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Who decides on the need for antibiotic prophylaxis in patients with major arthroplasties requiring dental treatment: is it a joint responsibility?

S S Sandhu FDSRCS[1]
Medical Student

S F Reuben FRCS[3]
Laming Evans Research Fellow

J C Lowry FDSRCS FRCS[2]
Consultant Oral and Maxillofacial Surgeon

M E Morton FDSRCS[2]
Consultant Oral and Maxillofacial Surgeon

[1]Faculty of Medicine, The University of Manchester
[2]Department of Oral and Maxillofacial Surgery, Blackburn Royal Infirmary
[3]Department of Orthopaedics, University of Manchester, Hope Hospital, Salford

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The role of antibiotic prophylaxis in patients with prosthetic joints who require dental treatment is controversial. A Working Party of the British Society for Antimicrobial Chemotherapy (BSAC) recently suggested that there was no evidence to support the use of antibiotic prophylaxis in these patients. The purpose of this study was to determine how closely these recommendations were being followed by maxillofacial surgeons (MFS), and to see if there was any consensus on the management of these patients between MFS and orthopaedic surgeons (OPS).

With the aid of a postal questionnaire, the opinions of 250 consultant MFS and OPS were sought, response rates were 148 (59.2%) and 113 (41.2%), respectively. Of the OPS, 77.7% always recommended the use of antibiotic prophylaxis as opposed to only 29% of MFS. There were also wide differences in opinion with regard to the antibiotic that should be used in these patients, with the majority of OPS suggesting a cephalosporin, although this may not be the most efficacious antibiotic for oral streptococci.

We conclude that this important matter seems to be far from satisfactorily resolved and that further co-operation between the specialties is required to produce guidelines for the safe and effective management of this increasing group of patients.

Correspondence to: Mr S S Sandhu, 21 Arley Avenue, West Didsbury, Manchester M20 2LQ

The use of prophylactic antibiotics to cover patients who have undergone prosthetic joint replacement and who require dental treatment has remained a controversial issue. There have been numerous reports in the literature that seem to suggest that there is a risk of developing late infection in a prosthetic joint owing to the haematogenous seeding of oral organisms after dental treatment *(1–4)*.

Some authorities have argued that the evidence is unconvincing and that a general policy of antibiotic prophylaxis cannot be justified *(5,6)*, a view endorsed by a working party set up by the British Society for Antimicrobial Chemotherapy (BSAC) *(7)*. However, it has also been suggested that not all patients with a prosthetic joint present a similar risk and that in certain groups antibiotic cover is recommended *(4–6)*. These include patients with rheumatoid arthritis, diabetes mellitus and immunosuppression, those on steroids and patients with re-operated hips.

A previous study showed that over 90% of orthopaedic surgeons surveyed in the USA recommended the use of antibiotic cover for patients with prosthetic joints undergoing dental treatment *(8)*.

The purpose of the present study was twofold: first to examine how closely the recommendations of the BSAC were being followed by maxillofacial and orthopaedic surgeons and, second, to assess the degree of agreement between orthopaedic and maxillofacial surgeons on the management of these patients.

Methods

The views of 250 consultant maxillofacial surgeons (MFS) were sought along with a similar number of consultant orthopaedic surgeons (OPS) using a postal questionnaire. All the surgeons questioned were currently practising in the UK.

The surgeons were asked to answer the questions below as 'Always, Sometimes and Never'. They were to assume that the patient was fit and well (unless otherwise stated) and that bacteraemia-producing dental treatment, eg extraction or scaling was required.

1 Would you recommend/use antibiotic prophylaxis in a patient with a prosthetic hip joint who required dental treatment?
2 Would you recommend/use antibiotic prophylaxis in a patient with a prosthetic knee joint who required dental treatment?
3 Would you recommend/use antibiotic prophylaxis in a patient who has already had one failed hip replacement who required dental treatment?
4 Would you recommend/use antibiotic prophylaxis in a patient who has already had one failed knee replacement who required dental treatment?
5 Would you recommend/use antibiotic prophylaxis in the following patients with a prosthetic hip or knee joint who required dental treatment?
   (a) Those on long-term steroid (eg for 6 months) treatment?
   (b) Those who have rheumatoid arthritis?
   (c) Those on immunosuppressive therapy?

In addition, they were asked to state which antibiotic they would recommend/use if the patient was not allergic to penicillin and which antibiotic they would recommend/use if the patient was allergic to penicillin.

The results were then analysed to assess whether there was a significant difference in the management of these patients when compared with the wishes of the orthopaedic surgeons and also to determine the treatment that was actually carried out by the maxillofacial surgeons. The results were also analysed to assess any differences in the antibiotics suggested by the OPS and those actually used by the MFS. Finally, the degree of compliance with the BSAC recommendations, not to provide antibiotic cover, was noted.

Results

The response rate (of suitable replies) to the questionnaires for the MFS and OPS was 148 (59.2%) and 113 (45.2%), respectively. The results are shown in chart form in Figures 1–3.

The responses to question 1 show that 77.7% of OPS always recommended the use of antibiotics as opposed to only 29% of MFS. When a direct comparison of results was carried out using the χ^2 test it was found to be highly significant in all response groups (ie Always, Sometimes and Never), $P < 0.001$.

A similar analysis was carried out with the responses to questions 2, 3, 4, 5a, 5b and 5c, where it was found that there were highly significant differences in the responses of MFS and OPS, $P < 0.001$.

Figure 3 shows the antibiotics that were suggested by MFS and OPS in both non-penicillin allergic and penicillin allergic patients. It can be seen that the vast majority of MFS used amoxycillin (78.8%) in non-allergic patients as opposed to a cephalosporin (49%)

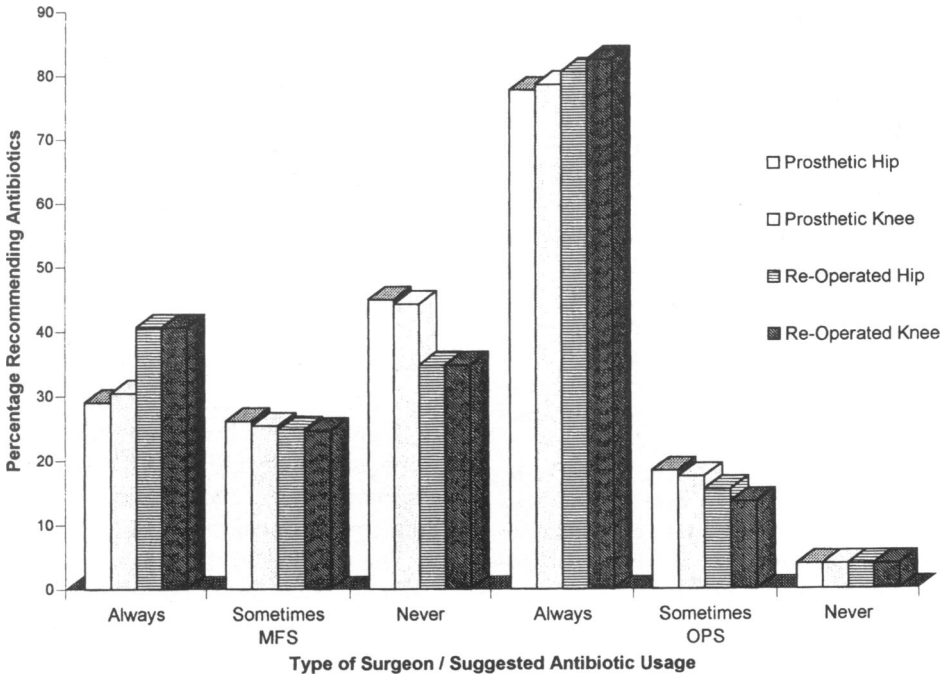

Figure 1. Responses to questions 1–4.

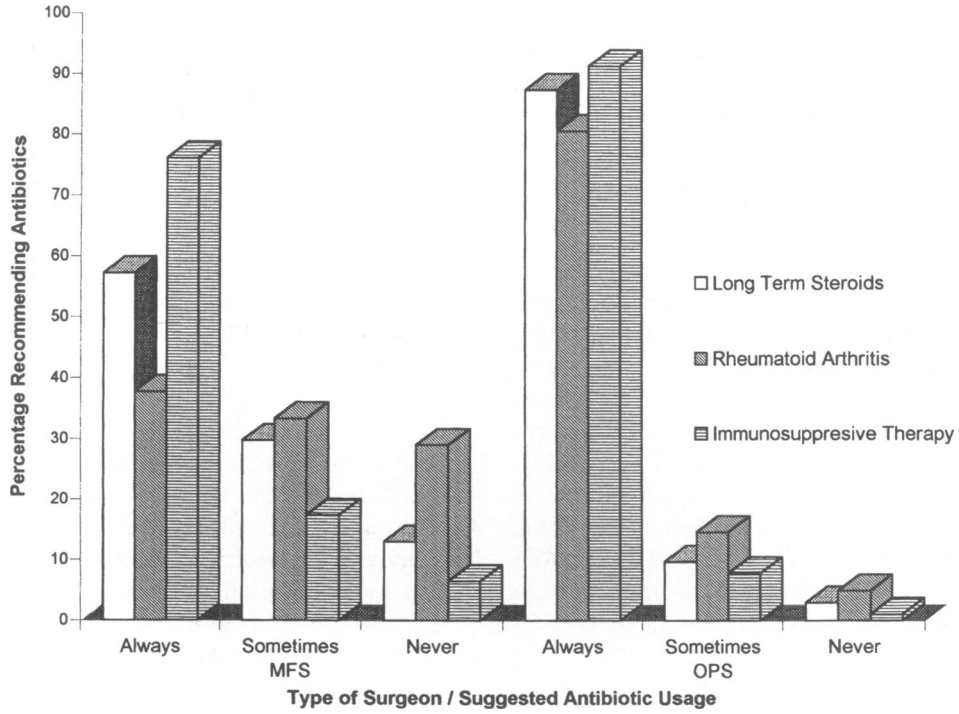

Figure 2. Responses to questions 5a–5c.

which was recommended by the OPS. Although 36% of the OPS recommended penicillin compounds these included many different antibiotics (amoxycillin, 3%; ampicillin, 5; flucloxacillin, 9%; phenoxymethylpenicillin, 10%; co-fluampicil, 7%; not specified, 2%), and as such were all placed in one group, with the exception of amoxycillin. The vast majority of the 'others' block in Fig. 3 were made up of combinations of drugs, eg a cephalosporin and metronidazole.

With regard to the issue of compliance with the guidelines of the BSAC by the MFS and OPS, it can be seen that they were virtually ignored by the OPS with only 3.9% never recommending antibiotic cover for patients with a prosthetic hip. The MFS were more compliant to the guidelines but still less than half (44.9%) followed them by not providing antibiotic cover for patients with hip joint replacement who require dental treatment. This still left significant numbers of MFS who were ignoring the guidelines, with 29% always and 26.1% sometimes providing antibiotic cover. No mention was

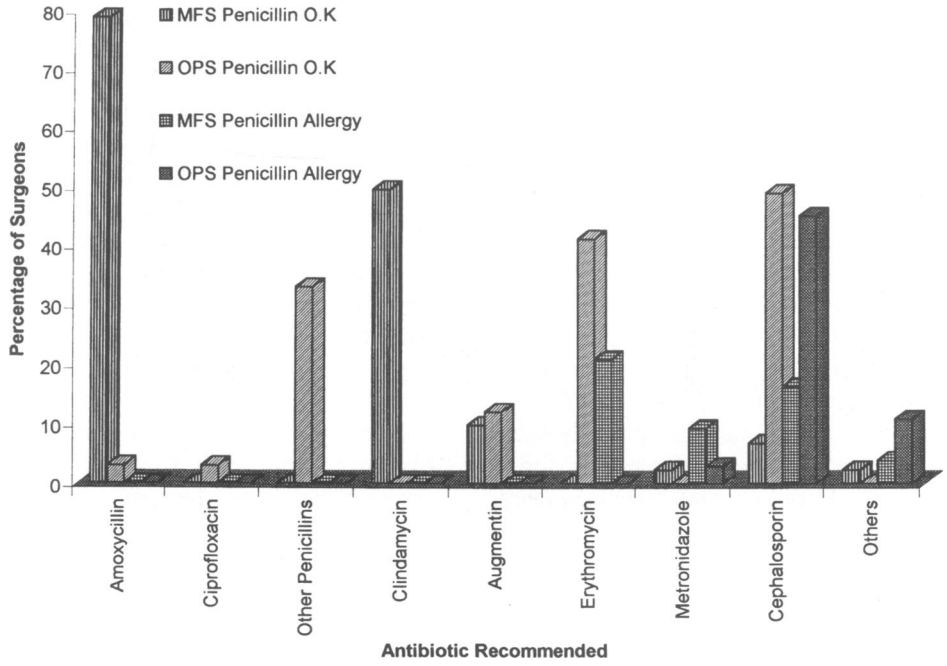

Figure 3. Antibiotics recommended by maxillofacial (MFS) and orthopaedic (OPS) surgeons.

made in the BSAC report on the suggested management of what some regard as other high risk groups (questions 2–5a, 5b, 5c) and therefore compliance rates cannot be ascertained.

Discussion

It can be seen from the results that the management of these patients remains a controversial issue with very little agreement between the OPS and the MFS. Of the OPS, 77.7% always recommending the use of antibiotic prophylaxis in a patient with a prosthetic hip joint, rising to 91.3% in the immunocompromised patient, the equivalent figures for the MFS being 29% and 76.1%, respectively. It is noted that the closest agreement shown between the MFS and the OPS was in the management of immunosuppressed patients, in which 76.1% of MFS used antibiotic cover and 91.3% of OPS recommended its use. However, even in this group of patients the differences were statistically significant, $P < 0.001$.

Even in those patients in which both sets of surgeons feel that antibiotic cover may be desirable, there is little agreement on the choice of antibiotic that should be used. The MFS used amoxycillin in 78.8% of cases, an antibiotic only recommended by 3% of OPS.

There was also a large difference of opinion in the antibiotics that were used/recommended in patients who were allergic to penicillin. Of the MFS, 49.6% used clindamycin, and yet not a single OPS recommended its use. It can be seen from Fig. 3 that a cephalosporin (45.1%) was once again the antibiotic most recommended by OPS. It is also interesting to note that ciprofloxacin was recommended by 3% of OPS for use in non-allergic patients and yet not used by any MFS in this group of patients.

Late infection of a prosthetic joint has previously been classified as one which occurs more than 3 months after its initial placement *(9)*. This can be due to a delayed growth of bacteria that were initially introduced into the operative site at the time of operation or from a distant focus of infection which has gained access to the joint by haematogenous spread *(10,11)*.

The majority of infections are due to staphylococci and streptococci *(1,12,13)*. In the staphylococcal group of organisms the most common isolates are *Staphylococcus epidermidis* and *Staphylococcus aureus (12,13)*. A whole host of streptococcal organisms have been implicated in prosthetic joint infections *(1,5,12,13)* including α-haemolytic streptococci of the viridans group *(4,14)*.

The incidence of late joint infection has recently been quoted as between <0.1% *(15)*, up to 0.6% *(1)*, those attributable to organisms from a dental source ranging from 0.04% *(16)* to 0.07% *(1)*. It has been suggested that even with this small number of cases, some of the methods used in case reports to establish a link between dental treatment and subsequent joint infection may have been flawed *(6)*, so the actual incidence of joint infection secondary to dental treatment may be even less.

The effects of late joint infection, however, are associated with significant morbidity and mortality. The mortality rate has been quoted between 4% and 18% *(4)*, with an estimated figure of 2–13/100 000 associated with dental procedures alone having been mentioned *(4)*.

On the face of it any method of preventing a possibly fatal infection with the use of prophylactic antibiotics would seem justifiable, a view which may explain the large numbers of OPS who recommended the use of prophylactic antibiotics, since they are the surgeons who must deal with the catastrophic consequences of an infected arthroplasty.

This must be compared with the dangers of the antibiotics themselves. It has been suggested that the risk of a fatal anaphylactic reaction to an oral penicillin or cephalosporin is in the region of 1–2/100 000 *(1)*. It can therefore be seen that the risk of death from an infected joint after a dental procedure is similar to that of anaphylaxis associated with prophylactic antibiotic therapy. Again, this fact may explain why most MFS did not provide antibiotic cover; since they are the prescriber of the antibiotics, in the event of a fatal reaction they will have to justify their actions, especially in the light of the BSAC recommendations.

The successful provision of antibiotic prophylaxis in these patients is dependent on the correct antibiotic being given. The bacteraemia produced at the time of dental treatment consists mainly of organisms in the viridans streptococcus group, and it is these organisms which the prophylactic antibiotics are supposed to prevent haematogenously seeding to the prosthetic joint. This study showed that the antibiotic most frequently recommended by OPS was a cephalosporin, as recommended by other authors *(13,17)*, and yet this has previously been shown to be ineffective in preventing haematogenous seeding of streptococcus viridans *(18)*. It would suggest that the OPS are following prophylaxis regimens used routinely at the time of primary surgery, and not taking into account that the risk organisms from dental treatment are different.

The use of antibiotic prophylaxis to prevent infective endocarditis in at-risk patients requiring dental treatment is well established, with oral streptococci being the largest infecting group *(19)*. In these at-risk patients, amoxycillin 3 g 1 h before the procedure is recommended; those patients who are allergic to penicillin receiving 600 mg of clindamycin *(20)*. Since an attempt is being made to eradicate the same transient bacteraemia, it would seem reasonable to adopt a similar antibiotic regimen in this particular group of patients, if thought necessary. It is therefore not surprising that this was the antibiotic protocol used by the majority of MFS.

Many of the MFS respondents added in their answers that they would consult the patient's OPS and follow the advice given. From the results of this study it can be seen that most OPS would recommend the use of antibiotics (77.7% to 91.3%) and they would, on the whole, recommend a cephalosporin (45.1% to 49%). It may be argued that the patient is being exposed to the risks associated with antibiotic therapy without the benefit of receiving adequate prophylaxis, the antibiotic not being the most efficacious against oral streptococci. The

dilemma for the MFS is apparent. Do they give a regimen of antibiotics recommended by the OPS, which they may feel is not the most appropriate or, alternatively, rely on their own judgement and knowledge by prescribing appropriate antibiotics, regardless of the OPS choice?

All the above has to be balanced with the views of the working party of the BSAC which recommended that a patient with a prosthetic joint does not require antibiotic prophylaxis before dental procedures. No mention is made in the report on the management of what others regard as high-risk groups, such as those with re-operated joints, patients with diabetes mellitus, those on immunosuppressive therapy and those patients on steroids.

Finally, we believe the wide differences in opinion between the OPS and MFS in this study are in part due to very little communication between the specialties on this important matter. A previous survey of 125 orthopaedic surgeons showed that 52% recommended the use of antibiotic prophylaxis before dental treatment, but in an equivalent number of general medical practitioners only 3% had received any advice from the local orthopaedic surgeons on the matter *(17)*. The number of dental practitioners receiving advice from the orthopaedic surgeons was not stated but can reasonably be assumed to be even smaller. The passing of relevant medical information to dentists from either the patient's hospital doctor or general practitioner has been shown to be poor *(21)*. Paediatric cardiology patients are, in theory, all issued with a 'yellow card' to inform dentists of the need for antibiotic prophylaxis, and a recent survey showed that 57% of patients had received one *(22)*. This is a long way short of ideal but, nevertheless, a system is in operation which is striving to ensure the patient receives appropriate dental treatment.

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