BULLETIN OF STOMATOLOGY AND MAXILLOFACIAL SURGERY
Volume 20, Issue 1

DOI: 10.58240/1829006X-2024.1-66

CLINICAL ARTICLE

THE USE OF PERIOSTEAL FLAP IN MANDIBLE PRIMARY RECONSTRUCTION AFTER SEGMENTAL RESECTION IN MEDICATION-RELATED OSTEONECROSIS PATIENT: CASE REPORT

Koryun Hakobyan PhD,[1*] Yuri Poghosyan DMSc, PhD[2]

1. Department of Oral and Maxillofacial Surgery "Yerevan" MC, Yerevan, Armenia
2. Professor of Department of Oral and Maxillofacial Surgery Yerevan State Medical University after M. Heratsi, Armenia, Department of Maxillofacial Surgery "Yerevan" MC, Yerevan, Armenia

** Corresponding author: Koryun Hakobyan PhD, "Yerevan" MC, 7 Nersisyan Str., Yerevan, 0014 Armenia, Tel. (+374 94) 915 924;*
e-mail: hakobyankoryun@yandex.ru

Received: *Jan 9, 2024;* ***Accepted:*** *Mar 12, 2024;* ***Published:*** *Mar 25, 2024*

Abstract

Background: The treatment of medication-related osteonecrosis of the jaws is challenging. Mandible segmental resection is the main treatment method for advanced stage 2 and stage 3 medication- related osteonecrosis of the mandible. This brings to the large continuity defects of the mandible, decreasing the life quality of the patients.
Method: In this study, a modified technique of mandible defect reconstruction, after segmental resection, with only a reconstruction plate, is described. In this technique, the periosteal flap is used for double-layer closure of the intraoral wound. Double-layer isolation of the reconstruction plate from the oral cavity prevents intraoral wound dehiscence and plate exposure. Also, for the bone fragments fixation, prebended 2.3mm reconstructive plate on the 3D-printed individual model of the patient's mandible was used. The use of a prebended plate reduces the operation time and increases the precision of fixation of mandible fragments in the correct position.
Results: After intraoral sutures removal on 14 days, there was a dehiscence of a few intraoral sutures on mucoperiosteal flaps. There was partial exposure of the periosteal flap, which secured the underlying reconstructive plate. Exposed periosteal flap spontaneously epithelialized during 1 month. The postoperative follow-up period was nine months. During this period no complications were noted
Conclusion: Within the limitations of the study, this method can be used as an effective and predictable method for the primary reconstruction of the mandible with only a reconstruction plate in medication-related osteonecrosis of the jaws patients.

Keywords: *Medication-related osteonecrosis of the jaws; mandible resection; mandible reconstruction with prebended plate; periosteal flap; MRONJ surgical treatment; 3D surgery planning.*

Introduction

MRONJ is a serious complication, as a result of the use of certain drugs.[1] Bisphosphonates and RANKL inhibitors are the most common drugs, the use of which may lead to MRONJ development.[1] These drugs are used for the treatment of malignancies as well as bone metastases but have also been used in the management of osteoporosis and Paget's disease.[1] Antiangiogenic drugs and Krokodil drug are the next common substances associated with MRONJ development.[1-3]

According to the AAOMS position paper, MRONJ is diagnosed when the following characteristics are present:[1]

1. Current or previous treatment with antiresorptive or antiangiogenic agents
2. Exposed bone or bone that can be probed through an intraoral or extraoral fistula in the maxillofacial region that has persisted for more than eight weeks
3. No history of radiation therapy to the jaws or obvious metastatic disease to the jaws.

No consensus has yet been reached on the principles of the MRONJ treatment. There are two options for the MRONJ treatment: operative and conservative.[1] According to AAOMS conservative treatment is considered for lower stages of MRONJ.[1] In advanced stage 2 and stage 3 cases, when there are no contraindications for surgery, operative treatment with segmental resection has a high success rate. Such operations bring large continuity defects of the mandible, which need primary reconstruction to increase life quality. Different techniques are used for this purpose. Despite this, there is a high rate of complications.[4-6] Usually, there is intraoral wound dehiscence and infection. So, there is a need for less traumatic and easily performed surgical techniques with a high rate of success for mandible reconstruction in MRONJ patients.[4-6]

In this study the authors present a modified technique of mandible segmental defect reconstruction with prebended reconstructive plate after segmental resection in MRONJ patients.

Method

Case Report. A 57-year-old female patient was referred to the maxillofacial surgery department of "Yerevan" MC, Armenia, Yerevan, for an advanced stage 2 MRONJ of the right mandible. She used zoledronic acid for breast cancer for 18 months. The last use was 8 months before the initial examination.

The patient complained of the exposure of jawbone in the oral cavity (Figure 1), pain, and purulent discharge on the affected side.

Figure 1. *The intraoral view of the osteonecrosis zone. There is exposure of the right mandible, partially covered by pus, with inflamed surrounding gingiva*

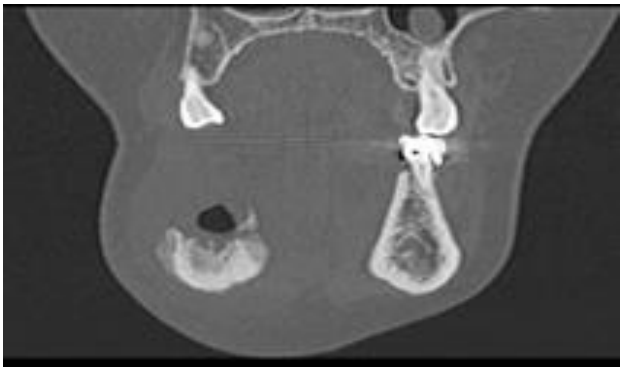

Figure 2. *The sagittal view of the CBCT scan. Bone destruction without clear demarcation is found*

The trigger factor for the MRONJ development was tooth extraction 5 months ago. During that period, she was operated on three times (in other clinics): once under general anesthesia and twice under local anesthesia. All three times disease recurrence occurred.

During the examination, no changes were found extraorally. Intraorally there was exposure of the right mandible, partially covered by pus, with inflamed surrounding gingiva (Figure 1). The patient noted anesthesia on the inferior alveolar nerve during the last three months.

On CBCT scans bone destruction without clear demarcation was found (Figure 2). The border of bone pathological changes was beneath the inferior alveolar neurovascular bundle.

Surgery

Before the surgery 2.3mm reconstructive plate was prebended on the 3D-printed individual model of

the patient's mandible (Figure 3).

Figure 3. *The prebended 2.3mm reconstruction plate on 3D-printed mandible individual model. Black lines – osteonecrosis zone; blue lines – resection lines*

The use of 3D printed jaw model increases the precision of plate bending and decreases the duration of surgery. Surgery was performed under general anesthesia. The mandible was exposed through the extraoral incision (Figure 4). After the exposure of the necrotic mandible the prebended plate was placed on the mandible and several screw holes were performed. Mandible resection lines were 5-10mm beyond the borders of necrosis. To prevent further intraoral wound dehiscence, double-layer closure was used. As a second layer periosteal flap was utilized (Figure 5). After the necrotic bone resection (Figure 7), the periosteal flap was elevated with its basis on upward. The periosteal flap was elevated at the buccal part of soft tissues, under the soft tissue defects of the oral cavity (Figure 5). Horizontal mattress sutures were used to close the oral mucosa, and a secondary running continuous suture was placed over the horizontal mattress sutures. Then, the periosteal flap was sutured beneath the intraoral wound. The bone fragments were fixed in their proper position with previously bended (on individual mandible model of the patient) 2.3mm reconstructive plate (Figure 6). The extraoral wound was sutured and drained.

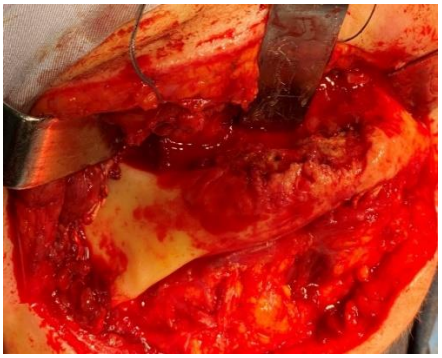

Figure 4. *Exposed necrotic mandible*

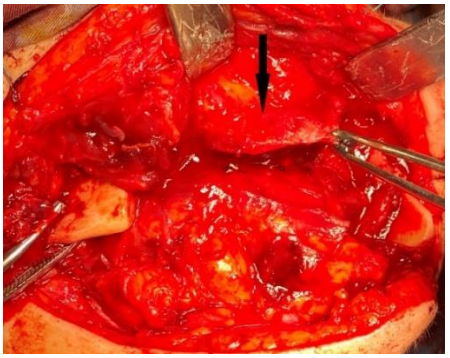

Figure 5. *Formed periosteal flap for double-layer closure (black arrow)*

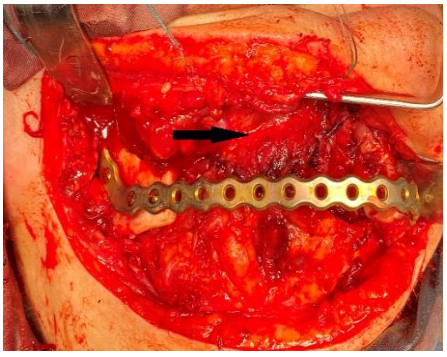

Figure 6. *Bone fragments are fixed with a reconstruction plate and the periosteal flap is fixed beneath the intraoral wound (black arrow)*

Figure 7. *The resected part of the mandible*

Postoperative period

Aside from postoperative antiseptic wound care, conservative treatment was also performed. This included clindamycin, metronidazole, analgesics, and oral cavity rinses with antiseptics.

Results

After intraoral sutures removal on 14 days, there was a dehiscence of a few intraoral sutures on mucoperiosteal flaps. There was partial exposure of the periosteal flap, which secured the underlying reconstructive plate. Exposed periosteal flap spontaneously epithelialized during 1 month. The postoperative follow-up period was nine months. During this period no complications were noted (Figures 8, 9).

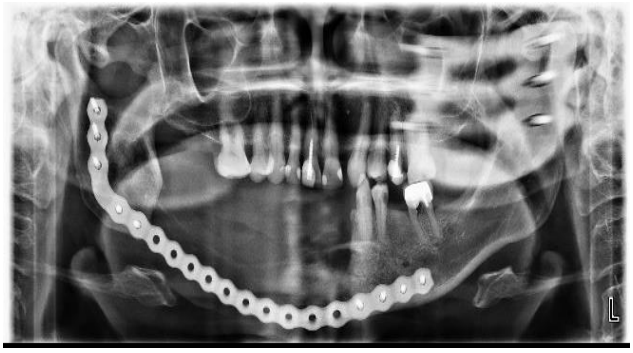

Figure 8. *Nine-month postoperative orthopantomogram*

Figure 9. *Nine-month postoperative intraoral view. There are no signs of disease recurrence or plate exposure*

Discussion

The treatment of MRONJ is challenging.[4-10] Mandible segmental resection is the main treatment method for advanced stage 2 and stage 3 MRONJ of the mandible.[4-10] This brings to the large continuity defects of the mandible, decreasing the patient's life quality. Microsurgical reconstructions of the mandible are the gold standard for the management of such defects.[4,6,7,10] However several circumstances make impossible microsurgical reconstruction in MRONJ patients. To many of the patients, it is contraindicated due to the general condition of the patient. Also, there is a high risk of complications at the donor site in MRONJ patients. Microsurgical reconstructions are not available to all patients in every country due to their cost effectiveness and the absence of highly qualified maxillofacial and microsurgical teams. Also, there is a high rate of complications in MRONJ patients.

Another method of mandible continuity defect reconstruction in MRONJ patients is the use of only a reconstruction plate. This method is easy to perform, takes less time than microsurgical reconstructions, and is available almost in any clinic. However, there is a high rate of complications when the surgery is performed in its traditional manner when the area of intraoral mucosal defect is closed only with local mucoperiosteal flaps.[4,11]

The most common complication is the dehiscence of intraoral sutures with exposure of the plate and further infection. The dehiscence of the intraoral sutures is a common complication in MRONJ patients which brings to the disease recurrence.[4,11] There are a few factors which contribute to this. The most obvious are the initial gingival defect at the affected area and persisting infection. Also, bisphosphonates have a directly toxic effect on the oral epithelium,[12] which leads to intraoral soft tissue healing failure. Moreover, the functioning of the mimic muscles of the face play a significant role in this process, especially with regard to the mandible, contributing to divergence of the sutures, even when the wound closure is tension free.

In our case, the periosteal flap was used to reduce the possibility of intraoral wound failure. This technique is easy to perform and there is no need for special training. It does not prolong the operation time too much. The periosteal flap prevents plate exposure, even if there is dehiscence of a few intraoral sutures on mucoperiosteal flaps. The exposed periosteal flap may epithelialize spontaneously during one month, as happened in our case. Also, this flap allows for achieving thicker

coverage over the plate, thus reducing the possibility of intraoral plate exposure during the late postoperative period.

The use of a prebended plate on individual mandible model, printed on a 3D printer, reduces the operation time and increases the precision of fixation of mandible fragments in the correct position.

Conclusion

Within the limitations of the study, the use of the periosteal flap for double-layer closure can be used as an effective and predictable method for the primary reconstruction of the mandible with only a reconstruction plate in MRONJ patients.

Declarations

Conflicts of interest and financial disclosures

The author declares that he has no conflict percent and there was no external source of funding for the research in question.

Ethical approval

The study was approved by the University ethics committee and was conducted in accordance with the Declaration of the World Medical Association.

Source of funding

This research received no external funding.

Data Availability Statement

Not applicable.

Abbreviations

3D	3 dimensional
AAOMS	American association of oral and maxillofacial surgeons
CBCT	Cone beam computed tomography
MRONJ	Medication-related osteonecrosis of the jaws
RANKL	Receptor activators of nuclear kappa B ligand

REFERENCES

1. Ruggiero SL, Dodson TB, Fantasia J, et al. American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on medication-related osteonecrosis of the jaw--2014 update. *J Oral Maxillofac Surg.* 2014;72(10):1938-56. doi:10.1016/j.joms.2014.04.031. Epub 2014 May 5. Erratum in: *J Oral Maxillofac Surg.* 2015;73(7):1440. Erratum in: *J Oral Maxillofac Surg*. 2015;73(9):1879

2. Hakobyan KA, Poghosyan YM, Poghosyan AY. C-terminal telopeptide level in ‘Krokodil’ drug-related jaw osteonecrosis patients. New Armen Med J 2017;11: 57-61,

3. Hakobyan K, Poghosyan Y. The efficacy of mylohyoid muscle flap use in surgical treatment of 'krokodil' drug-related osteonecrosis of the mandible. *J Craniomaxillofac Surg*. 2022;50(2):188-192. doi:10.1016/j.jcms.2021.11.007

4. Sacco R, Sacco N, Hamid U, Ali SH, Singh M, Blythe JSJ. Microsurgical Reconstruction of the Jaws Using Vascularised Free Flap Technique in Patients with Medication-Related Osteonecrosis: A Systematic Review. *Biomed Res Int.* 2018;2018:9858921. doi:10.1155/2018/9858921

5. Sacco R, Umar G, Guerra RC, Akintola O. Evaluation of segmental mandibular resection without microvascular reconstruction in patients affected by medication-related osteonecrosis of the jaw: a systematic review. *Br J Oral Maxillofac Surg*. 2021;59(6):648-660. doi:10.1016/j.bjoms.2020.12.014

6. Vercruysse H Jr, Backer Td, Mommaerts MY. Outcomes of osseous free flap reconstruction in

stage III bisphosphonate-related osteonecrosis of the jaw: systematic review and a new case series. *J Craniomaxillofac Surg*. 2014;42(5):377-86. doi:10.1016/j.jcms.2014.01.005

7. Nocini PF, Saia G, Bettini G, et al. Vascularized fibula flap reconstruction of the mandible in bisphosphonate-related osteonecrosis. *Eur J Surg Oncol*. 2009;35(4):373-9. doi:10.1016/j.ejso.2008.05.002

8. Migliorati CA, Casiglia J, Epstein J, Jacobsen PL, Siegel MA, Woo SB. Managing the care of patients with bisphosphonate-associated osteonecrosis: an American Academy of Oral Medicine position paper. *J Am Dent Assoc*. 2005;136(12):1658-68. doi:10.14219/jada.archive.2005.0108. Erratum in: *J Am Dent Assoc*. 2006;137(1):26

9. Bedogni A, Saia G, Bettini G, et al. Long-term outcomes of surgical resection of the jaws in cancer patients with bisphosphonate-related osteonecrosis. *Oral Oncol*. 2011;47(5):420-4. doi:10.1016/j.oraloncology.2011.02.024

10. Mücke T, Haarmann S, Wolff KD, Hölzle F. Bisphosphonate related osteonecrosis of the jaws treated by surgical resection and immediate osseous microvascular reconstruction. *J Craniomaxillofac Surg*. 2009;37(5):291-7. doi:10.1016/j.jcms.2008

11. Altay MA, Radu A, Pack SE, et al. Medication-related osteonecrosis of the jaw: An institution's experience. *Cranio*. 2020;38(5):333-341. doi:10.1080/08869634.2018.1528711

12. Reid IR, Bolland MJ, Grey AB. Is bisphosphonate-associated osteonecrosis of the jaw caused by soft tissue toxicity? Bone. 2007;41(3):318-20. doi:10.1016/j.bone.2007.04.196

ԴԵՂՈՐԱՅՔԱՅԻՆ ՕՍՏԵՈՆԵԿՐՈԶԻ ԺԱՄԱՆԱԿ ՍԵԳՄԵՆՏԱՅԻՆ ՌԵԶԵԿՑԻԱՅԻՑ ՀԵՏՈ ՎԵՐՆՈՍԿՐԱՅԻՆ ԼԱԹԻ ԿԻՐԱՌՈՒՄԸ ՍՏՈՐԻՆ ԾՆՈՏԻ ԱՌԱՋՆԱՅԻՆ ՎԵՐԱԿԱՆԳՆՄԱՆ ԺԱՄԱՆԱԿ: ԿԼԻՆԻԿԱԿԱՆ ԴԵՊՔ

Կորյուն Հակոբյան,[1] Յուրի Պողոսյան[2]

1. «ԵՐԵՎԱՆ» ԲԿ դիմածնոտային վիրաբուժության բաժանմունք, Երևան, Հայաստան
2. Երևանի Մ. Հերացու, պետական բժշկական համալսարանի դիմածնոտային վիրաբուժության ամբիոնի պրոֆեսոր, Հայաստան, «ԵՐԵՎԱՆ» ԲԿ Դիմածնոտային վիրաբուժության բաժանմունք, Երևան, Հայաստան

Ամփոփում

Ծնոտների դեզորայքային օստեոնեկրոզի բուժումը խնդրահարույց է: Ստորին ծնոտի սեգմենտային ռեզեկցիան դեզորայքային օստեոնեկրոզի 2-րդ և 3-րդ փուլերի փուլերի բուժման հիմնական մեթոդն է: Սա հանգեցնում է ծնոտի մեծ շարունակականության խախտումով արատների առաջացման՝ նվազեցնելով հիվանդների կյանքի որակը:

Այս ուսումնասիրության մեջ նկարագրված է ծնոտի արատների առաջնային վերականգնման մոդիֆիկացված տեխնիկան, սեգմենտային ռեզեկցիայից հետո, միայն վերականգնողական թիթեղով: Այս տեխնիկայում պերիոստեալ լաթն օգտագործվում է ներբերանային վերքի երկշերտ փակման նպատակով: Վերականգնողական թիթեղի երկշերտ մեկուսացումը բերանի խոռոչից կանխում է ներբերանային վերքի բացվելը և թիթեղների մերկացումը: Նաև ոսկրային բեկորների ֆիքսացիայի համար օգտագործվել է հիվանդի ծնոտի 3D տպագրված անհատական մոդելի վրա նախապես ծռված 2,3 մմ վերականգնողական թիթեղ: Նախապես ծռված թիթեղի օգտագործումը նվազեցնում է վիրահատության տևողությունը և մեծացնում է ծնոտի բեկորների ճիշտ դիրքում ֆիքսացիայի ճշգրտությունը:

14 օր անց ներբերանային կարերի հեռացումից հետո լորձաթաղանթ-վերնոսկրային լաթերի շրջանում նկատվել է մի քանի ներբերանային կարի անկայունություն: Հայտնաբերվել է վերնոսկրային լաթի մասնակի մերկացում, որն ծածկել է հիմքում ընկած վերականգնողական թիթեղը: Մերկացած վերնոսկրային լաթն ինքնաբերաբար էպիթելացվել է 1 ամսվա ընթացքում: Հետվիրահատական հետևողական շրջանը ինը ամիս էր: Այս ընթացքում ոչ մի բարդություն չի գրանցվել:
Հետազոտության սահմանափակումների շրջանակներում այս մեթոդը կարող է օգտագործվել որպես արդյունավետ և կանխատեսելի մեթոդ՝ ստորին ծնոտի դեղորայքային օստեոնեկրոզի դեպքում՝ միայն վերականգնողական թիթեղով ստորին ծնոտի առաջնային ռեկոնստրուկցիայի համար:

ПРИМЕНЕНИЕ ПЕРИОСТАЛЬНОГО ЛОСКУТА ПРИ ПЕРВИЧНОЙ РЕКОНСТРУКЦИИ НИЖНЕЙ ЧЕЛЮСТИ ПОСЛЕ СЕГМЕНТАРНОЙ РЕЗЕКЦИИ ПО ПОВОДУ МЕДИКАМЕНТОЗНОГО ОСТЕОНЕКРОЗА: КЛИНИЧЕСКИЙ СЛУЧАЙ

Корюн Акопян,[1] Юрий Погосян[2]

1. Отделение челюстно-лицевой хирургии МЦ «Ереван», Ереван, Армения
2. Профессор кафедры челюстно-лицевой хирургии, Ереванский государственный медицинский университет им. М. Гераци, Армения, отделение челюстно-лицевой хирургии, МЦ «Ереван», Ереван, Армения

Резюме

Лечение медикаментозного остеонекроза челюстей является сложной задачей. Сегментарная резекция нижней челюсти является основным методом лечения запущенного медикаментозного остеонекроза нижней челюсти 2 и 3 стадии. Это приводит к большим сегментарным дефектам нижней челюсти, снижая качество жизни пациентов.

В этом исследовании описана модифицированная техника реконструкции дефекта нижней челюсти после сегментарной резекции с использованием только реконструктивной пластины. При этом методе надкостничный лоскут используется для двухслойного закрывания внутриротовой раны. Двухслойная изоляция реконструктивной пластины от полости рта предотвращает расхождение внутриротовой раны и обнажение пластины. Также для фиксации костных фрагментов использовалась предварительно изогнутая реконструктивная пластина толщиной 2,3 мм по индивидуальной 3D-модели нижней челюсти пациента. Использование предварительно изогнутой пластины сокращает время операции и повышает точность фиксации фрагментов нижней челюсти в правильном положении.

После снятия внутриротовых швов на 14-е сутки произошло расхождение нескольких внутриротовых швов на слизисто-надкостничных лоскутах. Было выявлено частичное обнажение надкостничного лоскута, который закрывал подлежащую реконструктивную пластинку. Обнаженный надкостничный лоскут спонтанно эпителизировался в течение 1 месяца. Срок послеоперационного наблюдения составил девять месяцев. За этот период осложнений не отмечено.

В рамках ограничений исследования данный метод может быть использован как эффективный и предсказуемый метод первичной реконструкции нижней челюсти только с помощью реконструктивной пластины у пациентов с медикаментозным остеонекрозом челюстей.

Hakobyan K, Poghosyan Y. The Use Of Periosteal Flap In Mandible Primary Reconstruction After Segmental Resection In Medication-Related Osteonecrosis Patient: Case Report. *Bulletin of Stomatology and Maxillofacial Surgery*. 2024;20(1):66-72. doi: 10.58240/1829006X-2024.1-66