Limb Deformities: Congenital or Acquired?

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As the foal takes his initial stance, a proud owner takes stock to see how straight and strong the youngster's legs are. Many foals are born with seemingly crooked legs (congenital). Most of these crooked legs straighten by the time the foal is a couple of weeks or months old. Some limb deformities develop after birth, as the foal grows (acquired). In determining what specific veterinary intervention is necessary, it is helpful to determine whether a crooked leg problem is congenital or acquired. Let's take a look at some of the ways in which a foal's legs can deviate from normal, and what can be done to restore potential for the foal to grow into a conformationally correct equine athlete.

Angular Limb Deformities

An angular limb deformity (ALD) creates a crooked leg when viewed from the front or back. A common problem is a knock-kneed foal--a condition known as carpus valgus. In this case, the foal's knees (carpi) are too close together and one or both of the lower front limbs are splayed out. This outward deviation of the legs can also occur in the hocks; then it is called tarsus valgus.

One main concern when examining the foal for carpus or tarsus valgus is to be sure that the bones of the knee and hock joints are formed completely rather than suffering from incomplete ossification (incomplete hardening of cartilage into bone). If the bones of the joints are incompletely formed before birth, then the joints cannot hold up to the weight or movement of the foal. Potentially, there is a collapse of the joint spaces, which leads to a crooked leg. An ideal means of evaluating the condition of these bones in the joints is by radiographic examination.

Incomplete ossification is often associated with a foal which is somewhat premature (not yet developed) or dysmature (incorrectly developed). In one study, 18% of foals with angular limb deformities were found to be lacking in physical maturity at birth. Such cases might resolve with time as the bones continue to ossify after birth. Restriction of movement is essential to protect the joints from damage as the bones finish their development.

Another type of ALD is that of fetlock varus, which results in a toed-in conformation. In addition, carpus varus and tarsus varus will result in the knees or hocks being rotated in respectively; however, these are not as common. An additional form of ALD results in a windswept foal, which causes only both rear legs to be abnormally angled, but in the same direction (as if blown that way by a strong wind).

Congenital Factors for ALD

Many factors elicit a congenital angular limb deformity, or one that develops in utero (while the foal is still in the uterus). These malformations are often associated with a variety of factors:

- Intrauterine malposition of the foal;
- Overfeeding of the mare in the last half of gestation;
- Ingestion of locoweed by a pregnant mare;
- Incorrect development of the growth plates due to bone infection or inflammation of the growth plates;
- Incomplete ossification of the tarsal or carpal bones; and/or
- Ligament laxity at birth with resulting soft tissue injury.

Some of these situations can be controlled through attention to management details. Feed a balanced ration to the mare and eliminate access to toxic plants, weeds, or medications known to cause birth defects. The other factors in this list are often out of one's control and can only be managed rather than prevented.

Acquired Factors for ALD

There are numerous situations that lead to acquired limb deformities in the horse:

- Inherently incorrect conformation that places abnormal stress on the growth plates;
- Overfeeding of rich supplements and feeds, and/or imbalanced nutrition during periods of growth;
- Excessive exercise leading to musculoskeletal fatigue and soft tissue injury;
- Lameness that causes more weight-bearing by the opposite limb; and
- Growth plate trauma due to an injury or infection.

Human intervention has a role in preventing a few of these scenarios. Select only proven athletic stock for breeding, concentrating on selection of horses with minimal conformational flaws. Eliminate the overfeeding equation by paying close attention to providing a balanced ration. Similarly, foals can be restricted from overzealous exercise. Limb injury or infection can only be addressed once these have occurred.

Treating Angular Limb Deformities

Initially, it's helpful to try therapeutic measures for correction of an ALD before considering surgical intervention. Exercise must be restricted to minimize stress on the incorrectly aligned joints. A cooperative effort by your veterinarian and farrier to use foot trimming and/or corrective shoeing might improve some of these cases. As an example, a glue-on extension is applied beneath the medial (inside) aspect of the hoof for a foal with a valgus deformity. Some foals also need the benefit of splints or tube casts to "straighten" the limb.

Surgery usually begins with a procedure known as hemicircumferential periosteal transection with periosteal stripping. An inverted T-shaped incision is made into the periosteum (sheath covering the bone) on the concave side of the leg. This technique relies on increased growth at the physis (growth plate) due to mechanical release of tension created by the periosteum. As this incision in the periosteum heals, the other side of the limb catches up in its growth; then both sides continue to grow at the same rate, with a straightened limb as the result.

If satisfactory results don't appear within four to six weeks, a more aggressive surgical procedure is recommended. For refractory cases or initially severe deformities, screws and wires (transphyseal bridging) can be placed on the convex (long, outwardly curved) side of the limb to retard its growth rate. These metallic implants should be removed when the leg straightens to a more correct alignment to keep from causing the opposite deformity.

The important issue with any surgical intervention is its timing. An ALD associated with the fetlock growth plates must be corrected by two months of age; these growth plates are closed (no longer growing) by four months of age, so surgery must be performed while there is still growth to achieve correction of the crooked limb. The knees and hocks should receive surgical intervention no later than four to six months of age to achieve results.

Flexural Contractures

Not all limb deformities have to do with angularly crooked legs. A flexural contracture describes an inability of an affected joint(s) to be fully extended. The limb is flexed to varying degrees, and in extreme cases might be folded past 90 degrees.

Congenital flexural contractures can occur due to malposition of the foal in utero. A congenital condition also arises from ingestion of teratogens (an agent that is toxic to fetal growth) or toxic weeds (such as locoweed) by a

pregnant mare. Most cases of congenital flexural contractures involve the carpal or fetlock joints. In some cases, the foal might not be able to stand due to pronounced restriction of joint movement.

Acquired conditions develop due to pain reflexes that cause the foal to resist full stretch of the limb. Limb pain can be caused by trauma, infection, rapid growth, or over-use. Flexural contracture of the pastern (proximal interphalangeal) or coffin (distal interphalangeal) joints is often precipitated by rapid growth associated with overfeeding and under-exercised foals, as is commonly seen with halter horses. Many cases of acquired lower limb contractures visibly develop over a three- to five-day period. The foal ends up walking on his toes within the week.

A more slowly developing process of distal interphalangeal (coffin) joint deformity occurs in which the heel stays in contact with the ground, but tends to overgrow. There is a noticeable bulging of the coronary band, and the foot appears boxy. This condition is known as a clubbed foot. Over time, the internal changes of the coffin bone within the hoof capsule result in a hoof wall that grows out with a dish, much as is seen with a laminitic foot.

Acquired flexural contractures are graded as mild, moderate, or severe. With a mild case, the hoof-ground angle is increased from its normal angle, but is less than 90 degrees. In these cases, a broken-forward hoof-pastern axis is obvious. A moderate case describes a hoof-ground angle increased past 90 degrees, while in a severe case, the foal is bearing weight only on the dorsal surface of the hoof wall.

Flexural contractures also develop in the fetlock. Acquired fetlock flexural contractures generally occur in rapidly growing youngsters between 10-18 months of age. Usually both fetlocks of the front limbs are affected at the same time. Grading the degree of contraction in the fetlock joints describes the degree of deformity. A foal with a mild grade fetlock contracture has fetlocks that are relatively straight. A moderate grade contracture describes fetlock joints that appear buckled forward (cocked appearance) when at rest. If the joint flexes to an angle of more than 180 degrees (135-degree flexion is normal), the extensor tendons become taut and visibly pronounced. In a severe grade contracture, the fetlocks are knuckled over (with the front of the fetlock joint facing the ground surface).

Treating Flexural Contractures

In a newborn with a congenital mild to moderate flexural contracture of the lower joints, the initial treatment of choice is the use of intravenous oxytetracycline (an antibiotic). In this case, it's not used for its antibiotic properties. It's theorized that oxytetracycline binds calcium in such a way as to prevent calcium influx into the muscle fibers of the deep digital flexor tendon and its associated structures, thereby stimulating tendon laxity. Beneficial effects of this treatment often only last a few days, so administration might need to be repeated. The most successful results are seen when oxytetracycline is given within the first few days of life. Kidney function should be monitored when using oxytetracycline in a neonate, especially in one which is already sick.

Splints are often used to help support the limb and provide tension for straightening.

Non-steroidal anti-inflammatory medications (flunixin meglumine or phenylbutazone) are used, but with extreme caution in neonates because of the likelihood of the development of gastric ulcers. These drugs help reduce pain reflexes while improving the foal's use of his limbs, but they should be administered with care and in conjunction with anti-ulcer medications.

If the foal cannot stand due to severe congenital flexural deformities, more aggressive procedures must be implemented in addition to splinting the affected limb(s). A foal with carpal (knee) contracture might require cutting of the superior check ligament. Cutting this check ligament (located just above the knee) away from the tendon facilitates release of soft tissues for correction. Severe congenital flexural abnormalities often involve the knee, fetlock, or multiple joints, with the leg(s) bent at a 90-degree angle. Due to contraction and fibrosis of the

joint capsule and associated ligaments, severe congenital cases rarely respond to treatment and result in euthanasia. However, with successful surgery the limbs will straighten out, with the foal growing up normally.

In addition to the use of oxytetracycline, multiple therapies are applied to mild or moderate lower limb flexural contractures. If the foot sits flat on the ground, then the foal might benefit from splinting and corrective shoeing with toe extensions. Toe extensions can be glued on to the hoof to increase stretch of the tendons. The heels can also be rasped down with a file to facilitate tendon stretch. Splints and bandages induce ligament laxity and can help the tissues stretch. Another technique is to apply physical therapy with controlled manual stretching of the limb two or three times throughout the day. Gentle and repeated extension exercises lengthen and stretch the soft tissues. Restricting the foal to controlled exercise (hand-walking) with no turnout protects the limbs from overuse.

If these treatments are not successful within 10 days, then surgical release of the inferior digital check ligament (located in the cannon region) is recommended. Assuming there is good release from surgery of the mild to moderate lower limb flexural contracture, prognosis for athletic function is favorable. Radiographs of the coffin bone and lower joints are important for monitoring health of these structures, and they are particularly helpful in guiding proper trimming of a club foot.

In all cases, it's important to balance the foal's nutritional plane and minimize excess energy intake. When possible, a foal with a flexural deformity should be removed from a heavy-milking mare.

Pro-Active Care

It is not easy to look at a horse and know whether his limb deformity is congenital or acquired, but the most important issue is to address the problem early with a defined treatment approach as outlined by your veterinarian. Rapid intervention often can turn a foal's limb deformity around, or at least keep the degree of the horse's abnormality to a minimum. It is essential that you, your veterinarian, and your farrier work together as a team to achieve the best possible results.