (Figure 14). The surgery was completed and customized healing abutment left in place. During surgery tight upper frenulum attachment was also released. Healing was uneventful.



Prosthetic Procedure



Figure 14: Frontal clinical pictures (A and B) showing the connective tissue grafting surgery for the soft tissue scaffold enhancement procedure

The provisional crown was fabricated using an implant provisional plastic cylinder to create the illusion of pontics emerging from the soft tissue (Protemp-4, 3 M-ESPE) (Figure 15).



Figure 15: Immediate Placement of a provisional crown to form the soft tissue around implant

After one month, the provisional fixed restoration was removed and impression for permanent restoration was made using closed-tray with vinylpolysiloxane impression material (Reprosil Putty; Dentsply Caulk, Milford, De). After that, implant-supported fixed prosthesis was constructed. Zirconia abutment was used as retainer. Prosthetic restoration was completed with porcelain crowns with zirconium framework.

The patient was very satisfied with the final outcome. The intraoral examination showed stable soft tissue around the implant and a good esthetic outcome (Figure 16).



Figure 16: Clinical view of the porcelain veneer crown at the second delivery. The esthetic result of the final outcome is more acceptable

DISCUSSION

Trauma to the orofacial region could lead to fracture of crown, root, and alveolar process, or avulsion of the tooth. Additionally, without any noticeable fracture, substance loss or avulsion of the teeth, traumatic injury could lead to pulp necrosis, damage of the periodontal membrane depending on the severity of the injury.²⁰ Consequently, if such injury goes unnoticed or there is no early and correct management available such as root canal treatment, infection-related root and bone resorption or even cystic lesions can occur. Excess alveolar bone resorption after the extraction of a tooth and/or cysts removal may prevent proper implant placement. In these cases, to tolerate of bone and soft tissues have been used augmentation procedures such as guided bone regeneration, cortical autogenous onlay block grafting, ridge expansion, distraction osteo-genesis, connective tissue graft and free gingival graft.

The young male patient in this presented case was admitted to our clinic with big cystic lesion overlying his tooth #11 and his tooth's radix almost completely resorbed. The treatment plan that was offered by the authors was extracting tooth, completely removing cystic lesion and reconstructing the defect at the same time. However, the immediate reconstruction with autogenous bone did not accepted by the family. Treatment plan was revised to wait at least 3 months time.

According the well-established literature today, an important prerequisite for long-term success and esthetic outcome for the implant therapy is circumferential bone anchorage and soft tissue scaffold around implants.^{21,22}

When patient reported to clinic after three months, the clinic and radiographic examination showed that the pre-implant site enhancement was a prerequisite. Since the autogenous bone very efficient for osseous reconstruction of the alveolar crest due to its biologic qualities, the mechanical properties and autogenous nature of these grafts, ^{10,16,23} the authors of this case decided to utilize ascending ramus graft instead of any bone substitutes. Harvesting ramus block graft is a well-established surgical technique in the literature.^{9,10,16,18,19,24} In the literature various surgical devices has been used with success for harvesting ramus graft such as motor driven rotary or oscillating tools, special electric handpiece with cutting disk or ultrasonic surgery device to date.^{9,10,16,23,24}

However, animal and clinical studies showed that the ultrasonic surgery yielded faster bone healing and remodeling.^{25,26} In the presented study, the authors utilized the ultrasonic surgery device to harvest ramus bone. According to treatment plan, the ramus graft was also planned to splitted into half horizontally as described by Khoury F et al.¹⁰ earlier. For that, small diamond disk was used to achieve proper splitting of the thin bone. The two rectangular pieces of the ramus bone was used to establish palisade in the buccal and palatal side that hold each other with bone screw. In between them, the cortico-cancellous bone particles that harvested with the bone scraper were filled with. As we seen in this case, 4-month of wait-

ing for the healing of the augmented area was enough to place proper implant insertion, even though there was not enough palatal residual bone in the coronal alveolar crest (marginal ridge).

To achieve esthetic and pleasing result with the implant in esthetic zone is not entirely up the bone structure around implant fixture or even prosthetic restoration to replicate the lost teeth as we seen in this case. One of the important factors to achieve good esthetic result is the peri-implant soft tissue. Peri-implant soft tissue creates a scaffold or frame around the prosthetic restoration and this very soft tissue scaffold must look like the contour and form of the surrounding the contra-lateral natural tooth for the esthetic result.^{21, 22} When the authors evaluated the outcome of the implant therapy with the patient, the patient was not high demanding and he said that he satisfied with the result. The authors of the study were not satisfied with the esthetic outcome of the therapy. After consultation with the patient, the soft tissue grafting procedure was commenced. As a result more esthetic outcome for the patient and the clinicians were achieved.

CONCLUSIONS

In conclusion, the authors of this case thought that even though augmenting or increasing bone volume prior to implant placement could be achieved various methods, the ascending ramus graft is one of the most versatile graft that could harvested easily and predictably. When it comes to evaluate success of the implant therapy in the anterior maxilla, the bone structure around the implant or 3D implant positioning in it is not the only important factor achieving esthetic outcome. The peri-implant soft tissue envelope must be considered an integral part of success and harmonious outcome of the final implant therapy.

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