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Short Communication

Free buccal fat pad graft for the bone defect filling of medication-related osteonecrosis of the jaws: A novel surgical approach

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Abstract Surgical intervention for medication-related jaw osteonecrosis (MRONJ) is currently the main treatment method, offering a higher healing rate than conservative approaches. However, the management of bony defects after sequestrectomy remains a challenging issue due to poor vascularization from the drug effect. The use of pedicled buccal fat pad (PBFP) for filling bone defects has become common and effective but is limited to the posterior maxillary region. To add to the advantages of the buccal fat pad, we explored a novel treatment approach using a free buccal fat pad (FBFP) to fill bone defects other than the posterior maxilla. While the FBFP has been employed in oral defect reconstruction, currently published cases have been utilized in recipient sites with good blood supply. There has yet to be any usage in poor vascularization defects like MRONJ. This article describes that the FBFP was used to fill the surgical defects of 8 patients who were diagnosed with MRONJ and who underwent sequestrectomy and saucerization. During follow-up visits, there was excellent wound healing and no significant tissue depression. Based on successful treatment experiences, FBFP is a reliable therapeutic option for the management of poor vascularization defects like MRONJ treated through surgical intervention.

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Introduction

In 2003, Dr. Marx first reported the adverse effects of bisphosphonate drugs on jawbone necrosis. Subsequently, these cases were termed “bisphosphonate-related osteonecrosis of the jaws” (BRONJ). Initially, these cases were described as “unresponsive to treatment,” indicating their challenging and refractory nature. Conservative treatments were recommended at the time to alleviate symptoms.¹ However, conservative treatment cannot cure the disease, leading to potential recurrence and hindering patients from continuing bisphosphonate or other anti-resorptive drug therapies for their primary conditions.

After 2009, an increasing number of successful surgical cases were reported. Dr. Rupel’s systematic review showed an 84% success rate for surgical treatment and a 36% success rate for conservative treatment.² Dr. Marx also advocated for surgery over conservative treatment in 2014.³ The American Association of Oral and Maxillofacial Surgeons (AAOMS) endorsed surgical treatment for severe MRONJ cases or those unresponsive to conservative therapy.⁴

Currently, the general consensus is that the aim of surgical treatment is complete removal of infected bone and either primary closure of the wound or coverage of the cleaned bone surface with a flap to prevent direct exposure to the oral cavity, which reduce the risk of recurrence.⁵ However, one clinical dilemma that remains is the extent of saucerization. Failure to adequately address the bone defect created after debridement can lead to the formation of dead spaces, hematoma development, decreased blood supply, and even wound dehiscence. Conversely, extensive saucerization requires the sacrifice of more healthy bone, thus complicating future prosthesis fabrication.

Traditionally, bone defects resulting from surgery or disease have been resolved with reconstruction procedures using bone grafts. However, systematic reviews have raised concerns about the use of bone grafts in patients receiving high-dose drug therapy, particularly bisphosphonate injections due to poor vascularization.⁶ Therefore, identifying methods to effectively manage bone defects with poor blood supply, like MRONJ patients, remains challenging.

The pedicled buccal fat pad flap (PBFP) is a soft tissue flap that is commonly used in oral surgery, as it has sufficient volume and provides additional blood supply to promote wound healing. It has been used to treat bone defects resulting from MRONJ surgery; however, its application is limited to the posterior maxillary region. To use it in other areas, the buccal fat pad must be detached and transplanted to different jawbone regions.⁷

Free fat grafting is commonly used in cosmetic and reconstructive surgery. The search for reference shows that there have been successful applications of free buccal fat pad in oral surgery.^{8,9} However, the current application of free fat grafting is limited to recipient sites with good vascularization, and no recent study has yet ventured to explore its use in tissue defects with poor vascularization.

Therefore, we tried the novel approach of using the free buccal fat pad (FBFP) to fill the bone defect with poor vascularization after surgery for MRONJ. The first case of

2017 was published in 2021.¹⁰ This article describes the continued application of the novel approach in 8 patients with MRONJ and their outcome to prove its reliability.

Materials and methods

Patient selection

Patients diagnosed with MRONJ stage II or stage III according to the staging system introduced in the 2014 American Association of Oral and Maxillofacial Surgeons (AAOMS) position paper.⁴ Whose conservative treatment failed were selected for surgical treatment. Patients with mandibular lesions that could not be filled using the pedicled buccal fat pad were included.

Surgical procedure

Under general anesthesia, the mucoperiosteal flap was raised to expose the infected area. Visible necrotic bone was removed, and the bone surface was further smoothed with a carbide bur until slight bleeding was observed. Saucerization involved only trimming sharp edges without removing a significant amount of healthy bone, resulting in a bowl-shaped bone defect (Fig. 1C and D).

A 1 cm incision was made near the upper first molar area buccal mucosa, and a FBFP of the needed size was obtained (Fig. 1E and F) and placed into the bone defect, covering the exposed bone surface and secured with absorbable sutures to the reflected mucoperiosteal flap (Fig. 1G and H) before primary closure. Postoperatively, parenteral antibiotics were administered for approximately five days. Oral antibiotics were continued until soft tissue healing was confirmed.

Results

From 2017 to 2018, a total of 8 female patients underwent this surgical procedure at 10 sites (Table 1), all had been diagnosed with MRONJ stage II according to the staging system introduced in the 2014 AAOMS position paper.⁴ The average age of the patients was 73.5 years old, with 6 patients originally diagnosed with osteoporosis and 2 with breast cancer combined with bone metastasis.

Regarding the antiresorptive drug therapies, 5 patients were taking bisphosphonates, and 3 were on denosumab, for an average duration of 3.94 years. All 10 surgical sites were located in the mandible, with 7 in the posterior area and 3 in the anterior area. Four patients did not discontinue their medication (drug holiday) before surgery.

The average follow-up period after surgery was 16.6 months. All patients showed excellent soft tissue healing with no observable soft tissue defects (Fig. 1J and K), and 4 underwent prosthetic rehabilitation (Fig. 1L and M).

Discussion

Currently, common surgical methods include sequestrectomy and saucerization combined with primary closure.

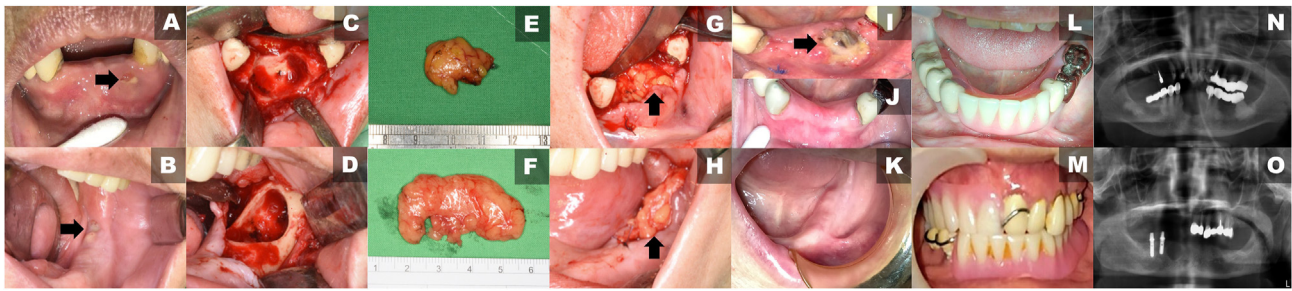


Figure 1 Radiographic and clinical photographs of our cases, Fig. 1A, C, E, G, I, J, L, M belongs to case I and Fig. 1B, D, F, H, K, M, O belongs to case II. (A, B) sinus tract with pus discharge (arrow) (C, D) bowl-shaped defect after sequestrectomy and minimal saucerization (E, F) harvested free buccal fat pad graft (FBFP) (G, H) FBFP directly placed into the bone defect (arrow), covering the exposed bone surface and secured with absorbable sutures to the reflected mucoperiosteal flap (I) wound dehiscence, but FBFP provides protection (arrow) in case 1, so no bone exposure (J, K) good soft tissue healing with no clinically observable soft tissue concavity (L, M) postoperative denture rehabilitation (N, O) postoperative panoramic films.

Table 1 Patient characteristics and results of surgery.

	Age/Gender	Original Dx	Drug	Period (years)	Site	Initial stage	Final stage	Drug holiday	Prosthesis	F/U time (months)
Case 1	82 y/o female	Osteoporosis	Bisphosphonate	5	LP	2	0	Y		10
Case 2	54 y/o female	Breast cancer with bone metastasis	Denosumab	1.5	LP	2	1	N		3
Case 3	74 y/o female	Osteoporosis	Bisphosphonate	unknown	LP	2	0	N	+	20
Case 4	72 y/o female	Osteoporosis	Bisphosphonate	2.5	LA	2	0	Y	+	10
Case 5	54 y/o female	Breast cancer with bone metastasis	Denosumab	2	LP	2	0	Y		23
Case 6	81 y/o female	Osteoporosis	Bisphosphonate	2.5	LA	2	0	Y		5
Case 7	83 y/o female	Osteoporosis	Bisphosphonate	3	LP	2	0	N	+	15
Case 8	88 y/o female	Osteoporosis	Denosumab	14	LP	2	0	N		14
				2.5	LP	2	0	Y	+	33
				2.5	LA	2	0	Y		33

Abbreviations: y/o, years old; Dx, diagnosis; LP, lower posterior; LA, lower anterior; F/U, follow up.

Sequestrectomy results in bone defects that must be addressed with saucerization to remove sharp bone edges, reduce dead space, and promote soft tissue adaptation. Without sufficient saucerization, the size of the dead space may increase, leading to compromised soft tissue adaptation and hematoma formation. This can subsequently result in postoperative wound infections, poor blood supply, and soft tissue dehiscence. However, performing adequate saucerization may sacrifice more healthy bone, which presents a challenging dilemma in managing bone defects in patients with MRONJ who underwent surgical treatment.

In general, guided bone regeneration (GBR) is a successful procedure in maxillofacial surgery. However, the use of antiresorptive medications can affect jawbone metabolism and the blood supply to the surrounding tissues, potentially negatively impacting GBR. Although successful cases have been reported, a systematic review and meta-analysis concluded that there is currently insufficient evidence to determine the safety and success rate of bone grafting surgery in patients using antiresorptive medications. Therefore, while GBR can be attempted, the potential risk of failure needs to be evaluated.⁶

PBFP is commonly used as a graft for soft tissue reconstruction in oral and maxillofacial surgery. It has an average volume of 10 ml, a thickness of 6 mm, and weighs approximately 9.3 g. It can be used to cover small to medium-sized defects with a diameter of approximately 4 cm. The advantages include providing mechanical protection, covering exposed bone to reduce bacterial invasion, having a good blood supply, and providing stem cells and growth factors. However, PBFP still has limitations, including size, potential tissue contracture leading to limited mouth opening and shallowing of the vestibule. Importantly, it is restricted to anatomical locations and can only be used in the posterior maxilla, making it difficult to use in the anterior maxilla, mandible, and regions with teeth.⁷

Although many researchers report the routine use of PBFP to fill bone defects after MRONJ surgery, as mentioned earlier, they are limited to the posterior maxilla.⁷ For MRONJ cases that are more likely to occur in the mandible, which has a worse prognosis, PBFPs have limited advantages. Therefore, the question is: Can the buccal fat pad be “freed” and transplanted to fill bone defects beyond the posterior maxilla?

Free fat grafts were initially introduced by Dr. Neuer in 1893 and have been widely used in breast and soft tissue reconstruction surgery, as well as cosmetic surgery, with favorable outcomes. However, their use in oral surgery is still less common.

Dr. Kablan in Israel was the first to utilize a FBFP in 22 patients undergoing soft tissue reconstruction of the gingiva following surgical management of periimplantitis and in 5 patients undergoing surgery for tissue defects in the hard palate.^{8,9} These cases provided sufficient clinical evidence to support the use of FBFP for oral soft and hard tissue reconstruction. FBFP retain most of the advantages of the pedicled buccal fat pad flap, such as providing volume for protection and containing stem cells and growth factors. With no restriction on mouth opening due to postoperative contracture and shallowing of the vestibule depth, most crucially, it is not limited to any specific anatomical location.

Like other free soft or hard tissue grafts, the key to success lies in the blood supply of the recipient site. Therefore, the applications mentioned above are all utilized in recipient sites with good blood supply.

We are the first team to use FBFP in poor vascularised defects of MRONJ. In our cases, FBFP were not limited to treating injuries in the dentition, did not cause vestibular shallowing and were not limited to only being applied in a specific anatomical location. They effectively filled bone defects left after sequestrectomy, thus reducing the need for saucerization and preserving ridge width and height, thereby increasing the potential for postoperative denture rehabilitation. All our patients obtained good soft tissue healing with no clinically observable soft tissue concavity.

Therefore, our findings confirm that FBFP can be used in poor vascularised defects of MRONJ. It fills the bony defect, reducing the size of dead space and preserving more healthy bone, provides additional mechanical protection and, most importantly, is not limited to only being applied in a specific anatomical location. An FBFP is a new option for filling surgical defects in patients with MRONJ.

Ethical approval

National Cheng Kung University Hospital Institutional Review Board. (IRB No: A-ER-112-407).

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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References

1. Marx RE. Pamidronate (Aredia) and zoledronate (Zometa) induced avascular necrosis of the jaws: a growing epidemic. *J Oral Maxillofac Surg* 2003;61:1115–8.
2. Rupel K, Ottaviani G, Gobbo M, et al. A systematic review of the therapeutic approaches in bisphosphonates-related osteonecrosis of the jaw (BRONJ). *Oral Oncol* 2014;50:1049–57.
3. Marx RE. A decade of bisphosphonate bone complications: what it has taught us about bone physiology. *Int J Oral Maxillofac Implants* 2014;29:247–58.
4. Salvatore LR, Dodson TB, Fantasia J, et al. American Association of Oral and Maxillofacial Surgeons position paper on medication-related osteonecrosis of the jaw—2014 update. *J Oral Maxillofac Surg* 2014;72:1938–56.
5. Stockmann P, Vairaktaris E, Wehrhan F, et al. Osteotomy and primary wound closure in bisphosphonate-associated osteonecrosis of the jaw: a prospective clinical study with 12 months follow-up. *Support Care Cancer* 2010;18:449–60.
6. Stavropoulos A, Bertl K, Pietschmann P, Pandis N, Schiodt M, Klinge B. The effect of antiresorptive drugs on implant therapy: systematic review and meta-analysis. *Clin Oral Implants Res* 2018;29:54–92.
7. Rotaru H, Kim MK, Kim SG, Park YW. Pedicled buccal fat pad flap as a reliable surgical strategy for the treatment of medication-related osteonecrosis of the jaw. *J Oral Maxillofac Surg* 2015;73:437–42.
8. Kablan F. The use of buccal fat pad free graft in closure of soft-tissue defects and dehiscence in the hard palate. *Ann Maxillofac Surg* 2016;6:241–5.
9. Kablan F. The use of buccal fat pad free graft in regenerative treatment of peri-implantitis: a new and predictable technique. *Ann Maxillofac Surg* 2015;5:179–84.
10. Cheng JW, Chen KC. Free buccal fat pad for surgical defect filling of medication related osteonecrosis of the jaws (MRONJ)- A case report. *Taiwan J Oral Maxillofac Surg* 2021;32:125–34.