

Infective endocarditis

The first descriptions of infective endocarditis (IE) date back to the mid-16th century. However, it was only after a series of lectures given by William Osler to the Royal College of Physicians in 1885 that the first systematic studies were undertaken.

It was noted that the presentation of IE could vary widely but there were several characteristics that were fundamental. These were, persistent bacteraemia with an appropriate infectious microorganism, predisposing factors (such as heart valve disease), active endomyocardial involvement, and vascular phenomena.

The diagnosis of IE has evolved significantly over the years particularly with the development of cardiac echo technology, improvement in blood culture systems and serology. These have been incorporated into the development of several diagnostic criteria with the Modified Duke Criteria being the most widely used. The underlying principles, however, remain the same.

Up until the 1960's, most patients had abnormal heart valves following an episode of rheumatic fever and the most common infecting organism were oral streptococci seen in 60-80% of all cases.

Since then, however, medical and demographic changes have led to the evolution of a quite different picture of endocarditis. These include; increasing rates of intravenous drug use, increased use of invasive procedures in chronically ill patients (e.g. surgical procedures, central intravenous catheters, haemodialysis), control of rheumatic fever (at least in the Western world), an ageing population (and hence increased rates of degenerative valve disease), and higher rates of nosocomial bacteraemia.

This has been confirmed by a number of epidemiological studies have been undertaken worldwide the largest of which is

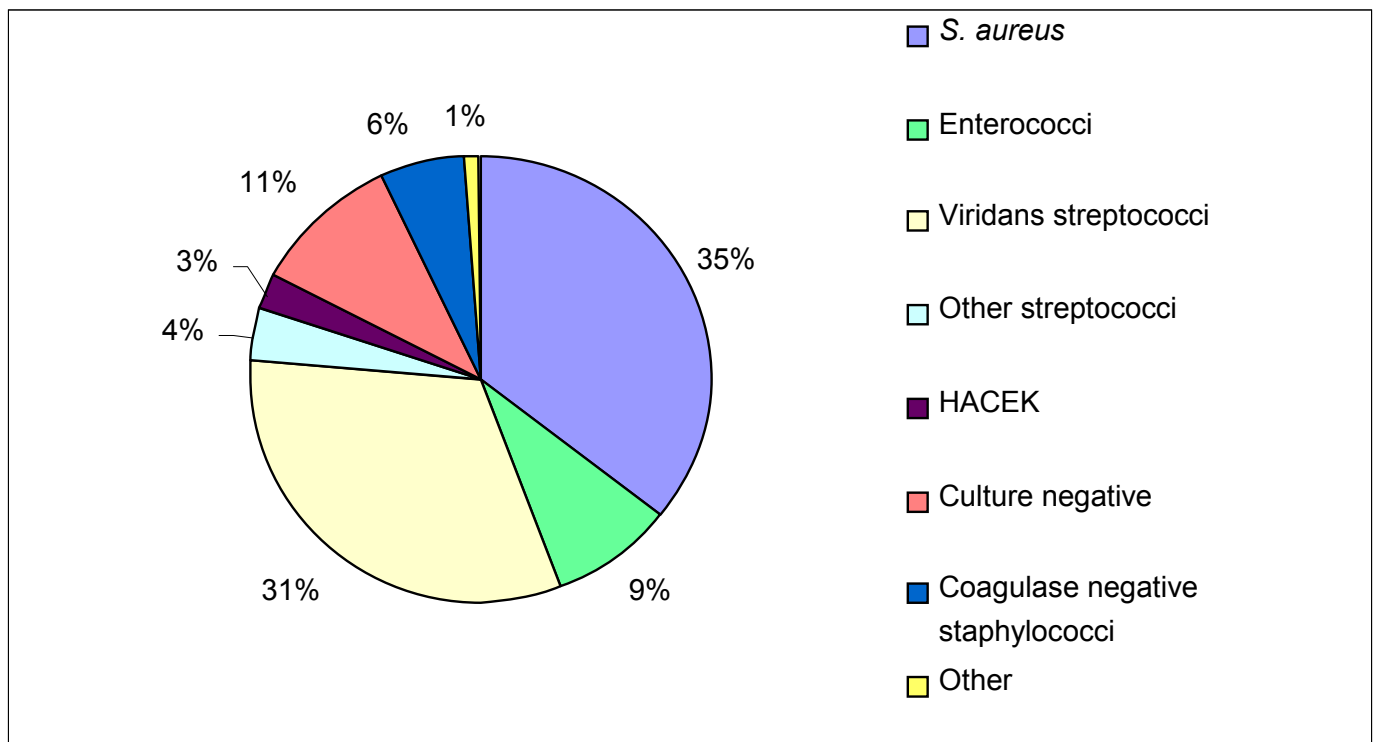


Figure 1: Organisms causing IE in Canterbury 1999-2007

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the International Collaboration for Endocarditis Prospective Cohort Study which has prospectively collected data on nearly 3000 patients worldwide and of which Christchurch has been a part of. These have documented a shift away from oral streptococci and more cases due to *Staphylococcus aureus*, coagulase-negative staphylococci, enterococci, and *Streptococcus bovis*.

The diagnosis of IE has also evolved over the last 30 years with the development of cardiac echo technology which allows much better visualisation of the heart and its valves and improvement in blood culturing systems which have seen an increasing recognition of difficult to culture organisms as a cause of IE such as HACEK group organisms.

IE in Canterbury

We recently undertook a retrospective audit of IE in adults in Canterbury over the period 1999-2007. Overall, the incidence was found to be 6.1/100,000 population/year which means we are seeing approximately 2 cases/month and a rate similar to that seen overseas. This rate climbs steeply with age. In the 20-29 year old age group the incidence is 2.5/100,000 population/year but is 10x greater for those aged 80+. Like other Western countries, *S. aureus* has become the most frequent case of IE

accounting for 35% of cases and viridans streptococci 31%. Unlike other centres but typical of our local epidemiology, the *S. aureus* was relatively sensitive. There were no cases due to MRSA and 20% were penicillin susceptible. Males account for 60% of cases overall but only 20% of cases in intravenous drug users (IVDU). Only 15% of the cases were health-care associated.

IE still remains a disease of high morbidity and mortality. The IE was complicated by stroke in 18% of patients, 20% developed new or worsening heart failure and cardiac surgery was needed by 14%. In addition, 14% of patients died in hospital.

Antibiotic treatment of IE

With the exception of uncomplicated, right sided endocarditis IE treatment requires a number of weeks of intravenous antibiotic therapy. From 2 weeks with uncomplicated IE due to viridans streptococci and up to 12 weeks of treatment for resistant enterococci. If cardiac surgery is needed these can be even longer. Multiple trials have shown treatment failure when shorter course are used. One of the reasons for the prolonged treatment requirement is the difficulty of getting antibiotic penetration into vegetations. Studies have shown there can be as much as a 200-fold

concentration gradient of antibiotic from the outside to the inside of vegetations. As the majority of serious complications are seen in the 1st and 2nd weeks of treatment, home intravenous treatment has been a great help in getting otherwise stable patients home to complete their treatment who would otherwise be stuck in hospital. In Christchurch, we are able to get around half of all patients with IE home to complete their intravenous treatment. The main reasons patients are not able to be discharged to home IV therapy are, intravenous drug use (given the potential for abuse of lines and because they often have uncomplicated right sided IE which can be treated orally), the need for ongoing rehabilitation at PMH and inpatient death. Our experience has been that it is safe and effective although no clinical trial has directly compared inpatient and outpatient treatment in a randomised manner.

Conclusion

IE is still a relatively rare disease. Despite changes in the epidemiology and evolution in the treatment of IE over the last 30 years, it is still a disease capable of causing significant mortality and morbidity. Given the ageing of the population and ongoing increase in the use of medical interventions, it seems likely that the incidence of IE can only increase.