Endodontics and Tooth Retention

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Dental clinicians are faced with the choice of retaining a tooth by performing either endodontic therapy and restoration or extraction and replacement. The purpose of this article is to aid in prosthodontic treatment planning by reviewing the role of endodontic treatment in retaining teeth.

Aims

The aims of endodontic therapy are to diagnose, prevent, and treat diseases and injuries of the pulp and associated periradicular tissues in order to facilitate rehabilitation of patients' masticatory systems via retention of functionally useful teeth. The need for endodontic therapy is most commonly due to caries and its restorative sequelae, and occasionally due to traumatic injury. The key to successful endodontic therapy is simply the removal of sufficient bacteria to allow normal healing processes to occur, followed by long-term bacterial exclusion.

Diagnosis, Prognosis, and Treatment Planning

Diagnosis must be systematically accomplished using a careful history, comprehensive endodontic examination, and radiography—usually multiple periapical films at different angles. Next, pulpal and periapical diagnoses are separately assigned, and the case difficulty is assessed. A prognosis and comprehensive treatment plan are then made, and informed consent should be obtained. Only then can treatment be initiated.

Endodontic prognosis is primarily affected by the preoperative pulpal and periapical diagnoses and the magnitude of periradicular pathosis. Patients with diabetes and probably those using bisphosphonate drugs may have reduced likelihood of bony healing after endodontic therapy. However, some medical conditions, such as bleeding disorders or sequelae of radiation therapy, place a premium on the avoidance of extractions or other surgical procedures. In these instances, endodontic treatment is often performed, even on teeth with no functional value.

The degree of loss of tooth structure is a key predictive factor for long-term clinical restorative success.[1] Caries, periodontitis, or fracture may cause the loss of endodontically treated teeth. Thus, the risk of caries and periodontitis must be included in overall prognostic determinations of natural teeth.

Outcome Measurement

Endodontic outcomes are usually measured by recording the healing or regeneration of previously inflamed, infected, or lost periradicular tissues using systematic diagnosis. Most endodontic outcome instruments were developed to finely discriminate small differences in healing rate for the study of prognostic indicators. Because the healing process may be long and irregular, such instruments typically have 3 to 5 categories, not just binary "success" and "failure" outcomes. Typically, postoperative pain and treatment complications resulting in deficient healing are treated as failures.

The Strindberg Criteria, used widely since 1956, is a 3-part scale based on a history of symptoms, clinical examination, and radiographic signs.[2] These criteria are extremely strict; even the radiographic appearance of a broken or poorly defined lamina dura is cause for assignment as "failure." The Orstavik Periapical Index (PAI), used widely since 1986, includes defined criteria, a 5-stage periapical health score, simple comparison to reference images, calibration of examiners, and blinding.[3] The PAI correlates with histology and radiodensitometry, and is accurate, reproducible, and highly discriminatory. Interestingly, endodontic cases measured using this system typically do not reach complete healing, or "success," until several years postoperatively. As far as 4 to 5 years postoperatively, slow healers tend to outnumber late failures of previously healed cases.

Some recent studies have reported endodontic outcomes in terms of survival and survival with intervention. This has allowed very large sample sizes to be attained.

Outcomes

Unfortunately, like many areas of restorative dentistry, most endodontic studies are generally low level and retrospective. Rigorous endodontic outcomes have been reported for a half-century, but mostly reflect

student or generalist care, not specialty care. Relatively few studies include current instrumentation.

Strindberg's landmark 1956 study of up to 10 years reported a 93% success rate for endodontic treatment in teeth with vital pulps or necrotic pulps without apical periodontitis; an 88% success rate in teeth presenting with apical periodontitis; and an 84% success rate following retreatment in teeth presenting with apical periodontitis.[2] Precise percentages of "successes" and "failures" appear to greatly depend upon the outcome instrument used; however, rankings by preoperative diagnosis or initial versus retreatment have remained the same.

Recently, several large retrospective endodontic survival studies have been published. A 3.5-year in-function survival rate of 94% in over 40,000 patients has been reported.[4] An 8-year study reported a simple survival rate of 97% and a survival with intervention rate of 96% in over 1 million patients.[5] A case-matched cohort study reported identical 6-year total survival rates of 94% for endodontically treated teeth and single-tooth implants.[6] Single restored endodontically treated teeth appear to undergo fewer interventions than single tooth implants or short fixed partial dentures. Interestingly, a majority of extractions of endodontically treated teeth occur for nonendodontic reasons.

Retreatment

Endodontic retreatment is superior to endodontic surgery in the treatment of recalcitrant periradicular disease. Retreatment addresses intra- and extracanal bacterial etiologies, whereas surgery addresses only apical tissues. Retreatment should be considered as a first-line fall-back, surgery should be performed only after retreatment, and extraction should be considered instead of endodontic resurgery.[7]

Restoration Following Treatment

Restoration is integral to endodontic success. Coronal leakage, or posttreatment ingress of bacteria, is a major source of endodontic failure. The quality and timeliness of the restoration may be as important as the quality of the root canal treatment itself.

Widespread Acceptance

Currently, most endodontic care is provided by general dentists. Much outcome data has been derived from dental schools or general practices. According to the American Dental Association, over 18 million root canal procedures are performed by US dentists annually. Overwhelming relief of pain is often provided.

Conclusions

Endodontic therapy to facilitate tooth retention has a uniquely important role in oral rehabilitation. Treatment planning must consider endodontic therapy as an alternative to tooth replacement, but this must be based on careful systematic endodontic diagnostic and prognostic assessments.

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