Hemisection of the first-molars mandibula: A case report

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ABSTRACT

Background: Hemisection is an endodontic surgery performed by removing one or more roots and existing crown structures to increase retention of the remaining teeth and to correct defected dental roots that are not possible to maintain. This study aims to evaluate the treatment of hemisection in the lower left first molar in the mesial tooth root with the restoration of the split crown end with tooth 35 as retention at Sanglah General Hospital, Bali, Indonesia.

Case Description: Male patient aged 21 years, in tooth 36 there is a cavity with a temporary restoration accompanied by a periodontal abscess. Teeth are sensitive to percussion tests and palpation, mobility is normal. Radiographic features appear to be perforated in the furcation section, and furcation involvement. Diagnosis of teeth 36 pulp necrosis is accompanied by abscess periodontal. During the first visit periodontal abscess drainage was performed, followed by functional crown lengthening in the periodontia. After one week of observation, there were no complaints, continued treatment of the distal root canal until the root canal filling. The next visit was carried out hemisection surgery in the form of separation of root bifurcation and extraction of mesial roots to the existing crown structure.

Conclusion: Surgical treatment of hemisection is a reliable alternative solution and has a good prognosis because it can maintain dental and periodontal tissue as long as possible without tooth extraction.

INTRODUCTION

Advances in dentistry have allowed patients to maintain their teeth functionally for as long as possible for a lifetime. Some experts had the principle that preserving a part of a tooth is better than pulling it out entirely. If three roots are better than two roots, and two roots are better than one root, then one root is better than no root at all. Endosurgery is an alternative treatment in the event of endoconventional failure. The main goal of endodontic surgery is to eliminate the disease, prevent the recurrence of the disease, and facilitate healing on the side of the involved tooth tissue so that it can be restored according to its function.

Endodontic surgery includes surgical procedures to eliminate the agents that cause periradicular abnormalities and restoration of periodontium tissue to a healthy biological and functional level. The success rate for endosurgery is 73% to 99%, but it is indicated only in less than 5% of all endodontic patients. The success or prognosis of the surgical endo depends on diagnosis factors, case selection, the accuracy of indications, contraindications, treatment procedures, periodic evaluations, statistical analysis and criteria of success itself. The selection of cases in the teeth to be preserved is crucial. The requirements include the defects of periapical lesions and whether or not the rest of the tooth structure is restored. Surgical endodontic treatment is a last resort if conventional endodontic treatment cannot be performed.

Hemisection is an effort of removing the root of a tooth along with a portion of the crown. The indications of hemisection are loss of supporting bone around one root, broad subgingival root caries affecting only one root, root perforation caused by resorption or instrument, as well as a root canal cannot be obturated due to obstruction, bent root shape, or root fracture. The use of the term hemisection is a surgical procedure to divide a double root at the furcation border, and the removal is limited to the root or part of a crown. The procedure is often done on the lower jaw teeth.

The contraindications in surgical endosurgery or hemisection were severe crown damage if the loss of more than one tooth root and the lack of supporting tissue. These roots gather or unite, or shaking-teeth. The parameters used can be evaluated clinically, radiologically. The leading cause of failure is persistent infection or recontamination of root canals by microorganisms and their products.

This case report will present about the hemisection procedure, which is one way of endo-surgical
measures indicated for cases with removal due to substantial bone loss related to the periodontium disease. The diseases were involving roots or furcation, which one root canal cannot be treated either conventionally. The root canal cannot be treated because Caries and the remaining part of the tooth are strategically important and can be restored. This case report aims to describe endodontic surgical treatment in the form of a hemisection of the mesial root of the lower left first molar and maintaining distal roots and adequate restoration.

**CASE REPORT**

A 21-year-old male patient complains that his left lower back tooth is painful, and there is a small lump under his teeth in the gums of the teeth close to the tongue. The tooth was treated one month ago. Teeth often bleed and now do not feel pain. The clinical examination shows that there is a cavity with a substantial temporary lift involving 2/3 of the lingual to the cervical surface extending to occlusal and periodontal abscesses in the gingiva of the lingual portion below the cervix (Figure 1). Percussion and palpation are positive (fluctuating), negative mobility. The Miller needle test entering 19 mm at the distal root is also no response. Periapical X-ray examination was performed and obtained a demarcated radiolucent (perforation in the bifurcation section) as well as the furcation involvement also occurred. In the mesial root, there is no root canal and no alveolar bone resorption. (Figure 2).

The treatment plan is periodontal abscess drainage, functional crown lengthening, conventional root canal treatment on the distal root canal, hemisection of the mesial root, and the chosen restoration is the tapered serrated post and the PFM splint crown with 35 teeth as retention.

The first visit was to drain the periodontal abscess drainage on tooth 36, which was removed thoroughly, clean the periodontal pocket and then smooth the tooth root surface and tooth line with scaling. Pulpal chamber in hemostasis with calcium hydroxide paste applied. Then the cavity was closed with a temporary lift—provision of anti-infective oral drugs, anti-inflammation and pain relief for 5 days and betadine mouthwash. Instruct the patient for control one week later and refer the patient to the periodontal section for functional crown lengthening.

The next visit was to control periodontal abscesses in tooth 36 with subjective and objective examinations to determine whether there were complaints. In the periodontia, a functional crown lengthening was performed with incision and excision of the 3 mm gingiva in the lingual section and 2 mm in the buccal section by removing the 1 mm lingual bone followed by clearing debris from calculus (Figure 3).

Two weeks later, root canal treatment was performed on teeth 36. We measure the working length from radiographic photographs of the diagnosis. The estimated working length of the distal root canal is 22 mm. The preparation of artificial walls on the mesial proximal wall of the lingual portion using resin-modified glass ionomer (RMGI, GI) was also conducted (Figure 4).

The next step is to determine the working length with the apex locator and confirm with radiographic photographs using K-file 15, the actual working length for the 22 mm distal canal. Then the distal root canal preparation was carried out using the crown down to F3 technique using the ProTaper hand use file (Dentsply). After that, a photo trial was carried out followed by a distal root canal preparation using a 17% EDTA chelation agent and each tool change; the root canal was irrigated with 2.5 ml NaOCl solution and rinsed with saline. The root canal was then flooded with 2% chlorhexidine digluconate for 30 seconds and finally rinsed with 17% liquid EDTA for 1 minute. The root canal is dried with sterile paper points. Calcium hydroxide with a 2% chlorhexidine digluconate mixture was applied to the root canal and the cavity was lifted with a temporary lift (Orafil G,
Preves Denpro). Patients Instruct for control a week later.

At the fourth visit, subjective, objective and radiographic examinations were performed, and no complaints were found in the patient. The patient subsequently underwent obturation of root canal in tooth 36 with guttap points (Figure 5A). After that, the single cone filling technique uses a resin sealer (TopSeal) (Figure 5B). The next step, above the root canal orifice, a thin glass ionomer cement (Fuji I lining cement GI) was also applied and continued with a temporary cavity (Caviton) (Figure 5C and 5D). The patient was instructed for control a week later.

The fifth visit was carried out for control of root canal treatment and preparation of a furcation hemisection plan of teeth 36. A mandibular anaesthetic block was performed with 2 cc peha-caine. Separation of mesial and distal root furcations in teeth 36 was performed using a long diamond fissure bur. It had been done by vertical buccal-lingual direction cutting technique until the tooth root 36 was separated into 2 mesial and distal parts (Figure 6A). The messed roots that have been disarray were slowly separated using bein and root pliers. The burial region of the mesial side of the tooth is formed and smoothed with a diamond fissure bur. The retraction socket is irrigated with saline to remove blood and remnants of granulation tissue and debris from the cutting and smoothing of the furcation area. The bone graft was then sutured and sutured with one silk 3.0 thread to prevent excessive movement of the teeth 36. Control the bleeding was conducted using a viscostat and the wound area was cleaned with iodine and glycerin gauze, besides the gingival pack dressing was

Figure 3  The clinical condition of teeth 36 following functional Crown lengthening

Figure 4  The clinical condition of teeth 36 following making an artificial wall

Figure 5  (A) Photo trial of teeth 36; (B) filling with single cone technique; (C) obturation of root canal teeth 36; (D) temporary cavity closed

Figure 6  The teeth 36 with (A) mesial removal, (B) radiographic confirmation, and (C) temporary crown insertion
CASE REPORT

Figure 7 The teeth 36 in (A) post-hemisection procedure, (B) radiographic tapered serrated shaft insertion, and (C) post-core radiographic confirmation of radiography

Figure 8 (A) Dental crown preparation; (B) Temporary crown insertion; (C) Installation of metal fusion porcelain crowns on teeth 36 and 35; and (D) Radiographs examination following the installation of metal fusion porcelain crowns

also applied (Figure 6A). Radiographic evaluation of teeth 36 was then performed (Figure 6B). Temporary acrylic crown insertion using was done using temporary cement. The installation of wire ligature on the buccal portion of teeth 36 to 35 was continued to prevent the movement of teeth 36 (Figure 6C). Prescribing antibiotics, analgesics, anti-inflammatory, and vitamin C were recommended to maintain oral hygiene. The patient was given postoperative instructions for control a week later.

The first control was done a week later after the hemisection procedure performed. On subjective examination, the patient still complains of a little pain. Whereas on an objective examination, a temporary crown was found in good condition, the extraction wound was closed, the percussion test (-), the palpation test (-), and the mobility test (-). On radiographic examination, it was found that there were no periodontal tissue abnormalities in tooth 36 (Figure 7A). Sutures were removed using bent scissors, and then the temporary crown was re-installed and the patient instructed to come a week later.

Three weeks after the first control, the guttap point was taken at the distal root of the patient. In order to increase the retention, the shaft was mounted in the root canal by using a tapered serrated shaft. Shaft size on radiographs using a scale and leaving 4 mm patches of gum in the apical root canal. The fitting of the tapered serrated post into the root canal is carried out with radiographic confirmation (Figure 7B). After that, a thin layer of packable composite resin that surrounds the mesial portion of the cavity is carried out where the installation of the fibre reinforced composite tape was also done by surrounding the base of the cavity wall of the cervix. Stakes that have been modified by resin cement (Core build it FR) are inserted using special drives. Resin cement was applied until it completely covered the tooth cavity, which could be used as a core, then the results were confirmed radiographically (Figure 7C).

Dental crown preparation on teeth 36 and 35 was performed using a diamond bur. (Figure 8A). After that, the colour determination was done for the full crown of the metal fusion porcelain with vacuum vitalumen. The next step was moulding for crown manufacturing and temporary crown placement before the true crown remains ready (Figure 8B). The patient was instructed to come for control a week later.

On the following follow up, metal fusion porcelain crowns were placed on teeth 36 and 35 with resin as luting cement. A week later, there was a final follow up to control PFM restoration. At the last follow-up, there were no complaints of pain in the patient during the intra-oral percussion examination. In addition, the gingiva appears normal and the patient can chew comfortably as seen in clinical and radiological features (Figure 8C and D).

DISCUSSION

It has been known that the treatment of multirooted teeth with furcation involvement is an important aspect and a significant challenge in periodontal therapy. Several factors have been associated with these issues such as the complex anatomy and morphology of molar teeth, root concavities, cervical enamel projections, development grooves on root trunks, inter radicular ridges, as well as the limited furcation entrance widths. In order to retain the furcation-involved molars, the hemisection surgical procedure has been chosen due to the furcations with an advanced degree of
involvement respond less favorably to nonsurgical therapy.\textsuperscript{14}

After it was decided to hemisect the distal root of tooth 36, filling the root canal was carried out only on the distal root. Considering hemisection procedure due to extensive caries in the mesial part of the tooth, the presence of perforation in the furcation section, and the presence of furcation involvement, so that there is a possibility of failure if endo-conventional treatment is carried out.\textsuperscript{15} It was one of the reasons to strengthens the reason for extracting mesial roots from the teeth 36. A previous study also found that the hemisection procedure provides a favourable environment for oral hygiene maintenance by eliminating plaque-retentive morphology and severely affected roots.\textsuperscript{16}

Before the hemisection procedure, the conventional root canal treatment was performed on the distal root. The preparation stage used 2.5% sodium hypochlorite (NaOCl) irrigation material because the solution was not only a solvent of pulp tissue and root canal irrigation but also had a significant anti-microbial property.\textsuperscript{17} A previous study by Baumgartner JC was also found the efficacy of several concentrations of sodium hypochlorite to prevent secondary infection through canal root irrigation.\textsuperscript{18}

The addition of shaft restorations to the distal root is highly recommended, giving the small amount of crown remaining and the need for retention for the restoration. Adequate distal root length and straight anatomical shape are potential to meet retention requirements for crown restoration. The crown design is also made in such a way that the occlusal load received is not too large as in a previous study.\textsuperscript{19}

The choice of restoration was a splint crown with teeth 35. This was done not only because the necrosis of the pulp teeth 36 treated by the endo shaft and crown, but also to increase retention, resistance, and to withstand the chewing load of teeth 36 that had hemisected its mesial root. This procedure aimed to prevent teeth sway when chewing.\textsuperscript{19} On the evaluation of periapical tissue, the visible healing extraction wound occurs thoroughly after two months of the procedure. Splint crown installation should be done after extraction wound healing occurs.

**CONCLUSION**

Based on the above discussion, it can be concluded that hemisection is a procedure to maintain teeth as long as possible in the oral cavity, which requires careful consideration, accuracy, and skills of an operator. In this case, the hemisection procedure could succeed due to supported by the condition of the anatomy of the roots as well as the proper supporting tissues of the teeth. The prompt diagnosis, prognosis, and the proper treatment plan could determine the success of treatment.

**CONFLICT OF INTEREST**

There is no competing interest regarding manuscript.

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**AUTHOR CONTRIBUTION**

The author contribute to the study from selecting relevant case, choosing the treatment provided to the patient, as well as evaluating and controlling the outcome of patient following the hemisection of the first-molars mandibula.

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