Description:

Angular limb deformities are described as deviations from the normal axis of the limb in the frontal plane. In simpler terms, the foal's limbs are deviating outward or inward when viewed head on. They are most commonly seen in young foals but can also be seen in more mature animals as a result of other conditions. From the frontal plane, the limb can deviate medially or laterally and these deviations are termed *varus* and *valgus*, respectively.

Varus deformities are deviations of the limb medially distal to the abnormality. For example: a foal that has a limb deviated inward below the fetlock would be termed “fetlock varus”. Although this terminology is not perfect it allows a unified language to discuss cases among peers. Valgus deformities are deviations of the limb laterally distal to the abnormality. For example: A foal with the limb deviated outward distal to the carpus would be termed “carpal valgus”.

Careful evaluation of the limb must be made as many foals with abnormalities will have more than one abnormality per limb. For example: Carpal valgus and fetlock varus.

Causes:

There are several causes of angular limb deformities in foals. These can be divided into perinatal and developmental factors. Perinatal factors may be numerous and lead to flaccidity of the joints or incomplete ossification resulting in deviation of the limbs. As the foal matures, nutritional imbalances or trauma to the physes can lead to excessive or retarded growth resulting in deviations. It is important to differentiate the causes of angular limb deformities as this will guide treatment options.

Diagnostics:

Performing a complete physical examination is important for assessing patients with angular limb deformities. Foals should be assessed from the front, the side and while walking on a hard surface. It is important to look at each limb from the frontal plane (dorsal midline of the limb) and not simply from the front of the animal. At birth many foals have both forelimbs externally rotated from midline which will give a false appearance of angular limb deformities which corrects as the chest broadens. Careful palpation of the limbs may also provide additional information. Newborn foals with angular limb deformities should have the limbs manipulated to determine if joint flaccidity exists. If physitis is the cause of the deviation a firm palpable swelling can sometimes be appreciated. In more chronic cases, uneven wear on the hoof may also be seen.

Radiographs of the limbs may aid in diagnosis. Radiographs are especially important for cases of carpal or tarsal varus/valgus as the presence of incomplete ossification may alter the course of treatment. Radiographs may also be used to plan more extensive surgical corrections (see corrective ostectomy later) and to determine if premature physeal closure exists. Although radiographs may provide a measurement of the degree of deviation, small changes in the angle of the radiographic beam may alter the appearance of the deviation so it is more important to use your visual examination to monitor progress.
Treatment Options:
Conservative:
Continued exercise on the deviated limbs may cause damage to the physis and cuboidal bones leading to permanent damage. Stall rest should be tailored to each case as deemed necessary but usually is for a period of time ranging from 2-6 weeks.
Rigid support of the limb is required in cases with incomplete ossification of the cuboidal bones. This rigid support should not extend past the fetlock as it may lead to laxity of the distal limb. Pressure sores should be closely monitored.
Corrective trimming and glue-on shoes can be used alone or in combination with other treatment protocols. In general the trimming/shoes are used to encourage the foal to bear weight on a particular part of the foot at a period of each stride to aid in straightening the deformity.

Surgical:
Surgical management can be divided into three main categories: growth acceleration, growth retardation, and corrective osteotomy/ostectomy. Surgical management should be used for foals with severe deformities or for foals who have failed to respond to conservative management. The table below shows a general guideline for when to treat.

<table>
<thead>
<tr>
<th>Joint Involved</th>
<th>Trimming/Stall Rest</th>
<th>Periosteal elevation</th>
<th>Transpyseal Bridging</th>
<th>Cessation of Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fetlock</td>
<td>&lt;2-3 weeks</td>
<td>&lt;4 weeks</td>
<td>4 weeks</td>
<td>9 months</td>
</tr>
<tr>
<td>Carpus/Tarsus</td>
<td>&lt;2-3 months</td>
<td>&lt;4 months</td>
<td>4 months</td>
<td>21 months</td>
</tr>
</tbody>
</table>

Table 1: Adapted from previously published work. 4

Growth acceleration should be used in early cases. Periosteal “stripping” or transaction is used to stimulate growth on the concave side of the limb. The procedure should be performed early prior to the end of the rapid growth stage. The validity of this procedure is in question as many conservatively treated animals do as well as those who are “stripped” but the procedure is easy to do and has few side effects which lead to its continued use in the field. 5-6

Growth retardation involves bridging the physis on the convex side of the limb. The goal is to stop physeal growth on one side of the limb while allowing the concave side to “catch up”. Techniques of stapling, screw and wire fixation and single screw placement have been used and the pros and cons of each will be covered in depth during the lecture. Careful post-operative monitoring of the patient is important to prevent overcorrection.

Corrective osteotomies and ostectomies are used to correct for moderate to severe deviations once the growth has ceased. It is also the only option to correct rotational deformities. Several techniques are available and will not be covered in the scope of this lecture unless time permits.
Reference: