Clinical Update

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Periodontal Root Resection in the Age of Dental Implants: A Dying Art?

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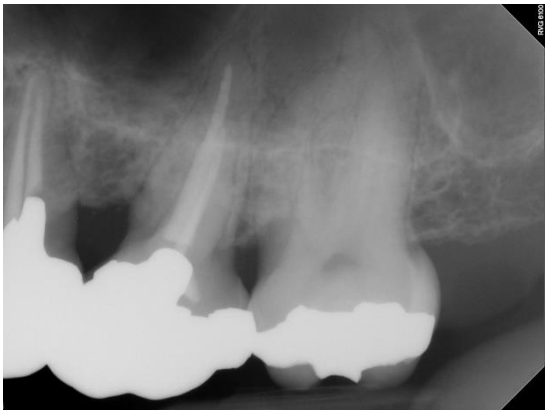
Introduction

Periodontal root resection procedures date back to the 19th century when Farrar first described resection as a "radical and heroic" measure to be used only "as a last resort" to salvage a compromised molar.[1] As the technique matured and became part of mainstream therapy, specific indications for root resection evolved: severe localized bone loss, difficult maintenance of severe furcation invasion, non-restorable furcal caries, localized severe bone loss around fixed prostheses, root fractures, and endodontic complications.[2] The advent of dental implantology in the 1980's marked a paradigm shift in treatment planning for the dental profession as a whole. With preservation of the natural dentition as a core founding principle, the dental profession is compelled to consider tooth extraction as a last resort. However, increased patient demand for implants, intensive marketing by implant manufacturers, enhanced predictability of implants and dwindling familiarity with root resection protocols have all contributed to the decline in popularity of resective procedures in favor of extraction and dental implant placement. A critical assessment of factors associated with success for both implants and resective approaches reveals a fascinatingly similar theme. Therefore, while a dental implant may be the most alluring choice for treating a compromised molar, proven classical approaches such as root resection deserve fair consideration. A comparative review of both therapeutic modalities is hereby warranted in order to provide clinicians with knowledge that may be beneficial in their treatment planning endeavors.



Courtesy of LT Christopher Connors, DC, USN

Success Rates

Classic periodontal literature exhibits wide variability in success of root resections. Hamp reported a 100% survival rate for 87 cases of root resection spanning 5 years, while Klavan described a 97% success rate in a smaller sample of 34 maxillary cases over a period of 3 years.[3,4] Data published by Basten revealed a 92% success rate of 49 root resections followed for an average of 12 years.[5] In contrast, Erpenstein reported a success rate of only 79% in 34 molar amputations monitored for a mean of 3 years, and Park reported a modest success rate of 70% in 342 resective cases followed for 10 years.[6,7] Similar accounts were also noted in the literature reporting a success range of 62% to 87% over 3-10 years.[8-11]

While it is now generally accepted that implants with rough surfaces are more successful than those with smooth, machined surfaces, historical success rates of dental implants vary significantly depending on a number of variables.[12] Intraoral location and associated bone quality influences success with higher failure rates common to the maxillary posterior region.[13] In a study of more than 1,400 implants by Fugazzotto, the lowest success rate of 85% was reported in lone standing molar sites.[13] The presence of systemic disease also has a negative impact witnessed by success rates in controlled diabetics of only 85.7% after 6.5 years in function.[14] Periodontal disease status is an additional consideration for success of dental implants. Patients with past or current chronic or aggressive disease profiles show decreased implant success ranging from 83-90% compared to healthy controls.[15,16] However, improved technology, proper patient selection and sound surgical and prosthetic acumen have yielded high, long-term success rates of 95-97% with immediate implants, short implants, implants associated with simultaneous grafting, and conventionally placed implants monitored for up to 16 years.[13,17-20]

Factors Associated with Failure

Failure of root resection has been frequently associated with root fractures, caries, unfavorable arch location, uncontrolled parafunction and recurrent periodontal disease.[2,4-11,13,21] Of 342 resected molars followed for 10 years by Park, 19% of failures were due to root fracture and 11% were due to caries.[7] Resected maxillary molars occupying a terminal arch position in an intact arch displayed a failure rate of 36.4% and parafunctional habits were associated with 34.4% of resected molar failures.[13] In a study of 100 resected molars by Langer, 47% of failures were associated with fractures primarily in the mandibular arch, while 26% of failures were linked to progressive periodontal disease largely in the maxillary arch.[8] Langer contended that the location of the resected root, the number of pontics supported by the resected molar, the presence of a post and the degree of bone loss at the time of surgery were key predictors of ultimate success. Langer's data and subsequent commentary were soundly supported by Fugazzotto who reported a mere 75% success rate for resection of the distal root in mandibular molars while any single, resected maxillary molar root displayed a success rate of 96-100%.[22,13] Such evidence supports the prevailing themes in resective therapy of proper case selection, keen interdisciplinary communication for proper restorative and occlusal analysis and adequate periodontal maintenance in order to achieve long-term success.

Implants exposed to inflammatory insult are similarly susceptible to periodontal disease progression witnessed in the natural dentition. Peri-implant mucositis, akin to gingivitis in the natural dentition, involves inflammation of peri-implant tissues including bleeding, suppuration and increased probing depths. Peri-implantitis, akin to periodontitis, involves all of the components of peri-implant mucositis

with the addition of progressive bone loss.[23] In a 2012 meta-analysis assessing 6,283 dental implants over a minimum of 5 years, Atieh reported a prevalence of 30.7% for peri-implant mucositis and 9.6% for peri-implantitis. Interestingly, an appreciable trend linked regular periodontal maintenance to reductions in prevalence of peri-implant disease.[24] Considering that an estimated two million dental implants were placed in the North America in 2005[25], extrapolation of current data regarding the prevalence of peri-implant disease conservatively suggests that more than 750,000 implants are affected each year in the United States. As seen with resective approaches, parafunctional habits and unfavorable arch location have also been linked to increased risk of implant failure. Fugazzotto explained an unimpressive 84% success rate of mandibular second molar implants through observations of parafunctional activity combined with terminal arch positioning. He also reported a reduced success rate of 85% for mandibular second molars as compared to maxillary and mandibular first molars that displayed success rates over 97% for up to 13 years.[13] Restorative complications with dental implants must also be considered when speaking to the subject of implant complications. Connection and suprastructural complications such as screw loosening, fracture of restorative components and loss of retention are also commonly reported in the literature ranging from 4.3 to 26.4%.[26] Such statistics highlight the importance of establishing a regular maintenance interval in all implant patients in order to identify early signs of peri-implant disease and to address restorative complications in a timely manner.[24]

When comparing factors associated with the success and failure of these two diametrically opposed treatment modalities, common themes rise to the surface. First, both root resections and implants require proper case selection for long-term success. Second, arch location combined with occlusal and parafunctional analyses influences the success of both implant and resective therapy. In either case, once the patient and arch location have been deemed favorable, proper surgical and prosthetic protocols must be utilized for ideal outcomes. Finally, education in oral hygiene, control of parafunctional habits and implementation of a regular periodontal and restorative maintenance program are vital to success.

Conclusion

When presenting treatment options for a severely compromised molar, clinicians are inherently influenced by their skill and experience with particular therapeutic modalities. However, we must make a concerted effort to present all relevant treatment options to our patients in an evidence-based approach. Preservation of the natural dentition is not only a founding principle of the dental profession, but also a common desire of an overwhelming majority of patients. While the growing success and demand for dental implants is undeniable, classic resective approaches for treating severely involved molars deserve equal consideration based upon nearly 4 decades of sound, clinical research by master clinicians. The finality of tooth extraction should not be masked by the excessive appeal of dental implants, and patients deserve to know that implants are not without complications. With proper case selection, adherence to surgical and restorative protocols and proper long-term periodontal maintenance, both therapies can be viable treatment options in today's modern clinical practice.

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