Dental procedures may lead to a transient bacteraemia lasting for up to 30 minutes. Of the numerous cases of total hip arthroplasty (THA) reported which have been infected from haematogenous sources, dental procedures have been involved only infrequently. We reviewed the records of 2973 patients after THA. Of the late infections identified in 52 patients, three (6%) were strongly associated with a dental procedure. Infection was diagnosed by culture from the affected joint; Streptococcus viridans was identified in two cases and Peptostreptococcus in one. One patient had diabetes mellitus and another rheumatoid arthritis, both conditions predisposing to infection. The dental operations all lasted for more than 45 minutes and no patient received perioperative antibiotics.

Infection of a THA after dental procedures is more common than has been previously suspected. Patients with systemic disease, or who are undergoing extensive procedures, should be considered for prophylactic antibiotic treatment.

Late infection is a devastating complication of total hip arthroplasty (THA) and may require removal of the components, irrigation and debridement, and prolonged antibiotic therapy. Successful revisions can often be accomplished in patients with infected THAs, but reimplantation may be delayed for six weeks to more than one year and the patients are subjected to substantial morbidity in this intervening period. Some infected hips may require resection arthroplasty or, rarely, disarticulation at the hip or arthrodesis.

Blomgren,1 Blomgren and Lindgren,2 and Southwood et al3 have described animal models of late infection around prosthetic joints associated with haematogenous seeding. Organisms in the bloodstream may come from the skin, the gastrointestinal tract, the genitourinary tract, the respiratory tract, surgical wounds, the oral mucosa, or infection in other joints.4-17 Maderazo et al16 in a review of 67 infections developing more than one year after arthroplasty, found that the most common site of origin was the skin and soft tissues (46%), followed by the mouth (15%) and the urinary tract (13%).

Transient bacteraemia after a dental procedure may be a source of infection in total joint arthroplasty.4,6,7,10,12,14,15,17 Routine dental operations can produce transient bacteraemia of two to ten colony-forming units per ml18 for up to 30 minutes.19,20 More extensive oral procedures such as tooth extraction, periodontal scaling, and endodontic surgery may increase the potential for infection.12 The risk of infection is increased in the presence of diabetes mellitus, rheumatoid arthritis, corticosteroid therapy, immunosuppression, haemophilia, or revision operations.21,22

A review of the literature has identified more than 30 cases of late infection in arthroplasties in which bacteria may have originated from the mouth,4,6,7,10,12,14,15,17 although in many there was no direct proof. We describe three patients with deep infection of a THA closely associated with a dental procedure.

Patients and Methods

We have analysed retrospectively the records of all primary THAs carried out by the senior authors (DSH and MAM) between 1982 and 1994. Of 2973 patients, 52 (1.7%) had a deep late infection, defined as being diagnosed more than six months after operation. Infection occurring earlier than this was not included since it may have been related to the primary operation. From the records of these patients we determined age, gender, diagnosis, previous procedures, and associated medical conditions. Factors identified which may have predisposed patients to infection included the use of corticosteroids, rheumatoid arthritis, diabetes mellitus,
and open wounds. Identification of any dental procedures which may have contributed to the infection was by interviews with the patients and examination of their medical records. Other procedures possibly related to the infection, such as endoscopy of the gastrointestinal system or cystoscopy, were also noted.

In the 52 patients with late infected THAs we reviewed the dental records and interviewed the patients to determine whether any antibiotic prophylaxis had been used. Concurrent oral infections or cultures were also noted.

We recorded the time of onset of symptoms in the hip, the interval before seeking medical attention, and the date of hip surgery. The onset of symptoms of infection in the arthroplasty was noted as were the findings on physical examination and the presence of pain and swelling.

The surgical treatment, operative history, the complete blood cell count and ESR, the results of cultures and postoperative care were all assessed and recorded.

Results

Three patients had had a dental procedure within the two weeks before evidence of infection in the hip, with the organism cultured being identified as oral in origin. We found no other source for the infection. The details of the two women and one man are shown in Table I. The times since their primary arthroplasties were 15, 24 and 39 months, respectively. These cases contributed 6% of the 52 late infections identified and 0.1% of the 2973 arthroplasties which had been carried out.

The associated dental episodes were multiple tooth extractions, root-canal operations and a periodontal procedure, lasting 45, 60 and 90 minutes, respectively. The patients did not receive prophylactic antibiotics. Associated risk factors are listed in Table I.

The onset of symptoms in the hip followed the dental procedure by two, five and 11 days, respectively, in the three patients. All complained of pain in the affected hip and one had both pain and swelling. None had a temperature greater than 38°C.

The organisms cultured were 🍹 Streptococcus viridans 🍹 in two cases and 🍹 Peptostreptococcus 🍹 in one. They were sensitive to most tested antibiotics, including penicillin.

Before the onset of pain, all patients were functioning well with Harris hip scores of 88, 97 and 104, respectively. When reviewed at 15, 24 and 39 months after the infection began the corresponding scores had fallen to 45, 52 and 68. Radiographs taken when infection was diagnosed showed no signs of loosening; the leucocyte counts were 4.9, 7.2 and 11.0 10^9/µl and the ESR 32, 68 and 80 mm/hour, respectively. Levels of C-reactive protein were not obtained.

All the patients were treated with a staged reimplantation. Initially, the prostheses were removed and the joints debrided. Cement beads, impregnated with tobramycin were introduced and the wounds closed over two drains which were left in place for two days. Appropriate antibiotics were administered intravenously for six weeks. Further cultures were taken and a revision arthroplasty was carried out only after a negative culture was obtained. Two patients were subsequently followed up at three months, six months and then at yearly intervals.

There was no recurrence of infection at the latest follow-up (Table I). The prostheses remained in situ and the Harris hip scores were 90, 93 and 96, respectively.

Discussion

Many studies have reported small numbers of patients in which joint infections were closely correlated with dental procedures. Many studies have reported small numbers of patients in which joint infections were closely correlated with dental procedures. Bartzokas et al described four arthroplasties infected by Streptococcus sanguis, from the viridans group. Each patient had a history of significant periodontal disease and caries. Waldman et al described nine patients with late infections in total knee arthroplasties after dental procedures. The responsible organisms were all typical of oral flora.

In our patients, none had an active dental infection at the time of their oral procedure. All of the hip infections presented within 12 days of extensive dental work and more than one year after the arthroplasty. Proof of the source of infection would require the organism to be cultured from the mouth, blood, and infected joint simultaneously. This is almost never done in patients without an active dental infection.

The prophylactic use of antibiotics has been the subject of debate. Although the consequences of infection in a joint arthroplasty may be devastating, it is important to recognise that the routine use of antibiotics is associated with problems and does not completely eradicate the risk of infection. In 1991, Jacobson, Schweitzer and Kowalski calculated that routine prophylaxis with penicillin, in one

Table I. Clinical details of the three patients identified as having late infection of total hip arthroplasty associated with dental procedures

<table>
<thead>
<tr>
<th>Case</th>
<th>Gender</th>
<th>Age (yr)</th>
<th>Presentation</th>
<th>Associated risk factors</th>
<th>Organism</th>
<th>Treatment</th>
<th>Follow-up (mth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>F</td>
<td>63</td>
<td>Pain, multiple tooth extraction</td>
<td>Rheumatoid arthritis, Corticosteroid therapy</td>
<td>Streptococcus viridans</td>
<td>Delayed exchange arthroplasty</td>
<td>38</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>72</td>
<td>Pain, multiple root canals</td>
<td>Adult-onset diabetes mellitus</td>
<td>Streptococcus viridans</td>
<td>Delayed exchange arthroplasty</td>
<td>27</td>
</tr>
<tr>
<td>3</td>
<td>F</td>
<td>78</td>
<td>Pain and swelling, periodontal procedure</td>
<td>None</td>
<td>Peptostreptococcus</td>
<td>Delayed exchange arthroplasty</td>
<td>50</td>
</tr>
</tbody>
</table>
millions of hypothetical patients with total joint arthroplasty who were undergoing dental treatment, would result in 400 cases of anaphylaxis. In a review of the English language literature, Deacon et al. identified five reports of late infection of a prosthetic joint associated with a dental procedure despite antibiotic prophylaxis, confirming that infection may still occur in spite of such therapy. Sandhu et al. in a recent editorial, suggested that prophylactic antibiotics should not be given since there was no scientific evidence to support their use. Indiscriminate use of antibiotics contributes to the increasing resistance of many bacteria.

In 1997, an advisory statement was adopted by both the American Academy of Orthopaedic Surgeons and the American Dental Association. A panel of experts decided that antibiotic prophylaxis is not routinely indicated for dental patients with total joint arthroplasties, but should be considered in a small number of patients undergoing procedures with a high incidence of bacteremia. They identified increased risk in those with inflammatory arthropathies (such as rheumatoid arthritis or systemic lupus erythematosus), disease-, drug-, or radiation-induced immunosuppression, insulin-dependent diabetes mellitus, previous prosthetic joint infections, haemophilia or malnourishment, as well as those in the first two years after joint replacement. Wilson, Kelley and Thornhill found that there was an increased rate of infection in patients with diabetes mellitus, recurrent infection of the urinary tract, obesity and those receiving systemic corticosteroids. Garvin and Hanssen suggested that elderly patients, the most common group to have total joint arthroplasty, may also have a compromised immune system. Elderly patients and those with recurrent infections of the urinary tract or obesity are not included in the group recommended for antibiotic prophylaxis by the 1997 advisory statement.

The statement also separated dental procedures into those with a high and low incidence of bacteremia. The former group includes dental extractions, periodontal procedures, placement of dental implants, endodontic instrumentation and root-canal surgery, initial placement of orthodontic bands, intraligamentary injections of local anaesthetic, and prophylactic cleaning of teeth or implants when bleeding is anticipated. Routine dental procedures involving little or no bleeding may not pose a significant risk.

The decision as to whether antibiotic prophylaxis is indicated depends largely on the chance of the prosthesis becoming infected during the dental procedure. Jacobson et al. found that of 30 late prosthetic joint infections (0.04% of the total number of arthroplasties) was associated with a dental procedure, and others have reported an incidence of between 0.04% and 0.05%. We found that 0.1% of THAs carried out, or 6% of all late infections, may become infected because of dental procedures, approximately double the incidence previously described. Waldman et al. found nine infected total knee arthroplasties associated with dental procedures out of 3490 prostheses implanted, an incidence of 0.2%. This increased level may reflect the higher overall level of infection in total knee arthroplasties. It may also be due to a more intensive level of investigation, or to some factor specific to the patient population. Earlier studies used data collected solely from hospital records by researchers who were not orthopaedic surgeons. This may have contributed to an underestimation of the actual number of infections.

Our study found a higher prevalence of infected THAs associated with dental procedures than has been reported in many previous analyses. These findings lend support for the use of antibiotic prophylaxis in patients with systemic or local factors that predispose them to the risk of infection or in those who undergo extensive dental surgery. We do not encourage the use of prophylactic antibiotics in routine dentistry. In patients in whom prophylaxis is indicated, the 1997 advisory statement recommends an empirical regimen which includes cephalaxin, cephradine or amoxicillin orally one hour before the procedure for patients not allergic to penicillin, and clindamycin orally or intravenously for those who are.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References


