

Hemisection and Endodontic Treatment of First Molar Tooth and Mandibular Fracture Repair in a Dog

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Abstract : This clinical report describes hemisection and endodontic treatment of first molar tooth and mandible fracture repair in a dog. A 10 years old spayed female shih-tzu was diagnosed as left mandibular fracture by oral examination and dental radiography. First, partial odontectomy of mesial root of mandibular first molar placed in fracture line was performed, and then endodontic treatment of distal root and bone graft in extraction site was performed. Thereafter the fracture region was fixed with interdental wiring and acryl resin splint. Mandibular fracture site was healed without any complications, observed for 19 weeks follow-up period. Upon this result, this case is proving that fractured mandible can be treated successfully with hemisection followed by bone graft, interdental wiring and acryl resin splint to preserve the remaining tooth for mastication rather than tooth extraction.

Key words : hemisection, mandibular fracture, endodontics, bone graft, dog.

Introduction

Mandibular fractures represent 2.5-2.7% of fracture cases in dogs. These fractures are nine times more common than maxillary fractures (1).

Mandibular fractures are attributable to trauma caused by car accident and dog fight in 89-100% of cases. However, they can also cause by pathologic fracture due to periodontal disease and neoplasia as well (2). In particular, mandibular pathologic fracture is caused by small external trauma in geriatric dogs with periodontal disease and often found at molar (3). The treatment can be divided into invasive and noninvasive procedures. Invasive procedures are involving external or internal fixation devices. By contrast, noninvasive treatments rely on closed reduction and tooth-borne devices (1). When some parts of tooth root of a teeth with multiple roots on mandibular fracture line is damaged, partial odontectomy or partial root resection could be applied to reserve undamaged parts of the teeth (3).

Hemisection, one of partial odontectomy, is the splitting of a multi-rooted tooth into two separate portions. After sectioning of the tooth, all tooth portions are either retained or one or several tooth portions are extracted (4). The treatment goal is preservation of remaining tooth structures and restoration of the function (5).

The purpose of this study is to report a case of mandibular fracture in first molar tooth treated with hemisection for conservation of the tooth and function of mastication in a dog.

Case

A 10 years old spayed female shih-tzu with a history of

anorexia and severe pain in left lower jaw after falling from a chair presented to Ji Dong-bum Animal Hospital. After oral examination and skull diagnostic imaging, a fracture was found on left mandible. Blood test (CBC, chemistry, electrolyte test), thoracic and abdominal radiographic examination, electrocardiography, blood pressure measure was performed to assess the general status of the patient and no abnormalities were detected. General anesthesia was performed as following; cephazolin (Cephazolin Inj®; Chong kun dang Pharmaceutical Corp. Seoul, Korea) 20 mg/kg IV was injected for prophylaxis, midazolam (Midacum Inj®; Myungmoon Pharm Co, Hwaseong, Korea) 0.1 mg/kg IV, butorphanol (Butopan Inj®; Myungmoon Pharm Co, Hwaseong, Korea) 0.1 mg/kg IV for premedication, and propofol (Provive Inj® 1% Myungmoon Pharm Co, Hwaseong, Korea) 6 mg/kg IV for induction. After intubation, 2-3% isoflurane was used to maintain anesthesia. With oral radiographic examination, a fracture line was found in the bottom parts of the first molar mesial root in the left mandible and, in this tooth, periodontitis was found in mesial root only and there was no issue with distal root in alveolar bone. Before fracture repair, dental scaling was performed to prevent possible infection and 0.2% chlorhexidine was applied.

For partial retention, partial odontectomy was planned instead of whole tooth extraction. Interdental wiring was chosen as part of non-invasive treatment. Two percent lidocaine for block anesthesia was directly injected to left mandible and mesial root of the first molar was partially extracted. As a result, pulp of the cut surface was exposed, and endodontic therapy was planned. For endodontic treatment, the length of root canal was determined by file and pulp tissues inside root canal were removed. Four percents NaOCl was used to irrigate inside root canal and root shaping was applied with step back technique (10). For obturation of root canal, sealer and

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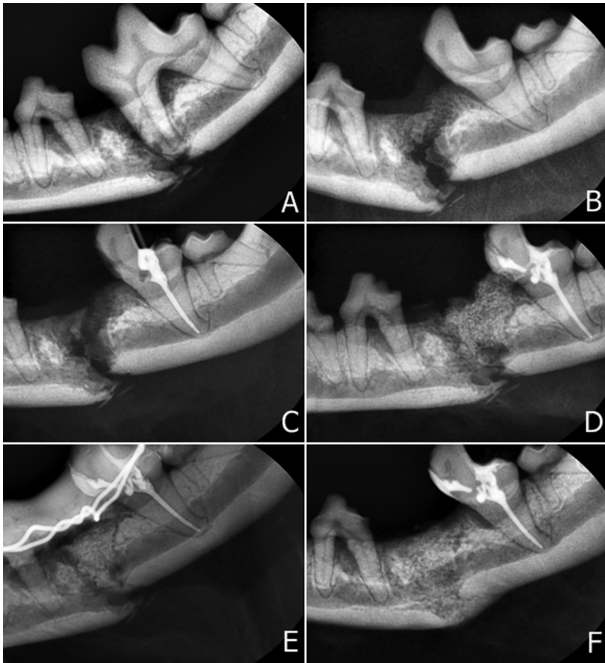


Fig 1. Right mandibular fracture beneath mesial root of #309 (A). Hemisection of mesial root of #309 (B). Root canal therapy of distal root of #309 (C). Synthetic bone graft at extraction site (D). Wire and Acryl resin fixation (E). After 20 weeks postoperatively (F)

gutta percha cone was used and resin was applied for restoration.

Next, the extraction site was debrided using curette and irrigated with 0.9% sterilized normal saline solution for bone graft. For bone graft, synthetic bone (Consil®; Nutramax Laboratories, Inc, Maryland, USA) mixed with autoserum was filled in the extraction site to regenerate left mandible and prevent alveolar bone loss (Fig 1). After filling synthetic bone on the extraction site, attach gingiva lingual aspect and buccal aspect was undermined to make a pedicle flap and sutured with absorbable 4-0 (Monosyn®; B.Braun Surgical, S.A., Rubi, Spain) to the extraction site. To increase stability of the jaw, interdental wiring was used, and composite acrylic resin splint was applied above it (11) (Fig 2). Tape muzzle was considered. However, as this patient had a cataract surgery two week ago, muzzle was not applied. Doxycycline (Doxycycline; Kukje Pharm, Ansan, Korea) 5 mg/kg bid PO and Bromelain (Gimotabu; Jeil Pharm, Seoul, Korea) 2 mg/kg bid PO was prescribed for four weeks after the surgery



Fig 2. Application of wire fixation and acryl resin.

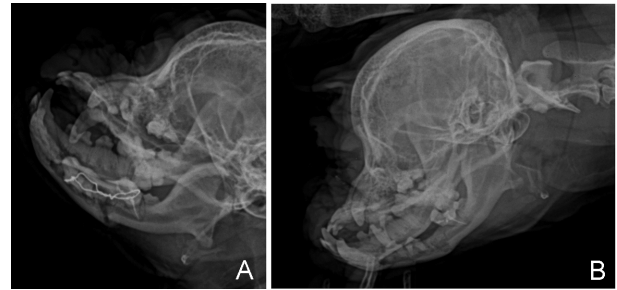


Fig 3. DR images after operation (A) Postoperative DR image of mandibular fracture (B) The DR image after 20 weeks of hemisection and bone graft treatment. The fracture line has disappeared.

and no pain was observed. Every three weeks, a follow-up for fracture line had been performed with X-ray test. Finally, no fracture line was found in 19 weeks after the surgery. Composite acrylic resin and interdental wire was removed after general anesthesia 20 weeks postoperatively. After six months, no discomfort and normal mastication was observed (Fig 3).

Discussion

In general, various methods for mandibular fracture repair in dogs include pinning technique, plate and screw fixation, intraoral acrylic or composite splint, external fixation, intramedullary pin, interdental wiring, tape muzzle, dental composite resin application and combination of multiple methods (7). However, all of these methods have advantages and disadvantages, and the choice of fracture repair method should take into consideration various factors such as the age and physical condition of the patient and the type of fracture (9). In this case, the methods of mandibular repair using hemisection and interdental wiring was used as it was less invasive than complete tooth extraction and helps to maintain function of teeth.

This patient was a geriatric, small breed dog and had mid-level periodontitis and a fracture in mandibular first molar. Partial extraction of the first molar was decided because the alveolar bone of distal root in the first molar has merely damaged and pulp chamber has not been closed in this case.

Generally, mandibular canine tooth and the first molar in small breed dogs have higher chance of pathologic fracture because teeth root is bigger than alveolar bone (8). When the root is exposed to the cut surface, decision making for tooth extraction is difficult because it can make mandibular fracture worsen. If periodontal disease is found on the fracture line, it is recommended to extract the teeth completely or partially (3). Therefore, diagnosis on periodontal diseases and pulp diseases should make first and find a relationship between those diseases and fracture line (8). The advantage of partial tooth extraction is more conservative and less invasive than complete tooth extraction, and more effective to maintain function of mastication (12). The disadvantages of tooth root hemisection is extensive postoperative care, need of endodontic treatment and restoration (4,6,12). Indications for hemisection of a tooth include severe vertical bone loss involving only one root of multi-rooted teeth, endodontic

failure, root fracture involving only one root, and severe tooth destructive process (4,6). Hemisection of a tooth is contraindicated in root fusion and inoperable canals in root to be retained (6).

Conclusion

When a tooth is in the fracture line, hemisection rather than complete tooth extraction could be a choice for conservation of the tooth and function of mastication.

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