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Prevention and management of osteochondral disease

Osteochondrosis, osteochondrosis dissecans and bone cysts are part of a group of developmental orthopaedic diseases (DOD) that we see in the joints of young thoroughbreds. As these three diseases can significantly affect horses both at the sales and in training, it is useful to understand the disease process and the risk factors involved so that, where required, appropriate management changes can be made to minimise the risk of them occurring.

Osteochondral disease

When bone is formed in the uterus, it starts as cartilage and then transforms into bone (Figure 1) prior to birth. This process occurs in ossification centres in the middle and at the ends of the bone. When foals are born this process is nearly complete apart from a cartilage layer (the physis) that remains between the two main centres of ossification. The physis, or 'growth plate', is where the majority of bone growth occurs from in early life.

Developmental orthopaedic diseases

- **Osteochondrosis (OC)**
- **Osteochodrosis dissecans (OCD)**
- **Bone cysts**
- Sesamoiditis
- Physitis
- Acquired angular and flexural limb deformities
- Cuboidal bone collapse
- Cervical vertebral malformation (wobblers)

All of the developmental orthopaedic diseases listed (see panel) in some way relate to disruption of this process of bone development, be it a mismatch between the rate of growth of bone and that of musculotendinous units causing flexural limb deformities, or because of trauma to the rapidly dividing cartilage cells in the growing physis, causing physitis. For osteochondrosis, osteochondrosis dissecans and bone cysts, it is the transition into bone of the deep cartilage layer overlying

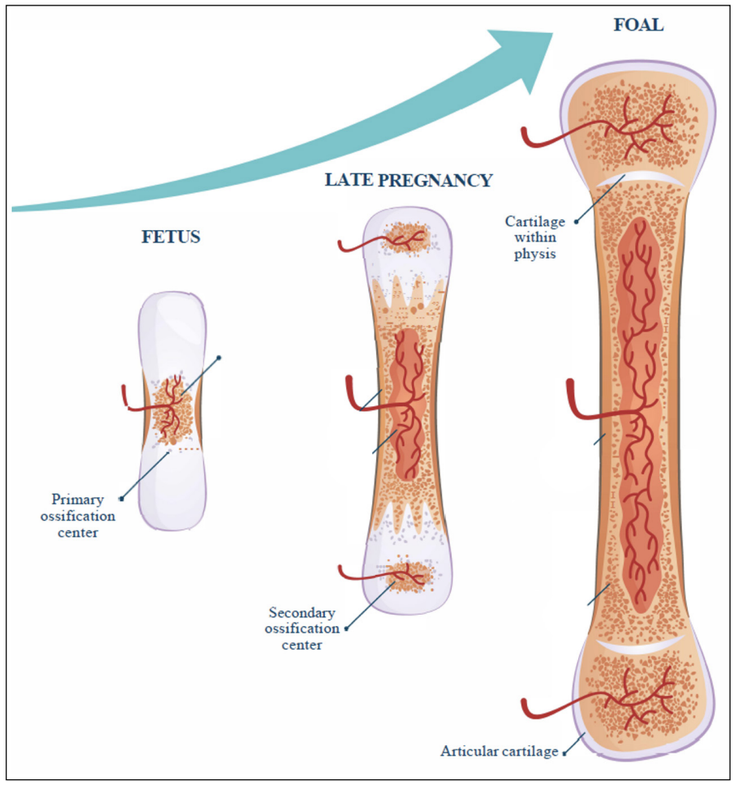


Figure 1 Transformation from cartilage to bone; the process continues in the physis and at the joint surface in young foals

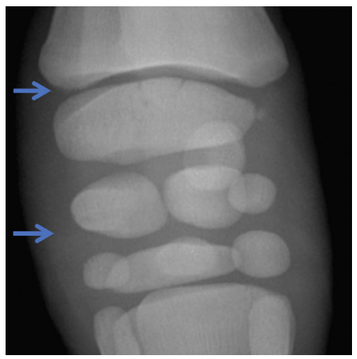


Figure 2 An x-ray example of the soft cartilage layer within the physis (top arrow) and immature knee bones surrounded by cartilage in a premature foal (bottom arrow)

joints, a process called 'endochondral ossification', that becomes disrupted.

The main cause has been found to be damage to channels within the cartilage that carry the blood vessels supplying this region (Figure 3). This is thought to be due to trauma in early life when the cartilage is soft and lacks the structural integrity of the bone which replaces it. It should be noted that though trauma may be the direct cause, there may be many reasons for the structure of the cartilage to be weak, including lack of vital nutrients, excessive or irregular growth and genetic factors leading to poor quality cartilage.

Because the architecture of the vessels in this area are such that single channels supply specific areas, if one vessel becomes damaged the area

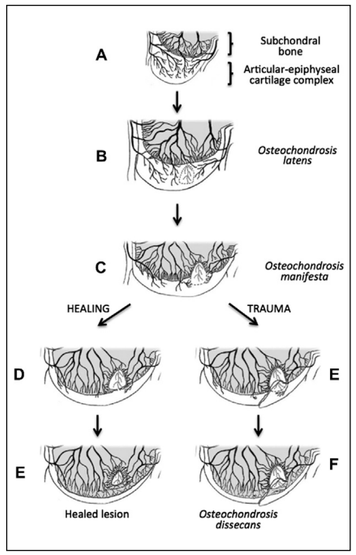


Figure 3 The progression of osteochondrosis

may die off, causing osteochondrosis. Two outcomes can then occur. If the affected area is small and further excessive trauma doesn't occur, the lesion can heal. If the lesion is large and there is further direct trauma, the bone cartilage (osteochondral) complex may fragment and displace in to the joint. This is called osteochondrosis dissecans (OCD). Bone cysts are a related condition that likely have a similar cause, but occur at different sites.

Some of the predilection sites for these diseases are listed below:

Osteochondrosis/ Osteochondrosis dissecans

- **Fetlocks** – dorsal aspect of the sagittal ridge
- **Hocks** – distal intermediate ridge of the tibia
- **Stifles** – lateral trochlear ridge

Bone cysts

- **Stifle** – medial condyle of the distal femur

Clinical signs

Clinical signs associated with osteochondrosis typically develop between four months and two years of age. However, many osteochondrosis lesions are clinically silent and are only noted as an incidental finding on sales or survey x-rays.

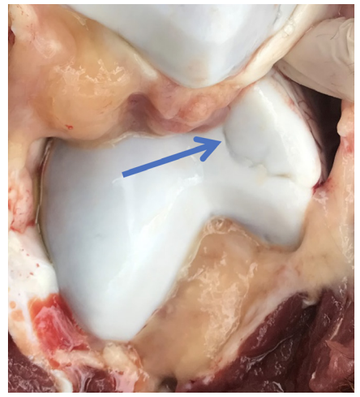


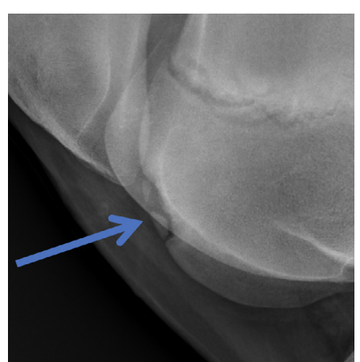
Figure 4 A large non-displaced fragment within the lateral trochlear ridge of the stifle joint

Signs to look out for include:

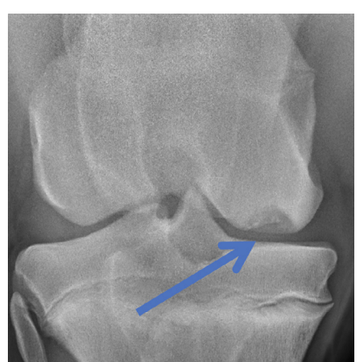
- **Effused (puffy) or swollen joints.**
- **Lameness** – this can vary depending on the extent of the injury and whether an OCD fragment is present. Many horses do not show any signs of lameness.
- **Altered gait** – Osteochondrosis may occur in multiple joints altering the gait. A bunny hopping gait is typically associated with stifle disease in young horses and may be a sign of osteochondrosis.

Diagnosis

Osteochondrosis is most commonly diagnosed with x-rays. Where osteochondrosis is noted on survey x-rays, follow up x-rays after two months are useful to get a better idea of whether the lesions are healing or are still developing. Ultrasound scans can also be used as a screening tool and can also be useful to assess the joint surface.



Large osteochondrosis fragments within the stifle of a yearling



A bone cyst within the medial femoral condyle of the stifle

Treatment

Vets will take into account the exact position of the lesion, its size and whether there is any fragmentation before making an assessment of the risk to athletic performance and the best approach to treatment.

For osteochondrosis where there are no or only mild clinical signs and no fragmentation has occurred, a significant number of cases will heal with conservative management and the athletic performance will not be affected.

These cases may benefit from some exercise restriction to give the bone the best chance of healing. Where foals have become heavy-topped, or are growing too quickly, there may be a benefit to restricting the food intake, although this can be difficult to achieve when the foal is still on the mare. Anti-inflammatory drugs can also be used to reduce the inflammatory response within the joint to try to avoid long-term damage to joint cartilage.

Where fragmentation has occurred, in all but the smallest fragments, surgery is likely to be required to reduce the issues of chronic inflammation and the potential for osteoarthritis developing within the joint. This is done by keyhole surgery. It should be noted that foals will often require up to two months restricted exercise post-surgery.

Risk factors

A number of risk factors have been described for osteochondrosis.

- **Weight –** increased birth weight has been associated with an increased risk of the disease. In a recent study involving studs in the UK, USA and Australia by Saracens Horse Feeds

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and Kentucky Equine Research, heavier foals were found to be more likely to have hock and stifle OCD. They also found that foals out of maiden mares were on average 8kg lighter and had overall 30% less osteochondrosis lesions and 70% less osteochondrosis lesions within the lateral trochlear ridge of the stifle.

- **Growth rate** – excessively fast or irregular growth has been shown to contribute to the development of osteochondrosis.
- **Nutrition –** high energy diets, an imbalance of calcium and phosphorus, decreased levels of copper and high levels of zinc have all been associated with the development of osteochondrosis.
- **Genetics –** although genetic factors contribute to osteochondrosis, the situation is complex with many different genes being involved. Genes involved in body size and those involved in the growth and development of cartilage and bone have been associated with the development of OCD.

How to reduce the incidence of osteochondrosis

Given the above risk factors, the following recommendations can be given for reducing the incidence of the disease:

- **Exercise –** regular but not excessive exercise is critical to the conditioning and development of the young musculoskeletal system. Care should be taken to avoid young foals with soft cartilage having traumatic events to the cartilage that may later develop into osteochondrosis lesions. In practice this means having adequate numbers of nursery or smaller paddocks to avoid galloping in young foals.
- **Nutrition –** avoid over-conditioned mares and foals. Excessive foal weights relative to the stage of development of the skeletal tissues will contribute to the disease. Foals also derive many micronutrients from stores that build up in their liver in the last trimester of pregnancy, so it is important to make sure that mares have adequate access to micronutrients. Mineral licks in paddocks can be a useful dietary supplement for this.

Balanced growth – try to avoid significant fluctuations in growth rate. Regular weight, height and condition score measurement can be a useful monitoring tool to ensure balanced growth. Avoid prolonged periods of box rest where possible.

- **Genetics –** published heritability estimates for osteochondrosis are relatively low. This, combined with the large number of implicated genes and lack of commercially available testing, mean that it is unlikely that we will be able to significantly influence the incidence of osteochondrosis through altering breeding programmes in the short term.
- **Survey x-rays –** survey x-rays in foals and yearlings are a good tool to identify the disease in the early stages and to help inform the best treatment strategies to avoid progression of the disease. They are also useful to give an understanding of the prevalence of osteochondrosis in your stock. If rates are higher than expected, management changes can be implemented.