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CLINICAL ARTICLE

THE USE OF BUCCAL FAT PAD IN THE SURGICAL TREATMENT OF MEDICATION-RELATED OSTEONECROSIS OF MANDIBLE

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Abstract

Background: Treatment of the medication related osteonecrosis of the jaws is challenging. For the treatment of the stage 1 and non-advanced stage 2 cases marginal resection is used. Despite there are many studies on MRONJ treatment, high rate of disease recurrence is found (up to 47%), when intraoral wound is closed only with mucoperiosteal flaps.

Aim: The aim of this study is to evaluate the usefulness of the BFP use in the surgical treatment of stage 1 and non-advanced stage 2 mandible MRONJ, when the osteonecrosis zone is localized distal to the first molar.

Method and materials: A retrospective study of 9 patients with non-advanced stage-2 MRONJ of the distal mandible was performed. In all cases, surgery included removal of the necrotic bone and tension-free closure of the formed mandibular bone wound with local mucoperiosteal flaps and BFP. Data were expressed as means ± SEM. Statistical analysis was conducted IBM SPSS Statistics 20 was used for statistical analysis.

Results: In all patients, the postoperative period was uneventful. After suture removal (after 10-14 days), small areas (about 3-5 mm in diameter) of buccal fad pad exposure were found in 5 patients, which epithelialized successfully over the following month. The postoperative follow-up period was 12–16 months, during which all patients were free of symptoms: no signs of recurrence were found.

Conclusion: Within the limitations of the study, the radical debridement of necrotic bone and the transposition of buccal fat pad can be used as an effective and predictable method for the treatment of distal mandible MROMJ.

Key-words: *Medication-related osteonecrosis of mandible; mandible marginal resection; double-layer closure technique; buccal fat pad; MRONJ surgical treatment; Krokodil drug*

Introduction

Medication-Related Osteonecrosis (MRONJ) is a serious complication, as a result of the use of certain drugs. The most common drugs, the use of which may lead to the MRONJ development are bisphosphonates and RANKL inhibitors.[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] Krokodil drug and antiangiogenic drugs are the next common substances associated with MRONJ development. Krokodil is the

street name of a new synthetic drug mixture.[1,2]

The drug component of Krokodil is desomorphine, which is an opiate.[2] The drug abusers synthesize Krokodil themselves. They use cheap and widely available substances, which are easily obtained from drug stores. Codeine-containing analgesics (Sedalgin, Pentalgin etc.), iodine, soda, red phosphorus (from matchboxes), hydrochloric acid and gasoline are among the substances used in the process, so during intravenous use many side products enter the bloodstream.[2]

Low levels of serum C-terminal telopeptide (CTX), found in these patients, indicates the decreased bone turnover, which is the result of the action of Krokodil's some components.[3]

Thus, Krokodil has an anti-resorptive effect on bone tissue, which means that ONJ in Krokodil abusers is a new type of medication-related osteonecrosis of the jaws (MRONJ).[3]

Treatment of MRONJ is challenging. According to AAOMS, conservative treatment is considered for lower stages of MRONJ.[1] For stage 1 and non-advanced stage 2 cases marginal resection is used.[1,2] Segmental resection is the main treatment option for the advanced stage 2 and stage 3 MRONJ.[1,2]

Despite there are many studies on MRONJ treatment, high rate of disease recurrence is found, when intraoral wound is closed only with mucoperiosteal flaps. Recurrence rate is higher in marginal resection cases (up to 47%) than in segmental resection cases (up to 21.4%).[2,4] Different double layer closure techniques are offered for the reduction of the recurrence rate. Most popular techniques are the use of buccal fat pad (BFP),[5,6] mylohyoid muscle flap (MMF),[4,7] periosteal flap (PF).[8] Due to the lesion localization and features of flap preparation, there is no one universal technique, which is possible to use in any case.

The aim of this study is to evaluate the usefulness of the BFP use in the treatment of stage 1 and non-advanced stage 2 mandible MRONJ, when the osteonecrosis zone is localized distal to the first molar.

Materials and methods

A retrospective study of 9 patients with non-advanced stage-2 MRONJ of the distal mandible, treated in the Department of Maxillofacial Surgery of "Yerevan" Medical Center, Yerevan, Armenia during 2023, was performed. Clinical, laboratory and radiological (CT) (figure 1) methods were used. All cases were analyzed with regard to the used antiresorptive drug, complaints, age, period of the antiresorptive drug use, antiresorptive drug withdrawal period, and surgery outcome.

Surgery

In all patients, surgery was performed at least after the 1-month drug holiday. Surgery in all cases included removal of the necrotic bone and tension-free closure of the formed mandibular bone wound with local mucoperiosteal flaps and a BFP. Necrotic bone exposure was achieved through midcrestal incision with releasing incisions on both sides (figure 2).

Mucoperiosteal flaps were elevated, exposing underlying bone tissue. After necrotic bone exposure (figure 2):

- if a clinically formed sequestrum was found, it was removed and bone debridement was continued about 0.5 cm in all directions
- if a clear demarcation line was found between vital and non-vital bone, resection of necrotic bone was performed and debridement was continued about 0.5 cm in all directions
- if no demarcation line or sequestrum formation was found, resection of necrotic bone was performed until bleeding areas appeared (figure 3).

The height of the interdental septa and vestibular bone adjacent to the teeth in the necrectomy zones were reduced by one-third to prevent their exposure in the postoperative period. All bone margins were rounded with burs (figure 3). BFP was mobilized with blunt dissection through the incision over the periosteum for its mobilization (figure 4). BFP was sutured with lingual mucoperiosteal flap. Then, local mucoperiosteal flaps were closed using horizontal mattress and secondary running continuous sutures (figure 5).

Patient V. with mandible stage-2 MRONJ.

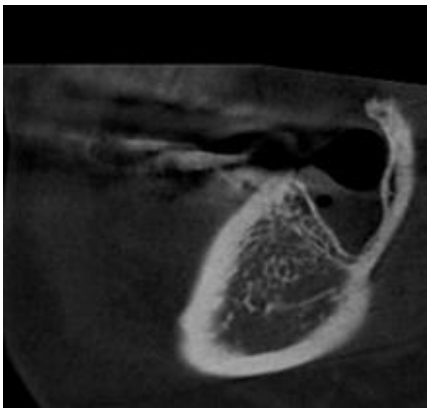

Figure 1. *CBCT view. patient with mandible stage-2 MRONJ. There is empty dental socket, without demarcation line*

Figure 2. *Exposed necrotic bone via intraoral incision, there is no demarcation line*

Figure 3. *Bone view after bone debridement*

Figure 4. *mobilized buccal fat pad*

Figure 5. *intraoral wound view*

Postoperative period

Aside from postoperative antiseptic wound care, conservative treatment was also performed. This included clindamycin, metronidazole, and oral cavity rinses with antiseptics. Sutures were removed after 10–14 days. If a dehiscence of mucoperiosteal flaps was found, through which the underlying BFP could be noticed, the wound was left to heal by secondary intention using oral rinses. Patients were called in 3, 6, and 8 weeks, then 3, 6, 12 months for clinical examination. Patients were considered as recovered if local signs of inflammation (intra- and extraoral suppuration, soft-tissue abscesses, and inflammatory masses) and exposed bone were absent.

Statistical analysis

Data were expressed as means ± SEM. Statistical analysis was conducted IBM SPSS Statistics 20 was used for statistical analysis.

Results

Regarding the antiresorptive drug used, the patients were divided into two groups. Patients who used Krokodil drug were included in the group 1. In the group 2 were included patients who noted the use of bisphosphonates.

Description of the group 1

5 male patients were included in the group 1. All patients were HCV positive. The mean ages of patients were 51.2 ± 3.3 (range 41–60) years. The mean period of Krokodil use and Krokodil withdrawal period were 21.6 ± 3.1 (range 12–30) months and 15.6 ± 3.1 (range 6–24) respectively.

For 4 patients in the group 1, the trigger for osteonecrosis development was the removal of the second or third molar, while in the other 1 patient, ONJ occurred as a recurrence following previous surgical treatment of distal mandible ON.

Discription of the group 2

4 patients were included in the group 2. Those were 3 female patients with breast cancer and one male patient with prostate cancer. All patients noted the use of zoledronic acid previousely. The mean ages of patients were 63.3 ± 2.9 (range 57–70) years. The mean period of zoledronic acid use and zoledronic acid withdrawal period were 15.0 ± 3.9 (range 6–24) months and 7.3 ± 1.7 (range 4-12) respectively.

For 2 patients in the group 1, the trigger for osteonecrosis development was the removal of the second or third molar. While in the other 2 patients, ONJ occurred as a recurrence following previous surgical treatment of distal mandible ON.

All patients in both groups had complaints relating to intraoral bone exposure, purulent discharge from the affected area, and pain. In all patients, one lesion of stage-2 osteonecrosis (according to the AAOMS[1]) was found in the distal mandible (distal to the second molar). The exposed bone was a pale yellow-grey color and was covered with greyish plaque. Granulation tissue growth was also present. The surrounding mucosa was pale pink in color. Defects were found in the vestibular mucosa over the exposed bone.

The involvement of the maxilla was not examined, being outside the scope of this study.

In all patients, the postoperative period was uneventful. After suture removal (after 10-14 days), small areas (about 3-5 mm in diameter) of buccal fad pad exposure were found in 5 patients (three patients from the group 1, two patients from the group 2), which epithelialized successfully over the following month. The postoperative follow-up period was 12–16 months, during which all patients were free of symptoms: no signs of recurrence were found.

Discussion

MRONJ is an important complication of the use of certain medications and drugs. This disease decreases the patient's life quality and, in some cases, may be life-threatening. Main clinical features of MRONJ are jaw exposure in oral cavity, pain, sinus tracts with purulent discharge.[1,2] Also, in some cases it may be complicated by cervical deep spaces infection, sepsis. There are rare cases of skull base osteonecrosis and intracranial complications.[9]

Surgery is the main treatment method for stage 2 and 3 MRONJ.[2] The patients are operated minimum one month after the antiresorptive agent use termination. The bone resection margins should extend at least 0.5 cm beyond the visible borders of osteonecrosis towards the healthy tissues. Also, the intraoral wound should be closed in tension-free manner with soft tissues.[2] Classically, in cases of stage-1 and stage-2 MRONJ (according to the American Association of Oral and Maxillofacial Surgeons (AAOMS) staging), after marginal resection, the bone defect is closed only with local mucoperiosteal flaps.[2] On maxilla, the recurrence rate is minimal when patients are treated in this manner.[2] Also, the use of buccal fat pad, in distal area, reduces the rate of oroantral communication formation.[5,6] On mandible, when the intraoral wound is close only with mucoperiosteal flaps, there is high rate of recurrence (up to 47%).[7] Several circumstances bring to the intraoral wound dehiscence in MRONJ patients, which leads to the disease recurrence. In most cases, it is impossible to achieve tension-free closure with local mucoperiosteal flaps due to the initial vertical defects of the vestibular and lingual gingiva. This is the main cause of the wound dehiscence 3-6 days postoperatively. Infection is common in ONJ patients. It can jeopardize healing processes, promoting wound dehiscence. Also, 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.

To reduce the MRONJ recurrence rate, multilayer closure techniques are used. Buccal fat pad (BFP) is a reliable method for the multilayer closure intraoral wounds in osteonecrosis patients.[5,6] The advantages of BFP can overcome the main problems mentioned above. BFP use is a proper technique, when ON occurs in mandible alveolar ridge distal to the first

molar. The use of BFP makes possible the closure of the defect with two layers (BFP and mucoperiosteal flaps). Even if BFP exposure is seen after suture removal (5 patients), spontaneous epithelialization occurs within about 1 month. Low rates of infection are found after BFP use, which makes the use of BFP a reliable method for infected areas (as found in ONJ patients). Stem cells found in fat tissue promote angiogenesis, decreasing ONJ recurrence rates.[10] The size of BFP makes possible the closure of large defects.

Over recent years, there have been several reports of BFP use in MRONJ patients. All authors reported good results.[5,6,11]

The retrospective design of the study and small number of included patients are relevant limitations of the study. These might limit the validity of the results.

Conclusions

Within the limitations of the study, the radical debridement of necrotic bone and the transposition of buccal fat pad can be used as an effective and predictable method for the treatment of distal mandible MROMJ.

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.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Source of funding

The work was not funded.

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