REVIEW ARTICLE

ENDODONTIC RETREATMENT USING SURGICAL AND NON-SURGICAL METHODS. A BRIEF REVIEW OF LITERATURE

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ABSTRACT

The success rates for root canal therapy, when done under acceptable clinical guidelines and aseptic conditions are generally high. The microbial etiology of periradicular periodontitis is such that it sometimes requires great effort to eliminate the infection from the peri-radicular tissues and the root canal system. Majority of the pariapical radiolucent lesions heal after endodontic treatment uneventfully. However, there may be some cases that require periradicular surgical procedures so that the pathological tissues from the per-apical areas could be removed which could not have been removed by orthograde root canal treatment. In clinical endodontics, such decisions are very important especially when surgical and non-surgical retreatment has to be provided. The aim of the current paper is to briefly discuss the different factors responsible for failures in endodontics, the prognosis and decision making, and to further evaluate the retreatment of surgical and non surgical endodontic procedures as a whole. The factors responsible for success and failure of different treatment modalities have also been addressed in the current descriptive review.

KEYWORDS: Retreatment, Root Canal Therapy, Clinical Endodontics, Treatment Failure

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INTRODUCTION

Due to increased dental and oral awareness and increased socio economical conditions, most of population likes to save their natural teeth which have compelled dentists as a whole to retreat the teeth with persistent endodontic disease.

A good clinical practice is achieved when there is a sound knowledge base, good practical and clinical skills, and when there is reliable clinical decision-making process. The decision-making process in Endodontics is very complex, especially when decision to perform surgical or a non-surgical retreatment has to be made. This has turned out to be even further difficult due to the advancements in techniques and instrumentation that allows a clinician to do easy dismantling of the restorations placed coronally. This could also mean that non-surgical alternatives may be ever more useful.

The factors involved in the decision-making process involve the dentist, resource factors and especially the patient. Because of this complexities involved, there is possibility of differing attitudes of clinician towards the endodontic treatment in any one case[1]. The success and failure of endodontic therapy critically and largely relies on the eradication of infection present in the pulp space [2,3]. The infection of the root canal, in a manner similar to many other infections, is mainly induced by the bacterial biofilm formation [4,5]. A clear relationship has been established between the bacterial biofilms and induction of peri-apical periodontitis by histobacteriological studies which were conducted recently [6,7].

1. SURGICAL AND NON-SURGICAL TREATMENT MODALITIES:

Due to microbial etiology of periapical periodontitis, every effort should be made so that the infection

from root canal system and periradicular tissues is eliminated. When non-surgical root canal treatment fails, periradicular surgery becomes a suitable option of endodontic re-treatment [8,9]. The success rates are usually high in endodontic treatment when the procedure is performed under aseptic clinical conditions and principles. However; about 16% to 64.5% of teeth treated endodontically have been reported to be associated with periapical lesions. The suggestions to treat a failed endodontic case vary from clinician to clinician. Since the understanding of the disease process in endodontics is the key towards successfully treatment, it is vital that those factors which are related to the failure of endodontically treated teeth are very well understood.

In majority of the cases, the failed endodontic therapy is mainly because of the microorganisms that persist within the root canal system, even in those teeth which are very well treated[10]. Many radiolucent lesions usually heal uneventfully after successful endodontic treatment. However, there may be some which may require periradicular surgery so that the pathological tissue from the affected region could be removed. This could ensure that any source of irritation that was left during orthograde root canal treatment does not exist.[11]

Non-surgical and surgical retreatment measures both share the same difficulty of a negative outcome in the presence of periapical periodontitis. However; positive results could be achieved in many teeth when both the procedures are combined. But there also suggestions that those teeth, which fail after endodontic treatment should be replaced using dental implants. When certain criteria of comparison is applied to the outcomes of both treatments modalities, the survival rates of endodontic treatment and implant therapy are more or less the same. Cost, flexible clinical management and time specify that the endodontic retreatment procedures should be performed first except when the tooth is judged to be fully untreatable.[12]

From an endodontic standpoint, periradicular surgery is usually indicated after nonsurgical endodontic treatment of good quality has previously been attempted, was not completed or where healing did not take place following treatment. An infected canal is the usual reason for periapical inflammation and surgery should not be considered as the first treatment of choice, rather nonsurgical root-canal re-treatment is more likely to achieve the reduction in inflammation. However, for several reasons this interpretation may not always be possible. [12,13]

Those cases in which the endodontic pathosis is not responding to non-surgical re-treatment methods can be eliminated by using the surgical interventional methods. The prime aim of the surgical therapy is to offer conditions that favor the natural healing and repair process. The procedure usually involves the elimination of the necrotic material (including the break-down products of tissues), lessening, and/or complete elimination of the infection from entire root canal. Once that is achieved, the sealing (fluid-tight) of the apical portion of the root canal system with a biocompatible material is highly recommended[14]. The outcomes of the procedure in the literature vary widely and the success rates of surgical endodontics procedures have been shown to be very high in recent years. The improved execution of treatment principles and surgical techniques is partly responsible for better outcomes.

The evaluation of the treatment outcomes is mainly based on the assessment of healing of the periapical tissues using clinical and radiographic criteria. The influence of the periodontal tissue conditions, as one of the causative factor in relation to the post-operative success, has not been widely established. The persistence of endodontic infection as a contributing risk factor for progressing marginal attachment loss after periradicular surgery has been mentioned in the literature[15]. The eventual goal in restorative dental procedures is not only the elimination of any pathological processes which are associated to a specific tooth and the repair of the components, but also the regeneration of the tissues which have been lost.

Endodontic surgical procedures have now become reliable therapeutic procedures for treatment of those teeth which have periapical lesions. The treatment modality is particularly useful when orthograde retreatment cannot be performed due to several reasons. There is not much information available about outcomes of surgical procedures which have been performed on teeth that had been previously treated using periapical surgery.[16,17] However; periapical surgery is now a well-established and acceptable endodontic procedure for preservation of teeth with persistent periapical pathology. The outcome of the procedure has been evaluated in numerous studies with higher success rates. Variations in the success rates may be due to differences in sample size, the selected teeth types, observation periods, treatment procedures and materials used, as well as the recall rate.[17]

FACTORS RESPONSIBLE FOR PROGNOSIS

There appears to be a common observation that teeth treated using the surgical approach has higher failure rates than the teeth which are treated by means of the orthograde re-treatment. Many recent surveys have shown that there is not much significant difference in the treatment out-come. Kvist and Reit[18] did a study on 95 incisors and

canines which had been termed as failed cases. The teeth were either treated using a surgical or a nonsurgical re-treatment method. Those authors observed that those cases which were treatment using the surgical approach had better healing at 12 months as compared to those which were conventionally treated. However; during the 48th month examination of the subjects, there was no significant difference in the healing rates of both groups.

Prominently though, it is suggested that when the conventional re-treatment methods are carried out on teeth before periapical surgery, the success rates are even improved further by 24% [19]. That will mean that when an orthograde retreatment has been performed prior to surgery, approximately 90% success rate for the treated teeth could be expected. The use retro-tips, the surgical microscopes, ultrasonic tips with new retro-filling materials have enabled the clinicians to achieve surgical treatment outcomes with higher success rates and predictability.

MAGNIFICATION ENHANACED ENDODONTICS

The Dental Operating Microscope has been used in dentistry and endodontics since the 1980s and was introduced by Dr. Gary Carr[20]. He suggested that the illumination and magnification can be really helpful in increasing the success rates of endodontics and peri-apical surgeries. The use of surgical microscopes in various specialties has been described which includes; for diagnosis and excavation of caries[21], post placement and crown margins[22], bone grafting procedures and surgical procedures[23, 24, 25] and also, for furcation and perforation repairs. Buhrley et al. in 2002 stated that it is very essential to use an operating microscope or at least dental loupes for locating the second mesio-buccal canal[26]. Evidence suggests that those peri-apical surgical procedures which are done using modern instrumentation show better success rates as compared to those which are performed without the use of modern instrumentation[27].

There is evidence to suggest that peri-apical periodontitis or other post-treatment complications occur in nearly 25–35% of all root filled teeth[28]. To manage such conditions, there are usually three alternative options including the use of orthograde re-treatment, peri-apical surgery and the extraction/removal of the tooth[29, 30]. Where possible, the later should be avoided as there are implications of biological consequences. In addition, the reported success rates of orthograde retreatment and apical surgery in the dental literature are excellent [19, 31]. The use of magnification by means of endodontic microscopes in dentistry is becoming more and more common. A study published in 2008 by Kersten[32] stated that in the USA the use of the microscope by endodontists increased from 52% in 1999 to 90% in 2007. Rubinstein and Kim reported success rates of 96.8% at 1-year follow up[33] and of 91.5% at 6- to 8-year follow up[34], for cases involving peri-radicular surgery and were treatment using the surgical microscope.

THE CHOICE OF ROOT-END FILLING MATERIAL

Because of the newer inventions in the equipment, the advancements in material sciences, the endodontic surgery has become a predictable treatment option for those cases which have not responded to the initial root-canal therapy[35]. Amalgam has been widely used as a root-end filling material in dentistry despite of having certain drawbacks i.e. non-adhesiveness and micro-leakage of mercury[36]. The drawbacks of amalgam has led to the development of several other materials including modified Zinc oxide eugenol-based cements (Super-EBA® & IRM), Glass ionomer cements (GIC), Calcium hydroxide cements, Gutta-percha, Composite resins and more recently, Mineral trioxide aggregate (MTA).

GIC is a material with universal properties and can be effectively used as a dentin substitute. It has the ability to bond chemically with the tooth and provides very good adhesive seal. Studies have also shown that glass ionomer cement possesses excellent antibacterial activities because of its ability to release fluoride[37]. However; due to its sticky nature and plasticity, the cement may be difficult to condense into the root-end cavity since it is extremely sensitive to moisture[38,39,40]. MTA was introduced by M. Torabinejad and contains tricalcium silicate, tricalcium aluminate, tricalcium oxide, silicate oxide and sets in presence of water[41]. It shows the formation of calcium-phosphate layer which reduces the risk of marginal percolation and gives long-term clinical success. It has certain disadvantages like prolonged setting time, difficulty in manipulation and technique sensitivity[42].

Newer experimental Ca3SiO5-based restorative cement has been introduced in the dental market with the name of BiodentineTM (Septodont, Saint-Maur-des-Fosses, France)[42]. The mode of action of this material is similar to that of calcium hydroxide however; but has minimum drawbacks. The material consists of encapsulated powder and liquid in a pipette. The powder mainly contains tricalcium and dicalcium silicate. It also contains zirconium dioxide that serves as a contrast medium. The liquid consists of calcium chloride in aqueous solution with an admixture of polycarboxylate. The manipulation requires mixing of the powder with the liquid in a triturator for about 30 seconds. Once mixed, the material sets in about 10-12 minutes. The material has been shown to provide better bond strength values as compared to the MTA. However; like MTA, its bond strength is negatively affected by blood contamination[43].

CONCLUSION

With the understanding of post-endodontic treatment pathosis and technological advances, clinicians have been able to manage the cases more efficiently. Most of the failed endodontically treated teeth may still have a good chance of success if they are managed appropriately. The surgical removal of such teeth is not justified where one considers a favorable treatment prognosis. However; it is necessary that careful and thoughtful approach in assessing and treatment planning of cases, along with the patient's involvement in the decision making is carried out.

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