



HAL
open science

Viewpoints of dentists on the use of bisphosphonates in rheumatology patients

Coline Daron, Christophe Deschaumes, Martin Soubrier, Sylvain Mathieu

► To cite this version:

Coline Daron, Christophe Deschaumes, Martin Soubrier, Sylvain Mathieu. Viewpoints of dentists on the use of bisphosphonates in rheumatology patients. *International Dental Journal*, 2018, 68 (4), pp.279 - 286. 10.1111/idj.12363 . hal-04515167

HAL Id: hal-04515167

<https://hal.science/hal-04515167v1>

Submitted on 23 Jan 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Viewpoints of dentists on the use of bisphosphonates in rheumatology patients

Coline Daron¹, Christophe Deschaumes², Martin Soubrier¹ and Sylvain Mathieu¹

¹Service de Rhumatologie, CHU Gabriel Montpied, Clermont-Ferrand, France; ²Service d'Odontologie, Implantologie, CHU Estaing, Clermont-Ferrand, France.

Objectives: Although typically prescribed in oncology, bisphosphonates (BPs) are also employed in rheumatology, particularly for the treatment of osteoporosis, sometimes resulting in complications, such as osteonecrosis of the jaw. Because of different opinions between rheumatologists and dentists on BP use, this study aimed to assess the views of dentists regarding administration of BPs in rheumatology. **Methods:** A questionnaire was sent to 880 dentists from the Auvergne region of France to determine their views on BP treatment. **Results:** We obtained 382 (43.4%) responses and analysed 376 (58.7% men). In total, 156 (41.5%) of the responders analysed had attended an in-service training course (ISTC) on the topic. A total of 237 (63.0%) systematically inquired as to whether their patients were undergoing BP treatment; this proportion was higher among those who had been practicing for fewer than 10 years ($P < 0.004$). For patients receiving BPs, 84.5% of practitioners felt ill at ease about performing dental surgery ($n = 318$) and 11% felt ill at ease about performing nonsurgical dental care ($n = 41$); 67% stated that their practice differed depending on the method of BP administration (*per os* or intravenously). Overall, 53.7% of practitioners felt uncomfortable when asked by a rheumatologist whether a given patient's dental status permitted prescription of BP ($n = 202$). This proportion was higher among those who had never attended an ISTC (62.6% vs. 50.7%; $P < 0.03$). **Conclusions:** Dentists feel ill at ease providing dental surgery to patients receiving BPs. Closer collaboration and better information-sharing between rheumatologists and dentists is necessary to facilitate the administration of BPs in rheumatology.

Key words: Bisphosphonates, rheumatology, dentists, viewpoints, questionnaire

INTRODUCTION

Bisphosphonates (BPs) are widely prescribed, particularly in rheumatology (to treat osteoporosis) and oncology, to reduce the risk of pathological spinal fractures by 40%–60% and non-vertebral fractures by 60%–80%¹. BPs have also been used to treat Paget's disease², brittle bone disease³ and fibrous dysplasia⁴. In oncology, BPs are used to manage lytic bone metastases and paraneoplastic hypercalcaemia⁵.

Most BP-induced side effects are minor and transient (e.g. flu-like symptoms, digestive disorders), but BP administration has been associated with the risk of one serious side effect, osteonecrosis of the jaw (ONJ)^{6–10}. The physiopathology of ONJ is not well understood, although several risk factors have been identified. Such risk factors may be local (e.g.

periodontal surgery, implant-related, poor buccodental condition, trauma linked to badly fitting prostheses, exostosis and specific anatomic features) or systemic (e.g. steroid therapy, anti-angiogenic treatments, chemotherapy/radiotherapy, alcoholism, tobacco use, diabetes, obesity, age >65 years and female gender) in nature. In addition, the risk is proportionate to the cumulative BP dose. Administration of BP through the intravenous (i.v.) route has been suggested to constitute an additional risk factor¹¹.

In 2012, the French Society of Stomatology and Maxillofacial Surgery reported a considerably lower incidence of ONJ in patients undergoing BP treatment for rheumatological diseases (0.001%–0.1%) than in those receiving oncological care (1%–10%), with a higher incidence of ONJ associated with myeloma rather than solid cancers¹². The prevalence and

incidence of ONJ are difficult to assess as a result of the progression of treatments and disparity between related studies, which do not always take risk factors into account.

Given that the patient population is aging, the number of BP prescriptions is likely to increase, entailing an increased risk of more common complications. In order to reduce the number of cases of ONJ as much as possible, the various risk factors must be controlled through mutual collaboration among dentists and prescribing physicians. In addition, ONJ is difficult to treat, so professional awareness is particularly important.

During the last few years, we have experienced difficulty treating patients with osteoporosis, especially regarding BP initiation. Our colleagues disagreed with our benefit–risk assessment; we considered the risk of ONJ after BP treatment to be less than the risk of fracture with no treatment, whereas our dentistry colleagues found a higher risk of ONJ. Therefore, we decided to investigate the views of dentists in Auvergne, France, regarding BP administration in rheumatology. A questionnaire was utilised to collect data on professional practices and the practitioners' attitudes and feelings.

MATERIALS AND METHODS

Ethics

The study protocol was presented to the Clinical Research Ethics Committees of Clermont-Ferrand, France and was deemed to comply with ethical principles and the Declaration of Helsinki. Our study has been independently reviewed and approved by the Ethics Committee. All participants of this study were invited to respond to our questionnaire. A response was considered to constitute their written consent.

Questionnaire

This questionnaire, created by CD and SM, was presented to the other rheumatologists in the Rheumatology Department of Gabriel Montpied teaching hospital in Clermont-Ferrand, France, and to Professor Christophe Deschaumes, a dental surgeon in the Odontology Department. Each question was analysed, discussed, changed or withdrawn, according to its relevance, until we had a final questionnaire that was unanimous and validated by all of the above practitioners.

The questionnaire comprised four independent sections:

- Characteristics of the dentist
- Day-to-day practice during dental surgery consultations

- Practices for patients already undergoing BP treatment for rheumatological indications
- Practices for patients intended to start BP treatment for rheumatological indications.

The addresses of all Auvergne-based dentists were obtained. In the event that a given surgeon was listed under multiple addresses, the questionnaire was sent to all registered addresses. All questionnaires and return envelopes were anonymous. The questionnaire was accompanied by a letter explaining the study objectives and stating that participation was voluntary. A reminder was sent 1 month after the initial mailing and specified that the questionnaire was not to be returned a second time if the practitioner had already sent a response.

Statistical analysis

The statistical analyses were essentially descriptive. Qualitative data were expressed as numbers and percentages, whereas quantitative data were presented as means or medians and associated ranges. The chi-square test was used to assess associations between dentists' habits and explicative variables, such as age, gender, practice type (independent or hospital-based), location (urban or rural), structure (single practitioner or group practice), overall practice experience (in years) and past attendance of an in-service training course (ISTC) on the topic. Fisher's exact test was utilised when the number of participants was fewer than five. A value of $P < 0.05$ was considered significant.

RESULTS

We sent out 880 questionnaires. After the initial mailing, 274 responses were received. The reminder sent 1 month later yielded 102 additional responses. Therefore, the final response rate was 42.7% (376/880). In addition to the questionnaire responses that could be analysed, 17 were returned as a result of unknown addresses and six questionnaires remained unanswered by dentists stating that they were not applicable to the study, as their practices solely involved orthodontics (*Figure 1*). The epidemiological characteristics of the 376 respondents whose responses were analysed are presented in *Table 1*.

Day-to-day dental practices

Of the 376 respondents, 237 (63%) systematically inquire as to whether their patients are undergoing BP treatment. This proportion was higher when the dentist had <10 years of experience (71.4%, $P < 0.004$), worked in a group practice (71.3%, $P < 0.001$) or had attended an ISTC on the topic (71.6%, $P < 0.001$), but no difference was found according to

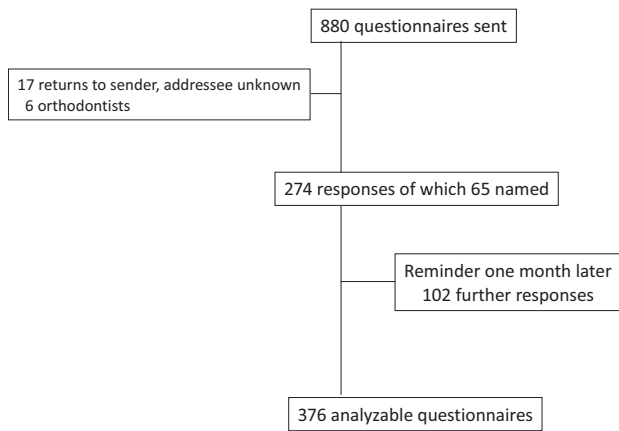


Figure 1. Flowchart of the questionnaires.

Table 1 Epidemiological characteristics of questionnaire respondents

Characteristic	Number of respondents (%)
Gender*	
Male	221 (58.7)
Female	154 (40.9)
Age*	
<35 years	81 (21.5)
36–45 years	85 (22.6)
46–55 years	100 (26.5)
56–65 years	98 (26)
>65 years	11 (2.9)
Practice type*	
Independent	368 (97.8)
Hospital	18 (4.7)
Private	2 (0.5)
Funded by insurance company	4 (1)
Practice location*	
Rural	75 (19.9)
Semi-rural	113 (30)
Urban	188 (50)
Practice structure*	
Single practitioner	165 (43.8)
Group practice	210 (55.8)
Overall practice experience*	
<10 years	80 (21.3)
10–30 years	194 (51.5)
>30 years	101 (26.8)
Department**	
Allier	74 (19.6)
Puy-de-Dôme	205 (54.5)
Haute-Loire	62 (16.4)
Cantal	33 (8.7)
Participation in an ISTC	
Yes	156 (41.5)
No	208 (55.3)

ISTC, in-service training course.

*Missing data: 1.

**Missing data: 2.

gender or practice location (Table 2). A total of 344 (91.5%) respondents declared that they inquired about indications (rheumatological or oncological) for BP administration. Of those who did not systematically ask about the treatment, 133 (35.3%) posed the question before a dental avulsion (extraction), 106

(28%) before fitting an implant and 111 (29.5%) before periodontal surgery. Such inquiries were almost never made before interventions to treat dental caries, scaling or fitting crowns or inlay cores.

Among the respondents, 253 (67.2%) stated that their day-to-day practice differed according to whether BP treatment was being administered by the i.v. route or *per os*. Dental panoramic radiography was performed systematically before all treatment by 208 (55.3%) dentists. Overall, 71 (18.8%) practitioners reported at least one case of dental complications in the context of BP treatment: ONJ ($n = 49$); healing issues ($n = 12$); and bony sequestrae ($n = 3$). Four dentists stated that the complications arose in patients undergoing treatment for cancer. Reports of complications did not differ according to gender, practice structure (single practitioner or group practice), overall practice experience, practice location or attendance of ISTC (Table 2).

For patients taking BPs, 318 (84.5%) practitioners felt uncomfortable performing dental surgery and 41 (11%) felt uncomfortable performing other dental treatment. These results did not differ significantly according to overall practice experience, practice structure or practice location. Male dentists were more comfortable with surgery (18.9% *vs.* 6.0%; $P < 0.001$). However, we found no significant difference in terms of issues regarding non-surgical dental treatment according to gender, structure, location of practice, practice experience or attendance at an ISTC (Table 2).

Patients administered BPs for a rheumatological indication

Among the dentists surveyed, 307 (81.6%) did not discontinue BP administration *per os* before dental surgery. When BPs were discontinued before surgery, the time interval most frequently requested between the last BP administration *per os* and the start of dental treatment was 3–6 months (27%). In contrast, 88 (19.3%) practitioners admitted that they were unaware what time interval to request between discontinuing BP administration *per os* and surgery. Similarly, 116 (30.8%) practitioners reported not knowing what time interval to request between BP infusion and subsequent dental treatment. For 106 (28%) respondents, no time interval was considered as reasonable.

A correlation was observed between dental condition and the type of dental treatment performed in patients receiving BPs *per os*, with poor condition being strongly associated with a lower frequency of dental treatment being performed, including treatment for dental caries and scaling (Table 3).

Table 2 Univariate analysis of the characteristics of dentists and their professional practices

Characteristic		Comfortable approving treatment initiation		Systematically inquired about BP treatment		Comfortable with dental care		Comfortable with dental surgery		Occurrence of complications during treatment	
Gender	Male	137/213 64.3%	$P < 0.001$	137/220 62.3%	$P = 0.44$	198/217 91.2%	$P = 0.09$	41/217 18.9%	$P < 0.001$	47/216 21.7%	$P = 0.18$
	Female	65/149 43.6%		100/151 66.2%		131/153 85.6%		9/150 6%		24/149 16.1%	
Practice structure	Single practitioner	91/155 58.7%	$P = 0.36$	88/161 54.6%	$P < 0.001$	145/162 89.5%	$P = 0.85$	18/162 11.1%	$P = 0.2$	31/160 19.3%	$P = 0.95$
	Group practice	111/206 53.9%		149/209 71.3%		184/207 88.8%		32/204 15.6%		40/204 19.6%	
ISTC	Yes	56/150 37.4%	$P < 0.03$	111/155 71.6%	$P < 0.001$	141/154 91.6%	$P = 0.16$	16/155 10.3%	$P = 0.12$	36/151 23.8%	$P = 0.097$
	No	99/201 49.3%		119/206 57.7%		178/205 86.8%		32/201 15.9%		34/203 16.7%	
Practice location	Rural	33/63 52.4%	$P = 0.32$	44/71 62%	$P = 0.92$	60/71 84.5%	$P = 0.35$	6/69 8.6%	$P = 0.12$	17/69 24.6%	$P = 0.49$
	Semi-rural	56/109 51.4%		70/109 64%		98/110 89%		11/109 10.1%		19/108 17.6%	
	Urban	91/186 49.7%		121/187 64.7%		168/185 90.8%		31/184 16.8%		35/184 19%	
Overall practice experience	<10 years	42/77 54.6%	$P = 0.52$	55/77 71.4%	$P < 0.004$	69/77 89.6%	$P = 0.24$	15/77 19.4%	$P = 0.24$	10/77 12.9%	$P = 0.25$
	10–30 years	86/186 46.3%		131/193 68%		167/193 86.5%		23/188 12.2%		41/188 21.8%	
	>30 years	39/99 39.4%		51/101 50%		93/100 93%		12/101 11.8%		20/100 20%	

BP, bisphosphonate; ISTC, in-service training course.

Table 3 Distribution of dental treatment according to patient dental condition

Treatment	Good dental condition (%)			Poor dental condition (%)			P-value
	Yes	No	Missing	Yes	No	Missing	
Dental caries	332 (88)	4 (1)	40 (10.6)	296 (78.7)	32 (8.5)	48 (12.7)	<0.001
Scaling	312 (83)	21 (5.6)	43 (11.4)	235 (62.5)	87 (23.1)	54 (14.3)	<0.001
Dental avulsion	91 (24)	228 (60)	57 (15.1)	48 (12.7)	269 (71.5)	59 (15.7)	<0.001
Crown	330 (87.7)	4 (1)	42 (11.1)	271 (72)	54 (14.3)	51 (13.5)	<0.001
Inlay core	325 (86)	6 (1.6)	45 (11.9)	270 (71.8)	55 (14.6)	51 (13.5)	<0.001
Implant	28 (7.4)	255 (68)	93 (24.7)	18 (4.8)	259 (68.8)	99 (26.3)	0.14

Patients due to start bisphosphonate treatment for rheumatological indications

Peri-apical or periodontal infections, the presence of residual roots or non-conservable teeth, teeth requiring avulsion, the fitting of an implant and periodontal surgery constituted contraindications for initiating BP treatment for 86%–97% of respondents. However, for most of the dentists the presence of caries or requirement for endodontic or orthodontic treatment did not constitute contraindications for BP prescription. Upon completion of dental treatment, 103 (27.4%) practitioners waited 1–3 months to approve the initiation of BP treatment.

Of the respondents, 161 (42.8%) felt uncomfortable when a rheumatologist or physician inquired as to whether a patient's dental condition was compatible with BP prescription. This proportion was higher among women (56.4% women *vs.* 35.7% men;

$P < 0.001$) and practitioners who had not attended an ISTC (62.6% of attendees *vs.* 50.7% of non-attendees; $P < 0.03$). No significant difference was found according to practice structure, location or experience (Table 2). Most practitioners who felt ill at ease when approached with this issue consulted the guidelines from scientific societies (45%). Among the others, 30% referred the patient to a colleague and 24% opted to confer with other dentists.

Effects of ISTC on participant responses

Overall, 156 respondents had already attended ISTCs on 'BPs and dental care'. Table 2 shows that dentists who had participated in an ISTC were more comfortable authorising BP initiation and more frequently asked patients if they were receiving BPs before dental intervention. However, we found no significant

association between ISTC participation and greater comfort in administering dental care or dental surgery to patients receiving BP treatment. ISCT participants were slightly more concerned about dental complications following BP therapy. The percentage of respondents in agreement with the French Society of Stomatology and Maxillofacial Surgery guidelines, as based on their participation in an ISCT, is provided in *Table 4*.

DISCUSSION

Approximately 87% of dentists in the responding cohort felt uncomfortable performing surgery on patients undergoing BP treatment and 42.8% expressed discomfort in being posed the question, 'Does the patient's dental status permit initiation of BP treatment?' Attendance of an ISTC on the topic facilitated the decision-making process. In addition, the quality of a patient's dental condition in cases involving BP treatment correlated with the dental care performed, except implant fitting, which was not performed in 68% of cases, regardless of the patient's dental condition.

According to the guidelines published by the French Society of Stomatology and Maxillofacial Surgery¹³, which are summarised in *Table 5*, the estimated incidence of ONJ in patients undergoing i.v. BP treatment

for malignancies is 1%–10%. The incidence of ONJ in patients receiving oral BPs for benign diseases remains low, at 0.001%–0.10%. We were surprised to find that 13% of responding dentists reported ONJ-related complications. We propose two explanations for this discrepancy. First, four respondents reported an underlying neoplastic disease as constituting an indication for BP treatment rather than osteoporosis or another rheumatological disease, and it is likely that cases of ONJ occurred when such information was not given, leading to overestimated results. Second, dentists who had experienced this complication and therefore felt concerned by the subject were probably more inclined to participate in our study. We also found that 91.5% of the latter respondents asked their patients about the indications for their treatment, implying potentially different practices in these two populations (rheumatological and oncological).

The guidelines also reported that annual i.v. administration of BP is weakly associated with ONJ onset. A controlled, randomised trial reported one case of ONJ among 3,889 postmenopausal patients with osteoporosis treated with annual i.v. injections of zoledronate, and one case of ONJ in the control group of 3,876 patients who received placebo¹⁴. In our study, 67.2% of respondents reported varying their clinical practices in cases involving i.v.

Table 4 Effect of in-service training course (ISCT) on practitioner responses

Questions	Expected response according to guidelines	Percentage of participants in agreement with guidelines (%)		P-value
		ISCT	No ISCT	
What is the reasonable time lapse before performing dental care after BP infusion?	None	52/156 (33.3)	51/208 (24.5)	0.065
Do you systematically ask patients to discontinue oral BP therapy before performing dental surgery?	No	128/156 (82.1)	169/208 (81.3)	0.845
In cases of good dental status, do you perform the following dental interventions without discontinuing BPs?				
Caries	Yes	139/140 (99.3)	182/185 (98.4)	0.467
Scaling	Yes	126/138 (91.3)	176/184 (95.7)	0.110
Fitting crowns	Yes	137/139 (98.6)	182/184 (98.9)	0.777
Inlay cores	Yes	10/116 (8.6)	17/159 (10.7)	0.569
In cases of poor dental status, do you perform the following dental interventions without stopping BPs?				
Caries	Yes	125/137 (91.2)	161/180 (89.4)	0.594
Scaling	Yes	97/135 (71.9)	130/176 (73.9)	0.692
Fitting crowns	Yes	116/136 (85.3)	146/178 (82.0)	0.440
Inlay cores	Yes	9/114 (8.0)	9/155 (5.8)	0.498
When dental care is finished, what is the reasonable time lapse before starting BP treatment?	0–15 days	15/141 (10.6)	25/185 (13.5)	0.433
Are the following dental diseases contraindications to starting BP treatment?				
Peri-apical infection	Yes	132/149 (88.6)	188/201 (93.5)	0.102
Periodontal infection	Yes	137/149 (91.9)	176/198 (88.9)	0.342
Caries	No	139/145 (95.8)	171/189 (90.5)	0.059
Are the following dental interventions contraindications to starting BP treatment?				
Avulsion	Yes	155/155 (100.0)	199/203 (98.0)	0.079
Fitting implants	Yes	147/149 (98.7)	197/201 (98.0)	0.644
Periodontal surgery	Yes	152/156 (97.4)	186/202 (92.1)	0.029
Endodontic treatment	No	116/145 (80.0)	147/195 (75.4)	0.314
Orthodontic treatment	No	85/130 (65.4)	103/181 (56.7)	0.131

BP, bisphosphonate.

Table 5 Summary of the French Society of Stomatology and Maxillofacial Surgery guidelines^{12,13}

Questions	Good practice guidelines
How to diagnose osteonecrosis of the jaw (ONJ)?	For the diagnosis of ONJ, it is recommended to refer to the following criteria: patients treated or have been treated with BP; exposure of maxillary and/or mandibular bone for at least 8 weeks after the first determination by the dentist; absence of prior irradiation of the jaws and absence of metastasis confirmed by histological examination.
How to assess ONJ risk before a surgical procedure?	For a better risk assessment of ONJ prior to surgery, it is recommended to take into account several risk factors: factors related to the type of molecule administered, dose, duration of treatment and pathology (benign or malignant); other systemic risk factors (such as age, diabetes, tobacco use); concomitant treatment (corticosteroid, chemotherapy); immunosuppressive treatment; and local factors such as periodontal disease, oral hygiene, prosthesis, those concerned with the anatomical zone (mandible, posterior region of jaws) and bone anatomical features.
Which protocol to minimise the ONJ risk during surgical procedure?	It is recommended to reduce inflammation and local infection by periodontal remedial measures before surgery and daily use of a chlorhexidine mouthwash before surgery and during the days after. The prescription of antibiotics and their initiation and duration will be governed by the presence and type of infection, the disease and mucosal healing. The trauma of the surgical procedure must be minimised.
BPs and risk of ONJ. Is an implant a risk factor?	When there are several surgical needs, in order not to expose the patient to an increased risk of ONJ, it is preferable to proceed by sector and, if possible, wait 2 months before the next surgery. The risk of ONJ is higher during implant placement, and the development of ONJ is faster in patients treated with intravenous BP for malignant disease. The risk of ONJ seems low in patients treated with BP for a benign bone disease, such as osteoporosis, but it cannot be excluded completely. The risk of ONJ can be directly linked to the surgical procedure (and then appears quickly after the implant pose), but ONJ can also develop as a late complication several years after the pose. In patients treated with oral BP, the success rate of implant pose is the same as in patients not receiving BP. Implant pose is not recommended in patients treated with intravenous BP for malignant disease. This pose is possible for osteoporotic patients treated with oral BP after a rigorous risk assessment.
Which treatment and which follow-up? Patients with an implant and candidate for BP treatment	Patients have to be informed about the risk of ONJ with BP. After a complete oral and dental assessment by a dentist, patients need to have a good dental status or receive appropriate dental care before beginning BP. A common approach is now advocated for all patients who are candidates for oral or intravenous BP. It aims to achieve a healthy dental condition. When dental avulsion is a risk factor for ONJ, it is recommended to perform it and then wait for tissue healing before initiating BP treatment.
Which treatment and which follow-up? Patients treated with BP and being candidate for implant	The patient must be informed of the ONJ risk associated with implant placement. This risk is low and can be minimised by good oral and dental follow-up and rigorous oral-hygiene practices. However, it cannot be completely ruled out and cannot be predicted by validated diagnostic methods. It is no longer systematically advocated to stop BP before an implant pose to reduce the risk of ONJ. Any modification or temporary cessation of treatment should be discussed with the prescribing physician to evaluate the benefit/risk ratio. The trauma of any oral or maxillofacial invasive bone involvement should be minimised. Implantation in patients with BP should be carried out with precautions: antibiotic prophylaxis (amoxicillin or clindamycin) the day before surgery and then until complete healing; a non-traumatic procedure (minimal removal of the periosteum); healing of soft- and bone-tissue wounds; and regularisation of sharp bone edges. Prolonged oversight of healing and regular follow-up are necessary to detect early and treat, if necessary, any signs of peri-implant inflammation.

BP, bisphosphonate; ONJ, osteonecrosis of the jaw.

administration of BP, including for rheumatological indications. This questionnaire did not reveal whether practitioners used greater caution when BP was administered intravenously.

Good dental condition was associated with a higher frequency of dental care, except regarding implants. One possible explanation may be that placing implants is difficult regardless of the patient's dental condition. Therefore, few dentists utilise implants, even in patients exhibiting good dental condition. Nearly 70% of dentists in Auvergne are not qualified to perform implant placement. Our results also reveal a decrease in the frequency of surgery in patients being administered BPs, especially in the case of poor dental condition, which is recognised as a local risk factor for ONJ. Nonetheless, this decrease also concerned common dental treatment, such as dental

caries and scaling, which are not associated with a high risk of ONJ, even in cases of poor dental condition. Further investigations, possibly qualitative in nature, are required to explore the reasons for such responses.

The guidelines offer no consensus in terms of maintaining or discontinuing BPs before invasive dental treatment, such as fitting implants or dental avulsion. The 2012 guidelines¹² state that the risk of ONJ appears to be low in patients treated with oral BP for benign bone disorders (*Table 5*). According to the guidelines, it is possible to place implants in patients affected by osteoporosis who are treated with oral BP 'after thorough risk assessment'. No data are available to assess the risk arising from implant fitting in patients receiving i.v. BP for a rheumatological indication. Dental avulsions are a

known risk factor for ONJ, with an incidence of ONJ of approximately 60% following dental avulsion¹⁵. When preventive measures (e.g. antibiotic therapy before and after surgery) were employed in conjunction with the least traumatic surgical protocols possible, a prospective study reported an absence of ONJ in 700 patients receiving oral BP for osteoporosis who underwent tooth avulsion¹⁶. In addition, several surgical protocols have been proposed in the various guidelines published by expert societies^{12,13}. These guidelines are reassuring regarding the low risk of ONJ at the BP doses used to treat osteoporosis. However, dentists remain suspicious, perhaps even too careful, possibly because of insufficient information or insufficient diffusion of these guidelines.

Despite several studies published on this topic^{17–20}, no biological or genetic factor has been identified for predicting ONJ. This study demonstrated no significant difference in terms of complication frequency according to the gender of the dental surgeon, practice structure, location, practice experience or attendance of an ISTC. Attending an ISTC on the topic was associated with a more systematic approach regarding the issue of BP therapy and better informed decision-making in terms of whether a given patient's dental condition is compatible with initiating BP treatment. Attendance of an ISTC program resulted in more in-depth knowledge of guidelines, except in the case of those concerning the reasonable time interval before initiating BP after dental care or performing a dental intervention after discontinuing BP. Therefore, ISTC sessions covering the topic of BPs for rheumatology and a patient's dental condition must be continued, and even further developed, in order to facilitate professional practice and decision-making by dentists in their day-to-day clinical practice.

Some other studies have reported the views of dentists on BP administration. Most of these studies concerned the occurrence of ONJ after BP treatment. Khan *et al.* recalled that this complication is rare and reported a cumulative incidence of 0.001% in Ontario for osteoporosis or metabolic bone disease observations²¹. This side effect is not always recognised by dentists²². De Lima *et al.* found that 58% of Brazilian dentists did not recognise BP-related ONJ (BRONJ) as an oral side effect of BP or point out oral conditions that are not associated with the use of BP²³. Alhussain *et al.* reported the opinions of dentists regarding the treatment of patients receiving BP; 60% of dentists had good knowledge of BRONJ, but most were not comfortable performing oral surgery in patients receiving BP, and 63% would refer patients if they were taking BPs. Only 23% of dentists followed the guidelines for surgical treatment of

a patient taking BPs²⁴. The discrepancy with guidelines reported in the previous study adds to the disagreement between dentists and practitioners. Taguchi *et al.* found that, in Japan, medical professionals and dentists still continue to recommend their own treatment position; 72% of practitioners reported no cooperation with dentists²⁵. This discrepancy has also been reported in Australia²⁶. Common consensus and better cooperation between medical practitioners and dentists are warranted to reduce doubt and reinforce patients' confidence in the prescribed treatment.

Our study has some limitations. Our response rate was 42%, which could be considered as low. However, this response rate is reasonable compared with other studies employing similar methods: 24% in the Savani study²⁷ and 17.5% in the study by Buchbinder²⁸. Response rates range between 20% and 30% on average. We opted for standard mail rather than email to distribute the questionnaires given that response rates are typically reported to be lower via the Internet^{29–31}. Nevertheless, nearly 58% of the dentists we contacted failed to reply. This implies that our study is probably limited by selective bias and that our results could not be generalised. We only analysed the responses of dentists most interested in, or concerned by, the study. It would be worthwhile to repeat this study in other regions of France, both rural and urban, to determine whether they yield similar results or exhibit discrepancies according to the teaching attitudes and cultures of dentistry institutions in different regions. The various limitations of this study restricted its potential and, as previously mentioned, further trial results are required for confirmation.

This study, with a satisfactory participation rate, reveals that dentists in the Auvergne region of France are uncomfortable performing dental surgery on patients undergoing BP therapy. Six orthodontists returned the questionnaire unanswered because the topic is not applicable to their patients. The results of our study could be used to alert orthodontists to the fact that the use of such medications should be checked and could modify their decision to move teeth. Thus, the development of ISTCs on BPs and dental care should be expanded.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the dentists who responded to our questionnaire.

COMPETING INTERESTS

We received no financial or other material support for this study and have no competing interests.

AUTHORS' CONTRIBUTIONS

SM had full access to all study data and assumes responsibility for the integrity of said data as well as the accuracy of the data analysis. Study concept and design: CD, MS, ChD, SM. Acquisition of data: CD. Analysis and interpretation of data: CD, MS, ChD, SM. Drafting of the manuscript: CD, SM. Critical revision of the manuscript in terms of significant editorial content: CD, MS, ChD, SM. Statistical analysis: SM. Administrative, technical, or material support: MS. Study supervision: MS, SM.

REFERENCES

- Crandall CJ, Newberry SJ, Diamant A. Comparative Effectiveness of Pharmacologic Treatments to Prevent Fractures. An Updated Systematic Review. *Ann Intern Med* 2014 161: 711–723.
- Bolland MJ, Cunney T. Paget's disease of bone: clinical review and update. *J Clin Pathol* 2013 66: 924–927.
- Lindahl K, Langdahl B, Ljunggren O *et al.* Treatment of osteogenesis imperfecta in adults. *Eur J Endocrinol* 2014 171: R79–R90.
- Chapurlat R, Gensburger D, Jimenez-Andrade J *et al.* Pathophysiology and medical treatment of pain in fibrous dysplasia of bone. *Orphanet J Rare Dis* 2012 7(Suppl 1): S3.
- Debiais F. Bone targeting agents: bisphosphonates. *Bull Cancer* 2013 100: 1199–1206.
- Silverman SL, Landesberg R. Osteonecrosis of the jaw and the role of bisphosphonates: a critical review. *Am J Med* 2009 122 (2 Suppl): S33–S45.
- Lee JK, Kim KW, Choi JY *et al.* Bisphosphonate-related osteonecrosis of the jaw in Korea: a preliminary report. *J Korean Assoc Oral Maxillofac Surg* 2013 39: 9–13.
- Borromeo GL, Brand C, Clement GJ *et al.* A large case-control study reveals a positive association between bisphosphonate use and delayed dental healing and osteonecrosis of the jaw. *J Bones Miner Res* 2014 29: 1363–1368.
- Serrant PS, Clark S. The characteristics of bisphosphonate patients developing bisphosphonate-related osteonecrosis of the jaw attending an OMFS department. *Dent Update* 2013 40: 740–742.
- Marx RE. Pamidronate (Aredia) and zoledronate (Zometa) induced avascular necrosis of the jaws: a growing epidemic. *J Oral Maxillofac Surg* 2003 61: 1115–1117.
- Hallmer F, Bjornland T, Nicklasson A *et al.* Osteonecrosis of the jaw in patients treated with oral and intravenous bisphosphonates: experience in Sweden. *Oral Surg Oral Med Oral Pathol Oral Radiol* 2014 118: 202–208.
- Société Française de Stomatologie et Chirurgie Maxillo-Faciale. Implantologie et Bisphosphonates. Recommandations de Bonne Pratique Juillet 2012. Available from: <http://www.sfscmfco.fr/> [Accessed on 21 September 2017].
- Société Française de Stomatologie, Chirurgie Maxillo-Faciale et Chirurgie Orale. Ostéonécrose des mâchoires en chirurgie oromaxillofaciale et traitements médicamenteux à risque (antirésorbeurs osseux, antiangiogéniques) Recommandations de Bonne Pratique Juillet 2013. Available from: <http://www.sfscmfco.fr/> [Accessed on 21 September 2017].
- Black DM, Delmas PD, Eastell R *et al.* Once-yearly zoledronic acid for treatment of postmenopausal osteoporosis. *N Engl J Med* 2007 356: 1809–1822.
- O'Ryan FS, Lo JC. Bisphosphonate-related osteonecrosis of the jaw in patients with oral bisphosphonate exposure: clinical course and outcomes. *J Oral Maxillofac Surg* 2012 70: 1844–1853.
- Mozzati M, Arata V, Gallesio G. Tooth extraction in osteoporotic patients taking oral bisphosphonates. *Osteoporos Int* 2013 24: 1707–1712.
- O'Connell JE, Ikeagwani O, Kearns GJ. A role for C-terminal cross-linking telopeptide (CTX) level to predict the development of bisphosphonate-related osteonecrosis of the jaws (BRONJ) following oral surgery? *Ir J Med Sci* 2012 181: 237–242.
- Diz P, Limeres J, Fedele S *et al.* Is oral bisphosphonate-related osteonecrosis of the jaw an endemic condition? *Med Hypotheses* 2012 78: 315–318.
- Baldi D, Izzotti A, Bonica P *et al.* Degenerative periodontal diseases and oral osteonecrosis: the role of gene-environment interactions. *Mutat Res* 2009 667: 118–131.
- Sarasquete ME, González M, San Miguel JF *et al.* Bisphosphonate-related osteonecrosis: genetic and acquired risk factors. *Oral Dis* 2009 15: 382–387.
- Khan AA, Rios LP, Sandor GK *et al.* Bisphosphonate-associated osteonecrosis of the jaw in Ontario: a survey of oral and maxillofacial surgeons. *J Rheumatol* 2011 38: 1396–1402.
- López-Jornet P, Camacho-Alonso F, Molina-Minano F *et al.* Bisphosphonate-associated osteonecrosis of the jaw. Knowledge and attitudes of dentists and dental students: a preliminary study. *J Eval Clin Pract* 2010 16: 878–882.
- de Lima PB, Brasil VL, de Castro JF *et al.* Knowledge and attitudes of Brazilian dental students and dentists regarding bisphosphonate-related osteonecrosis of the jaw. *Support Care Cancer* 2015 23: 3421–3426.
- Alhussain A, Peel S, Dempster L *et al.* Knowledge, practices, and opinions of Ontario dentists when treating patients receiving bisphosphonates. *J Oral Maxillofac Surg* 2015 2015: 1095–1105.
- Taguchi A, Shiraki M, Tsukiyama M *et al.* Impact of osteonecrosis of the jaw on osteoporosis treatment in Japan: results of a questionnaire-based survey by the adequate treatment of osteoporosis (A-TOP) research group. *Calcif Tissue Int* 2015 97: 542–550.
- Raj DV, Abuzar M, Borromeo GL. Bisphosphonates, healthcare professionals and oral health. *Gerodontology* 2016 33: 135–143.
- Savani J, Sabbah W, Sedgley CM *et al.* Current trends in endodontic treatment by general dental practitioners: report of a United States national survey. *Endod* 2014 40: 618–624.
- Buchbinder R, Mp S, Sanahan EM *et al.* General practitioner management of shoulder pain in comparison with rheumatologist expectation of care and best evidence: an Australian national survey. *PLoS ONE* 2013 8: e61243.
- Braithwaite D, Emery J, De Lusignan S *et al.* Using the Internet to conduct surveys of health professionals: a valid alternative? *Fam Pract* 2003 20: 545–51.
- Eysenbach G, Wyatt J. Using the internet for surveys and health research. *J Med Internet* 2002 Res 4: E13.
- Leece P, Bhandari M, Sprague S *et al.* Internet versus mailed questionnaires: a controlled comparison (2). *J Med Internet Res* 2004 6: e39.

Correspondence to:
 Sylvain Mathieu,
 Rheumatology Department,
 Gabriel Montpied Teaching Hospital,
 58 Rue Montalembert, F-63003, Clermont-Ferrand.
 Email: smathieu@chu-clermontferrand.fr