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Original research

Antibiotic prophylaxis for dental treatment after prosthetic joint replacement: exploring the orthopaedic surgeon's opinion

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ABSTRACT

Background: Antibiotic prophylaxis before dental treatment is routinely recommended by orthopaedic surgeons to prevent prosthetic joint infection (PJI). This recommendation is at odds with current guidelines.
Methods: A postal survey of 9 checkbox or short-answer questions was completed by 633 orthopaedic surgeons.
Results: The majority of respondents (n = 186 of 260, 72%) believe that antibiotic prophylaxis is required indefinitely for dental treatment. A small number (n = 43, 15%) seek a dentist's opinion before elective joint replacement. The surgeons reported low numbers of PJIs, although 24% (n = 68 of 280) believed that they were associated with dental treatment.
Conclusions: Australian orthopaedic surgeons continue to recommend antibiotic prophylaxis for dental treatment. The recording of PJI in relation to dental procedures into clinical registries would enable the development of consistent guidelines between professional groups responsible for the care of this patient group.

Introduction

Prosthetic joint infection (PJI) is associated with significant morbidity, functional decline, potential implant failure, and mortality; therefore, measures to prevent its occurrence are important [1,2]. The majority of PJIs occur after intraoperative contamination from airborne pathogens or microorganisms present on the patient's skin. Late PJIs, 1-2 years after surgery, are often due to bacterial seeding via the hematogenous route, from the oropharynx, gastrointestinal, or genitourinary tract [3,4].

Antibiotic prophylaxis before dental treatment is used to prevent late PJI infection that could occur after invasive dental treatment. There are risks associated with antibiotic prophylaxis including the potential for an increase in the number of adverse reactions, including antibiotic sensitivity and anaphylaxis, as well as increasing the prevalence of multidrug-resistant bacterial infections [5-7].

There is limited evidence demonstrating an association between dental treatment and PJI [1]. Case reports and retrospective studies that suggest a relationship between dental treatment and PJI are usually cited as justification for continuing to use antibiotic prophylaxis [8-11]. Current international guidelines do not support the use of antibiotic prophylaxis to prevent PJI [7,12-15]. The Australian Therapeutic Guidelines recommend reducing the risk of infection by comprehensive medical management perioperatively [15]. Despite these recommendations, some dental and orthopaedic surgeons continue to prescribe antibiotic prophylaxis hoping to protect patients from the dire consequences of PJI [16,17].

The aims of this survey were to (1) measure the practice of Australian orthopaedic surgeons on the need for, and use of, antibiotic prophylaxis before dental treatment for patients with

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prosthetic joint replacements, (2) investigate whether orthopaedic surgeons recommend a dental assessment before surgery, and (3) identify how long they recommend patients wait before attending the dentist after their joint replacement.

Material and methods

There were 1210 orthopaedic surgeons registered with the Australian Health Practitioner Regulation Agency (AHPRA) according to the 30th June 2012 annual report [18]. We initially planned to survey the entire orthopaedic surgeon population because of evidence of a poor response rate in similar studies which indicated difficulty encouraging participation [16,17,19]. However, a comprehensive list of surgeon names and addresses was not made available by either AHPRA or the professional association representing orthopaedic surgeons. Without comprehensive mailing lists, it was not possible to survey all surgeons. The study sample was therefore determined by surveying all surgeons in the smaller states and territories—Tasmania, Australian Capital Territory, the Northern Territory—and half the number of surgeons in the larger States—New South Wales, Queensland, South Australia, Victoria, and Western Australia. In total, 633 surgeons were identified, just over half of all orthopaedic surgeons registered in Australia (Table 1).

Internet searches of the Royal Australian College of Surgeons and Health Engine websites were used to gather potential participant names and addresses [20,21]. If letters were returned to sender because of an incorrect address, further online searches of the AHPRA and Yellow Pages websites were conducted to obtain the correct or updated contact details [22,23].

The survey was developed by a multidisciplinary dental and medical team (the authors) and did not include an orthopaedic surgeon. A mixed-mode approach was adopted, with surgeons given the option to access the survey online or complete and return a hard copy. There were 9 short-answer or checkbox questions that complied with the requirements of SurveyMonkey, the free online survey tool used (Table 2) [24]. Based on available literature, the questions assumed that surgeons recommended antibiotic prophylaxis for dental procedures that were likely to induce a bacteremia [2,16].

The hard copy questionnaire consisted of one double-sided A4 sheet of paper. Unique identification numbers were hand written on each survey, and each covering letter was personally signed. The survey was posted to surgeons and a follow-up reminder was mailed 4 weeks later. Data collection occurred between October 2013 and January 2014.

Ethics approval was obtained from the Human Research Ethics Committee (HREC; The Queen Elizabeth Hospital/Lyell McEwin Hospital/Modbury Hospital (TQEH/LMH/MH); HREC reference number: HREC/13/TQEHLMH/55). The study was funded by Aged and Extended Care Services at the Queen Elizabeth Hospital. No external funding was used. Descriptive results are presented; analysis was performed using SPSS, version 21.0 [25].

Table 1
The number of registered orthopaedic surgeons and survey response rate by state and territory, n (%).

State	Registered	Sampled	Returned usable surveys
ACT	25 (2.1)	23 (92.0)	12 (52.2)
NSW	396 (32.7)	202 (51.0)	100 (49.5)
NT	7 (0.6)	4 (5.7)	1 (25.0)
QLD	260 (21.8)	129 (49.8)	64 (49.6)
SA	111 (9.2)	56 (50.5)	30 (53.6)
TAS	21 (1.7)	20 (95.2)	11 (55.0)
VIC	278 (23.0)	138 (49.6)	66 (47.8)
WA	112 (9.3)	61 (54.5)	30 (49.1)
Total	1210 (100.0)	633 (52.3)	314 (49.6)

ACT, Australian Capital Territory; NT, Northern Territory; NSW, New South Wales; QLD, Queensland; SA, South Australia; TAS, Tasmania; VIC, Victoria; WA, Western Australia.

Table 2
The survey questions and response options.

1. Gender
   - ☐ Male
   - ☐ Female
2. How many years have you been practicing as an orthopaedic surgeon?
   Enter number
3. How many prosthetic hip replacements do you perform each year?
   - ☐ 1-10
   - ☐ 11-20
   - ☐ 21-30
   - ☐ 30+
4. What percentage of your patients have developed a prosthetic joint infection (please consider any joint not just hip)?
   - ☐ Early - %
   - ☐ Delayed - %
   - ☐ Late - %
5. Do you refer patients to a dentist prior to an elective prosthetic joint replacement?
   - ☐ No
   - ☐ Yes
6. How long after the joint replacement surgery do you recommend your patients wait before seeking dental treatment?
   - ☐ <3 months
   - ☐ 3-6 months
   - ☐ 6-12 months
   - ☐ >12 months
   - ☐ Other - Describe
7. In your opinion do patients with a prosthetic joint require antibiotic prophylaxis prior to dental treatment?
   - ☐ No
   - ☐ Yes
8. In your opinion, for how long after the joint replacement surgery is antibiotic prophylaxis required for dental treatment?
   - ☐ 3 months
   - ☐ 6 months
   - ☐ 12 months
   - ☐ Indefinitely
9. Do you believe that any PJIs developed by your patients were the result of dental treatment?
   - ☐ No
   - ☐ Yes
     If yes how many - %

Results

Of the 633 surgeons approached, 314 (49.6%) usable surveys were returned and analyzed (Table 1). Sixty-two (9.8%) surgeons advised that they do not perform joint replacements and were excluded from the analysis. One-third (n = 238, 37.6%) did not complete or return the survey or were no longer at the practice address. Of the 314 returned surveys, only 11 (0.04%) surgeons completed the online version.

The majority (n = 297, 96.7%) of respondents were male and had been practicing as orthopaedic surgeons from 1 to 43 years, with 33.9% (n = 105) being in practice between 11 and 20 years. Seventy-two (23.2%) had been in practice <5 years. Two-thirds (n = 190, 67.1%) of the respondents perform >30 joint replacements each year.

Surgeons reported that <2% of their patients experienced a joint infection at any stage after the replacement. One-quarter of the surgeons who responded to this question (n = 68 of 280, 24.3%) believed that PJIs had resulted from dental treatment.

Most respondents (n = 186 of 260, 71.5%) believe that antibiotic prophylaxis is required indefinitely for dental treatment. Some

surgeons commented that this recommendation is dependent on the type of dental procedure required or if the patient currently has dental infection. Recent graduates (n = 61 of 68, 87.1%) with 0-5 years in practice were more likely to recommend antibiotic prophylaxis than surgeons >20 years of experience (n = 44 of 64, 64.7%). Surgeons generally recommend patients wait 3 to 6 months after joint replacement before seeking dental treatment and that antibiotic prophylaxis is required at this time.

Forty-three (14.5%) respondents said that they refer patients to a dentist before elective joint replacement. Twenty-five surgeons (7.8%) added that although they do not routinely refer to a dentist, they do if the patient reports a dental problem before surgery. The decision to refer to a dentist was not influenced by the number of years in practice. Surgeons who had graduated in the past 5 years (n = 60 of 69, 86.9%) were just as likely to seek a dentist's opinion as those who had been practicing for >20 years (n = 54 of 67, 80.6%).

Discussion

The number of hip and knee joint replacements being performed in Australia is increasing with the aging population. In 2014, 95,515 total hip and knee replacements were performed in Australia, and this has increased by 58.6% for hip replacements and 88.3% for knee replacements since 2003 [26]. Infection rates are very low, but an infected prosthetic joint will result in significant morbidity for the patient often requiring revision surgery [1,27,28]. Respondents to this survey reported very low infection rates among their patients but generally considered the outcome of a PJI so dire; all attempts should be made to avoid it.

Consistent with the findings of previous, similar studies, this survey demonstrates that the majority of Australian surgeons still routinely prescribe antibiotic prophylaxis for dental treatment, despite current guidelines indicating they are not beneficial or necessary [16,17]. In a study of Canadian orthopaedic surgeons, 54 of 153 (35%) surveyed reported 85 cases of late hematogenous infection, and they believed that dental treatment was the likely cause and therefore recommend indefinite antibiotic prophylaxis [17]. A study of orthopaedic surgeons working in Nebraska found that 74.5% were likely to prescribe antibiotic prophylaxis before any invasive dental treatment.

There are reports that organisms of oral origin have been identified in a small number of cases (6%-13% of PJIs); thus, it is difficult to prove that a PJI has originated from the oral cavity [29]. There has only been 1 case-control study that examined whether antibiotic prophylaxis for dental procedures reduced the risk of PJI. They found that there was no increased risk of a PJI for patients undergoing high- or low-risk dental procedures whether antibiotic prophylaxis was used or not [1].

Several articles suggest that good oral hygiene is the key to preventing PJI of dental origin and recommend a dental consult before elective joint replacement [8,30,31]. This was not a common practice among the respondents. Yet the utilization of a dentist before the surgery has the potential to negate or minimize the risk of infection from dental origin and establishes an appropriate level of risk for future infection. Referral to a dentist before elective joint replacement surgery, as part of the comprehensive medical management, would seem to be an effective way of reducing the potential for joint infection by oral microflora. The incorporation of a dental consult before joint replacement surgery, as a means of reducing infection, and the need for antibiotic prophylaxis have not been researched. In light of the lack of conclusive evidence for the use of antibiotic prophylaxis, it would be beneficial to incorporate this as a component of future studies.

The response rate of 49.6% in this survey is considered a good result given similar surveys of surgeons have returned 30.9% for an email-only survey [17] and 39.3% for a postal survey [16]. It is reported to be difficult to gain a good response rate from orthopaedic surgeons, with Sprague et al [19] reporting response rates among surgeons as low as 15%. This was made more difficult in our study because of the inability to access a comprehensive database, resulting in sampling surgeons who were retired or deceased, and inaccuracies in available practice postal addresses. A mixed-mode approach, electronic and hard copies, has been shown to be most effective in encouraging surgeons to reply [19]. This survey did not have a good response rate from the electronic survey; however, with access to a complete mailing database, it is advisable to continue to use the mixed-mode approach to encourage a larger response rate. Despite the limitations in data collection, the response rate suggests that this is a topic that orthopaedic surgeons are keen to discuss and engage in further.

There were significant limitations associated with this study that suggest the results should be considered exploratory and not representative of all Australian orthopaedic surgeons. The survey was designed to be short, quick to complete, and comply with constrains of the free version of SurveyMonkey. Therefore, questions were limited to yes and no answers or predefined checkbox answers. This approach has been adopted in other surveys [17], but given the interest, it would have been advantageous to pretest orthopaedic surgeons for their opinion on terminology, the question design, and answer options. By doing this, we would have been more likely to produce more statistically relevant results. A more comprehensive study would also incorporate a survey of dental and general medical practitioners to compare or contrast the recommendations given to patients [16,17].

Surgeons and dentists in the United Kingdom, Canada, Australia, and the United States are following a variety of antibiotic prophylaxis guidelines led by what they believe is in their patients' best interest. This may result from individual surgeons not being aware of or up to date with current literature, suggesting more effort needs to be spent on dissemination of current best practice guidelines.

Conclusions

The lack of conclusive evidence linking PJI with dental treatment is a major barrier to surgeons adopting the guidelines and adjusting their practice. An individual's infection risk is far more immediate to a surgeon than the more distant and nebulous risk of antibiotic resistance. This suggests that surgeons will continue to prescribe antibiotic prophylaxis, which in their minds is avoiding putting their patients at risk of a PJI. Studies that track patients prospectively before and for several years after joint replacement surgery, maintaining records of PJI, proximity of development in relation to dental procedures, and use of antibiotics would be of great assistance to the profession to make decisive recommendations that benefit patients.

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