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ENTEROCOCCUS FAECALIS: PIONEERS OF ROOT CANAL INFECTION

Dental Science

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ABSTRACT

Enterococcus faecalis which is a part of intestinal normal flora is an important bacterium which is responsible for failure of root canal treatment cases. The bacterium is equipped with number of virulence factors. It has also been recognised as a leading cause of nosocomial infections which are difficult to treat because of its increased resistance towards wide variety of antimicrobial agents.

KEYWORDS

Enterococcus faecalis, root canal treatment, intracanal medicaments

Enterococcus faecalis is a gram-positive cocci typically found in short chains or pairs. It may be found in soil, plants and water. It has been found to be associated with both community and hospital a cquired infections.[1] It is a commensal bacterium inhabiting the gastrointestinal tract of healthy individuals. When immunity is weakened bacteria can enter wound, blood and urine. The indwelling devices like intravascular and urinary catheters also harbour this organism. The strains of *E. Faecalis* isolated from hospitals are mostly antibiotic resistant.[2] The bacteria has also been recovered from plaque, saliva and other sites of oral cavity. [3] The main focus of the contemporary studies on root canal infections had always been the anaerobes, because they outnumber rest of the bacterial population. [4] However anaerobes predominates among the polymicrobial flora responsible for the primary endodontic infections but the secondary endodontic infection etiology comprise of few bacterial species.[5] Among the bacteria persisting endodontic treatment *E. Faecalis* has been frequently encountered.[6] This has been supported by various studies as the bacteria is resistant to various intracanal medicaments and other treatment procedures.[7] Effective eradication of bacteria in the canal system before obturation increases the probability of a favourable outcome with root canal treatment significantly. There are number of factors which contribute towards root canal failure and re-infection. The important factors identified as the cause of treatment failure are procedural errors and the microorganisms persisting in the root canal system or periradicular area. However treatment failure has been reported in cases where all the standards of procedures has been followed, which indicate the role of microorganisms persisting during the procedures in the treatment failure of the well treated tooth.[8] The failure of endodontic infection treatment has been linked to the presence of *E. faecalis*.[9]

The study of the pathogenicity of *E. faecalis* is complicated and yet to be clarified. Moreover it is not regarded as virulent as other gram-positive bacteria such as *Staphylococcus aureus*, *Streptococcus pneumonia*e and *Streptococcus pyogenes*.[10] The predominant virulence features of *E. faecalis* are cytolysin and proteolytic enzymes, adhesins, collagen-adhesion proteins (*Ace*), enterococcal surface protein (*Esp*) and capsular and cell wall polysaccharide.[11] Additionally this bacteria is resistant to penicillins and ampicillins[2] and have low susceptibility for clindamycin and metronidazole. Beside antibiotics it also resists bile salts, heavy metals, desiccation, azide, ethanol, detergents etc.[12] It can survive in ultra harsh environmental conditions like increased salt concentration, increased pH and low nutrient level. Its growth is favoured over wide range of temperature that is 10-45 ^{0}C and it can also withstand heating at 60^{0}C for 30 min.[13] It also have remarkable ability to strategically acquire further resistance mechanism towards antibiotic in use during the course of treatment. Moreover it is also possible to relate its virulence factors like gelatinase production to biofilm forming capability. This in turn favours the disease sustenance by restricting the penetration of antimicrobials to reach the effective concentration at the target site. Additionally the root canal causes selection from a multispecies community towards biofilm comprised of one or a few species often including *E. faecalis*. In such communities the bacteria often exist in close proximity to each other which facilitates variety of bacterial interactions.[13] The recognition of *E. faecalis* as a potential pathogen armed with wide variety of virulence factors indicate the need of microbiological diagnosis of root canal infection, effective elimination of such nasty bacterium from the root canal and assurance that bacteria do not re-enter the root canal spaces from other sites in oral cavity. Though PCR is highly sensitive method of bacterial DNA detection, but bacterial DNA can be detected even long after cell death so real time PCR is better alternative of detection of *E. faecalis* in root canal. By employing proper aseptic treatment procedures, increasing the apical preparation size and using combinations of irrigants and inracanal medications can be helpful in eliminating *E. faecalis*. Various studies have shown that silver nano-particles used for disinfection provide with a higher surface area and a positive charge density which enhance their antibacterial activity.[14] Few other newer techniques like high power lasers[15] and photodynamic therapy[16] are beneficial in eliminating *E. faecalis* if used in conjunction with the irrigants and inracanal medicaments. However further studies are required to clarify the role of *E. faecalis* and its virulence factors in the pathogenesis of endodontal infections.

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