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Resect and Restore an Endodontically failed tooth

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Abstract:
Early loss of molars due to any disease process like caries or periodontitis leads to various unpleasant sequelae such as loss of arch length, supra eruption of opposing teeth etc. Resective procedures like hemisection, root resection provide a means of salvaging the tooth without extraction. Hemisection is essentially the split of tooth into two portions followed by removal of the diseased root and part of crown. In the present case, a molar with failed endodontic therapy was successfully treated by hemisection and subsequent rehabilitation.

Key-Words: ***Mandibular molar, Hemisection, Failed endodontic therapy, Resective procedures***

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I. Introduction:

Molars are one of the most important teeth of the dentition and have a key role to play in occlusion. Extraction of permanent molars due to periodontal bone loss, gross decay etc leads to occlusal disharmony. To prevent this, procedures like hemisection or bicuspidization and root resection have been advocated. Hemisection is the splitting of mandibular multi-rooted tooth into two halves followed by removal of poorly prognosed crown part with the root.

Hemisection (HS) is often used to retain teeth in place for restorative abutments or occlusal support. It is a conservative approach that focuses on maintaining as much tooth structure as possible. Careful periodontic, endodontic and prosthodontic assessment is necessary before this procedure is attempted.

Indications for such resective procedures include: advanced bone loss surrounding one root, extensive furcation involvement, unfavorable root proximity, endontically untreatable teeth, endodontic failures like perforations, instrument breakage, and vertical root fractures etc. [1]

Contraindications include root proximity of resecting teeth, presence of occluding or calcified root canals of retaining teeth and when that tooth can't be prosthetically rehabilitated. [1]

II. Case History:

A 45-year old male patient presented to the Department of Periodontics with the chief complaint of pain and swelling in the lower left back tooth region along with slight mobility of a tooth. On examination, there was a fluctuating swelling involving the marginal and attached gingiva in relation to 36 associated with a probing depth of 6 mm and Grade I mobility of the tooth (Figure 1). On radiographic examination, there was bone loss in the furcation area though the mesial and distal bone were intact. The swelling was diagnosed as peri-apical abscess based on clinical signs.

Abscess drainage was done as an initial periodontal therapy and antibiotics 500 mg amoxicillin thrice a day for five days along with anti-inflammatory tablets acelophenac was prescribed. The patient was referred to the Department of Endodontics for further root canal treatment. While preparing the mesial root, an endodontic file broke in the canal and could not be retrieved (Figure 2). A decision was made to desect the root. Remaining endodontic therapy was completed before the plan of hemisection (Figure 3).

Complete diagnostic tests were carried out before to surgery and all the results were within the normal range. Under adequate anesthesia, a long tapered carbide bur was used to split the crown. A vertical cut was made extending into the furcation area bucco lingually (Figure 4, 5). A thin probe was used to assess the separation of the crown completely. Pre and post operative radio graphs were taken to assess the procedure

(Figure 6). The mesial half of the tooth was extracted and excess tooth structure and irregularities were smoothened and prepared for crown placement (Figure 7). Extraction socket was irrigated and sutured with 3-0 black silk.

After one week of satisfactory healing all metal crowns were prepared and delivered to patient (Figure 8, 9).Patient was given instructions and recalled after three months of follow-up period. The patient had no complaints and healing was satisfactory (Figure 10).

III. Discussion:

For more than a century, resective therapy is being used for the treatment of severe form of bone loss with furcation defects. The surgical removal of half of a tooth by sectioning the tooth and extracting one root is known as hemisection. It is typically used in context to lower molars. [1]

Root resection is the removal of the diseased root without removal of the crown. Bicuspidization is the splitting of the tooth into two halves and maintaining both the segments individually as abutments. [1]

The success of the resective procedures depends on appropriate selection of case. The ideal situation for performing a hemi section is when one half of the mandibular molar can be retained to occlude with and prevent the supra-eruption of the opposing teeth. The root that is retained should have adequate periodontal support, a favorable crown-root ratio.

A variety of factors will influence the long-term tooth prognosis: [2]

1. Quality of endodontic treatment in the retained part of tooth.
2. The contour and quality of the final restoration
3. The ability to maintain the health of supporting periodontal soft and hard tissues.

The prognosis of the retained tooth component maybe affected by any of the above. Buhler stated that hemisection should be explored as an option before any molar extraction, since it provides a good, absolute, and biological cost saving alternative with long-term success. [3] The procedure also comes with its own disadvantages. It might induce discomfort like any other surgical procedure. The root surfaces modified by grinding are more prone to caries. Failure of endodontic treatment due to any reason might contribute to the failure of the entire procedure. Faulty margins of the prosthesis or occlusal surfaces without a physiologic form will result in periodontal destruction and eventual failure. [4]

Erpenstein in 1983 reported the results of root resection of 34 molars examined clinically and radiographically over 4-7 years. During the follow-up period, 3 molars were extracted of which 2 were because of apical periodontitis and another due to deep pockets and excessive mobility. [5]

Buhler H in 1988 showed a 10-year review of 28 resected molars in which a 32% rate of failure was noticed. The primary reason was endodontic and not periodontal. [3]

Park in 2009 reported the long term effects of HS on a tooth with questionable prognosis. He stated that the teeth remained healthy without much mobility or bone loss for up to 7 years provided the patient maintained optimal oral hygiene. [6]

SY Park et al in 2009 conducted a retrospective study for 10 years on 691 molars in 579 patients. A failure rate of 29.8% was noticed. Molars resected due to periodontal involvement had a higher success rate than those resected due to non-periodontal problems (fracture, caries etc). In the molars with periodontal problems, the bone support of the retained roots at the time of surgery had a substantial impact on the survival rate. [7]

Needleman I in 2010 conducted a systematic review. The survival rate of molars treated with hemisections and other resective procedures was 62-100% in a follow-up period of 5-13 years. The most common consequence following resective treatment was endodontic failure. [8]

Napte B et al in 2014 treated an advanced endo-periodontal lesion in a mandibular left molar tooth by RCT followed by hemisection. The occlusal plane of the tooth was reduced and prosthesis was given. At 1 month, the healing of tissues was satisfactory. [9]

Babaji P et al in 2015 managed a periodontally involved deeply carious molar tooth in a young patient by means of hemisection. The mesial half was amputated followed by splinting of the 2nd premolar, 1st and 2nd molar. Later a ceramic bridge restoration was given. Success was observed radiographically at 1, 3 and 6 months in which there was no widening of periodontal ligament and formation of bone at the extracted root site. [10]

Mittal P et al in 2016 had performed hemisection procedures on 2 patients with periodontally compromised mandibular molars. In both the cases, endodontic treatment was completed initially followed by removal of the offending root. [11]

Arora A et al in 2017 tried a measures approach trying to retain as much original tooth structure as possible against the option of extraction of a grossly carious 46 with compromised periodontal support. The mesial root was removed and the tooth was later restored using a suitable prosthesis. Complete healing was seen at 4 weeks clinically and radiographically. [12]

Baranwal HC et al in 2018 treated 3 cases with periodontally involved mandibular molar which were not restorable by root canal treatment alone. Hemisection was done and tooth restored using various prosthetic

options. The patients were followed up to a period of 1 year and adequate healing was seen with reduction of mobility. [13]

Singh M et al in 2018 performed hemisection in a 44 year old patient with bone loss involving the distal root. The affected root was extracted and the socket was preserved using a mixture of PRP and bioactive glass bone graft. The remaining tooth was built-up and prosthetically rehabilitated. [14]

Megarbane JM et al in 2018 retrospectively evaluated the results of root resection and hemisection of 195 patients with follow up of almost 40 years. The overall survival was 94.8%. The results were satisfactory with proper case selection, good treatment plan and effective maintenance protocol. [15]

Setzer FC et al in 2019 conducted a systematic review and meta-analysis to report the outcome rates for crown and root resection. A mean survival rate of 85.6% was reported. [16]

Rajasekar P et al in 2019 performed hemisection in a left molar presenting with a deep pocket on the distal side along with bone loss surrounding the root and furcation. The case was followed up till 6 months at the end of which the tooth presented with no problems. [17]

Bhosale M et al in 2020 salvaged a mandibular molar with advanced furcation involvement by means of hemisection. The tooth was healthy at follow up. [18]

Widiadnyani NKE in 2020 treated a 21 year old with a periodontal abscess and furcation involvement of the mandibular left molar. Endodontic treatment was completed and the affected mesial root was extracted followed by rehabilitation. At the end of 2 months, the patient had no complaints and there was also good radiographic bone fill. [19]

In the present case, hemisection was selected as the treatment option as the patient couldn't afford an implant. The mesial root was resected in as it was deemed un-restorable. The retained distal root is also wider and straight providing more surface area to be used as an abutment. Good prognosis was observed with no mobility and good periodontal condition at the end of three months.

IV. Conclusion:

Hemisection should be considered a potential treatment option and a cost-effective alternative to other expensive procedures like implants. An appropriate treatment plan with regular periodontal maintenance and proper restoration is critical for the long term prognosis of such teeth.

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FIGURE OF LEGENDS:
Figure 1 Pre-operative irt 36
Figure 2 File breakage irt mesial canal of 36
Figure 3 Endodontic therapy completed irt 36
Figure 4 Splitting of tooth using airotor
Figure 5 Tooth split into two halves
Figure 6 Extraction of mesial root
Figure 7 Post operative RVG
Figure 8 Fabrication of all-metal crowns irt 35,36
Figure 9 Cementation of crowns
Figure 10 Radiograph at 3 month follow-up


Figure 1 Pre-operative irt 36

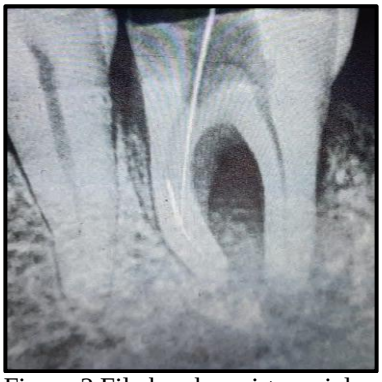
Figure 2 File breakage irt mesial canal of 36


Figure 3 Endodontic therapy


Figure 4 Splitting of tooth using airotor


Figure 5 Tooth split into two halves


Figure 6 Extraction of mesial root

Figure 7 Post operative RVG

Figure 8 Fabrication of all-metal crowns irt 35,36

Figure 9 Cementation of crowns

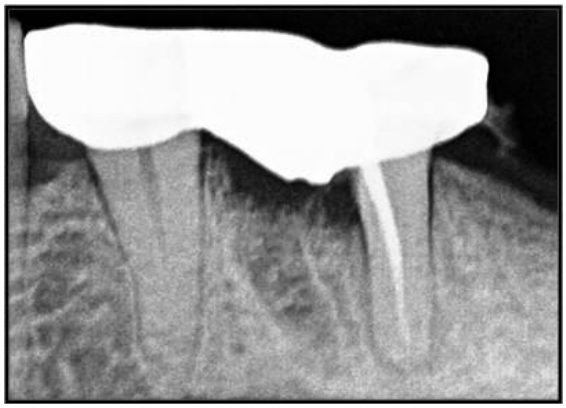

Figure 10 Radiograph at 3 month follow-up

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