IN BRIEF

- 319 cases of infective endocarditis involving patients suing dentists were reviewed
- The legal basis for successful litigation after dental treatment was a short incubation period and an isolation of an oral *Streptococcus*
- No cases of infective endocarditis in this series were associated with restorative dentistry

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CPD PAPER

Infective endocarditis and dentistry: the legal basis for an association

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Objectives The objectives of this study were to determine on what evidence infective endocarditis (IE) could be legally linked to dental treatment.

Method The records of 319 legal cases involving dental treatment as the probable cause of IE were analysed. The medical history, type of dental operation, and whether antibiotic prophylaxis was provided were noted. The time taken for the onset of symptoms (incubation period) and hospitalisation was calculated. The identity of the infecting micro-organism was investigated and it was also noted whether litigation was successful for the patient.

Results A total of 83 patients were successful in legally linking dental treatment to the onset of infective endocarditis. In all successful cases there was a short incubation period (*circa* nine days) and in 80 of the patients an oral *Streptococcus* was isolated. The dental operations included exodontia (28), scaling (29), endodontics (12) and minor oral surgery (11).

Conclusions Dental treatment was deemed to be the probable cause of IE in 26% of patients who sought litigation. In the majority of legal cases clinicians did not follow recognised guidelines or keep adequate clinical notes. The three main factors which link dental procedures legally were the dental operation, the isolation from the blood of an oral micro-organism and a short incubation period.

INTRODUCTION

Infective endocarditis (IE) is a rare, serious and potentially fatal complication following dental treatment.¹ The treatment for IE is prolonged antibiotic therapy and often surgical intervention, such as valve replacement, is required.² One other

complication of IE for dentists is legal redress by the patient, or their relatives. The legal basis for linking IE to a dental operation is often not clear. A previous review of 53 cases of IE involving litigation provided evidence for certain dental procedures being linked with the disease.³ The aim of this paper was to examine a larger series of legal cases to determine what dental procedures have been legally linked to IE and why the association was made.

MATERIALS AND METHODS

The records of 319 dental patients who had contracted IE following dental procedures were examined. These patients had all made legal claims against dentists. The records were obtained from either insurance company records, or had been submitted to one of the authors (MVM) for an expert opinion. The patients had all been diagnosed with IE during the period 1983–2005 and litigation had commenced within this time. The patients were from Australia, UK, Ireland, Hong Kong, France and Germany.

Data collection

The dental records made by the dentists were examined for the data listed in Table 1. A full medical history was adjudged to have been taken when there was clear evidence of a proforma history sheet or full notes in the records. Partial recording of a medical history was when there was evidence of the medical history being recorded but no proforma. A case was considered to be successful if it was settled in the patient's favour prior to being tried, or after court proceedings. The data for the cases that were legally successful were compared to those that were unsuccessful to determine any associations.

RESULTS

A total of 319 patient's records were included in the survey, 156 males and 163 females (mean age 57.8 yr; range 27.2–89.7 yr). A total of 83 cases were successful with their legal claims and 236 unsuccessful. A summary of the successful and unsuccessful cases is shown in Tables 1 and 2.

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Table 1 The data collected from the dental records of the patients with IE

Age, gender
Whether a full, partially complete or no medical history was taken by the dentist
Type of predisposing medical condition
Whether antibiotic prophylaxis was given
Dental operation
Time elapsed from dental operation to appearance of symptoms (incubation period)
Symptoms during incubation period
Bacterium isolated from blood stream
Time from dental treatment to hospitalisation
Whether treatment of IE was successful
Whether patient was successful with legal claims

Table 2 A summary of the 83 cases which were legally successful

Data collected	Outcome of litigation	
	Successful	Unsuccessful
Medical history		
Incomplete	81	212
Partially completed	2	24
Type of predisposing medical condition		
Coarctation of the aorta	54	114
Mitral incompetence and regurgitation	16	101
History of a murmur	11	16
History of rheumatic fever	1	4
Previous infective endocarditis	1	1
Antimicrobial prophylaxis		
Not given	69	190
Non-recommended antibiotics given	14	46
Dental operation		
Exodontia	28	128
Scaling	29	79
Endodontics	12	22
Minor oral surgery	11	5
Crown and bridge work	0	2
Incubation period (time elapsed from dental operation to onset of symptoms)	Mean 9 days (range 2–22 days)	Mean 89 days (range 48–193 days)
Signs and symptoms		
Fever	69	178
Lassitude, weakness	55	101
Night sweats	35	81
Headaches	32	30
Dyspnoea	22	78
Aching joints	14	22
Weight loss	11	41
Nausea/vomiting	10	32
Time taken from dental operation to hospitalisation	Mean 19 days (range 14–27 days)	Mean 117 days (range 44 to 221 days)
Outcome of hospital treatment		
Patients discharged	78	211
Deaths	3	0
Bacteria isolated from blood stream		
No isolation	3	137
<i>Streptococcus sanguis</i>	70	0
<i>S. gordonii</i>	4	0
<i>S. oralis</i>	2	0
<i>S. mutans</i>	4	0
Staphylococci	0	77
<i>Candida</i> spp	0	22

DISCUSSION

The collection of data on IE is difficult, as there are no central national statistics collected about the disease. Information that can be used to determine what connection (if any) there is between dentistry and IE is difficult to find, as publications are limited to case reports and prospective or retrospective surveys.^{4,5} The series of cases reported in this paper is therefore limited and cannot be a complete record of all persons contracting the disease, as it is probable that not all patients or their relatives chose to sue dentists after contracting IE.

Linking IE to dentistry is also difficult as there are no clearly defined parameters on which to make a legal judgement. It must be remembered that in civil litigation the 'balance of probabilities' must be established for a case to be successful.⁶ This is not as rigorous as scientific proof, where the data has to be more exacting.⁷

In a previous report of cases of litigation involving IE, it was suggested that three factors could be used to make an association between the infection and dentistry.³ These three factors were the type of dental procedure, culture and isolation of an oral *Streptococcus* from blood, and a short 'incubation' period before the onset of the patient's symptoms. In the 83 cases reported which were legally successful, all had a short incubation period, and in all but three cases an oral *Streptococcus* was isolated from blood.

The incubation period of streptococcal IE is known to be short; in this study it was between two and 21 days (mean nine days) before symptoms were noticed. This is similar to the report of Starkebaum *et al.*, who suggested in a review of 76 cases of IE that the mean incubation period was seven days.⁸ In this series of cases, streptococcal IE following dental treatment was not an indolent disease and had a short incubation period. The time for the patients to be hospitalised was also rapid and occurred between 14 and 27 days. In contrast, those cases which were not thought to be associated with dentistry had a much longer time for the onset of symptoms and hospitalisation.

The pre-existing cardiac condition which predisposed the patient to IE in the successful cases was limited to only five conditions, although a large number of cardiac conditions are thought to predispose a patient to IE. By far the most numerous of these pre-existing conditions were coarctation of the aorta and mitral incompetence and regurgitation.

The isolation of an oral *Streptococcus* from blood cultures is diagnostic of IE. In all but three cases of the legally successful group, an oral *Streptococcus* was isolated. The majority of the bacteria isolated were identified as *S. sanguis*, but care must be exercised with this data. The identification schemes for oral streptococci were refined and delineated in the 1990s and therefore some of the isolations before this period probably would not now be identified as *S. sanguis*.⁹ It is interesting that three cases were found legally to be associated with dentistry without the isolation of an oral *Streptococcus*; all three cases went to court.

The dental operations associated with legally successful cases of IE were exodontia, scaling, endodontics and minor oral surgery. All of these operations have been known to be associated with a risk of IE in patients predisposed to cardiac infection.¹⁰ There were only two cases putatively associated with restorative dentistry, despite restorative procedures

probably being the most common dental intervention in the countries included in this study. The lack of an association between restorative dentistry and IE provides some evidence to support the notion that antimicrobial prophylaxis is not required for these procedures.¹¹

In all of the cases reported in this paper there was a clear failure to report and record a complete medical history. The taking of a thorough medical history is important for the well-being of the patient and also for the prevention of litigation. Whilst it is acknowledged that a comprehensive medical history can be taken without the use of a proforma, the presence of a dated and completed questionnaire provides objective evidence of good clinical practice. There was also a failure in all cases to give recommended antibiotic prophylaxis pre-operatively. This is despite well-published national and other guidelines and recommendations for antibiotic prophylaxis.¹²

The finding of a common link between legally successful cases of infective endocarditis and dentistry does not establish a scientific link. There are opinions that the link between IE and dentistry is circumstantial and improbable.⁴ The British Society for Antimicrobial Chemotherapy (BSAC) recently reviewed this issue and considered recommending that antimicrobial prophylaxis should not be given for any dental procedures; this was based on a risk assessment of currently available data.¹³

The dental patient or their family (the claimant) uses the civil law of negligence primarily to seek compensation. This is a legal mechanism by which a dentist (the defendant) may be held accountable for their actions or omissions. It is also useful in maintaining or improving clinical standards. The claimant has a number of hurdles to cross in order to have a successful claim:

1. **The defendant owed the claimant a duty of care.** All of the patients in this series will have passed this particular test as they had been accepted for a course of dental treatment by their dentist.
2. **The defendant breached that duty.** Again, all patients in this series will have passed this test. All cases, including those that were not legally successful, demonstrate a poor standard of clinical care. Medical histories were not present or were incomplete and clinicians did not adhere to well-established prescribing guidelines for managing these patients. The role of guidelines in clinical negligence cases will be considered later.
3. **The breach of duty led to the harm which the patient suffered.** This is known as causation and is the legal concept by which the clinician is held responsible for acts or omissions. It is this hurdle that separates the successful from the unsuccessful cases. The factors linking IE to dental treatment will be used to establish causation. The difference between success and failure in this series of cases clearly turns on the timing of the onset of symptoms.

The standard of care that a clinician owes a patient was established in the case of *Bolam v Friern Hospital Management*

Committee (1957). The main tenet of this decision was that:

*'A doctor is not guilty of negligence if he has acted in accordance with a practice accepted as proper by a responsible body of medical men skilled in that particular art.'*¹⁴

A patient's clinical record should contain a medical history, usually as a proforma and this should be regularly updated. This would certainly be considered to be proper practice as per *Bolam*.

The Working Party of the BSAC would be considered to be a responsible body and their clinical guidelines on the management of dental patients susceptible to IE would carry great weight legally.¹³ A dentist would have to have a robust argument for not following such well-established guidance.

Clinical guidelines, which are evidence based, will always face challenges from competing opinions. Guidelines on the use of antibiotics to prevent infective endocarditis are no exception, as demonstrated by the letters in the correspondence pages of the *British Dental Journal*.¹⁵⁻¹⁸

In the United Kingdom, the *Bolam* test has not been superseded and clinical care that adheres to authoritative guidelines will be defensible under the *Bolam* principle. Guidelines do not actually set legal standards for clinical care, but they provide the court with a benchmark by which to judge clinical conduct.¹⁹

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