Rib Fractures in Newborn Foals

Rib fractures are common injuries in foals at around the time of birth: A study carried out on a large Thoroughbred stud in 1999 in the US reported that 1 in 5 foals, less than 3 days of age, either had rib fractures or dislocated ribs. This study found the injuries not to cause further problems, however, a study a few years later, looking at foals admitted to a critical care unit of a veterinary hospital, found rib fractures had a significant impact on the overall sickness of the foal and the ability of the foal to recover. Another study, carried out in 2003, found rib fractures to be the cause of death in almost a third of foals with fatal thoracic injuries.

HOW DOES RIB FRACTURE OCCUR?

Previously, it was thought that mares standing on their foals caused the thoracic trauma resulting in fractured ribs. However, due to the position of the rib fractures in the chest, birth trauma is now considered the main cause. Risk factors for increased birth trauma include a mare that is giving birth for the first time, a difficult birth or one which requires excessive manipulation with an assisted delivery, and a narrower than usual pelvic canal and associated vaginal structures. The position of the foal’s elbow may also play a role by focally increasing pressure on the ribs, especially if retained in a flexed position during birth. Foal weight and chest diameter do not seem to influence the risk, but the shape of the chest, particularly in Thoroughbred foals, has also been considered a factor.

CLINICAL SIGNS

Clinical signs seen in foals with rib fracture/s may include:

- Mild to moderate pain
- Increased respiratory effort
- A depressed demeanour
- A reluctance to make sudden movements
- Swelling and bruising over the ribs around the fracture site

If any of the above signs are detected, the foal should be handled with care to avoid causing secondary thoracic trauma, as the fractured rib ends can displace and damage surrounding soft tissues and blood vessels, which may cause the following:

- Internal bleeding leading to hypovolaemic shock.
- Pneumothorax if the pleural lining around the lungs is damaged.
- A diaphragmatic hernia if ribs lying close to the diaphragm are fractured and lacerate the diaphragm.
- Sudden death if the heart muscle is lacerated.

If several consecutive ribs are fractured a ‘flail chest’ may occur where a section of the foal’s chest wall will sink in during inspiration rather than expanding as air is inhaled, making it difficult for the foal to breath.
DIAGNOSIS

Groaning or grunting of the foal on palpation of the chest with areas of oedema over the ribs should alert the examiner to the possibility of rib fractures. Crepitation or a clicking sensation when the hand is gently pressed over an affected area and subcutaneous emphysema are other common findings that aid diagnosis.

Diagnostic imaging is important in the diagnosis of rib fractures, with ultrasound being the modality of choice. Ultrasound has been shown to detect 4 times as many rib fractures as xray with less positioning or manipulation of the foal. It effectively identifies non-displaced fractures and has the added benefit of imaging the surrounding soft tissue structures as well. Allowing identification of any fluid around the heart or any contusions in the underlying lung.

CT Scanning can be very valuable where there are multiple rib fractures as the anatomy of the fractured bones is easy to visualise in three dimensional reconstructions and there can be complex patterns of damage to the underlying tissues within the chest.

When making a diagnosis the following should be considered:

- The most common site of injury to the ribs is the costochondral junction and the area immediately above it.
- Most fractures show a moderate degree of displacement.
- Rib fractures commonly occur on the left side of the chest.
- Fillies are more commonly affected than colts.

Figs 3 and 4: Ultrasound images of displaced rib fracture fragments (arrows) in a foal. In this foal the fragments are protruding outwards so there is damage to the subcutaneous tissue creating pockets of fluid (black areas).

Fig 5: An ultrasound image of a displaced rib fracture fragments (arrows). In this foal, the lower fragment is acting like a dagger, pointing inwards straight towards the heart!

Fig 6: A CT reconstruction of the rib cage in a foal. Two rib fractures are visible on the left side in this foal and they have occurred low down in the bone, near the costochondral junction.

Fig 7: This foal has 7 rib fractures in total: the ones at the front are protruding outwards, whereas in the last four fractures, the lower part of the bones as slipped behind the upper part and are pointing inwards.

Fig 8: In this CT image, of the same foal, the CT images have been manipulated to show the internal organs and tissues. Imagine the foal has been sliced like a sausage and you are looking into the back half. The relatively healthy right lung (displayed on the left side is bright orange. The heart and blood vessels are red. The broken left ribs have punctured the lung so it has collapsed and there is a pocket on air within the chest (arrow). The remaining lung is collapsed and as a result it is a purplish colour.
TREATMENT

It is also important to remember that a large number of foals will present with concurrent problems such as sepsis or maladjustment syndrome and this can have an important influence on the case management. Foals that are otherwise healthy and have a small number of fractures can recover fully with medical management. Foals that have multiple fractures with extensive damage to thoracic organs, and particularly those that have additional problems which are compromising their ability to cope with the fractures may require surgery.

Medical treatment normally involves 2-3 weeks of box or small pen confinement. Administration of pain relief should be judicious to discourage the foal from vigorous movements, which may cause fracture displacement and sudden death.

During initial stabilisation of foals with complex problems, foals should lie on a cushioned pad in lateral recumbency with the affected side down to keep the better lung on top and maximize the amount of healthy lung for respiration. Intransal oxygen should be administered and the foal can be sedated to keep it quiet if necessary. Broad-spectrum antibiotics may be prescribed if there is evidence of sepsis. Secondary complications, such as shock, should be treated as necessary.

Surgical treatment is pursued when the injuries involve ribs that are in close proximity to the heart, where multiple ribs are fractured or where significant internal injuries have been sustained.

Several surgical techniques are available and they all aim to stabilise the rib fracture and facilitate healing by successfully resisting fracture displacement.

Stabilisation also reduces pain, the risk of additional life-threatening injuries, and restores satisfactory respiratory function. 4 to 6 weeks is required for stabilisation of the chest wall following a rib fracture at which time the surgical implants may have to be removed.

Fig 9: A bone plate being put in place to stabilise rib fractures that were damaging the heart (see fig 5).

Fig 10: In this case ultrasound and radiographic examination confirmed presence of 8 rib fractures 7 of which displaced (ribs 4-11). The lower fragments of the ribs were displaced into the chest, causing haemorrhage and damage to the lung lining and were very close to both the diaphragm and the heart indicating surgical stabilisation was the only viable option. This radiograph shows four plates across rib fractures. The bones between are also fractured but because the plates provide a solid framework, these additional fractures have been repaired with loops of suture – the clips securing this are visible (arrows), as are the two lines of staples which are sealing the surgical incisions in the skin.

Fig 11: A radiograph of the same foal after the surgical plates were removed.

PROGNOSIS

Rib fractures heal well in most cases. However, the prognosis is mainly influenced by the secondary trauma that may be caused by the fractures and any concurrent diseases. However, providing the foal survives the immediate problem, the long term outlook is excellent and the majority of foals grow up to have a healthy and productive life.