Endodontic Treatment in The Hiv Positive Patient

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Abstract

Ever since the first clinical appearance of AIDS in 1981, there has also been an unusual increase in the accumulation of rare and fatal illnesses due to the immunosuppression of such patients. During the first decade of the HIV epidemic HIV and AIDS were discussed as a disease with a fulminant course that is capable of leading to rapid death. Earlier, infected individuals were at a much higher risk of getting opportunistic infections than healthy patients. Due to the advent of Highly Active Anti-Retroviral Therapy (HAART), HIV has gradually become a chronic immunodeficiency disease. Medical advances to tackle this disease is constantly aimed at improving the immune status of infected patients which enhances their quality of life and lifespan. Information regarding the pathology and clinical progress of apical periodontitis and prognosis of endodontic treatment in these patients is limited. Results of clinical studies suggest that endodontic treatment in HIV infected patients have a poorer prognosis due to the compromised immune system. Non-surgical endodontic treatment should be routine for these patients and must be done on an out-patient basis with strict infection control measures and it is important that a dentist should not ethically refuse treatment for these individuals due to their HIV status.

1. Introduction

In the year 1983, Human Immunodeficiency (HIV) was responsible for a world-wide pandemic since its first clinical appearance in 1981. It was described by Gottlieb as an unusual collection of rare and fatal running illness of previously healthy young homosexual men in USA. All the patients were severely immunocompromised with infections such as Pneumocystis jiroveci and Kaposi's sarcoma. At early stages, acquired immunodeficiency disease was the most probable cause. In the year 1983, a French group led by Luc Montagnier established that the lymphadenopathy virus (LAV) was the culprit behind AIDS. Since 1985, there was a test for the detection of this LAV virus which then came to be known as HIV. Today, there are two different types of this virus, HIV I and HIV II with multiple subtypes which exist depending on the regional locality. 1, 2

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Highly Active Anti-Retroviral Therapy

HIV/AIDS was initially characterized by a rapidly progressive immunodeficiency course which leads to death. It has now changed its evolutionary pattern into a chronic one due to the advent of a new therapeutic regimen. This therapeutic regimen, known as highly active antiretroviral therapy (HAART), comprises of a combination of at least three antiviral medications with two or more classes of drugs. Several such combinations are available in clinical practice today. HAART is defined as the presence of one or more nucleoside reverse transcriptase inhibitors (NRTIs) which as combined with a protease inhibitor (PI) and supplemented with a drug from another class. 3

Such protocols have reported to decrease the overall viral load which has ultimately resulted in the reduction in morbidity and mortality related to AIDS. Moreover, since the introduction of HAART, there has also been a significant decrease in the opportunistic infections that are related to HIV-infected patients.Oral manifestations of AIDS such as oral candidiasis, hairy leucoplakia, Kaposi's sarcoma, herpes simplex labialis and periodontal diseases became less prevalent in individuals undergoing HAART.4

Endodontic Treatment Of Apical Periodontits

The primary objective of nonsurgical endodontics is to prevent or eliminate apical periodontitis completely. The prevention of these periradicular diseases is achieved through extirpation and complete debridement of irreversibly inflamed, vital pulp tissue followed by obturation of the root canal system. Another goal of endodontic treatment is to achieve a significant reduction of the microbial content within the canals as it is a known fact that bacteria and their by-products are responsible for causing and maintaining periradicular pathoses. 5-7

Complete elimination of bacteria is desirable in all the cases and especially those which are accompanied by a lesion but it has been observed that even thorough biomechanical preparation is not enough to achieve complete sterilization of the root canal systems. Teeth with necrosis of the pulp and a periradicular lesion have shown bacteria to be present on both the external surfaces of the roots as well as the periradicular environment. 8-13

Completely eliminating all the bacteria both intra and extraradicularly through nonsurgical endodontic treatment may still remain an impossible challenge but the clinician should at least try to reduce the critical mass of the microbes and attempt to entomb those which are remaining in the root canal system with a fluid tight obturation followed up with a permanent coronal restoration thereby depriving the microbes of the nutrition and space needed to multiply. 14,15

Persistence of such bacteria as a result of inefficient cleaning in such teeth with apical periodontitis after primary endodontic treatment results in poorer prognosis of these cases. Literature has shown that success rates are 10-20% lower in cases whichare accompanied by periapical lesions in addition to pulpal necrosis. Ultimately, the main goal for these necrotic teeth is to minimize the intra and extraradicular microbes beyond a critical level which would allow for proper host immunological defence mechanisms to resolve the remaining infection and make complete healing of such lesions, a possibility. 16-18

Apical Periodontits in The Immunocompromised Patient

Complications arise in these cases when we use the same kind of treatment philosophies that we use for healthy patients in immunocompromised individuals. Studies have shown that patients with diabetes had a significantly lower long-term success rate after endodontic treatment as compared to healthy patients. Alteration in immune functions as well as the propensity of diabetic patients to harbour more pathogenic flora are factors which contributed to the poorer prognosis of such patients. Though HIV is not as prevalent as diabetes, it may be equally detrimental to the endodontic prognosis in such patients. 19,20

About one million people are living in Northern America with HIV/AIDS which makes it a considerable source of morbidity and economic expenses throughout the region. Patients with HIV are at risk of developing a lot of opportunistic infections but HAART has had a significant effect in the reduction of such infections. However, such infections are observed at very low CD4+ T lymphocyte counts which clearly indicates that there is a great degree of reconstitution of the immune responses which are associated with HAART. 21,22

Cooper in the year 1993 conducted a retrospective study where he assessed the short-term (3-month post-treatment) success rates of endodontic treatment on HIV positive and HIV negative patients. The study primarily focused on complications following the treatment. They defined success as lack of clinical signs and symptoms from the periapical disease at 1- and 3-month follow-up visits. There were no significant differences observed in both the groups in terms of complications observed and short-term success rates. Only one HIV positive patient had problems following endodontic treatment which demanded further therapeutic interventions. It was concluded that root canal therapy could be carried out in patients with HIV following standard procedures without using antibiotic prophylaxis. It has to be kept in mind that this study was conducted before the advent of HAART and utilized very short follow-up periods. The main takeaway from this study is that HIV patients did not experience any unusual immediate postoperative pain compared to healthy patients. 23

Immunocompromised patients, particularly those with HIV are bound to have a poorer prognosis for

endodontic treatment of teeth in the presence of periapical lesions. T-cells play an extremely vital role in the development, progression and resolution of these periradiuclar lesions. Research has proven that in healthy patients, CD4+ T-cells, the primary target of HIV are more predominant in the earlier stages of development of these periradicular lesions whereas CD8+T-cells which are relatively unaffected by HIV are much more prominent in the chronic phase of the lesion as the CD4+T-cells decrease in number. 24-29
There is one case report which uses extracted teeth with chronic apical periodontitis on a patient with AIDS. Histological analysis showed that the periradicular lesion was devoid of CD4+T-cells and had an overabundance of CD8+ T-cells. It was reasoned that this relative lack of helper T-cells is an important reason for such poor defence exhibited by patients against microbes.Additionally, this also contributes towards delayed healing of apical periodontitis which is observed after the primary endodontic treatment. Since CD4+ T-cells play an important role in activating B-cells, macrophages and other T-cells, patients with low counts of these cells often have difficulty in mounting appropriate immunological defences against microbes which invade the root apex in the zone of infection. 30

Cellular Activity of The Hiv Patient

HAART leads to an improvement in the quality of life of HIV affected individuals followed by restoration and preservation of immunological functions. Untreated HIV infection shows persistently high levels of proinflammatory cytokines like IL-1, IL-6 and TNF-alpha. Moreover, coagulation biomarkers and acute phase proteins like fibrinogen, D-dimer and high sensitivity C-reactive proteins are also seen. 31-33
Such markers of inflammation are markedly reduced with effective anti-retroviral treatment which is suggestive of the fact that active HIV replication is the culprit behind such inflammatory responses. A few of these markers have shown to remain elevated despite the active suppression of HIV through antiretroviral treatment. The persistence of HIV may be due to various reasons such as the presence of other pathogens like cytomegalovirus and/or translocation of gut-associated bacteria which release lipopolysaccharide (LPS) as a result of the damage which occurs at the gastro-intestinal lymphoid tissues and the intestinal lining.34-36

Outcome Of Endodontic Treatment on The Hiv Patient

Chronic periodontitis along with rapid loss of attachment is one of the most prominent oral manifestations seen in HIV-infected individual. Complications and failure rates of endodontic therapy in such patients remain an enigma. Hilman reported a case where a patient with an AIDS-related complexinitially presented with acute exacerbation of a chronic periapical lesion, a lesion which was monitored for a period of several months. The lesion was refractory to all the attempted procedures and the tooth ultimately had to be extracted. Scully et al and Samaranyake recommended that all root canal procedures in such patients should be performed in a single visit with antibiotic cover. 37-40
HAART has transformed HIV into a chronic disease with fewer opportunistic infections in these patients. Indirectly, it has had an effect on root canal treatment outcomes because of the increased host immune response and may also have a similar effect on periodontal diseases. Conclaves et al demonstrated that HIV-infected individuals who are under HAART showed milder chronic periodontitis than non-HIV infected individuals with periodontitis. 41
It has been reported that when HAART begins, in the initial stages, patients develop an inflammatory disease which occurs as a consequence of dysfunctional residual T and B cells which may or may not be associated with some kind of opportunistic infection due to microorganisms. This consideration is clinically relevant because most of the endodontic infections are a consequence of pulpal necrosis followed by bacterial colonization. Additionally, there is also evidence suggesting that HAART may cause xerostomia in a few patients which also increases the risk of developing carious lesions. 42-46
Quesnell et al conducted a retrospective study where he compared the periradicular healing 1 year after a root canal treatment of a tooth with necrotic pulp presenting as asymptomatic periradicular lesions in HIV positive and negative patients where no statistically significant differences were found among the groups. Studies conducted evaluating factors such as prevalence of periradicular lesions, presence or absence of symptoms following endodontic treatment and success rates showed no difference between the two groups. Hence, it is unclear if HIV has an effect on the healing of such lesions. 47-50

Hiv And the Oral Microbiota

Since the oral environment is the main source of nutrition for endodontic bacteria, alteration in the oral microbiome following HIV infection can be modified by root canal infections. Presence of a virus within the dental pulp on an AIDS patient was reported in a case where DNA of HIV was also detected in periradicular lesions. However, very low chances exist that HIV caused the pulpal disease. 51,52
Among the fungi, Candida albicans is involved mainly in opportunistic fungal infections of a HIV patient. Chugal et al quantitatively determined the presence of yeast species in the canals of HIV patients with pulp necrosis and apical periodontitis. Results of the study showed that Candida was found in the oral cavity of 37% of HIV patients but not inside the root canals. Candida was also found on the surface of the teeth of the HIV positive patients, with their results indicating that these species may play a role in the endodontic diseases of patients with HIV.

53,54
Brito et al compared microbiota which were detected in endodontic infections of HIV positive and negative patients. Significant differences were observed in both the groups in that Stenotrophomonas maltophilia, Steptococcussobrinus, Cornebacterium diphtheriae and Helicobacter pylori were detected to a greater degree in healthy individuals whereas Prevotellatannerae, Prevotellaoris and Prevotellaloescheii were more commonly found in HIV infected individuals. There is a possibility of pulmonary pathogens to modify the endodontic microbiota of HIV/AIDS patients since these patients are at a greater risk for development of serious respiratory diseases but Brito et al showed that no such difference existed between healthy and affected individuals in regards to the proportion of pulmonary pathogens detected between the two groups. 55

Infection Control Measures For Endodontic Treatment

All precautions must be taken at any cost to avoid the risk of cross infection of HIV in a dental set-up. It is important to exercise more vigilance in such cases to keep such transmissions from occurring. Studies have demonstrated the presence of HIV in saliva of affected individuals. This process of detecting saliva, however took about three weeks of intensive culturing to isolate the virus which may suggest that the overall viral load may be low. 56
Accidental needle stick injuries or from a used scalpel with HIV infected blood may also lead to transmission of the virus. The risk of such transmission ranges from about 6% to as high as 50%. In case of such situations, a prophylactic administration of a triple anti-retroviral therapy regimen is recommended. Following this prophylactic injection, immediate referral needs to be made to a specialist. Precautions like wearing double gloves, not putting a used needle back in its sheath and wearing protective eyewear are recommended. To avoid cross infections due to HIV or Hepatitis B, it is recommended to wear a Z kit while working on such patients. It is also of utmost importance to keep the neighbouring staff and assistants informed before starting a procedure to ensure extra vigilance. 57-59
HIV has been found in both pulpal tissues as well as apical granulomas. Using a rubber dam is a very simple yet extremely effective way of ensuring optimal infection control and isolation of the field during endodontic procedures. It is also recommended to efficiently disinfect and sterilize endodontic handpieces and high-speed contra angled handpieces before and after using. Nickel Titanium rotary files after being used, should be discarded after a single use along with any other stainless steel hand K files. 2

2. Conclusion

It is extremely important to treat HIV infected patients with the same care and affection given to all other patients who are suffering from apical periodontitis. Non-surgical endodontic therapy in HIV positive patients should become a routine process on an outpatient basis. There is enough scientific evidence suggesting that HIV positive patients have the same prognosis as a healthy individual. Efforts must be directed towards improving the dental prophylaxis in these patients in order to encourage them to come forward and seek routine dental care. 2
Aspects of endodontic infections in HIV affected individuals and its true impact on clinical, microbiological and immunological features of an endodontic infection requires additional clarification. Attempts should be made to fully understand all the aspects of a HIV infection which may affect or alter the endodontic outcome in a patient in order to draw up better endodontic treatment plans with predictable outcomes of treatment.

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