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The importance of a thorough medical and pharmacological history before dental implant placement

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ABSTRACT

The risk of osteonecrosis in patients treated with bisphosphonates is well known and guidelines intended to prevent this complication have been established and accepted. Bisphosphonate related osteonecrosis of the jaws (BRONJ) is a unique condition in which even past administration of medication may be of current and future relevance. We present a case of BRONJ in the maxilla after dental implant placement. The patient suffered from osteoporosis and had been treated with oral alendronate sodium in the past. However, the medication was stopped two years before implant placement, and the treating dentist was unaware of the patient's past bisphosphonate use. Prevention of BRONJ is based on identifying at-risk patients, and then avoiding or modifying dentoalveolar surgical procedures in these individuals. Nevertheless, there seems to be some difficulties identifying patients at risk. We present some of the challenges that impede thorough assessment of a patient's medical background (review of systems) in the dental office, and suggest possible solutions.

Keywords: Alendronate, bisphosphonate related osteonecrosis of the jaws, education, oral medicine, oral surgery, review of systems.

Abbreviations and acronyms: AAOMS = American Association of Oral and Maxillofacial Surgery; BRONJ = bisphosphonate related osteonecrosis of the jaws; CTX = C-terminal cross-linking telopeptide.

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INTRODUCTION

Bisphosphonate related osteonecrosis of the jaws (BRONJ) affects all specialties of contemporary dental treatment, e.g. restorative and prosthodontics, periodontics, endodontics, orthodontics, oral medicine and oral and maxillofacial surgery.[1] In patients with previous exposure to bisphosphonates, BRONJ may appear after oral surgical procedures[2] or due to local inflammation (e.g. periodontal disease, traumatic ulcer)[3,4] and to a lesser extent without any apparent local trigger.[5,6] There is even a risk for BRONJ around long-standing osseointegrated dental implants.[7]

In patients given oral bisphosphonates the prevalence of BRONJ ranged between 0.01% and 4.3%.[8,9] In an analysis of 158 Australian BRONJ patients,[2] 72% of patients were treated with bisphosphonates for bone malignancies, and the main local trigger was dental extraction (73%). The calculated prevalence of BRONJ was 0.01% to 0.04% and 0.88% to 1.15% among oral and intravenous bisphosphonate patients, respectively.[2] Despite the seemingly low risk for BRONJ following oral bisphosphonate therapy, the large number of patients receiving oral bisphosphonates for the treatment of osteoporosis[10] makes it likely that most practitioners will encounter patients who use bisphosphonates and are at risk of BRONJ.[6]

BRONJ may be an incidental finding, but it usually has a symptomatic clinical presentation, including pain, neuropathy, erythema, swelling, suppuration, tooth mobility, halitosis, sinus tract formation, and pathologic fracture of the jaws.[5,11–13] Clearly these symptoms impact negatively on oral functioning and quality of life.[14] In addition, life-threatening consequences may ensue.[15]

In order to prevent BRONJ (and avoid its consequences), completion of needed dental treatments before (or soon after) commencement of bisphos-

phonate therapy and long-term maintenance are advised.[16,17] These methods aim to prevent dental deterioration with the need for oral surgery (e.g. crown lengthening, tooth extraction, and implant placement). When oral surgery is needed, the American Association of Oral and Maxillofacial Surgery (AAOMS)[11] recommends discontinuation of bisphosphonates in several circumstances before procedure (this should not be made by the dental practitioner, but by the prescribing physician); preoperative informed consent should be provided and regular follow-ups are required.[18] Other perioperative and operative methods have been suggested to prevent BRONJ, including preoperative C-terminal cross-linking telopeptide (CTX) serologic test,[1,19,20] modifying the surgical approach[21] and perioperative use of antibiotic and antiseptic mouthwashes.[22,23] However, the effectiveness of these preventive measures is unclear and the only proven method to prevent BRONJ in at-risk patients is to avoid dentoalveolar surgical interventions. The key to recognizing patients at risk is to obtain a thorough medical history using a structured questionnaire, interviewing the patient, and communicating with the patients' primary physician about current systemic diseases and regular medications.[24,25]

The purpose of this report is to highlight the importance of a thorough medical and pharmacological history before placing dental implants, and to discuss the obstacles that the clinician may encounter trying to achieve this goal.

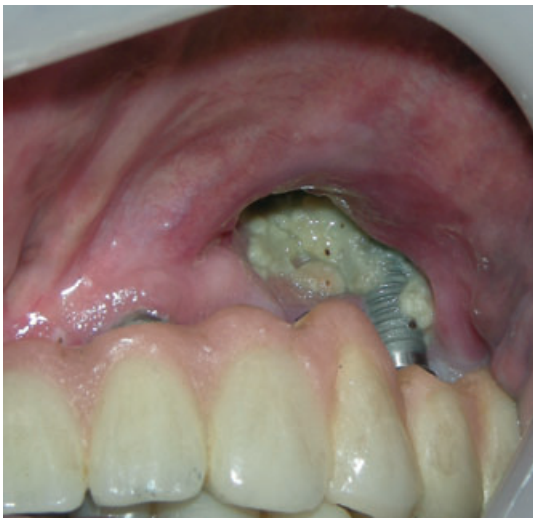

Fig. 1 Clinical photograph at presentation; exposed necrotic bone with purulent drainage and debris around the left posterior maxillary implant.

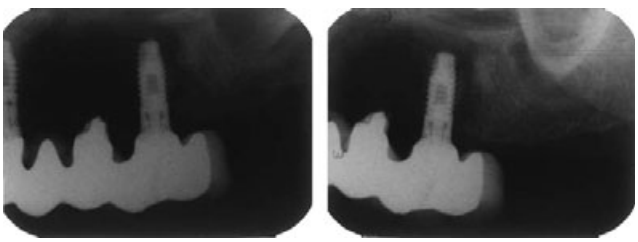

Fig. 2 Periapical radiographs at presentation. Area of necrotic bone is evident around the left posterior implant, extending to the floor of the maxillary sinus.

CASE DESCRIPTION

A 73-year-old woman was referred by her prosthodontist after exposed bone was observed in the left maxilla. Her medical history included rheumatoid arthritis, chronic obstructive pulmonary disease, gastro-oesophageal reflux disease, hyperlipidaemia, bilateral cataracts, osteoporosis and heavy smoking (up to 30 cigarettes a day for more than 50 years). Upon presentation her medications included prednisone (20 mg/d), albuterol inhalations (100 μg X 3/d), omeprazole (20 mg/d), simvastatin (10 mg/d), hydroxyl ethylcellulose 0.4% eye drops (X 2/d), lanolin oil 3% ophthalmic ointment (X 2/d), calcium (1200 mg/d) and vitamin D (600 IU/d).

Her dental history included the placement of four dental implants in the maxillary arch and three implants in the anterior mandibular arch; fixed maxillary and removal mandibular prostheses were placed eight months after implant surgery.

Upon presentation, the patient complained of intense pain (10 out of 10 using a numeric intensity scale) on the left side of the oral cavity and bad breath for several weeks. Daily salty mouthwashes were not helpful. Examination revealed an area of exposed necrotic bone with purulent drainage and debris around the left posterior maxillary implant (Fig. 1). The necrotic bone was very sensitive to light palpation and immobile as it was splinted by the implant-supported bridge.

A radiolucent area was observed around the posterior implant and extended anteriorly and superiorly toward the floor of the maxillary sinus (Fig. 2).

The medical history was revisited based on the clinical presentation. The medical file revealed that the patient took oral alendronate sodium (10 mg/d) for about 4.5 years which was stopped two years before implant placement; there was no history of therapeutic radiation to the head and neck area or administration of other medications known to cause osteonecrosis (i.e. bevacizumab and sunitinib).[26] The treating dentist was unaware of the history of bisphosphonate use before implant placement.

At the next appointment, three weeks after presentation, the new information was considered and the duration of the existing lesion was confirmed to be more than two months, therefore a diagnosis of BRONJ was made. The lesion was scored as Stage 2.[11]

The treatment plan included local antiseptic mouthwash (0.12% chlorhexidine gluconate X 2/d),

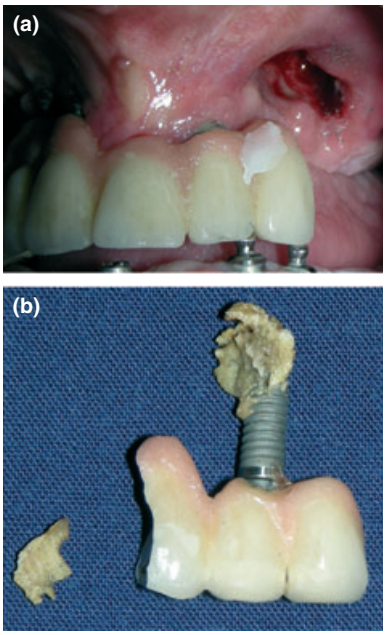

Fig. 3 (a) Clinical photograph taken immediately after cutting the prosthetic appliance and removal of the affected implant. (b) Implant and necrotic bone fragments.

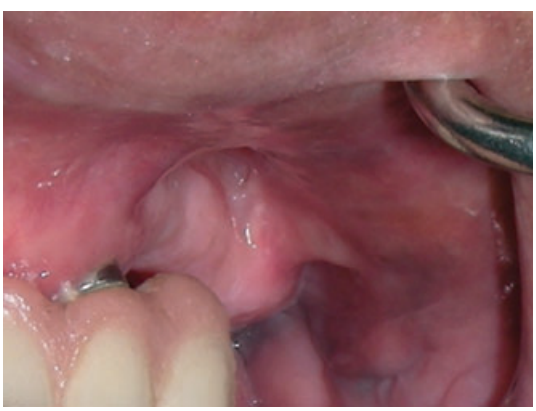

Fig. 4 Follow-up four weeks after removal of implant and necrotic bone; epithelialization of the lesion is almost complete. The prosthetic appliance was cleaned and re-cemented.

antibiotics (doxycycline 100 mg X2/d), removal of the involved implant, and surgical debridement of the necrotic bone. After the bridge was sectioned, the necrotic bone was mobile and removed without the need for further surgery (Fig. 3). At the two-week follow-up, healing was progressing well, and the suppuration ceased, with a significant reduction in pain. Therefore, antibiotic therapy was stopped and no other surgery was required. The patient continued with the daily antiseptic mouthwash. Regular follow-ups were uneventful during the following six months (Fig. 4).

DISCUSSION

This case demonstrates the anamnestic challenges that the dental practitioner needs to confront before performing surgical interventions. In this case the dental surgeon who placed the implant performed the accepted review of systems and asked about current medications. Only by examining the entire medical file of the patient, was the relevant history of bisphosphonate use revealed, which assisted in achieving the correct diagnosis. The challenge with obtaining an accurate history of bisphosphonate administration is threefold:

(1) *Bisphosphonates are administered using various dosing protocols and administration routes, such that the patient may not consider them as part of their 'regular/daily' medications.* Bisphosphonates used in the management of osteoporosis are administered orally weekly, bi-monthly or monthly, or intravenously once a year. Patients and physicians may not include the monthly or yearly bisphosphonate treatment on the current medication list.[27] Therefore, questions regarding regular medications (even when asking about osteoporosis) may not reveal the relevant medication. Therefore, we suggest that the practitioner specify that the list of regular medications needs to include *all* medications, even those taken once a month or once a year, and *all* routes of administration.

(2) *Patients may not consider it important to mention they have osteoporosis*. Due to the asymptomatic nature of osteoporosis (unless it causes a fracture) many patients do not consider it a 'disease'. Taking into account the prevalence of this condition, we suggest that the medical questionnaire includes a specific question about osteoporosis.

(3) *Patients do not understand the implications/importance of medications (current and past) to their dental treatment*. Patients are unaware that medications they previously took (such as bisphosphonates) may be relevant to their current dental treatment. Therefore, whenever the practitioner suspects that a patient may have once taken this medication, e.g. they report a diagnosis of osteoporosis, skeletal fracture, consumption of calcium and vitamin D, or treatment with drugs that may cause osteoporosis (such as steroids or tamoxifen in young breast cancer patients), the patient should be questioned directly about past bisphosphonate use.

In addition to knowing about a diagnosis of osteoporosis and the administration of bisphosphonates, the details of the accumulated doses are also important. Considering the relationship between bisphosphonate levels and the risk of BRONJ development,[11] the precise details of the dosing protocols, such as frequency and duration, should be determined. Furthermore, other risk factors should also be considered. In the current case, long-term steroid therapy and heavy smoking may have a role in the development of BRONJ. Concomitant steroid therapy enhances the risk for BRONJ development,[11] whereas the role of smoking is controversial.[28,29]

In order to have all this information before a procedure, there needs to be a high level of collaboration between the patient, the primary physician and the dental care provider. Obviously, all parties need to be educated about the importance of such cooperation. Furthermore, drug-induced osteonecrosis of the jaws is also associated with bevacizumab and sunitinib.[26,30] Therefore, the lesson learned from this case is also relevant to other situations.

Currently, the assessment of the patients' health ('review of systems') prior to dental treatment is mandatory and well-accepted. According to Little *et al.*,[24] during the first patient evaluation, the dentist should identify all drugs that a patient is taking, or is supposed to take. Over the years, several questionnaires have been formulated for patient-administered medical risk related history;[24,25,31,32] some aim to prevent in-office medical emergencies rather than long-term complications.[31,32] Most of the questionnaires only refer to current medications. One exception is Misch and Resnik's questionnaire[33] that asks about medication usage within the preceding six months before dental implant placement. However, the half life of bisphosphonates is approximately 10 years, and protracted administration of those medications may cause substantial drug accumulation within the bones;[34] therefore there is little benefit in inquiring about medications during the previous six months when considering bisphosphonates. It is advised to include questions relating to bone disease and present or past bisphosphonate therapy.[35]

This case demonstrates the importance of extending the scope of the medical questionnaire in dental practice to include past chronic diseases and medications in addition to the patient's current medical status in order to prevent BRONJ, especially before elective dental implant placement.

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