Vestibuloplasty with Retroauricular Skin Grafts for Dental Implant Rehabilitation in Vascularized Fibula Grafts: Two Case Reports

Metin Sencimen, DDS, PhD[1]
Aydin Gulses, DDS, PhD[2]*/Altan Varol, DDS, PhD*[3]
Mustafa Ayna, DDS, PhD[4]*/Jülide Ozen, DDS, PhD*[5]
Necdet Dogan, DDS, PhD[6]*/Yahya Açil, rer nat*[7]

The aim of this study was to present the use of retroauricular full-thickness skin grafts in vestibuloplasty surgeries for dental implant rehabilitation in vascularized fibula grafts. Two patients underwent mandibular reconstruction with vascularized fibula grafts due to mandibular gunshot injuries. Inadequate sulcus gaps secondary to mandibular soft tissue deficiencies were managed by full-thickness autologous skin grafts harvested from the retroauricular region. Dental rehabilitation was achieved by implants placed in free fibula grafts. In both cases, complete graft survival was achieved. Cosmetic and functional outcomes were satisfactory. Owing to its high resiliency and elasticity and its thin and hairless structure, full-thickness retroauricular skin graft is an effective treatment modality in the management of intraoral soft tissue deficiencies. Patients with gunshot injuries present great functional and esthetic demands, and every report presenting new treatment modalities is helpful in the management of the condition. Int J Periodontics Restorative Dent 2017;37:491–497. doi: 10.11607/prd.2238

[1]Professor, Gülhane Military Medical Academy, Department of Oral and Maxillofacial Surgery, Ankara, Turkey.
[2]Associate Professor, Christian-Albrechts University, Department of Oral and Maxillofacial Surgery, Kiel, Germany.
[3]Professor, Marmara University, Department of Oral and Maxillofacial Surgery, Istanbul, Turkey.
[4]Professor, Clinic Implantology and Periodontology, Duisburg, Germany.
[5]Professor, University of Aydin, Instanbul, Turkey.
[6]Professor, Gülhane Dental Facility, Department of Oral and Maxillofacial Surgery, Ankara, Turkey.
[7]Professor, Christian-Albrechts University, Department of Oral and Maxillofacial Surgery, Kiel, Germany.

Correspondence to: Assoc Prof Dr Aydin Gulses, Department of Oral and Maxillofacial Surgery, University Hospital of Schleswig-Holstein, Campus Kiel, Arnold-Heller-Strasse 3, 24105 Kiel, Germany. Fax: +49 0431 500 26006. Email: aguelses@mkg.uni-kiel.de

Gunshot injuries affecting the mandible can result in massive composite tissue loss and can lead to different levels of functional and esthetic deformities.[1] Treatment of the condition necessitates multidisciplinary management due to the complexity of the region and the impairment of speech, respiration, mastication, deglutition, and esthetics. These requirements following the rehabilitation of the maxillomandibular complex place exceptional demands on the reconstructive techniques.

Vascularized free fibula flaps are considered a good treatment option in the management of mandibular continuity and/or composite defects secondary to trauma and ablative surgeries. Fibula flaps help achieve optimum prosthodontic goals using removable and fixed prostheses via endo-osseous dental implant placement thanks to their good vascularization and high quantity of bone.[2–6] However, when undertaking mandibular reconstruction, the restoration of bony continuity should not be considered alone.[7] Success in restoration of functions such as chewing, swallowing, and oral competence also depends on the amount and structure of the overlying tissues of the oral region. Therefore, when evaluating patients with existing mandibular defects, quality and quantity of the remaining soft tissue is important.[7–9]

Following reconstruction of the mandibular continuity defect via a vascularized free fibula flap, insufficient vertical bone height of the fibula could lead to undesirable implant-crown ratios and decreased vestibular depth. Therefore, prosthetic rehabilitation of the alveolar height using a vascularized fibula is not always possible.[10,11] Oral mucosal deficiencies due to soft tissue loss following gunshot injuries can also result in inappropriate vestibular depth.

Skin graft is described as complete separation of a section of epidermis and dermis from its blood supply in one part of the body, the donor site, and transplantation to a recipient site.[12] Skin grafts are used in a variety of clinical situations, such as traumatic wounds, defects after oncologic resection, burn reconstruction, scar contracture release, congenital skin deficiencies, hair restoration, vitiligo, and nipple-areola reconstruction.[13] They can be classified as partial or full-thickness grafts, depending on the amount of dermis harvested. In the field of oral and maxillofacial surgery, skin grafts are commonly used to cover the defect of the vascularized free flap donor site before prosthetic surgery, repair the exposed raw surface after intraoral mass excision, and cover the defect after mass excision in the head and neck area or in the management of trauma.[14–17]

Reconstruction of the shallow vestibule with full (FTSG) or split-thickness skin grafts (STSG) with vestibuloplasty is reported to be a reliable method for vestibular lengthening and placement of mandibular endosseous implants in preparation for mandibular implant-supported overdentures.[18–21] According to the literature, both grafts offer stable and convenient options for rebuilding peri-implant soft tissue in selected patients with compromised atrophic ridges.[20,22]

This paper describes the deepening of the vestibular sulcus using FTSG harvested from the retroauricular region to rebuild appropriate peri-implant soft tissue and oral vestibule for two patients with large mandibular defects reconstructed using composite fibula flaps following gunshot injuries.

Case Reports

Informed consent was obtained from patients after the benefits and possible risks of the treatment were explained in detail. Preventive antibiotics were given 2 hours before surgery and after surgery for 7 days (either ampicillin 1 g or clindamycin 600 mg intravenously).

Case 1

A 40-year-old man was admitted to the department with the chief complaints of difficulties in eating and chewing. According to his history, following a gunshot injury involving the mandible in 1995, he underwent a vascularized free flap operation followed by a vertical distraction of the fibula graft in 1996.

Extraoral examination revealed excessive scar tissue and skin paddle of the fibula flap at the chin (Fig 1). The intraoral examination revealed the vestibular sulcus was not present in the anterior mandible (Fig 2). The patient denied having pain or infection but was very uncomfortable owing to edentulism.

After consultation with the department of prosthetics, treatment by vestibuloplasty using a FTSG harvested from the retroauricular region followed by placement of dental implants was selected.

Surgical Procedure

The patient was operated under general anesthesia. Following local anesthetic administration (Ultracaine DS Forte, Aventis), an incision was made and the prominent muscles were detached to improve the vestibular and lingual depths. Granulation tissues were removed (Fig 3). The buccal and lingual parts were elevated to completely expose the entire periosteum. The excessive subcutaneous tissue was removed using tissue scissors.

Following the preparation of the intraoral recipient bed, cardboard was placed on the host bed to develop a blotter pattern. The cutout was then applied over the donor site and traced with a surgical marking pen to resect a graft of the outlined area.[23] After local anesthetic administration, the auricle was reflected anteriorly, subcutaneous tissue having been infiltrated with saline to facilitate skin graft harvest (Fig 4), and two elliptical incisions were made using a no. 15 scalpel (Fig 5). Following graft harvesting, the underlying fat tissue was removed by trimming

Fig 1 *Extraoral examination revealed excessive scar tissue and skin paddle of the fibula flap at the chin.*

Fig 2 *The intraoral examination revealed that the vestibular sulcus was not present in the anterior mandible.*

Fig 3 *The buccal and lingual parts were elevated to expose the entire periosteum. Excess subcutaneous tissue was removed.*

Fig 4 *After local anesthetic administration, the auricle was reflected anteriorally. Subcutaneous tissue had been infiltrated with saline to facilitate skin graft harvest.*

Fig 5 *Two elliptical incisions were made using a no. 15 scalpel.*

Fig 6 *The underlying fat tissue was removed with scissors.*

with scissors (Fig 6). Multiple perforations were made throughout the graft to ensure rapid revascularization and prevent hematomas from developing. The graft was placed on the surface of the periosteum and stabilized at its edges using 4-0 monocryl sutures at a lower level to obtain an ideal vestibular sulcus position (Fig 7). The donor site was primarily closed with subcuticular and simple interrupted sutures (Fig 8).

The patient was fed via nasogastric tube for 48 hours to avoid food accumulation and retention in the operation field, to offer better nutrition, and to maintain good local hygiene.

On the third day following the operation, the graft began to turn pink in color. After 1 week, a fibrin layer was present at the wound edges neighboring the graft and an uneventful healing was observed. After 10 days, the graft was stable and adherent and the stitches were removed.

Implant Procedure

Two months after the vestibuloplasty operation, five dental implants (Tidal Spiral Implant Systems) were placed on the fibula graft at the corresponding area of the mandible (Fig 9). Three months after insertion of the implants, the patient underwent the prosthetic procedure.

Prosthetic Procedure

Healing abutments were placed (Fig 10), and 1 week later an impression was taken. A fixed overdenture was fabricated (Fig 11). Once the implant-borne denture was placed, the patient was given hygiene instructions that included use of an interproximal toothbrush with soft bristles to clean the superior aspects of the transcutaneous abutment cylinders.[24]

Fig 7 *The graft was placed on the surface of the periosteum and stabilized at its edges via 4-0 monocryl sutures at a lower level to obtain an ideal vestibular sulcus position.*

Fig 8 *The donor site was primarily closed with subcuticular and simple interrupted sutures.*

Fig 9 *Two months after the vestibuloplasty, five dental implants were placed on the fibula graft at the corresponding area of the mandible.*

Fig 10 (left) *Healing abutments were placed.*

Fig 11 (right) *An implant-fixed overdenture was fabricated.*

Fig 12 *Extraoral examination revealed the presence of scar tissue at the submandibular area.*

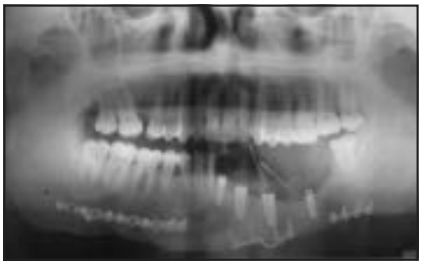

Fig 13 *Panoramic radiography of the case.*

Fig 14 *The remaining implants in the left posterior mandible were covered with oral mucosa.*

Case 2

A 36-year-old man was admitted to the department with complaints of difficulties in eating and chewing due to edentulism of the left posterior mandible. According to the patient's history, following a gunshot injury involving the mandible he underwent a vascularized free flap operation. One year after the grafting, four dental implants (AB Dental) were placed in the edentulous area. However, following implant placement, the prostheses could not be fabricated due to the shallow vestibule and the lack of attached keratinized tissue around the implants.

The extraoral examination revealed the presence of submandibular scar tissue (Fig 12). The intraoral examination revealed two implants with healing abutments on the anterior mandible; however, the remaining two implants of the left posterior mandible (Fig 13) were covered with oral mucosa extending from the buccal side to the floor of the mouth with no groove in the vestibular sulcus (Fig 14).

After consultation with the department of prosthetics, treatment by vestibuloplasty using a FTSG harvested from postauricular region followed by exposure of the remaining dental implants was selected.

Surgical Procedure

The patient was operated under general anesthesia. Following local anesthetic administration, a mucosal incision was made starting from the left retromandibular region and continuing anterior and inferior to the implant sites.

The prominent attachments and muscles were detached to improve the vestibular depth. Graft harvesting was performed as described previously. The graft was placed on the recipient bed supraperiosteally with its four corners and margins sutured to the periosteum with 3-0 vicryl sutures (Fig 15). Several small holes were made in the graft to allow exudation and hematoma drainage. The flap was closed using interrupted sutures. All sutures were removed after 10 days.

No complications were observed during the follow-up period.

Prosthetic Procedure

After 6 weeks and a consultation with the department of prosthodontics, the implant that was located most distally, where the fibula graft merged with the ascending ramus, was left uncovered to avoid occlusal forces to the distal junction of the graft. The healing abutment of the exposed implant was placed. An impression was taken, and an implant-supported fixed prosthesis was fabricated (Fig 16). The same instructions were given for maintaining oral hygiene as in Case 1.

The postoperative oral function of both patients reached a reasonable level. Postoperative complications were greatly reduced, and quality of life improved.

Fig 15 *The graft was placed on the recipient bed supraperiosteally, with its four corners and margins sutured to the periosteum with 3-0 vicryl sutures.*

Fig 16 *After 6 weeks, the implants were exposed, healing abutments were placed, and an implant-supported fixed prosthesis was fabricated.*

Discussion

Gunshot injuries to the mandible usually result in excessive composite defects and lead to inappropriate soft tissue support, which is essential for successful prosthetic management of the condition. In the literature, numerous articles focus on the preprosthetic management of oral soft tissue deficiencies with STSGs or FTSGs.

STSGs were preferentially used in cases of oral mucosal defects where the mobility of the underlying soft tissue would decrease the survival rate of a FTSG. However, the present authors have placed FTSGs on the periostea of the fibula grafts and no immobilization of the graft at the recipient site was experienced.

A FTSG consists of the epidermis and the full thickness of the dermis. Since none of the reticular dermis remains to allow spontaneous regeneration of skin, the surgeon must select a donor site where a small area of skin may be excised and the wound primarily sutured to lead to minimal scar tissue formation.[25] Common donor site areas for full-thickness skin grafts are the pre- and retroauricular, supraclavicular, and antecubital areas, upper eyelid, scalp, groin, and areola.[26] Kim et al[14] have evaluated the outcomes following FTSG from the groin for reconstruction in oral and maxillofacial surgery in 50 patients and have suggested that FTSG from the groin to repair soft tissue defects in reconstruction surgery is a good method due to the relatively large size of the graft, decreasing morbidity at the donor site, and higher graft survival rates. Eppley et al[27] performed a study on the use of retroauricular skin grafts for vestibular reconstruction in 17 patients (31 grafts) and stated that the procedure offers the advantages of a concealed donor scar, minimal patient discomfort and morbidity, ease of procurement, and confinement of the operations to a single region. According to their

results, the disadvantages of the procedure are the limited amount of skin available and the need to suture the graft to the recipient site. In the present cases, the retroauricular area was used due to its technical ease and convenience of intraoperative positioning. In addition, in both cases, the size of the graft required for reconstruction of the vestibule was relatively small.

Immediately after a skin graft is placed on the recipient bed, a fibrin network provides a scaffold for the necessary graft adherence. A thin fibrin layer holds the graft to the bed and forms a barrier against potential infection.[28] During the first 48 hours, the graft becomes engorged with plasmatic fluid by means of diffusion. Kim et al[14] have suggested that STSG requires much more effort in terms of postoperative care of the donor site.[29] The present cases were both fed with nasogastric tubes for 48 hours to avoid graft dislodgment and food accumulation.

By the 7 or 8 days after the procedure, marked hyperplasia of fibroblasts develops as the graft begins to heal.[30] This phenomenon was present in these cases, and the edges of the host bed adjacent to the grafts showed a fibrin layer around the graft on the seventh day. Wound contraction is a potential problem in graft healing. The contraction-inhibiting effect of dermis relies more on the percentage of dermis included in the graft than in the overall thickness of the graft: the greater the proportion of dermis, the greater the inhibition and the less the graft will contract. Therefore, it has been suggested that FTSGs inhibit wound contraction better than STSGs.[31] In the second case, minimal graft shrinkage was observed. However, it did not affect the outcome of the treatment.

This case serial is exceptional since FTSGs are seldom used for rehabilitation of peri-implant soft tissue deficiencies in patients reconstructed by composite flaps for mandibular defects. In 2012, Fang et al[24] introduced a STSG technique combined with secondary vestibuloplasty to rebuild keratinized peri-implant soft tissue and oral vestibule in five patients with large oromandibular defects reconstructed by composite flaps and reported satisfactory results. If the amount of soft tissue required is relatively small, FTSG is more suitable for reconstruction of the shallow vestibule owing to its appropriate resilience under prostheses because it shows minimal shrinkage and good resistance against minor trauma during and after healing. Obtaining a thick soft tissue profile around the implants and vestibular deepening were the basic goals of both cases presented. Consequently, FTSG was primarily selected to overcome the problem of postoperative contraction.

Conclusions

It is obvious that recent advances in tissue engineering offer various therapeutic options in the management of hard and soft tissue defects of the maxillofacial region.[32,33] However, graft applications are still basic components of the reconstructive surgical practice. In the present authors' opinion, owing to their high resiliency, elasticity, and thin and hairless structure, retroauricular FTSGs are effective treatment modalities in the management of intraoral soft tissue deficiencies.

Acknowledgments

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