


Case Study

<https://doi.org/10.20546/ijcmas.2023.1206.019>

## Successful Surgical Management of A Combined Case of Flail Chest and Humerus Fracture in a Pomeranian Dog

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### ABSTRACT

#### Keywords

Flail chest,  
pneumothorax,  
intramedullary  
pinning,  
paradoxical  
movement

#### Article Info

**Received:**  
04 May 2023  
**Accepted:**  
05 June 2023  
**Available Online:**  
10 June 2023

Successful surgical management of a combined case of flail chest and humerus fracture in an 8 month old female pomeranian dog is described. The patient was presented at Multi Speciality Veterinary Hospital Kudappanakunnu with a history of wild boar attack an hour previously. On physical examination a lacerated wound with paradoxical movement on breathing was seen over the distal third of 3rd to 5th ribs on the left chest wall making it a case of flail chest. On radiographic examination complete fracture on distal third of 3rd and 4th ribs were observed along with pneumothorax beneath the region of wound. There was also a complete mid-shaft transverse fracture on the left humerus which was confirmed by radiography. Under general anaesthesia the fractured edges of the ribs were apposed using sutures and the pneumothorax was eliminated. The complete mid-shaft transverse fracture was corrected using retrograde intramedullary pinning. The patient made a dramatic recovery from the very next day after the surgery itself and complete healing of wound took by 18 days post surgery. This case point towards the need of immediate surgical intervention for a case of flail chest and proper care of the patient post operatively.

### Introduction

Flail chest occurs when two or more adjacent ribs suffer segmental fractures and show paradoxical movement during respiration (Olsen *et al.*, 2002). This condition is not commonly observed in dogs and cats because of the compliance and anatomical shape of the thoracic cage, but the paradoxical movement accompanying pulmonary contusions may be life-threatening (Craven *et al.*, 1979). In veterinary medicine, especially toy breeds, only a

small number of reports are available dealing with the surgical treatment of rib fractures and available surgical techniques are limited because of small rib size (Knecht, 1973).

### Materials and Methods

#### Anamnesis

An 8 month old female Pomeranian dog was presented at Multi Speciality Veterinary Hospital

Kudappanakkunnu with a history of wild boar attack an hour previously. Animal had normal food and water intake before the wild boar attack and was properly vaccinated and dewormed.

### **Observations**

Animal was on right lateral recumbency. On physical examination a lacerated wound with paradoxical movement on breathing seen over the distal third of 3rd to 5th ribs on the left chest wall.

On palpation of left thoracic region subcutaneous emphysema could be noticed. On auscultation heart sounds were inaudible on the left thoracic region. On palpation of the left forelimb crepitation could be felt along the mid way of the humerus.

### **Clinical Examination**

Rectal temperature: 102.1°F

Mucous membrane: Pale rosseate

Lymph nodes: no abnormality detected

Complete blood count and serum values are given in table 2 and 3 respectively

On radiographic examination of the left forelimb a complete mid-shaft transverse fracture on the left humerus was noticed (figure 2).

The serum creatinine level was 0.33 mg/dl. Blood urea nitrogen was 10.70 mg/dl. SGOT and SGPT values were 319 IU/L and 123 IU/L suggestive of a possible liver damage post trauma. The animal was screened negative for microfilaria and haemoprotozoans.

On radiographic examination of thorax and left fore limb, complete fracture on distal third of 3rd and 4th ribs were observed along with pneumothorax beneath the region of wound (figure 1.a and 1.b) and a left humerus complete mid-shaft transverse fracture (figure 2) was observed.

### **Diagnosis**

Based on the history, clinical signs, observations and radiographic imaging it is evident that the animal had flail chest on left thorax (fracture on distal third of 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> ribs) and left humerus complete mid-shaft transverse fracture. With radiograph as prime evidence, surgical intervention was done to correct flail chest and humerus fracture.

### **Surgical Management**

The patient was pre-surgically stabilized with fluid therapy to avoid hypovolemic shock. The patient was prepared for the surgery by clean shaving of the surgical site with an antiseptic solution. Scrubbing of the surgical site was done with povidone iodine solution. Patient was pre-anesthetized with atropine (@0.045mg/kg) and dexamethasone (@0.5mg/kg) injection. Induction of anaesthesia was done by ketamine (@5 mg / kg), Xylazine (@1 mg/kg) and butorphanol (@0.2mg/kg). The surgical site was aseptically draped with sterile adhesive surgical drapes. Pre-surgical antibiotic - Ceftriaxone Tazobactam (@20 mg/kg), Analgesic- Meloxicam (@0.3mg/kg) and, Antihistaminic – Chloril were given intravenously. Anesthesia maintenance was done using ketamine and diazepam taken in the ratio 1:1. During surgery, fluids and plasma volume expanders were given intravenously. The patient was maintained on intermittent positive pressure ventilation (IPPV) using an ambu bag. The animal was positioned in right lateral recumbency; surgical site was draped with sterile drape, exposing the wound. An intravenous infusion of isotonic normal saline was administered throughout the period of surgery at the rate of 10ml/kg/hour. After debridement of the devitalised soft tissues including some parts of latissimus dorsi muscle, intercostal muscle and subcutaneous tissues, fixations of the 3rd, and 4th rib fractures were performed. The fractured ribs and intercostal muscles were apposed using mono filament polydioxanone (PDS) 2-0 (Relyon pds) in simple continuous suture pattern with bites taken 0.5 cm away from the fracture. The last suture was put

after ensuring the negative pressure within the thoracic cavity with a suction. Thoracic wall was reconstructed using latissimus dorsi muscle flap. The skin and subcutaneous tissues were apposed using horizontal mattress suture pattern using Nylon (2-0) suture. The paradoxical respiratory movement disappeared postoperatively.

The site was then dressed properly after the application of povidone iodine - metronidazole ointment and the trunk of the dog was supported in external coaptation using crepe bandage.

The left humerus had a complete mid-shaft transverse fracture. Radiographic examination was done to diagnose the type and site of humerus fracture (figure-2). The diameter of the steinmann's pin were estimated from the preoperative radiographs as 75 per cent of the diameter of the medullary cavity of humerus at its narrowest point.

The humerus shaft fracture was repaired by retrograde intramedullary pinning by open reduction. Adequate exposure of humerus shaft was achieved following standard cranio-lateral incision. After placing the pin securely the muscle layer was closed in simple continuous suture pattern using Poly-dioxanone (PDS) (2-0) and the skin was closed using nylon (2-0) in horizontal mattress suture pattern. External coaptation was also done.

### **Postoperative Management**

Post operative antibiotic therapy was instituted using Ceftriaxone Tazobactam at the dose rate of 25mg/kg body weight for 7 days; Analgesic - meloxicam at the dose rate of 0.3mg/kg for 3 days. The suture line was dressed with povidone iodine - metronidazole ointment routinely.

### **Results and Discussion**

Postoperatively, the results were evaluated by clinical and radiographic evaluation. The right lateral radiograph of the thorax and medio-lateral radiograph of the left forelimb immediately after the

surgery is shown in figure 3 and 4 respectively. The paradoxical respiratory movement disappeared postoperatively. In the following days the animal showed signs of improvement. The skin sutures were removed 18 days post surgery day (figure 5). The animal recovered uneventfully.

Pneumothorax is an acquired disease, most commonly associated with accidental blunt or penetrating thoracic trauma (King, 2004). Accidental trauma can cause pneumothorax by several mechanisms. In open pneumothorax, air may gain direct access to the pleural space across the thoracic wall defect.

When the chest remains closed, pneumothorax can be caused by the sharp ends of fractured ribs lacerating the parietal and visceral pleurae, resulting in leakage of air directly from the lung parenchyma (King, 2004).

Patients with traumatic pneumothorax are usually presented because of the traumatic episode, with a variable degree of respiratory distress, tachypnea, and increased respiratory effort. Mucous membrane color may also vary from pink to pale or cyanotic, depending upon the degree of respiratory and circulatory compromise.

Decreased lung sounds may be detected on thoracic auscultation, especially in the dorsal lung fields. The severity of clinical signs is proportional to the volume of air in the pleural space and the extent of the concurrent injuries (King, 2004).

Assessment of the patient's respiratory status can be made using subjective physical parameters (e.g., respiratory rate, respiratory effort, auscultation, and mucous membrane color).

Thoracic auscultation may reveal dull lung sounds in the caudodorsal part of the chest if a pneumothorax is present. Even if there are no respiratory signs, thoracic radiographs should always be made in the veterinary trauma patient to evaluate for the presence of thoracic injuries (King, 2004).

**Table.1** Signalment

<b>Animal</b>	<b>Dog</b>
<b>Species</b>	Canine
<b>Breed</b>	Pomeranian
<b>Age</b>	8 Months
<b>Sex</b>	Female
<b>Body weight</b>	5.5 Kg

**Table.2** The details of the hematological examination

Test done	Result	Unit	Range
<b>RBC</b>	4.99	10 <sup>6</sup> /micro liter	5 - 8.50
<b>Haemoglobin</b>	10.7	g / dl	12 - 18
<b>WBC</b>	17.5	10 <sup>3</sup> /micro liter	6 - 17
<b>Neutrophills</b>	73.7	%	58 - 85
<b>Lymphocytes</b>	20.4	%	8 - 21
<b>MCH</b>	21.5	pg	21 - 26
<b>HCT</b>	33.4	%	37 - 55
<b>Platelet</b>	289	10 <sup>3</sup> /micro liter	200 - 500

**Table.3** Serum value

Test	Result	Unit	Range
<b>SGOT</b>	319.00	U/L	13.0 - 66.0
<b>SGPT</b>	123.00	U/L	10.0 - 109.0
<b>Urea</b>	10.70	mg / dl	8.0 - 28
<b>Creatinine</b>	0.33	mg / dl	0.5 - 1.8

**Fig.1a**



**Fig.1b**



**Fig.2**



**Fig.3** Right lateral radiograph of thorax post surgery



**Fig.4** Medio-lateral radiograph of left humerus post surgery



**Fig.5** Surgical sites 18 days post surgery





**Fig.6** Left lateral aspect of dog 2 months post surgery



Open chest wounds require a sterile dressing to prevent further accumulation of air in the chest and contamination of the wound by the environment. Surgical exploration, debridement, thoracic drain placement, and closure of the thoracic defect should be undertaken as soon as the patient has been stabilized. The extent of tissue damage with thoracic bite wounds, in particular, is often quite severe. Such patients require intensive supportive care and careful monitoring (King, 2004).

Rib fractures may cause pneumothorax by penetration of the lungs, but usually neither the lung laceration nor the rib fractures requires surgical intervention. Severe displacement of fractured rib ends and multiple consecutive rib fractures may represent surgical disease.

However, large flail segments experimentally created in the chest wall of normal dogs did not alter arterial blood gas values in spontaneously breathing anesthetized subjects (Cappello *et al.*, 1995).

The authors of that study concluded that the hypoventilation and hypoxemia in patients with rib fractures and flail chest were more likely to be secondary to pain, pleural space disease, and pulmonary contusion, rather than to the rib fractures themselves (King, 2004). The prognosis of patients with traumatic pneumothorax is good with 90% survival (Kageyama *et al.*, 1997).

### **Acknowledgement**

Let me start by thanking the omnipotent, the creator of mankind, mother Nature for showering me with her strength, blessings and luck at times when I was weak, confused and unfortunate in the great journey of life. I acknowledge deepest of my gratitude to the doctors and all the staff members of Multi Speciality Veterinary Hospital, Kudappanakunnu. I would like to note my remembrance of my wife Dr Rekha A, my dear friend Dr Niyas E and all my friends and students especially Dr. Santhu Lal.

### **References**

- Cappello, M., Yuehua, C. and De Troyer, A. 1995. Rib cage distortion in a canine model of flail chest. *American journal of respiratory and critical care medicine*. 151(5):1481-1485. <https://doi.org/10.1164/ajrccm.151.5.773560>
- Craven, K. D., Oppenheimer, L. U. I. S. and Wood, L. D. 1979. Effects of contusion and flail chest on pulmonary perfusion and oxygen exchange. *Journal of Applied Physiology*.47(4):729-737. <https://doi.org/10.1152/jappl.1979.47.4.729>
- Kageyama, Y., Matsushita, K., Kita, Y., Ooi, S., Toyoda, F., Nogimura, H., Suzuki, K. and Kazui, T. 1997. An elderly case of pneumothorax treated with omentopexy.

- Kyobu geka. The Japanese Journal of Thoracic Surgery.* 50(13):1152-1155.
- King, L. G 2004. *Textbook of respiratory disease in dogs and cats.* WB Saunders.
- Knecht, C. D. 1973. Surgical treatment of diseases of the pleura, mediastinum and thoracic cage. *Veterinary Surgery.* 2(2):19-23.
- Olsen, D., Renberg, W., Perrett, J., Hauptman, J. G., Waldron, D. R. and Monnet, E. 2002. Clinical management of flail chest in dogs and cats: a retrospective study of 24 cases (1989–1999). *Journal of the American Animal Hospital Association.* 38(4):315-320. <https://doi.org/10.5326/0380315>

**How to cite this article:**

Anoop, R. 2023. Successful Surgical Management of A Combined Case of Flail Chest and Humerus Fracture in a Pomeranian Dog. *Int.J.Curr.Microbiol.App.Sci.* 12(06): 152-158.  
**doi:** <https://doi.org/10.20546/ijcmas.2023.1206.019>