ABSTRACT

Objectives: The use of allogenic bone grafts have been widely used in bone regeneration in Oral and Maxillofacial surgery procedures.

Material and Method: In this study, the application of Tutoplast allogenic graft materials on 101 patients which were treated for various reasons in oral surgery in 10 years and treatment results is presented.

Conclusion: In the presented clinical procedures allogenic grafts showed a biocompatible osteoconductive bone substitute that allows new bone formation and strong osteoconductive effect with rapid bone healing process.

Keywords: Allogenic bone graft, Oral surgery, Vestibuloplasty, Jaw augmentation, Sinus lifting, Cyst enucleation, Osteoconductive

ÖZET

Giriş: Oral ve maksillofasiyal cerrahi yaklaşımlarda kemik rejenerasyonu amacı ile allojenik kemik greftleri sıklıkla kullanılmaktadır.

Materyal Metod: Bu çalışmada 10 yıl içinde oral cerrahi tedavilerinde çeşitli endikasyonlarla 101 hastaya uygulanmış olan Tutoplast allojenik kemik greft materyallerinin uzun dönem takipleri sunulmaktadır.

Sonuç: Uygulanan klinik prosedürlerde allojenik greftlerin, biouyumlu ve güçlü osteokondüktif etkileri ile yeni kemik oluşumunu hızlandırdıkları tespit edilmiştir.

Anahtar Kelimeler: Allojenik kemik greftleri, Oral cerrahi, Vestibuloplasti, Çene augmentasyonu, Sinus lifting, Kist enükleasyonu, Osteokondüktif
INTRODUCTION

The use of allogenic cartilaginous and osseous grafts of cadaveric origin in the reconstruction of skeletal defects has a long history in orthopedic surgery. Even there exists a legend from the 3rd century that stems from ancient times, concerning this history.

It is known that, Job Van Meekeren has performed the earliest recorded bone transplantation operation. In this operation, bone obtained from the hip of a dog, has been implanted to the skull defect of a wounded soldier1,2. Later, in 1881, human fibula was used as an allogenic graft material for a child suffering from osteomyelitis and the operation turned out to be successful1.

In 1908, Lexer reported a broad series of operations and then in 1923, announced 50% success after examining the patients1. Encouraged by these results obtained, the increase of interest in such grafts helped Herndon and Chase, Curtiss, Bonfiglio make discoveries concerning the reducibility of allogenic graft immunogenity after 1960s1. Ottolenghi3 has shown that the fresh frozen preserving operation had been successful for more than half of the patients, by reporting broad series of operations. In 1970s, with the chemical solutions they prepared, the superior success of the human originated grafts, provided that slow freezing and quick thawing method applied, and was validated by the research of Tamford et al.4,5. By this method, the achievement of high number of living cells in the cartilaginous and osseous grafts, and the fact that collagen is an important factor in enhancing proper healing, has been reported5,6.

In a clinical study among tibia surface fractures, osteochondral allografts taken from cadaver donors within 24 hours have been applied to 17 patients. The patients have been observed for 2 years and been stated that 60% success had been achieved during this period although the osseous portion had shown obliteration toward articular interspaces via collapsing, among few patients6.

Via numerous researches and clinical applications, autogenous grafts, both osseous and cartilaginous, are known to be more successful than other types in the reconstruction of skeletal defects7.

The use of osseous and cartilaginous allogenic grafts for surgical success is of great importance. The methods of processing grafts to achieve optimal results; the biology of behavior of allografts and new bone substitutes, their corporation with the living tissues are seriously investigated8,9. Moreover, numerous researches mentioned for the biomechanical characteristics and behaviors of allografts corresponding with the vital bone10,11.

Sensitization response at host counterpart is very strong, especially after the use of fresh allogenic grafts. Only in the freeze-drying (lyofilisation) method, tissue response can be ignored1,9,12,13,14.

If the graft used passively supplies the function in the site of application and the matrix structure necessary for healing, this process is referred to as “osteoconduction”. However, if the graft plays an interactive role in the regenerative processes, and if transmits molecular signals by the help of the transplanted cells, then the process is named as “osteoinduction”.

Osteogenic induction is the vital process that; a tissue or products derived from it causes a second undifferentiated tissue to differentiate into bone2. The need for allogenic grafts in surgery has promoted the developing of the most suitable, the fastest, the easiest, the least risky, and the healthiest method for obtaining grafts, from the host, donor, and surgeon points of view15,16.

Therefore, in this study, the application of solvent dehydrated bone preserved (SDBP) Tutoplast allogenic graft materials on patients to be treated for various reasons by means of oral surgery in 10 years and treatment results is presented.
METHODS AND MATERIALS

101 patients were selected to present the various types of regenerative procedures in oral surgery. All surgical procedures were conducted under local anesthesia by the senior author. Postoperatively patients received an analgesic and systemic antibiotics for 1 week. During the procedures and follow-up in 10 years, names of using graft materials were changed according to the company profiles and literature developments. Tutoplast renamed with the same structure as Tutogene. We used the duramater membrane material in our operations till 2000 but in the last 2 years we preferred to apply bovine pericardium.

**Vestibuloplasty Cases**

In the area of preprosthetic surgery, we performed 16 lower jaw vestibuloplasty cases with SPDP membrane by using a modified technique. Detaching the mental muscles with following the high alveolar crest incisions, instead of secondary open epithelization, we used dura (Dehydrating in 0.9% saline solution) to cover the wound surface (Figure 1, 2). In most of the cases, we gain enough space for the dentures to fit. Only 1 patient had an infection that we lost the grafted dura in 4 days completely and the area was healed with a wide granulation tissue. In our cases relapse rate was about 25 – 30% that this was a tolerable healing margin in oral mucosal tissues. We observed that the SPDP allogenic soft tissue membrane grafts are quite suitable graft materials for the patients undergoing vestibuloplasty procedures.

**Lower jaw augmentation**

The neuromuscular bundles were mobilised and reflected laterally, following the labial incision. Bicortical osteotomy line was prepared between the 2 mental foramen and the upper cortical bone layer was elevated lingually. The spongiosa block was placed between 2 cortical reflected plates and fixed with titanium mini plates (Figure 3). With this technique, we operate 9 cases with a vertical height increase with a range of 12 to 16 mm. In the first 4 months following the operation, the resorption rate was
about 15% and the following 6 months after the operation the rate was about 10%. The grafted implant was totally changed to healthy bone structure (Figure 4).

**Peri-Implant Surgery**

The 24 peri-implant surgery were performed with this technique; 16 patients with membrane – microchips combination, 8 only with membrane. One of the patients had a gingival dehiscence due to local infection in duramater group resulting with the loss of all grafts and after 10 days, we lost the implant. Besides the osseointegrated peri-implant surgery, the technique can also be used for increasing the bone volume if it is not sufficient for convenient implant osteotomies. Following the implant insertion peri implant area supported by tutoplast microchips accompanied with the resorbable membrane application (Figure 5). This will prevent the possible fibrous tissue invasion during the osseo integration period. The results were very satisfactory for the 8 case that we able to load the implants after 3 months postoperatively.

**Sinus Lifting**

We performed 35 sinus lift operations, in 26 patients by lateral wall approach with SPDP allograft chips before the implant insertion (Figure 6). Postoperative clinical and radiological results showed satisfactory bone quality for the implant placement approximately 6-8 months after the surgery. In one stage surgery, allogenic microchips also revealed good results in handling and filling the surgical site which we use this technique in 4 patients. In two of our cases, we could not manage to insert implants bilaterally following the augmentation procedure, as the new forming bone was inadequate unfortunately.

**Cystic Lesions**

In giant odontogenic cystic lesions, carefully total enucleation of epithelium is the sufficient treatment method. The main point is to reconstruct the bone cavity immediately during the operation, if it is more than 2cm in diameter (Figure 7,8,9). Otherwise, the soft tissue collapse trough the cavity and opening of the sutures will
lead to secondary healing of the bone cavity. 17 cystic lesions both in upper and lower jaws were treated using SPDP human allogenic bone implants between 1994–2003 with the same method. We have only one postoperative complication in a mandibular giant odontogenic kerato cyst. It was the secondary infection of the surgical area due to opening of the sutures on the 7th postoperative day. The allogenic chips were removed immediately and the operation cavity was healed in 11 months secondarily. In 2 patients, we observed that very tiny graft particles extrude to the surface of the mucosa but this does not constitute any complications during the healing period.

DISCUSSION

Various types of allogenic graft materials have been widely used in bone regeneration procedures. Autogenous bone grafts are considered to be the gold standard and are therefore the primary source for osseous graft procedures. However, there are some disadvantages related to this modality, especially lack of sufficient available bone and the need for a second intraoral or extraoral surgical site, which increases patient inconvenience, morbidity and treatment time.

In vestibuloplasty operations without grafting procedure, after a very short time of operation relapse between 50-70% can be occurred. If the necessary sulcus depth is created by using mucosal and skin grafts, this will promote early healing with reduced scar formation, than acceptable relapse can be achieved. Moreover, there is no doubt that covering the wound surface with skin, mucosa will reduce postoperative pain and discomfort. However in the operation, taking a skin or a mucosa graft from the same individual is not always possible. Donor site problems, time consuming for the grafting procedure, hair follicles, limited graft tissue and anaesthesia are always handicaps for the patients.

Also in the presented lower jaw augmentation cases tutoplast spogiosia blocks have great advantages that we don’t need a second operation site. The prepared blocks can easily be re-
shaped and placed between two cortical plates in mandibular alveolar ridge. According to our experience, grafting technique between two cortical bone sites showed worthy results postoperatively. The only problem in sandwich technique is to find an adequate mucosal tissue to cover the operated area. This problem can easily handled by using the high-labial incision at the beginning of the operation. This will support the necessary soft tissue cover for the new constructed and increased bone high height.

Various synthetic non-resorbable membranes and bio-implants have been widely used in oral surgery\textsuperscript{21-25}. But most of the synthetic membranes must be removed with the consequent exposure of the surgical region, possibly causing undesirable bone resorption and infection. Moreover this procedure is a factor for the second operation for the patients and soft tissue dehiscence\textsuperscript{26-31}. Rasmusson et al reported that in their experimental model with the use of non-resorbable membranes, extensive resorption of the grafted bone was seen after barrier removal at the end of the observation period\textsuperscript{32}. From this point of view resorbable membranes and good osteoconductive bone alloplasts have gain importance for the peri-implant surgery. Tutogene Microchips is a good osteoconductive material for the treatment of 2 or 3 wall of peri-implant defects with or without SPDP membrane. If the defect around the implant is more than 4 mm, it is necessary to cover the microchips with dura before the closure of the gingival tissue.

The aim of the sinus lifting procedure is not only to fill this empty space inside the antrum, but also rather to create an adequate amount of viable bone underlying the alveolar crest for predictable retention of the implant\textsuperscript{33-36}. Tarnow et al reported their results to indicate that the placement of the barrier membrane tends to increase vital bone formation, also it has a positive effect on implant survival and membrane placement should be considered for all sinus elevations\textsuperscript{37}. Variety of grafting materials have been reported in the literature for the augmentation procedure\textsuperscript{38-40}. There is doubt that the autogenous bone is the most suitable grafting material but unfortunately harvesting bone graft from iliac crest is not always possible and easy. It carries out a large number of disadvantages for the patient and the surgeon such as the risks of general anaesthesia, second operation site morbidity, and hospitalisation time, time consuming in the operating theatre. From this point of view, for subantral augmentation, SPDP Tutogene is an alternative material for this procedure with its easy application and optimum osteoconductive effect.

SPDP allogenic implants show strong accumulation effect with rapid bone healing process in the treatment of cystic lesions. On the other hand, the operation site must be carefully closed carefully to avoid the possible contact of the grafted area with the oral cavity for uncomplicated bone healing. It is very convenient for the surgeon to achieve complete surgery (enucleation + graft) in only one operation site with unlimited allogenic graft material in a short operating time.

In the presented clinical procedures allogenic grafts showed a biocompatible osteoconductive bone substitute that allows new bone formation and strong osteoconductive effect with rapid bone healing process.

**REFERENCES**
