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DT Kaarthick

Assistant Professor, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

D Vishnugurubaran

Assistant Professor, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

C Rajesh

PG Scholar, Department of
Veterinary Surgery and
Radiology, Veterinary College
and Research Institute,
Orathanadu, Tamil Nadu, India

K Vijayakaran

Assistant Professor, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

A Vijayarajan

Professor and Head, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

P Prathinka

Research Scholar, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

Corresponding Author:

DT Kaarthick

Assistant Professor, Veterinary
Clinical Complex, Veterinary
College and Research Institute,
Orathanadu, Tamil Nadu, India

Management of unilateral oblique mandibular fracture with interfragmentary wiring technique in a Shih Tzu dog - A case report

DT Kaarthick, D Vishnugurubaran, C Rajesh, K Vijayakaran, A
Vijayarajan and P Prathinka

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Abstract

A two-year-old male Shih Tzu dog was presented to the Small Animal Surgery Unit of Veterinary Clinical Complex, Veterinary College and Research Institute, Orathanadu with the history of dog bite and post exposure prophylaxis done by the field veterinarian. On physical and radiographic examination, a right mandibular oblique fracture along the horizontal rami was observed. Further surgical correction through interfragmentary wiring was performed under general anesthesia as staged procedure at the site of fracture and proper positioning of the pin was verified radiographically. On the 45th day the radiographic examination revealed callus formation favoring the removal of pin from the site of surgery and the animal made an uneventful recovery.

Keywords: Dog bite, interfragmentary wiring, mandibular fracture, mandibular pinning

1. Introduction

A fracture in the jaw can range from a greenstick (incomplete crack) to severe comminution. Mandibular fracture may result from trauma, neoplasia, concurrent injuries like upper airway obstruction, pneumothorax and severe periodontitis. One of the major causes include trauma due to vehicles as dogs tend to freely wander and injuries during fights between dogs. Thoracic injuries occur concomitantly further observed as pulmonary contusion, pneumothorax, diaphragmatic hernia and traumatic myocarditis. Pathological fractures tend to affect older animals than young animals. The tooth roots, nerves, blood vessels and salivary duct are located within and adjacent to mandible with a high risk of being damaged during the fracture (*Fossum*).

Surgical intervention of fracture is considered if the site of injury is unilateral or bilateral. The techniques that can be employed for the same include tape muzzles, circumferential wiring, interdental wiring, acrylic splints, percutaneous skeletal fixation, intramedullary pinning, bone plating and partial mandibulectomy (Kachwaha *et al.*, 2011) ^[7]. Application of tape muzzle is an inexpensive option which favors rapid healing of minimally displaced fractures but difficult for repair of fracture in the vertical ramus (Harasen *et al.*, 2008) ^[4]. Circumferential wiring is effective for fractures in the mandibular symphysis where orthopedic wire is secured around the front parts of both jaws, with the help of large-bore needles (Higgins *et al.*, 2013) ^[3]. External fixation is an effective method wherein minimum of two pins or screws are placed percutaneously in each fragment, avoiding the mandibular canal. Its disadvantages are its increased expense and its use being limited to larger dogs (JR Davidson *et al.*, 2022) ^[6].

The ultimate aim of the surgery performed is to mimic the anatomical alignment of the fractured portion of the jaw hence facilitating mastication and prehension to the maximum. Healing of the site further depends on the level of vascularity retained and the absence of infection at the site of fracture. Advantages of interfragmentary wiring include precise alignment with minimal deformity, minimum tissue invasion further promoting rapid healing and minimal cost (Uma Rani *et al.*, 2022) ^[10]. Further this case reports highlight the successful

treatment of unilateral oblique mandibular fracture in a Shih Tzu dog by employing interfragmentary wiring technique.

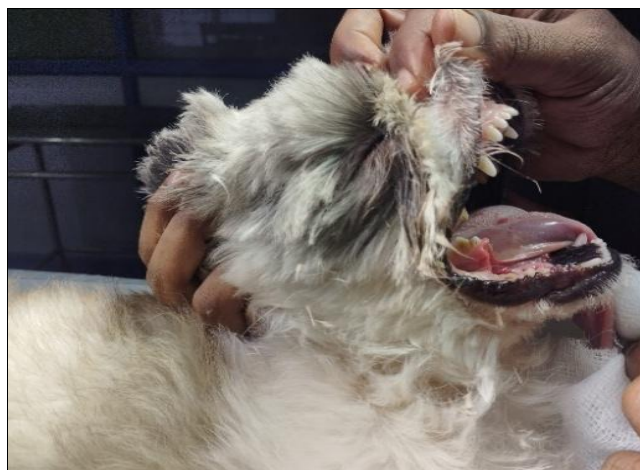


Fig 1: Gross appearance of the fracture along the ramus of the right mandible



Fig 2: Radiographic image of skull (lateral) visualizing the oblique fracture along the ramus of right mandible

2. Materials and Methods

On physical examination of the animal, asymmetry in the right jaw and swelling was noticed alongside pain evinced on palpation (Figure. 1). Radiographic examination of the animal's skull in lateral and dorsoventral view revealed an oblique fracture line along the right mandibular horizontal ramus (Figure. 2). Based on the observations it was evident that surgical intervention was necessary to restore the stability of the animal. The hematological and serum analysis was done whose values are tabulated below to ensure the status of the animal prior to surgery

Table 1: Hematological findings

Parameter	Sample value	Reference value
Hemoglobin (g/dl)	9.1	12-15
Packed cell volume (%)	31.3	35-37
Total RBC (cells/ μ l)	11.93×10^6	$5-9 \times 10^6$
Total WBC (cells/ μ l)	27×10^3	$5-15 \times 10^3$
Neutrophil (%)	68	60-75
Lymphocyte (%)	25	8-21
Monocyte (%)	4	2-10
Eosinophil (%)	3	0-9
Platelets	2.41	2-5

Table 2: Biochemical profile

Parameter	Sample value	Reference value
BUN (mg/dl)	40	10-20
Creatinine (mg/dl)	3	0.5-1.8
Glucose (mg/dl)	80	65-113
Albumin (g/dl)	3.5	2.6-3.3
ALT (U/L)	75	10-109
ALP (U/L)	380	20-150
Phosphorus (mg/dl)	5.5	2.5-5

Interfragmentary wiring was opted as the mode of treatment. The animal was initially stabilized by the administration of Inj. Ringers lactate (10ml/kg b.wt. I.V.), Inj. Ceftriaxone and Tazobactam (15mg/kg b.wt. I.V.), Inj. Dexamethasone (0.1mg/kg b.wt. I.V.) and Inj. Pantoprazole (1mg/kg b.wt. I.V.). Preanesthetic medication of Inj. Xylazine (0.5mg/kg b.wt. I.M.), Inj. Butorphanol (0.2mg/kg b.wt. I.M.) was given. Within an interval of 10 minutes, induction was done with the help of Inj. Ketamine (5mg/kg b.wt. I.V.) and Inj. Diazepam (0.5mg/kg b.wt. I.V.) Animal was placed in left lateral recumbency and the surgical site was shaved and aseptically prepared. Under general anesthesia, a 1.5mm K - wire was used for the correction of the mandibular fracture by a driller and the sharp tip was sealed with epoxy (Figure 3) Radiographic examination of the mandibular region revealed the presence of the implant intact at the site (Figure 4). The animal was advised to maintain on fluid therapy for the next 2 weeks alongside administration of antibiotics, analgesics with minimal jaw movement.



Fig 3: Radiographic image of skull (lateral) with positioning of the K-wire



Fig 4: Radiographic image of skull (lateral) after the removal of the K-wire

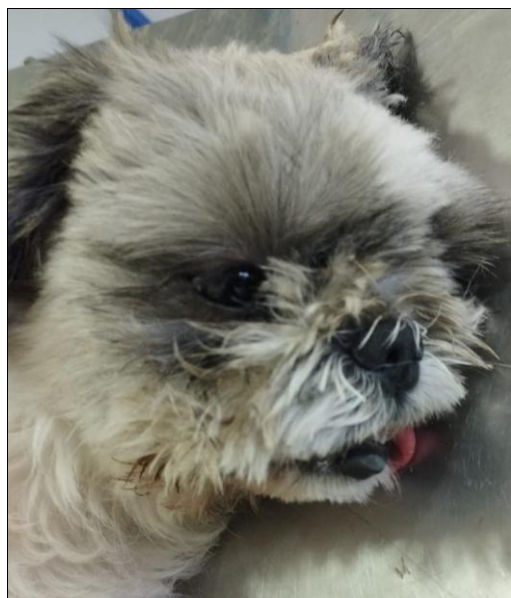


Fig 5: Recovered animal on the 45th day with intact interfragmentary wire

3. Results and Discussion

On 24th day in the post operative radiographic examination the pin was found to be intact and callus formation was noticed. On the 45th day the radiographic examination elucidated a proper alignment and fracture healing at the site of injury favoring the removal of the implant. Animal showed uneventful recovery (Figure. 5).

As mentioned earlier there are several methods for the correction of mandibular surgery which majorly focus on retaining normal occlusion that provide rigid fixation and therefore an early return to function. Due to the unique forces that mandibular fractures endure compared to other bones, veterinarians face numerous challenges during the surgical correction of these fractures (Harasen *et al.*, 2008) [4].

In this case, interfragmentary wiring was chosen due to the fracture's location, the time elapsed before referral, the severity of the fracture and the fact that the animal is a brachycephalic breed. We have utilised a K-wire with a diameter of at least 1.0–1.5 mm fixed to an electric drill and the wire was inserted percutaneously across the fracture site from the horizontal ramus till the level of ventral ramus and the external portion secured with epoxy. The possible complications are loosening of the wire, malalignment, development of submandibular abscess, intraoral ulceration, osteomyelitis and ventral deviation at the site (Imani Rastabi *et al.*, 2017) [5]. However, no such complication was observed in this case.

4. Conclusion

Interfragmentary wiring technique using 1.5mm K-Wire was used for the correction of oblique fractures in the horizontal ramus of the right mandible of a Shih Tzu dog. This procedure is economical, effective and less invasive, causing minimal disturbance to the animal therefore this technique is highly preferred.

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