Mandibular symphyseal fracture in dogs: a retrospective study on the incidence and age of cases admitted to the referral teaching hospital of faculty of veterinary medicine, Cairo University, and some private clinics

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1. Abstract

The mandible and maxilla have unique structural and functional characteristics compared to the rest of the skeleton, which affect the incidence of their fractures, as well as the complications that occur as a result, which may affect other vital systems such as the central nervous, the digestive, and the respiratory systems. Mandibular symphyseal fracture in dogs frequently happens as a result of forced trauma like being hit by vehicles, falling down from a height, or fighting another dog. The current study was designed as a retrospective and prospective study to record the incidence of dogs' mandibular symphyseal fractures at the referral teaching hospital of the faculty of veterinary medicine, Cairo University, and some private clinics in Egypt during a three-year study period from Jan 2020 to Dec 2022. This study was conducted on total admitted fracture case of 949 dogs including 94 skull fractures and 855 other fracture cases with an age ranging from 18.88 ± 22.41 months of both sexes (640 male & 309 female). Establishing of skull fractures diagnosis was based on history, clinical signs, and further diagnostic orthopedic examination and x-ray. From the obtained data, it could be concluded that the incidence of dogs' mandibular symphyseal fractures at the referral teaching hospital of the faculty of veterinary medicine, Cairo University, and some private clinics in Egypt was 5.1% of total canine fracture cases, and 51.1% of total canine skull fractures. Concerning age, the most affected age with mandibular symphyseal fractures was recorded in age less than one year.

Keywords: Canine, Mandibular symphyseal fracture, Orthopedic surgery, Skull.

2. Introduction

Oral trauma remains a common presentation in small animal practice as head trauma is the common cause of traumatic jaw fractures. In addition to vehicular accidents, other causes include falls, fighting bites with other animals, gunshot wounds, and blunt force trauma. Other predisposing causes which may result in a traumatic or pathologic jaw fractures include neoplasia, metabolic abnormalities, severe periodontal disease, and iatrogenic fracture during tooth extraction. the patient should be evaluated and stabilized for probable life-threatening injuries before general anesthesia and fracture fixation **[1-5].** Head trauma needs instant attention as it may associated with emergency critical cases. So, the primary approach must be focused on the patient stabilization and assessment of the main body systems including neurological examination,

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respiratory assessment, cardiovascular assessment, and ocular examination. Moreover, stabilization period and appropriate treatment is essential prior to consideration being given to fracture repair **[5].** It is recommended that perform thoracic radiographic examination and electrocardiography for all head traumatic patients. As it is recorded that about (33% to 42%) of fracture patients and cats with mandibular fractures suffered from degree of thoracic injury, most frequently pulmonary injuries like (lung contusions and pneumo-thorax) that may lead to delay the orthopedic fracture repair. Consequently, it is necessary to obtain at least two orthogonal radiographic projections of thorax **[5].** Furthermore, it is recommended as some authors advise that obtain an electrocardiogram to investigate evidence of traumatic myocarditis, as the most common type of post-traumatic arrythmia is ventricular ectopy which in form of pre-mature ventricular contractions. Even though, it may seem appropriate to restrict the use of ECG to animals with clinically noticeable compromise cardiovascular output. It is also important to evaluate and treat all other emergency conditions include head trauma, bleeding, and shock before the patient is anesthetized to repair the orthopedic injury **[5].**

Skull fractures are always associated with neurological dysfunction. Therefore, it is necessary to treat the neurological deficits precede the orthopedic injury treatment. Generally, most mild to moderate neurological dysfunction cases will respond to medical therapy, and not necessary need to the surgical treatment **[5].**

The goals of fracture management are the rapid restoration of normal function and normal restoration **[1-12]**.

Mandibular fractures are commonly seen in small animals' practice, which represent around (1.5-6%) of all fractures diagnosed in canines and (11–23%) of all fractures in cats **[1,13,14&15]**. Mandibular and maxillary fractures represent 3%–6% of all bone fractures in cats and dogs according to **[16].** Mandibular fractures occur more frequently than maxillary fractures, as maxillary fractures represent less than 1.07-0.8% in dogs **[15, 17&18].** Mandibular fractures are recorded to have a high incidence in male dog less than one year age almost about 50% **[19].** The relatively high incidence of oral fracture in older dogs was probably related to advanced periodontal disease in small breed **[15].** The most common mandibular fractures are mandibular body fractures **[14],** which represent about 80% according to **[13],** the premolar region fracture is the most common accounting 31% of mandibular fractures **[19]**. Mandibular symphysis fracture represented 15% of mandibular injuries in canines **[13]**. They are usually complicated with other injuries (soft tissue lesions, canine teeth injuries, caudal mandibular fractures, and ramus mandibulae). In contrast, in felines, the mandibular symphysis represented the majority of mandibular fractures about 73% **[16 and 19].** The mandibular caudal body and ramus were affected in 40% of canine mandibular fractures **[4].** Mandibular fractures lead to several functional problems in dogs and cats **[1].** Jaw fractures were most commonly occurred as an open fracture with variable degrees of infection and contamination. These fractures can be stabilized by one of several methods, such as screw applications and stabilization with intra oral cerclage wires. Cerclage wires can be removed after (6–8) weeks in fractures of

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the symphysis mandibulae **[16].** The complication rate of jaw fracture treatment represents about 34%, however, it is a high percent but two third of those complications involved osteomyelitis or dental malocclusion. In addition, the healing of most mandibular fractures is fast enough and heal without a large callus **[19].**

This study was designed as a retrospective and prospective study to record the incidence of dogs' mandibular symphyseal fractures at the referral teaching hospital of the faculty of veterinary medicine, Cairo University, and some private clinics in Egypt.

3. Materials and Methods

3.1. Ethical approval

This study was performed in accordance with the ethical standards of the institutional Animal Care and Use Committee, Faculty of Veterinary Medicine, Cairo University, Egypt with approval number# vetcu8032022396.

3.2. Study population

This study was conducted on a total admitted fracture case of 949 dogs including 94 skull fractures and 855 other fracture cases with an age ranging from 2 months to 14 years of both sexes (640 male & 309 female). Establishing of skull fractures diagnosis was based on history, clinical signs, and further diagnostic orthopedic examination and x-ray.

3.3. Data collection

Data were collected from patient's medical records and admitted cases during the study period from (Jan 2020-Dec 2022) at referral veterinary teaching hospital, Department of Surgery, Anesthesiology and Radiology, faculty of Veterinary Medicine, Cairo university, and ten private pet clinics distributed in different governorates as five clinics in Cairo, and one clinic in each province of Giza, Qalyubia, Menofia, Alexandria and Mansoura.

3.4. Diagnostic approach of mandibular symphyseal fracture on admitted cases

All animals under the study were exposed to comprehensive physical examination, clinical signs were recorded at the time of admission. To confirm the primary diagnosis, a radiographic examination was carried out.

Each patient was subjected to physical examination through examination of the oral cavity under the effect of general anesthesia as Pre-anesthetic medication was composed of atropine sulfate (0.02 mg/kg, SC) Sedation was induced by xylazine HCl (1.0 mg/kg, IM) and diazepam (0.2 mg/kg, IV) followed by induction with ketamine HCl (5.0 mg/kg, IM) **[20].** Diagnosis of mandibular fracture by inspection through allows gentle opening of the mouth that permits a visual assessment. Gently palpate of both ventral margins of the mandible gently for asymmetry or discontinuity by putting the fingers in the mouth of the patient adjacent to the alveolar margin **[10,11]**.

For confirmatory diagnosis of suspected fracture patient. Each dog was exposed for radiographic examination carried out with exposure factors (40-60 kVp and 0.1-0.3 mA) by making two orthogonal routine views of the mandible (ventrodorsal (VD) or dorsoventral (DV) and lateral views) **[13].** Radiological examination was be done using (X-ray unit (FISCHER), 1985, made in JAPAN)

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in department of Surgery, Anesthesiology and Radiology, Cairo university. Another (X-ray units (FCR) Prima, Fuji, 2000, made in JAPAN and (Siemens), Mobilett, XP Hybrid, made in Sweden) were used in private clinics.

4. Results

The total number of admitted cases suffering from fractures was 949 dogs ,(352) at referral veterinary teaching hospital, department of Surgery, Anesthesiology and Radiology, faculty of veterinary medicine, Cairo university, and ten private pet clinics distributed in different governates as five clinics in Cairo (303), and one clinic in each province of Giza (65), Qalyubia (58), Menofia (19), Alexandria (69) and Mansoura (83). Out of these cases, 94 dogs were suffering from skull fractures representing 9.9% of total canine fracture cases. The mandibular symphyseal fracture was recorded in 48 cases which represent 5.1% of total canine fracture cases, and 51.1% of total canine skull fractures (Table 1) (Figure 1).

Regarding age, Mandibular symphyseal fractures were recorded in 29, 13, and 6 cases of age less than one year, between one to three years, and more than three years respectively. The percentage of mandibular symphyseal fracture related to age illustrated in (Table 2) (Figure 2).

Each mandibular symphyseal fracture case was recorded and radiographic findings to establish the descriptive data, treatment, and follow-up in addition to confirmation of diagnosis which was documented using radiographic examination (figures 3-6).

5. Discussion

The incidence of orthopedic conditions in dogs was commonly described in previous literature **[21, 22 & 23].** Mandibular symphyseal fracture is one of the most important fractures in dogs and is commonly frequent in pet clinics. On the other hand, according to the author's knowledge, no available literature dealing with the incidence of mandibular symphyseal fractures in Egypt. Recording the incidence of such fractures constitutes an important subject that deserves study, to increase the awareness and knowledge of veterinarians, as well as provide the necessary diagnostic tools and instruments to deal with such types of fractures of a special nature.

In the present study, dogs suffering from skull fractures represented 9.9% and mandibular symphyseal fractures 5.1% of total canine fracture cases, so in every 20 admitted fracture cases, two were skull fractures with one of them being a mandibular symphyseal fracture. These findings are contradicting previous ones reported by **Akin et al. (2013)** who mentioned that mandibular and maxillary fractures represent 3%–6% of all bone fractures in cats and dogs respectively**.** The high incidence rate of skull fractures recorded in the current study could be due to the nature of the places under study, especially the teaching hospital of faculty of veterinary medicine, Cairo University, which is considered a referral site in Cairo, and also because of the frequent handling of rescue dogs that were exposed to traffic accidents and falls from heights.

In the current survey, half the total admitted canine skull fracture cases were mandibular symphyseal ones. The results declare the high rate of such conditions in dogs and reflect their importance. On the

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contrary, other researchers recorded that the most common mandibular fractures were mandibular body fractures **[13,14]** and the mandibular symphysis fracture was the lowest one of mandibular injuries in dogs. Our results may be due to the repeated admission of many cases of young ages, which often suffer from mandibular symphyseal fractures more than mandibular body ones **[3].**

Regarding the age of dogs under the present study, the percentage of skull fracture cases out of total fracture cases related to age in juvenile dogs represented about 1.5 times that in the adult and geriatric ones (12.0%, 7.5%, and 8.8% respectively). The results are logical and may be attributed to the patient's bone features like density and the bone absorption capacity to the traumatic forces **[24,25].**

The obtained results showed that the percentage of mandibular symphyseal fracture cases out of total fracture cases related to age in juvenile dogs showed the highest percentage of mandibular symphyseal fracture and about two times that in the adult and geriatric ones (7.1%, 3.5%, and 3.5% respectively).

In the extant work, in every ten admitted mandibular symphyseal fracture cases, about six cases were juveniles, three adults, and one geriatric (60.4%, 27.1%, and 12.5% respectively). The results may be contributed to the presence of a weak site of the immature mandibular symphysis which acts as a predisposing factor for fracturing **[26].**

6. Conclusion

From the obtained data, it could be concluded that the incidence of dogs' mandibular symphyseal fractures at the referral teaching hospital of the faculty of veterinary medicine, Cairo University, and some private clinics in Egypt was 5.1% of total canine fracture cases, and 51.1% of total canine skull fractures. Concerning age, mandibular symphyseal fractures percentage were 60.4%, 27.1%, and 12.5% out of total mandibular symphyseal fracture cases, 30.8%, 13.8%, and 6.4% out of total skull fracture cases, 7.1%, 3.5% and 3.5% out of total fracture cases related age, 3.1%, 1.4% and 0.6% out of total fracture cases, and 59.2%, 46.2% and 40.0% out of skull fracture cases related age of age less than one year, between one to three years and more than three years respectively.

Conflict of interest

Nothing to declare

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Table 1: The total admitted canine fractures, skull fractures, and mandibular symphyseal fracture cases.

Fracture type	*Other Fractures*	*Skull Fracture*	*Total*	*Mandibular symphyseal fracture*
Number of cases	855	94	949	48
% out of Total fracture cases	90.1%	9.9%	100%	5.1%
% out of Skull fracture cases	-	100%	-	51.1%

Table 2: The distribution of the total admitted canine fracture, skull fractures, and mandibular symphyseal fracture cases on the age.

Age	*Mandibular symphyseal fracture*				*Skull fracture*				*Total fracture cases*			
	<1 y	1-3 y	>3 y	Total	<1 y	1-3 y	>3 y	Total	<1 y	1-3 y	>3 y	Total
Number	29	13	6	48	49	28	15	94	407	372	170	949
% Out of Total Mandibular symphyseal fracture	60.4%	27.1%	12.5%	100%	-	-	-	-	-	-	-	-
% Out of Skull fracture cases	30.8%	13.8%	6.4%	51.1%	52.1%	29.7%	15.9%	100%	-	-	-	
% Out of skull fracture cases related age	59.2%	46.2%	40.0%	51.1%	100%	100%	100%	100%	-	-	-	
% Out of Total fracture cases	3.1%	1.4%	0.6%	5.1%	5.1%	2.9%	1.6%	9.8%	42.9%	39.2 %	17.9 %	100%
% Out of Total fracture cases related age	7.1%	3.5%	3.5%	5.1%	12.0%	7.5%	8.8%	9.8%	100%	100%	100%	100%

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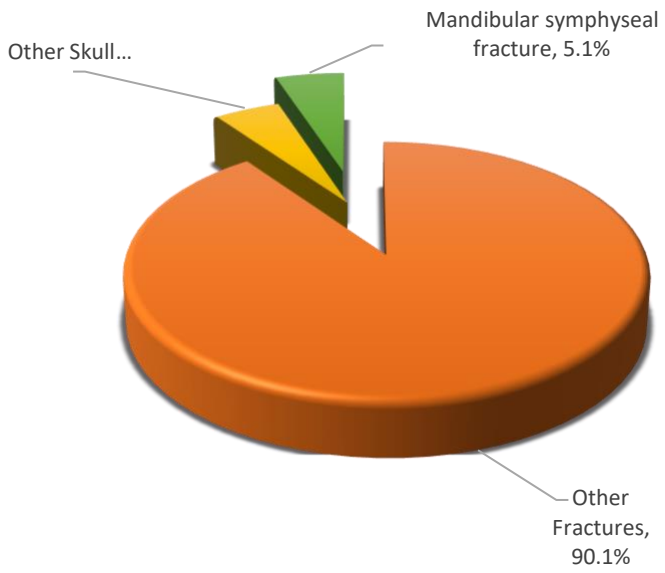

Fig. 1 Percentage of mandibular symphyseal fracture cases out of total admitted canine fractures, and skull fractures cases.

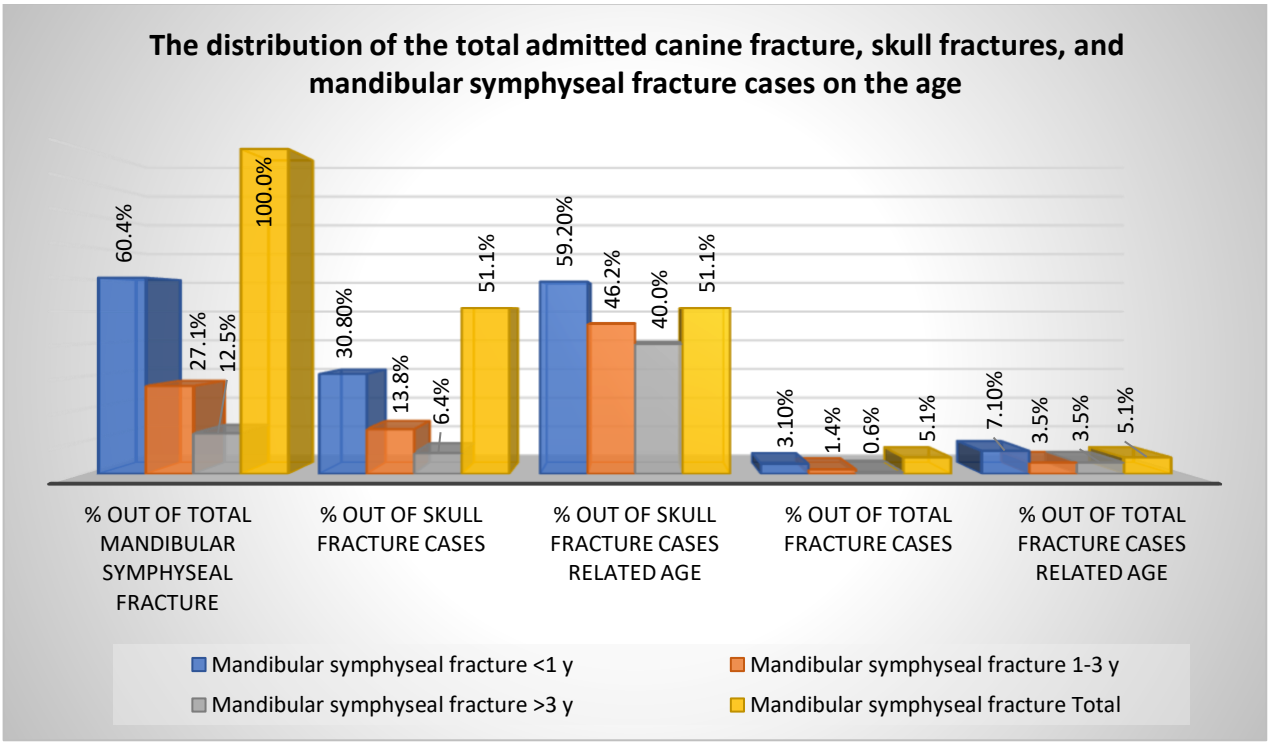

Fig. 2. The distribution of the total admitted canine fracture, skull fractures, and mandibular symphyseal fracture cases on the age

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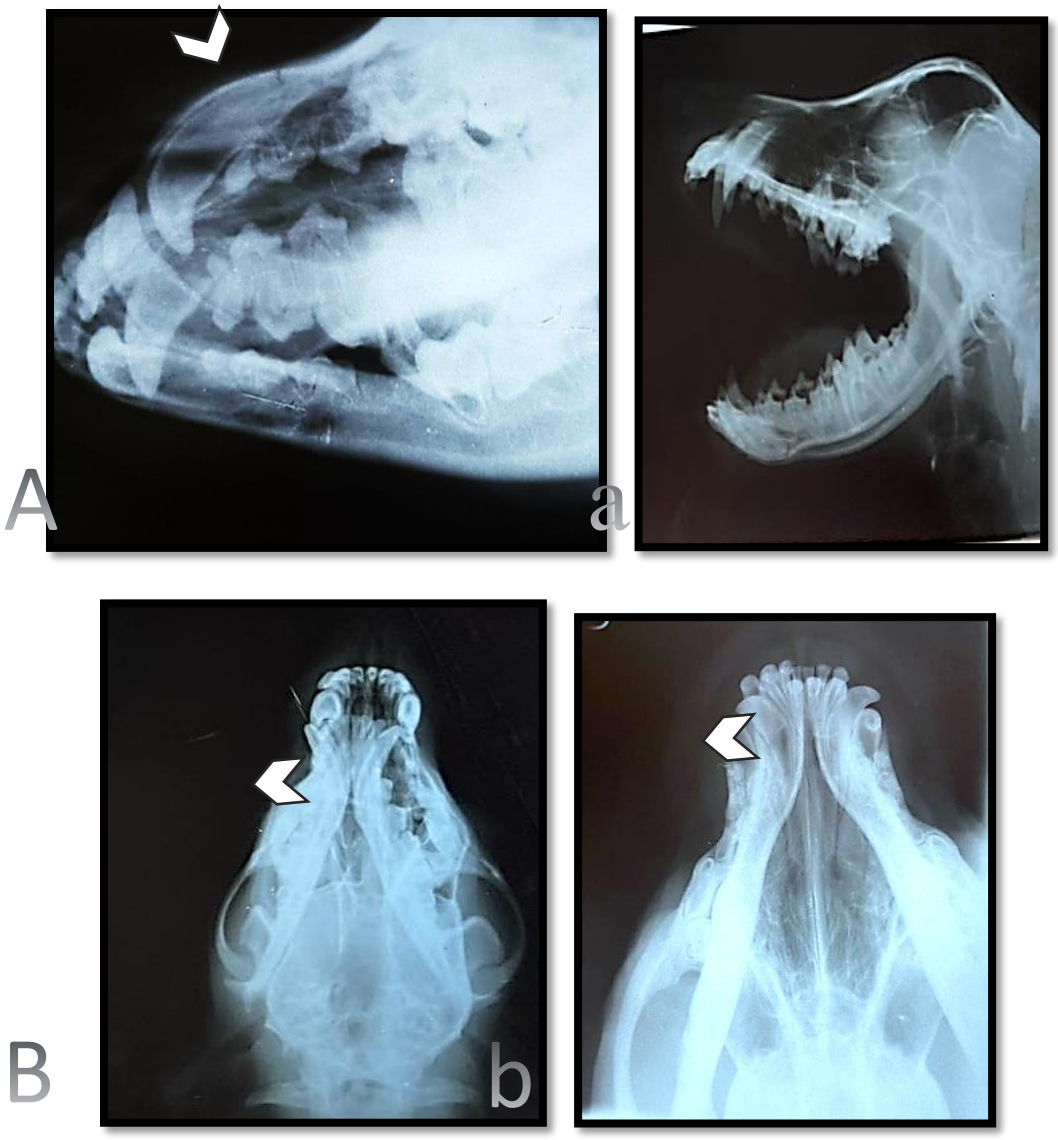

Fig. 3. (A) lateral view of a six-month-old Rottweiler male dog showing incomplete maxilla fissure fracture at the level of left upper canine root (white arrow), (B) VD view of the same case with mandibular symphyseal fracture (arrowhead). and (a) Lateral view of a nine-month-old German shepherd dog male, suffering from a mandibular symphyseal fracture and(b) VD view of the same case suffered from mandibular symphyseal fracture (arrowhead).

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Fig. 4. a) Lateral view of a four-month-old mixed breed female dog, with mandibular symphyseal (arrowhead) and mandibular body fracture (white arrow) and b) VD view of the same dog and after fixation of mandibular body fracture using a mini-titanium plate (white arrow) and mandibular symphysis using a lag screw (arrowhead).

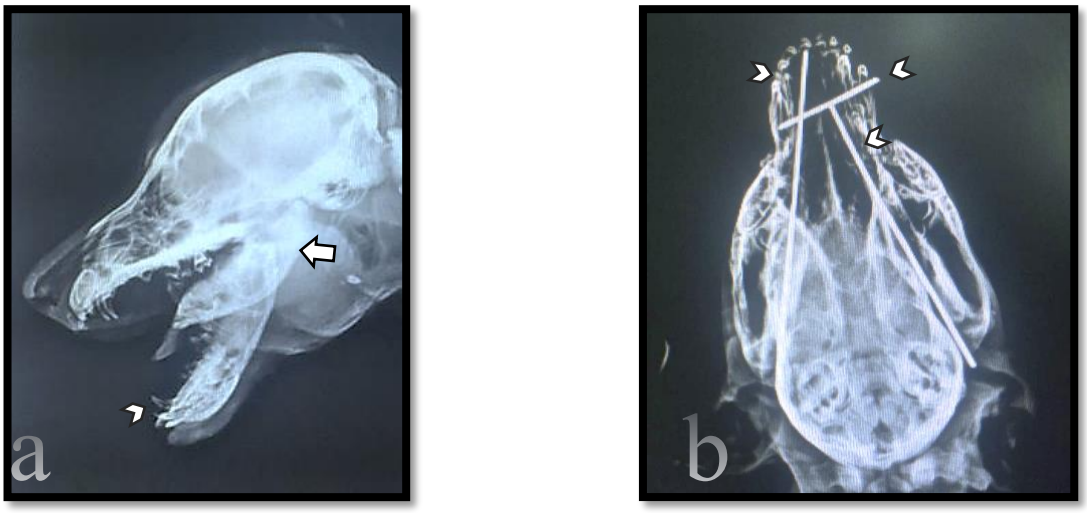

Fig. 5. a) lateral view of a three-month-old mixed breed male dog suffering from mandibular symphyseal (arrowhead) and mandibular body fracture (white arrow) before and b) after fixation using K wires (arrowheads).

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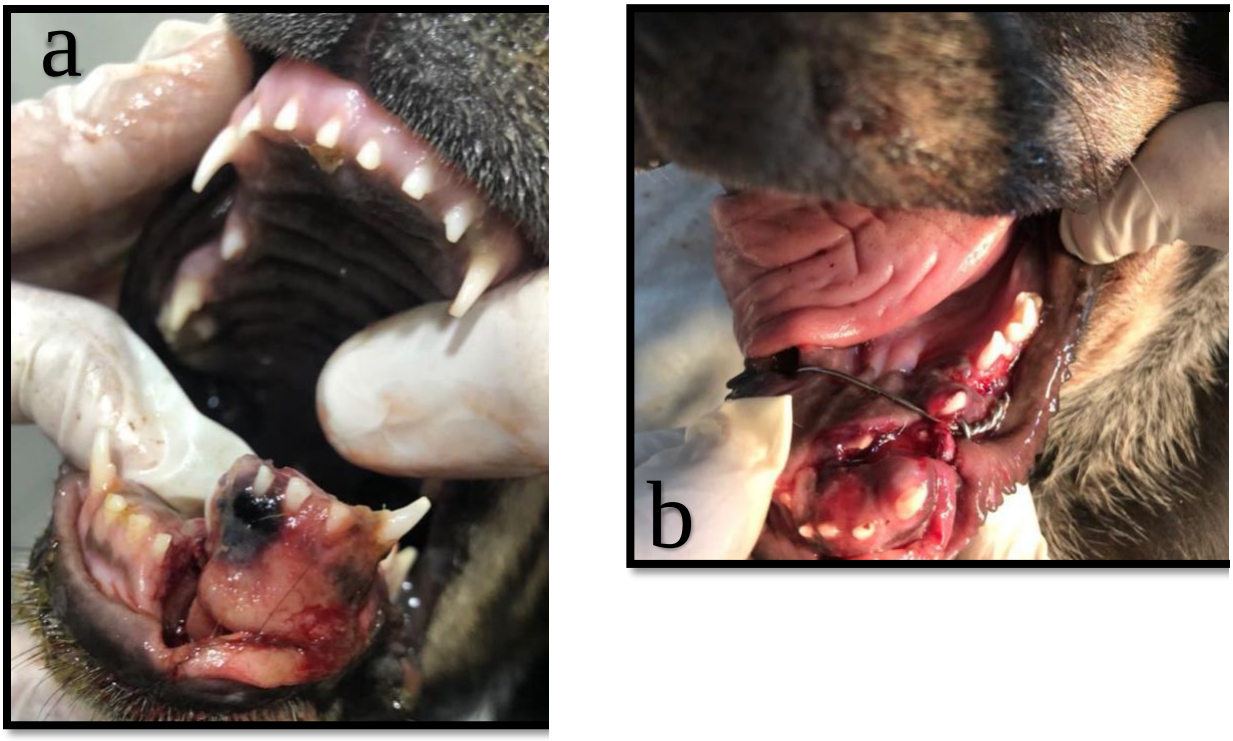

Fig. 6. a) Photograph of a three-month-old male German shepherd dog suffering from mandibular symphyseal fracture before and b) after fixation using cerclage wire.

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