Management of thoracic trauma in the dog and cat

Thoracic trauma in dogs and cats may be the consequence of blunt or penetrating injury. Trauma of this nature is most likely to result in emergency presentation of the patient in order for thorough assessment and stabilisation to be performed. Definitive management may be indicated at the time of initial presentation, or after a period of patient stabilisation in the systemically compromised patient. This article will review the specific types of thoracic injury that may be encountered, the assessment and stabilisation of the patient and finally, the definitive management of specific injuries.

Key words: Thorax, lung, trauma, dog, cat, diagnostic imaging

Introduction

Thoracic trauma in small animal patients may be the result of blunt trauma or a penetrating injury such as a bite or impalement. Having sustained thoracic trauma, dogs and cats are likely to present in the acute setting in need of emergency stabilisation and appropriate management of any wounds and associated injuries, either definitively or as a temporary measure, prior to definitive management following stabilisation. This article will review the presentation, stabilisation and management of thoracic trauma.

Thoracic injury

Trauma is often unobserved but if the incident was witnessed, useful information can be gained from knowledge of the type of injury sustained. Understanding what caused the injury and the nature of the impact (static versus dynamic, blunt versus penetrating) can provide information relating to the type and extent of the injuries and the likelihood of residual foreign material being present in the patient. Consequently, a complete clinical history should always be obtained.

It is important to remember that the readily identifiable injuries on initial assessment may not be the most pertinent. For example, a fractured limb with associated non-weight bearing lameness will be clear to see but concurrent pneumothorax with subdelt tachypnoea may be less apparent, or misinterpreted as a response to pain, and it is the latter which has the potential to be life threatening. In light of this, a thorough clinical examination is indicated in all instances, even if the nature of the traumatic injury appears to be readily apparent on a cursory assessment.

It is also worth considering that the location of the entry point of a penetrating injury may be misleading. A small puncture wound in a location remote from a body cavity may seem innocuous on preliminary assessment but bear in mind that penetrating injuries may tunnel subcutaneously for long distances before penetrating deeper into a body cavity (Figure 1). An example of a remote entry point is extensive oropharyngeal stick injuries, which have the potential to extend into the thoracic cavity; an oral injury of this nature warrants consideration of concurrent thoracic injury (Figure 2). In addition, the skin may move at the time of impact and then retract, meaning deeper injuries may be located remote from the site of skin penetration. It therefore follows that injuries in apparently benign locations may be more significant than an initial assessment might suggest.

If foreign material, for example a stick fragment, persists in the patient at the time of presentation and is readily identifiable externally, the temptation to remove it should be resisted. Such a procedure should be carefully planned as the removal of indwelling foreign material could rapidly lead to acute decompression in a previously stable patient. Examples of this may occur include marked haemorrhage after the removal of foreign material causing vessel occlusion and entry of air into the pleural space if the foreign material was creating a seal to thoracic air entry. It is essential that provisions are made to stabilise the patient as far as is possible ahead of foreign
material removal and a management plan is in place for potential clinical deterioration after the material is removed. As the consequences of removal are often unpredictable, it is usually preferable to leave the material in situ if referral is planned. Depending on the nature and location of the material, this will likely necessitate the administration of analgesia and possibly sedation in order to aid patient compliance and limit premature removal of the material or further injury in transit. Provisions will also need to be made for safe transportation of such a patient and this may necessitate attendance by a member of the veterinary team.

Thoracic trauma may result in injury to the thoracic wall, lung parenchyma or other intra-thoracic structures including the trachea, oesophagus and neurovascular structures. A change within the pleural space environment may also occur. The pleural space is a potential space between the lung and the thoracic wall. This space is normally under negative pressure to allow lung expansion during inspiration. Accumulation of air (pneumothorax) or blood (haemothorax) within this space can occur after trauma and will negatively impact respiratory function. The thoracic wall consists of the ribs and intercostal musculature. These structures are susceptible to fracture and tearing respectively. A penetrating injury (stick, fence post, machinery impalement etc.) may cause a full thickness defect in the thoracic wall and has the potential to contaminate the thoracic cavity with foreign material, hair and bacteria. If the surrounding soft tissues seal the entry point of a penetrating injury, the patient may remain relatively stable due to preservation of respiratory function. On the other hand, if the injury creates a defect in the thoracic wall that allows air entry on inspiration but prohibits expulsion of air on expiration (a ‘one-way valve’ effect) then this creates a tension pneumothorax which can become rapidly life threatening. If the defect in the thoracic wall is very large, air should should move freely in and out of the pleural space and the patient is likely to remain relatively stable. Following blunt thoracic trauma, the lung parenchyma is susceptible to the development of pulmonary contusions (oedema and haemorrhage within the alveolar spaces) or, less commonly, rupture resulting in pneumothorax. Penetrating injury to the thoracic cavity can lead to penetration of one or more lung lobes. Pneumothorax may, or may not, ensue depending on whether the penetrating object is then displaced or if it remains in situ to ‘plug’ the defect in the lung parenchyma.

Less commonly, thoracic trauma may result in damage to other anatomic structures. Examples include tracheal avulsion, rupture of the diaphragm and abdominal organ injury following penetrating injuries that traverse the diaphragm.

**Patient assessment and stabilisation**

**Respiratory function** may be negatively impacted by any type of thoracic trauma. The degree of respiratory compromise will depend on the injuries sustained and may range from a normal clinical assessment with mild pulmonary contusions to severe compromise with major trauma. Remember that handling and restraint may result in rapid decompensation and consideration should be given to keeping the patient as calm as possible. A full clinical examination should be performed. For patients presenting in a critical state, a rapid, preliminary assessment (mucous membrane colour, capillary refill time, respiratory rate and effort, pulse rate and quality, thoracic auscultation, SPO₂ measurement via pulse oximetry) should be performed before steps are taken to stabilise the patient. This is likely to include administration of flow by oxygen therapy, obtaining intravenous access with concurrent blood sampling for analysis of a minimum database (PCV, total solids, basic biochemical and electrolyte screen) and percutaneous needle thoracocentesis if clinical examination findings suggest pleural space disease. In a patient with absent or dull lung and heart sounds on thoracic auscultation, ultrasound can be used as a rapid means of assessing the pleural space for fluid or air; commonly termed TFAST meaning thoracic focused assessment with sonography for trauma (Boyson and Lisciandro 2013). If access to ultrasound is not available and the patient is compromised to a degree that positioning for thoracic radiographs is not appropriate, needle thoracocentesis (see below) without further diagnostics may be indicated to address the suspicion of pleural air or fluid and subsequently stabilise the patient. In a stable patient with suspicion of pleural space disease, thoracic radiographs are typically performed to investigate this possibility and determine if thoracocentesis is indicated. A dorsoventral thoracic radiograph is likely to be the best tolerated and most rewarding view although three views (dorsoventral and both laterals) should be obtained if possible to allow for complete evaluation. It is imperative that imaging is performed at an appropriate time and does not take precedence over patient stabilisation or risk compromising the patient. Advanced blood work in the form of blood gas analysis can be considered if more specific information relating to oxygenation and ventilation status are required and the means to process these samples is available in-house.