

Atraumatic Teeth Extraction in Bisphosphonate-Treated Patients

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Purpose: The purpose of this study was to suggest an alternative technique for atraumatic teeth extraction that would prevent bone exposure and the associated complication of osteonecrosis of the jaws in bisphosphonate (BP)-treated patients, without terminating the treatment.

Patients and Methods: A total of 10 patients treated with BPs for multiple myeloma, metastatic breast cancer, and osteoporosis, requiring dental extractions of nontreatable teeth, were included in this study. The extractions were performed by means of orthodontic elastics placed around the roots, causing slow and gradual exfoliation of the teeth.

Results: The technique was applied to 21 roots of 15 teeth. A total of 19 roots exfoliated spontaneously. Two roots had to be removed with minimal manipulation by forceps. The mean time required for exfoliation was 5.8 weeks. All sockets showed soft tissue secondary healing and there were no signs of inflammation or exposed bone during the 9-month follow-up.

Conclusions: Atraumatic extraction by use of elastics is a safe technique that may be used in BP-treated patients to prevent osteonecrosis of the jaws.

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Painful exposure of the jaw bones in patients receiving bisphosphonates (BPs) was first described by Marx¹ in 2003. Since then, the number of reported cases has increased steadily, and awareness of the new pathologic condition has become worldwide.

Although osteonecrosis of the jaw bones (ONJ) induced by BPs may develop spontaneously, up to 80% of the cases are related to dental extractions or other surgical interventions in the oral cavity.²⁻⁶

The pathophysiology of ONJ is not fully clear. However, most investigators agree that the interruption in osteoclast activity by the BPs results in the inhibition of bone turnover and bone healing.^{3,4} Bone remodeling is crucial in the healing process after tooth extraction. Therefore the exposed bone that normally ap-

pears in the socket for a short period of time in healthy patients does not heal and becomes necrotic and infected in BP-treated patients.⁷

One of the preventive recommendations in the literature in such patients is to avoid dental extractions. In mandatory cases the extraction should be performed with minimal bone damage or bone exposure.^{4,9} Prophylactic antibiotics and suturing of the socket are also advised.⁷

In this study we propose an alternative tooth extraction technique, avoiding bone exposure and the possible detrimental effect of the BPs on the jaws.

Patients and Methods

A total 10 patients treated with BPs and requiring extraction of nonsalvageable teeth were referred to the Oral and Maxillofacial Surgery Clinic at the Hadassah-Hebrew University Medical Center, Jerusalem, Israel.

Of the 10 patients, 8 were treated with intravenous BPs for metastatic breast cancer and multiple myeloma. Two patients had been treated with oral BPs for osteoporosis for 10 years and were included in this study.

All the patients were informed about the possible sequelae of dental extraction under BP treatment and were given the option to undergo the extraction via the atraumatic technique.

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FIGURE 1. Root canal treated and split mandibular molar during exfoliation process. Note extrusion of mesial root.

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DESCRIPTION OF TECHNIQUE

An elastic (orthodontic) band was placed around the cervical part of the affected tooth. Because of its elasticity, the elastic band tended to slide from the larger cervical circumference toward the lesser apical perimeter of the root. As the band moved apically, it caused periodontal ligament destruction, resulting in extrusive movement of the tooth.

To increase the efficacy of the technique, a fresh band was added around the root once a week, thus pushing the previous elastic(s) apically.

When the crown protruded beyond the bite line, it was ground, allowing additional space for the extrusive movement.

The technique is suitable for conical roots. Teeth with multiple divergent roots were split, and the elastics were placed on each separate root. For vital teeth, root canal treatment was required before sectioning.

Periapical radiographs were taken before and during the process to verify eruption of the tooth (Fig 1). After completion of the process, follow-up visits were scheduled to confirm secondary healing of the socket.

Results

A total of 15 teeth in 10 patients were treated by this technique: 10 molars (9 mandibular and 1 maxillary), 2 mandibular premolars, and 3 incisors (2 mandibular and 1 maxillary) (Tables 1, 2).

Six mandibular molars received root canal treatment and split before application of the elastics to each root, so for all practical purposes, elastics were applied to a total of 21 roots (Table 2).

The mean time for complete exfoliation was 5.8 weeks (range, 2-14 weeks). No sutures were required to close the sockets, and no antibiotics were given. All the patients continued the BP treatment during the procedure, except 2 who discontinued the treatment according to their oncologists' recommendation.

A total 19 roots exfoliated spontaneously. In 2 roots forceps were used in the final stage to complete removal of the apical part, which was embedded in soft tissue only. All the sockets showed full soft tissue secondary healing 2 weeks after complete exfoliation of the roots.

The longest follow-up period was 9 months, with no signs of inflamed tissue or exposed bone in any of the cases.

Figures 2 through 5 show the procedure in case 6, a 69-year-old woman with metastatic breast cancer who had been treated with zoledronate for 2 years and required extraction of the right mandibular first premolar and second molar.

Table 1. CLINICAL DATA OF PATIENTS

Case No.	Duration of BP Treatment	BP Used	Disease	Gender	Age (yr)
1	6 mo	Zoledronate	Breast cancer	F	47
2	2.5 yr	Pamidronate	Breast cancer	F	55
3	10 yr	Risedronate	Osteoporosis	F	70
4	22 mo	Pamidronate	Multiple myeloma	M	47
5	N/A	Zoledronate	Multiple myeloma	F	42
6	2 yr	Zoledronate	Breast cancer	F	69
7	N/A	Zoledronate	Breast cancer	F	67
8	9 mo	Zoledronate	Breast cancer	F	57
9	2 yr	Zoledronate	Breast cancer	F	72
10	10 yr	Alendronate	Osteoporosis	F	73

Abbreviation: N/A, not available (patient did not recall details or records could not be located).

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Table 2. RESULTS AND FOLLOW-UP

Case No.	Result	Time for Exfoliation (wk)	Roots	Split	Tooth
1	Exfoliated	10	M	+	R mand second molar
	Extracted	14	D		
2	Exfoliated	5		-	L mand central incisor
	Exfoliated	5		-	R mand central incisor
3	Exfoliated	8	M	+	R mand second molar
	Extracted	8	D		
4	Exfoliated	8	D	+	R mand first molar
	Exfoliated	9	M	+	R mand second molar
	Exfoliated	5	M	+	L mand second molar
	Exfoliated	5	D	-	R mand third molar
	Exfoliated	5	M		
	Exfoliated	5	D		
	Exfoliated	4			
5	Exfoliated	7		-	R max third molar
6	Exfoliated	7		-	R mand first premolar
	Exfoliated	3		-	R mand second molar
7	Exfoliated	7		-	L mand first premolar
8	Exfoliated	2	M	+	L mand first molar
	Exfoliated	4	D		
9	Exfoliated	9		-	R mand second molar
10	Exfoliated	3		-	L max central incisor

Abbreviations: M, mesial; D, distal; R, right; L, left; Mand, Mandibular; Max, maxillary.

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Discussion

The purpose of this study was to propose an alternative tooth extraction technique that would prevent ONJ in patients treated with BPs.

Most of the recent publications suggest that dental treatment in BP-treated patients should be conservative. Restorative dentistry, limited nonsurgical periodontics, and endodontics are the methods of choice in such patients. Extractions and all types of surgical interventions involving bone exposure should be avoided.^{7,8,10} If an extraction is unavoidable, it should be performed with minimal bone damage or exposure.⁷ However, no technique that could fulfill these requirements had been suggested in the English-language literature.

Elastics were first used for bloodless extraction of teeth in hemophilic patients by Dalitsch¹¹ in 1934 and by Birch and Snider¹² in 1939. According to them, the technique was suggested first by Wentworth in 1870 after an accidental loosening of a tooth by a rubber band.

Nowadays, the elastics are considered to be of great value in orthodontics and for intermaxillary fixation. Orthodontists using elastics are fully aware of the iatrogenic extraction potential when they are used improperly.¹³⁻¹⁵

The mechanism of the slow extraction method is based on the principle of the inclined plane. The biological process involves reaction of the tissue in the periodontal ligament in response to the presence of a foreign body in addition to the physical pressure pushing the root out of the socket.

The forces applied by the elastics are sufficient to cause destruction of the periodontal ligament and eruption of the tooth without direct impact on the bone, thus preventing bone exposure.

As a foreign body, the elastic band causes an inflammatory reaction in the soft tissue, impairing the at-

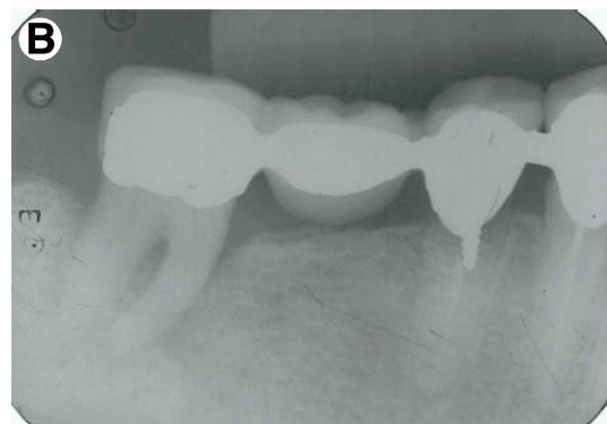


FIGURE 2. The right mandibular first premolar and second molar before procedure. A, Clinical picture. B, Periapical radiograph.

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FIGURE 3. Teeth after exfoliation of the second molar and extrusion of the first premolar.

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tachment apparatus. The granulation tissue that is formed around the root pushes it out of the socket while at the same time maintaining unexposed bone.

In our study, the procedure was successful in 19 of 21 treated roots of 15 teeth. The remaining 2 mandibular roots (cases 1 and 3) did not exfoliate spontaneously, and forceps had to be used to complete removal of the apical part of the root that was embedded in soft tissue.

The failure in the first case (case 1) may be attributed to irregular root morphology due to a dentin bulge that prevented the sliding of the elastics along the root (Fig 6).

In the other case (case 3), failure resulted from a fracture of the crown under the gingival line, making it impossible to add additional elastics.



FIGURE 4. Sockets immediately after exfoliation of both teeth.

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FIGURE 5. Complete healing 2 months after exfoliation.

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Nevertheless, in both cases no healing problems were observed in the extraction sockets. It could be that the elastics, though used for a short period of time, loosened the attachment of the roots and led to

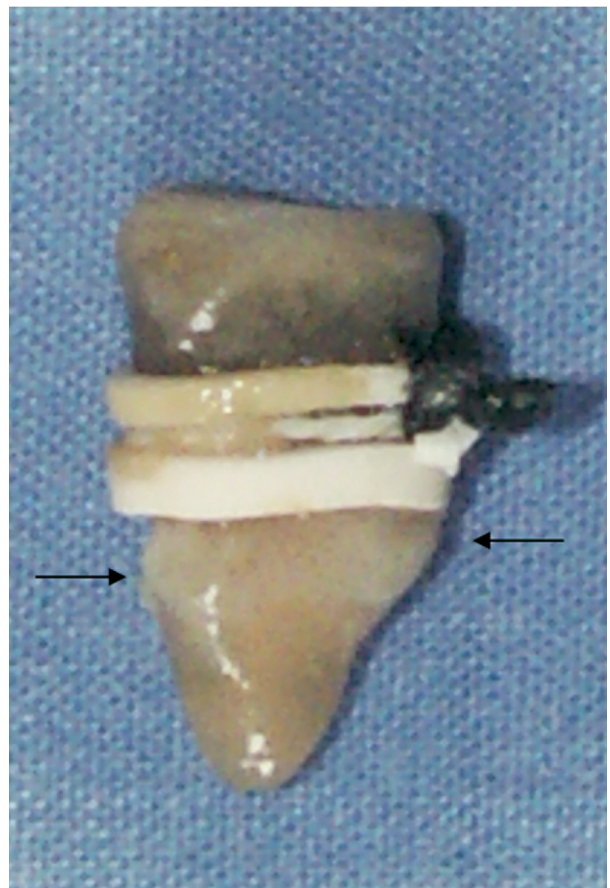


FIGURE 6. Dentin bulge (arrows) preventing elastics from sliding apically.

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the production of sufficient granulation tissue around the root to coat the socket and prevent the exposure of bone to the oral cavity.

The mean time required to extract a tooth via this technique was approximately 6 weeks (6 recall appointments). The length of the procedure depended on the morphology and the attachment apparatus of each root and the patient's cooperation.

The relatively short length of time required, the minimal associated inconvenience, and the lack of complications render this technique a treatment of choice whenever an extraction of a tooth is mandatory in patients treated with BPs, without the need to discontinue this treatment.

By following simple but precise rules and with good cooperation on the part of the patient, the complications associated with dental extractions in patients treated with BPs can be minimized.

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