



Contents lists available at ScienceDirect

## International Journal of Surgery Case Reports

journal homepage: [www.casereports.com](http://www.casereports.com)

## Case report of maxillofacial fracture in a patient under bisphosphonates in the absence of ONJ disease: Guidelines?

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## ARTICLE INFO

## Article history:

Received 26 May 2018

Received in revised form 20 August 2018

Accepted 28 August 2018

Available online 10 September 2018

## Keywords:

Bisphosphonate

Traumatic maxillofacial fracture

Guidelines

## ABSTRACT

**INTRODUCTION:** Inspired by the presented case, this paper investigates treatment options for patients under active bisphosphonate therapy, suffering from a traumatic fracture in the absence of MRONJ (patients classified as ‘at risk’). We review literature in search of standardized protocols and in combination.

**PRESENTATION OF CASE:** A 75-year-old woman, suffering from osteoporosis for over a decade and being treated with alendronate for about 10 years, stumbled and fell and ended up with a displaced fracture on the right side of her extremely atrophied mandible. Under general anesthesia, using a limited sub-mandibular approach with minimal reflecting of the periosteum, an external fixation device was placed. The patient recovered well from surgery and was discharged after 2 days. Long term follow-up shows good healing with a mouth opening of 46 mm in the absence of any sensory of functional deficits.

**DISCUSSION:** We conclude from our literature review that there are no clear guidelines regarding fixation of traumatic (non-pathologic) maxillofacial fractures in patients under active antiresorptive therapy. Literature suggests that damaging the periosteum needs to be avoided since this would endanger the already fragile blood supply in the area. This could make an intra-oral approach unfavourable.

**CONCLUSION:** We prefer an extra-oral approach whenever possible. The choice between the use of supraperiostally placed locking reconstruction plates or external fixation should be based on the overall medical condition of the patient, the regional osseous anatomy and the specific fracture morphology.

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## 1. Introduction

Antiresorptive medication is used in pathology affecting the bone in order to prevent pathological fractures, firstly by causing apoptosis of the osteoclast and secondly by decreasing the osteoblast-mediated osteoclastic resorption [1–5]. The combined result is an increase in bone mass and density, as well as a modification of the bone architecture resulting in altered mechanical properties. [1,6] Elevated bone turnover, greater blood supply to the jaws and constant strain caused by masticatory function resulting in microdamage accumulation, might explain why the jaws are more susceptible to the effects of these medications.

Diminished or absent osseous and mucosal healing of the oral tissues is a known side effect. This is important in two ways. Firstly, Medication-Related Osteonecrosis of the Jaws’ (MRONJ) with incidence ranging from 0.8–12% [7], its complications and management strategies are well documented and reviewed and will

not be discussed in this paper [2,3,7–1,2,3,4,5,6,7,8,9]. Secondly, the decreased osseous healing causes difficult fracture treatment which we will discuss here. Moreover, the elder patient is especially at risk because of the added difficulty of age-related diminished blood flow to the bone and varying degrees of atrophy making fracture treatment very challenging [3,8,10,11]. We specify on traumatic fractures in patients without MRONJ (commonly classified as ‘at risk’)? Although epidemiological data about this specific matter is lacking, the research question is clinically relevant since the amount of patients on antiresorptive medication is growing and so the correct fracture treatment in this population needs to be established. This case report is in line with the SCARE criteria [12].

## 2. Presentation of case

A 75-year-old woman, suffering from osteoporosis for over a decade and being treated with alendronate for 10 years, stumbled and fell. She didn’t seek any medical assistance until 2 weeks later. Clinical and radiographical examination revealed extremely atrophic jaws with a displaced mandibular fracture on the right side. (Fig. 1) The image is distorted due to the patient’s inability to stand completely still (as a result of concomitant multiple sclerosis) during the acquisition of the X-ray.

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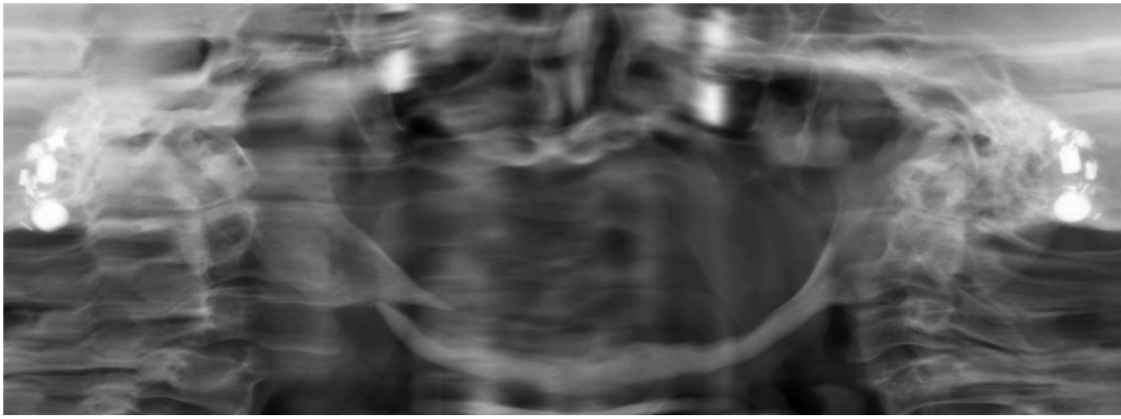


Fig. 1. Panoramic X-ray depicting the mandibular fracture on the right side.



Fig. 2. Panoramic X-ray after surgery.



Fig. 3. Clinical photograph at time of removal of external fixation. A: lateral view; B: frontal view; C: lateral view after removal.

Using a submandibular approach with minimal reflecting of the periosteum, an external fixation device was placed. Fig. 2 shows the post-operative situation. Reduction of the fracture was deliberately done in a non-anatomical position since this would lead to insufficient buttressing of the fragments. Therefore, some overlapping of the bony fragments was intended with the interpositioning of a synthetic bone graft. The patient recovered well and was discharged 2 days later. Check-up shows good, though very slow bone healing. Fixation was removed after 2,5 months (Fig. 3). Long term follow-up after 4 years shows adequate healing of the fracture. (Fig. 4) The patient is functional with a mouth opening of 46 mm

in the absence of any sensory deficits. She is free of any remaining complaints. (Fig. 5)

### 3. Discussion

In essence, we have an elderly patient under active oral bisphosphonate therapy (classified by AAOMS as 'at risk') with a displaced fracture of the mandible. Our research question was: "Are there guidelines for treatment of a traumatic maxillofacial fracture in patients under active antiresorptive treatment but without MRONJ?"

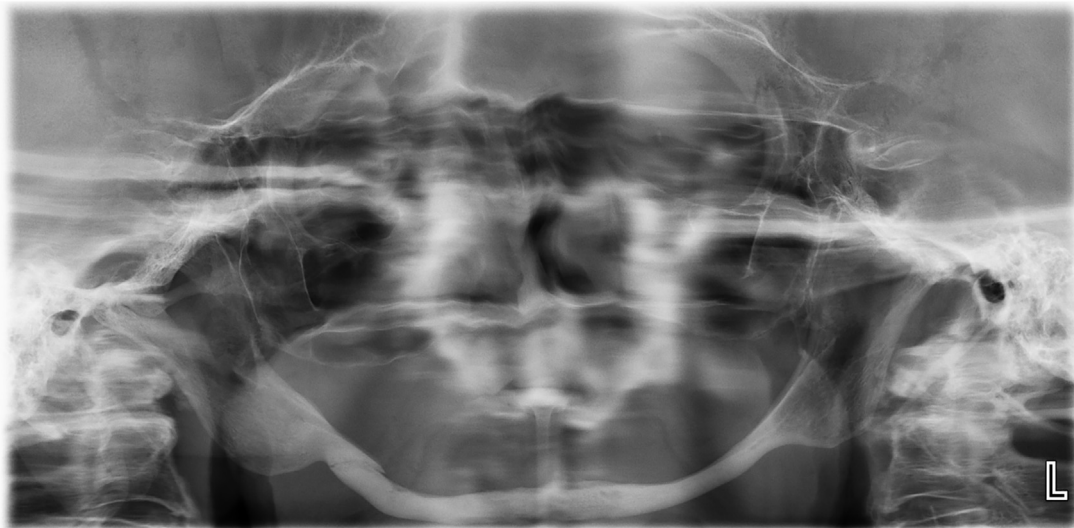


Fig. 4. Panoramic X-ray after 4 years.



Fig. 5. Clinical photograph after 4 years. A: frontal view; B: frontal view with maximal mouth opening; C: lateral view with maximal mouth opening; D: Mouth opening of 46 mm.



A comprehensive search of the PubMed and Medline database was performed on 07/01/2018 for literature in the last 10 years using MeSH terms ‘jaw fractures’, ‘bone density conservation agents’. To avoid articles discussing pathological fractures and articles concerning BRONJ, we used following MeSH terms as exclusion criteria ‘fractures, spontaneous’ and ‘bisphosphonate-associated osteonecrosis of the jaw’. The initial search rendered 4 articles selected for full text reading [1,13–15]. Because of the limited articles that were found, the exclusion criteria were removed from the search, adding another 2 studies [2,16]. None of these suggest any guidelines concerning the topic.

Further analysis of literature based the reference lists from the selected articles, reveals some articles suggesting guidelines. In the article from Coletti and Ord [3] a treatment rationale is proposed based on the etiology of the fractures. In their population however, fractures are caused by osteoradionecrosis, osteomyelitis, bisphosphonate-related osteonecrosis, osseous tumors or metastatic bone lesions. This is in contrast to our research question, specifying on patients without any lesions who receive antiresorptive medication on prophylactic basis only. The article by Gerhards et al [17] is not applicable for the same reason.

Ellis and Price [9] describe common problems with fractures in atrophic mandibles. They proficiently describe a treatment protocol for these fractures, mostly using an extra-oral approach. However, there were no patients under active bisphosphonate therapy.

When looking for treatment options, we are faced with spectrum of possible solutions, each with their benefits but also their disadvantages.

- 1 Conservative approach may be indicated in minimally displaced fractures or in patients with severe medical issues not able to undergo surgery.
- 2 Intermaxillary fixation (utilizing Erich splints or IMF screws) is a conservative approach, though it is very debilitating for the patients. Also there is no rigid fracture fixation, possibly leading to insufficient fracture healing [6]. Furthermore, IMF in edentulous patients is often challenging.
- 3 External fixation is a method of fracture stabilization which is used less frequently, but is minimally invasive. This means that it can be used on severely medically impaired patients with relative ease. Although debilitating to the patient, it does not comprise blood flow and can indeed ensure correct fracture healing.
- 4 Intra-oral open reduction and fixation is the most commonly used method for fractures of the maxillofacial skeleton. It does have several down sides: [7,11]
  - a the exposure of the bone to intra-oral bacteria
  - b difficulty of fixation due to (severe) atrophy. The correct positioning of bone fragments may become very difficult due to insufficient buttressing. Using multiple mini-plates is difficult because of the reduced bone volume. Therefore, a single thicker plate yielding increased stability will often be needed, impeding functional use of a removable prosthesis [11].
  - c extensive reflecting of the periosteum comprising blood flow
- 5 Extra-oral open reduction and fixation provides better surgical access and allows for less periosteal stripping. Mini-plates or locking reconstruction plates (LRP) can be used. Especially in edentulous jaws, a LRP may be beneficiary as a LRP will better withstand cyclic deformation of the mandibular arch while taking up less space. They can be placed supraperiosteally with minimal compression to the bone as not to disturb blood flow [7,18]. Also, the use of LRP can be successful in rehabilitation function even when no real fracture healing occurs.

In healthy patients, the use of bone grafts is said to cause an increase of bone healing through the introduction of osteocompetent cells to the fracture area. However, this results in an increased

invasiveness of the procedure [19]. Also, no data is available on this procedure in patients under antiresorptive medication.

From the aforementioned important issues, we deduce that adequate fracture healing in this specific situation needs to answer to following key points:

- 1 Strongly consider an extra-oral approach. This approach provides a more sterile operation area and allows for less periosteal stripping.
- 2 Minimize reflecting of the periosteum as not to impair blood supply.
- 3 Rigid fixation of the fracture with complete immobilization may be the preferable method, general medical condition of the patient permitting. In (severely) medically impaired patients, an external fixation can be used with good functional outcome.
- 4 When a LRP is used, supraperiosteal (or even superficial of the platysma) placement may be considered [7,11].

In parallel to the guidelines of a drug holiday in case of planned dental surgery [3] discontinuation of the bisphosphonates after the traumatic event may be considered [19,20]. However, one must realize that these molecules have a very long half-life, especially the ones given intravenously. This implies that discontinuation may not have a significant short-term influence on bone healing. The anti-angiogenic effect may recuperate more quickly. The discontinuation is advised, though decision for cessation of the medication should be made in discussion with the treating physician, weighing the pros versus the cons.

### 3.1. Conclusion

We conclude that there are no epidemiological data nor any clear guidelines regarding traumatic (non-pathologic) maxillofacial fractures in patients under active antiresorptive therapy. Hard and soft tissues in these patients have different qualities to those in healthy individuals and will react differently to fracture treatment with delayed and/or incomplete healing. An extra-oral approach should be used whenever possible. The choice between supraperiosteally placed locking reconstruction plates or external fixation should be based on the overall medical condition of the patient, the regional osseous anatomy (eg severe atrophy) and the specific fracture morphology. Bisphosphonates should be halted during healing phase, general medical condition permitting.

### Conflicts of interest

None.

### Sources of funding

None.

### Ethical approval

This case report was exempt from ethical approval. The study was written with consent of the patient involved. Patient data were anonymised to protect the privacy of the patient.

### Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

**Author contribution**

Van Camp Philippe: data collection, preparation of paper, review of manuscript.

Gemels Bert: preparation of paper, review of manuscript.

Heijsters Guido: review of manuscript.

Schepers Serge: review of manuscript.

**Registration of research studies**

Not applicable, case report.

**Guarantor**

Van Camp Philippe.

Schepers Serge.

**Provenance and peer review**

Not commissioned, externally peer-reviewed

**Acknowledgements**

None

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