Angular limb deformities and their treatment in foals and young horses constitute a significant part of the orthopedic problems that veterinarians must manage. This article discusses the clinical management and prognosis of these postural deformities.

TREATMENT

The absence of controlled studies has impaired the accumulation of scientific data guiding the management of angular limb deformities in foals (Table 1). The following management recommendations are based on the literature and our experience in treating foals with angular limb deformities. Also, we use the terms mild, moderate, and severe angular deformities, which are defined as less than 10˚, 10˚ to 20˚, and greater than 20˚, respectively.1

ANGULAR LIMB DEFORMITIES IN FOALS: TREATMENT AND PROGNOSIS*

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ABSTRACT:

This article presents an overview of the clinical management of foals with angular limb deformities. Both conservative and surgical treatment options exist; the choice of which to use should be based on the type, severity, and location of the deformity as well as the age of the foal. Conservative measures include controlled exercise, rigid external limb support, and corrective hoof trimming. Surgical treatment modalities comprise techniques for manipulating physeal growth and, after physeal closure, various corrective osteotomy or ostectomy methods. The prognosis is generally good if treatment is initiated well in advance of physeal closure.

Conservative Treatment

In most foals born with mild to moderate angular deformities, spontaneous resolution occurs within the first 2 to 4 weeks of life.2 In newborn foals, periarticular laxity is the most likely cause, and these foals require no special treatment other than a short period of controlled exercise. In our opinion, mildly and moderately affected foals should not be confined to a stall because exercise is important for normal muscular development and resolution of the angular deformity. The opposite treatment (i.e., unlimited exercise) often leads to fatigue, which exacerbates the deformity. Therefore, we suggest that the mare and foal be placed in a small paddock (e.g., 15 × 15 m). Alternatively, the mare and foal may be kept in a large stall (e.g., 5 × 3 m) and allowed frequent access to a small paddock for a few hours at a time to prevent excessive fatigue. There is a lack of scientific data documenting how much confinement these foals need, and these recommendations are
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Based only on our experience.

Foals with severe periarticular laxity and grave angular deformities are unlikely to experience spontaneous correction. These foals often need some form of external support to straighten the limb in addition to stall and small paddock rest. A splint bandage or tube cast (i.e., a cast that does not enclose the foot and fetlock) can be applied to keep the limb straight and allow the periarticular tissues and collateral ligaments to strengthen within 2 to 4 weeks. By not incorporating the foot, a splint bandage or tube cast allows weightbearing, thus preventing muscular atrophy and worsening of the condition. However, treatment of periarticular laxity by rigid external support has been debated and, according to one author, may actually delay strengthening of the periarticular structures. Because periarticular laxity most often affects the carpus or tarsus, the splint bandage or cast should extend from the proximal radius or tibia to just above the fetlock joint. We use a transected polyvinylchloride pipe to create a hemispherical splint that can be applied to the palmar aspect of the forelimb over roll cotton padding regardless of whether a valgus or varus deformity is being treated.

Because of the anatomy of the hindlimb, tarsal deformities can be best stabilized by applying a dorsal splint that is bent to follow the dorsal contour of the limb. For splint bandaging, the foal should be sedated and laterally recumbent. After this, the deformity can be manually corrected and the splint applied to the limb. Splint bandages should be changed at least every 3 to 4 days to check for skin pressure sores. However, a shorter bandage change interval is preferred. In our experience, managing splint bandages is problematic on many farms because of the help necessary in placing a splint: someone to hold the mare, someone to restrain the foal, and someone to apply the splint. The labor required for splint application competes with the demands of a breeding farm during the breeding season. To minimize these labor concerns, we have used snap-on splints or tube casting. The snap-on splint is custom-made from padded fiberglass (Endurasplint 2, Carapace Inc., New Tazewell, TN; Figure 1). These splints have enough strength for foals younger than 6 weeks of age. The foal should be sedated and laterally recumbent. A rectal sleeve should be placed over the limb to be splinted to protect it from contact with water and polyurethane resin. The splint should be immersed in water at a temperature of 69.8°F to 73.4°F (21°C to 23°C) for 2 to 4 minutes. The splint should be assembled in a manner that allows weightbearing. The splint should be bent to follow the contour of the limb dorsally, with the proximal end of the splint resting on the proximal radius or tibia. The distal end of the splint should extend just above the fetlock joint. The splint should be applied to the palmar aspect of the forelimb over roll cotton padding.

Confinement to reduce axial compressive forces on the affected limb is an important part of managing angular limb deformities in foals.

Table 1. Treatment Modalities for Foals with Angular Limb Deformities

<table>
<thead>
<tr>
<th>Treatment Modality</th>
<th>Angular Limb Deformity</th>
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<tbody>
<tr>
<td>Stall and/or small paddock rest</td>
<td>All types</td>
</tr>
<tr>
<td>Rigid external support to the limb (e.g., splint bandage or tube cast)</td>
<td>Periarticular laxity</td>
</tr>
<tr>
<td>Corrective hoof measures (e.g., trimming, shoeing)</td>
<td>Cuboidal bone hypoplasia</td>
</tr>
<tr>
<td>Surgical manipulation of physeal growth (growth acceleration and/or growth retardation techniques)</td>
<td>Hypoplasia of the proximal aspect of the fourth metacarpal bone</td>
</tr>
<tr>
<td>Corrective ostectomy or osteotomy</td>
<td>Deformities originating in a long bone before cessation of physeal growth</td>
</tr>
<tr>
<td></td>
<td>Deformities originating in a long bone before cessation of physeal growth</td>
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<tr>
<td></td>
<td>Deformities originating in a long bone after cessation of physeal growth</td>
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*Auer JA: Personal communication, University of Zurich, Switzerland, 2003.*
23°C), and excess water should subsequently be squeezed out. The splint should be applied to the limb so that the felt is against the skin and half of the circumference of the limb is covered. It should then be secured to the limb with gauze and allowed to dry sufficiently to hold its shape. The splint should be removed and allowed to set for 5 to 7 minutes before reapplying it to the limb. Because the splint is padded and molded to the contour of the limb, it should be easy to place and only a single roll of self-adhesive elastic bandage should be needed to secure it, making it convenient for daily use. In a hospital setting, we recommend leaving the splint on for 12 hours at a time to prevent pressure sores; the splint should be applied at night while the foal is less active.

Another means of establishing external support to a limb is application of a tube cast, which is best done with the patient under general anesthesia. Casts should be changed at 10- to 14-day intervals to allow rapid growth of young foals. The main disadvantage of tube casting is the risk of developing skin pressure necrosis; this can be somewhat reduced by cutting the cast into two half shells immediately following application. The shells may then be removed every 3 to 4 days to evaluate the skin. It should be noted that foals cope with rigid uni- or bilateral forelimb bandages or unilateral hindlimb bandages without difficulty, whereas they need help rising if both hindlimbs require rigid external support.

In foals born with angular deformities associated with cuboidal bone hypoplasia of the carpus and/or tarsus, treatment should be directed toward maintaining normal alignment of the affected limb and allowing the cartilaginous templates to ossify under even loading (Figure 2). Except for very mild cases (<7°), untreated foals are at risk of developing permanent angular limb defor-
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Orthotics

We have treated a select number of weanlings with angular deformities using orthotic devices (orthoses). Orthotics is the science that focuses on the design, manufacturing, application, and evaluation of orthotic devices to assist in patient ambulation and correction of various skeletal deformities. Using orthotic devices in children is well established and recommended for a variety of pediatric conditions.\(^4\) In veterinary medicine, the use of orthotic devices has been extremely limited (excluding corrective shoeing and the standard splints and casts described in this article). Use of an ankle–foot orthosis in a dog with traumatic sciatic neuropathy has been reported.\(^4\) The orthotic devices that we have used are custom-made to a given limb of a weanling. A mold is first made using a roll of cast material over a stockinette to reproduce for the orthotist the relevant portion of the limb. The cast is cut and removed so that the custom-made device can be constructed to fit the limb of the animal. To treat angular deformities, a stabilizing stainless-steel bar should be placed on the concave side of the deformity and pressure applied on the convex side to help correct it (A). The foal should wear the device for progressively longer periods up to 12 hr/day. The device should be removed at night. Further investigation into this technology is required before its value and potential can be fully assessed.


Angular limb deformities caused by asymmetric physeal or epiphyseal growth usually develop between 2 weeks and 6 months of age; foals are rarely born with this type of angular deformity. These foals should not be treated with external support because it almost invariably results in skin pressure sores without correction of the deformity.\(^3\)–\(^5\) Mild deformities often respond well to stall or small paddock rest, whereas moderately affected foals need additional treatment in the form of corrective hoof trimming and, possibly, application of glue-on shoes.\(^11\)–\(^12\) Confinement reduces the axial compressive forces acting on the physeal and epiphyseal cartilage, possibly correcting deformity by stimulating longitudinal growth on the concave side of the limb.\(^10\) Contrary to this, excessive compressive forces as a result of free pasture exercise reduce longitudinal growth on the concave side. Free exercise may therefore delay correction or even cause the deformity to worsen.\(^6\)
To further correct the deformity, the high side of the hoof wall can be frequently trimmed so that the foot is level. The aim of hoof trimming is to correct the concurrent rotational deformity. In foals with valgus deformities, this is done by slightly rasping the outside hoof wall, which causes the inside hoof wall to contact the ground first during ambulation, thereby causing slight inward rotation of the foot. Correspondingly, the inside hoof wall should be lowered in foals with varus deformities.

The effect of corrective hoof trimming may be increased by placing a glue-on shoe with extension to the inside in foals with valgus deformities (outside in foals with varus deformities). As an alternative to glue-on shoes, an extension can be molded directly onto the hoof using acrylic (minimal or nonhyperthermic polymers should be used to prevent hoof damage); we do not feel that this is as safe as glue-on shoes because more stress can be applied to the hoof laminae (by building onto or molding the hoof wall), possibly tearing a portion of the laminae. By forcing the foot into an abnormal position, corrective trimming and shoeing result in torsional forces that may influence joints and periarticular structures negatively and lead to concurrent angular deformities elsewhere. For example, a varus deformity at the metacarpophalangeal joint could be created during correction of a carpal valgus. Therefore, some authors do not recommend trimming and shoeing as outlined but prefer light rasping to balance the foot and ensure normal breakover instead. However, in our experience, the described methods for trimming and shoeing, if used judiciously and with frequent monitoring, can be applied with success.

Alternatively, trimming and shoeing to correct carpal and tarsal deformities could be done after closure of the distal metacarpal or metatarsal growth plate. It is important not to extend the period of corrective trimming and shoeing for too long. Also, we recommend that glue-on shoes not be left on for longer than 2 weeks to avoid development of a contracted foot. At least 7 to 10 days of growth should be allowed to pass before resetting the shoes. If confinement and, possibly, trimming and shoeing have not resulted in significant improvement of the deformity within 4 to 6 weeks, surgical treatment should be attempted.

**Both conservative and surgical treatment options are available for managing angular limb deformities in foals.**

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### Table 2. Period of Rapid Growth and Age at Radiographic Closure of Some Growth Plates in Horses

<table>
<thead>
<tr>
<th>Growth Plate</th>
<th>Period of Rapid Growth</th>
<th>Age at Radiographic Physeal Closure</th>
</tr>
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<tbody>
<tr>
<td>Distal radial</td>
<td>0–8 mo</td>
<td>22–36 mo</td>
</tr>
<tr>
<td>Distal tibial</td>
<td>0–6 mo</td>
<td>17–24 mo</td>
</tr>
<tr>
<td>Distal metacarpal/metatarsal</td>
<td>0–100 days</td>
<td>6–15 mo</td>
</tr>
</tbody>
</table>

### Table 3. Age Limit Recommendations (for Optimal Results) for Correcting Angular Limb Deformities by Surgically Manipulating Physeal Growth

<table>
<thead>
<tr>
<th>Growth Plate</th>
<th>Technique and Age Limit (mo)</th>
</tr>
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<tbody>
<tr>
<td>Distal radial</td>
<td>HCPTE: 4 TPB: 12</td>
</tr>
<tr>
<td>Distal tibial</td>
<td>HCPTE: 4 TPB: 10</td>
</tr>
<tr>
<td>Distal metacarpal/metatarsal</td>
<td>HCPTE: 2 TPB: 3</td>
</tr>
</tbody>
</table>

HCPTE = hemicircumferential periosteal transection and elevation; TPB = transphyseal bridging.
potential should remain and surgery should be performed well before the end of the rapid growth phase. Restricted exercise until the angular limb deformity is corrected is an important part of postoperative treatment. It is important to note that the period of rapid growth is different from the age at radiographic evidence of physeal closure6,15 (Table 2). The age limits for optimal results of surgical manipulation of physeal growth depend on the degree and location of the deformity.15 Recommendations regarding the optimal age for surgical treatment vary among authors.1,16,17 In general, for optimal postoperative results, deformities caused by asymmetric growth at the distal radial and distal tibial growth plates should be treated before 4 months of age, whereas deformities at the distal growth plate of the third metacarpal or metatarsal bones should be treated before 2 months of age (Table 3). These are only general guidelines because the degree of deformity greatly influences the possibility of surgical correction. The earlier surgery is performed, the faster correction occurs, which is often the rationale for choosing surgical treatment well before the end of the rapid growth phase.3 However, according to a recent experimental study18 in which angular deformities were created by abaxial growth-plate retardation, surgically induced growth acceleration was as effective in correcting carpal angular limb deformities as stall confinement alone. In that study, the cosmetic blemish left after surgery gave the visual impression that limbs that were operated on were straighter than control limbs, but radiographic comparisons showed there was no difference between limbs. Multiple conclusions can be extrapolated from this study: Growth acceleration is of little value, and exercise restriction is effective in treating angular limb deformities.

Since its introduction into equine surgery approximately 20 years ago,7,13,19 growth acceleration by hemicircumferential periosteal transection and elevation (HCPTE) has gained widespread acceptance as the standard surgical technique for correcting angular limb deformities.3,5,8,16,17,19–21 However, previous clinical studies all lacked a control group and merely relied on the degree of limb straightening as evidence of a positive effect of the procedure. This fact and the results of the experimental study already mentioned may change the interpretation of the value of HCPTE in the future. With the patient under general anesthesia, HCPTE should be performed on the concave aspect of the bone responsible for the deformity. A periosteal incision shaped like an inverted T should be made proximal to the affected growth plate followed by elevation of the periosteum to create two triangular flaps (Figure 3). The periosteal incision and elevation stimulates longitudinal growth for approximately 2 months and can be repeated if correction is incomplete.3 Overcorrection of the deformity has not been reported with this technique. The exact mechanism by which HCPTE exerts its effect remains unknown. However, several mechanisms have been proposed,
including induction of mild metaphyseal ischemia, removal of periosteal compression across the growth plate, and creation of a so-called “internal splint” that braces the metaphyseal area and helps regulate its growth.\textsuperscript{22,23}

Postoperative exercise restriction to reduce the axial compressive forces on the growth plate is an integral part of treatment. HCPTE results in a cosmetic blemish that may increase in size up to 2 months after surgery and then progressively remodel in the following months. The result is that the carpus in the vast majority of yearlings that have undergone surgery bears no evidence of this. In our experience, the cosmetic results at the metacarpo- or metatarsophalangeal joint are not quite as good, and yearlings that have had previous surgery occasionally have detectable thickening at the surgery site.

Growth retardation by temporary transphyseal bridging (TPB) was once the surgical treatment of choice for correcting angular limb deformities.\textsuperscript{24–27} Although there are no controlled studies to document its effectiveness, there is little doubt that TPB is effective. The surgery is performed with the patient under general anesthesia and entails placing a growth-restraining implant across the growth plate on the convex aspect of the bone (Figure 4). The implant temporarily arrests longitudinal growth, allowing the concave aspect of the bone to continue to grow, which eventually corrects the deformity.

The rate of correction following TPB has been reported.\textsuperscript{28} In general, carpal deformities that are treated at 1 month of age can be expected to correct at a rate of
To 0.5˚ per day, which successively decreases to 0.05˚ to 0.1˚ per day at 100 days of age. The corresponding improvements for metacarpal or metatarsophalangeal deformities are different from those just mentioned because of the relatively short growth phase of the distal metacarpus or metatarsus: The rate of correction rapidly declines from approximately 0.3˚ to 0.4˚ per day at 2 weeks of age to 0.1˚ per day at 80 days of age.

Three techniques for TPB have been described (see box above):

- **Stapling**
  One or more Vitallium (Dentsply Austenal, York, PA) staples should be inserted, with the staple legs placed equidistant on each side of the growth plate. The staple legs should be parallel to the growth plate and the cross member perpendicular to it. The staples should be placed using special equipment (staple holder and driver).

- **Screws and wires**
  A screw (cortex or fully threaded cancellous) should be placed on each side of the growth plate. One or two loops of 1.2-mm cerclage wire should be placed and tightened in a figure-of-eight pattern over the screw heads.

- **Screws and a small bone plate**
  A 2.7-mm bone plate should be contoured to the shape of the bone and placed perpendicular to the growth plate by a 3.5-mm cortex screw on each side of the growth plate. The screws should be inserted to produce compression across the growth plate.

TPB remains an effective therapy in managing foals with angular limb deformities. TPB can be performed in young foals with severe angular deformities, miniature foals, or foals with significant limb deformity after the rapid growth phase is over. In these cases, growth acceleration and retardation techniques are often combined for faster and more complete correction of the deformity. TPB can be successful in treating carpal or tarsal angular limb deformities in growing horses 6 to 12 months of age. Similarly, the technique can be used to correct distal metacarpal or metatarsal deformities in foals 2 to 3 months of age. However, it is our clinical impression that many warmblood and draft horses may have a slower growth profile; thus surgery may be useful even in slightly older foals.

Foals with angulation of the third metacarpal or metatarsal bone should first be treated with restricted exercise. If the deformity is severe or no improvement is seen in the first month of life, we perform periosteal stripping on the concave side of the deformity. With the patient under general anesthesia, an I-shaped periosteal incision is made and elevation is performed on the entire length of the angulated bone on the concave side. The hypothesis is that if surgery is performed at a young age, the resulting periosteal reaction will be followed by a natural remodeling process that eventually leads to axial loading of the affected bone because of bone resorption on the convex side and preservation of newly formed bone on the concave side. A similar principle has been applied to foals younger than 2 months of age with bench knee conformation. In that study, bench knee conformation was corrected by a combination of HCPTE at the distolateral aspect of the radius and an I-shaped periosteal incision and elevation on the medial aspect of the third metacarpal bone. However, this approach has never been evaluated in a controlled clinical study.

Correction of angular limb deformities after cessation of physeal growth necessitates a corrective osteotomy or osteotomy. Several types of corrective ostectomy and osteotomy techniques have been reported in the literature (box on p. 144). Because corrective ostectomy or ostotomy requires substantially more skill, experience, and equipment, is associated with a higher postoperative risk rate, and is more expensive, the technique is usually reserved for valuable animals with significant angular limb deformity after physeal closure.

**PROGNOSIS**

Several studies have reported the response to both nonsurgical and surgical treatment of foals with angular
One study reported that in 81.5% of foals treated with HCTPE to correct angular deformities, total limb straightening was achieved and 60% of foals went on to be used at their intended performance level. In a study that reported the results of transphyseal bridging, 80% of foals with carpal deformities and 27.3% of foals with metacarpo- or metatarsophalangeal deformities went on to a form of athletic use. The poor results obtained in the foals treated for metacarpo- or metatarsophalangeal deformities were attributed to the fact that several of these foals were operated on near or after the end of the rapid growth phase of the distal third metacarpal or metatarsal growth plate. Racing performance after HCPTE in Thoroughbreds has been reported; treated foals had fewer starts at 2 years of age and lower start percentile ranks. However, it is difficult to rely heavily on these comparison numbers because many foals that have undergone surgery for angular limb deformities are not declared as such in yearling sales. A study reporting the results of treatment in foals with tarsal valgus demonstrated that only 52.4% met the expectations of their intended use, and these authors concluded that foals with tarsal valgus have a poorer prognosis for future athletic use than do foals with carpal deformities. Another study showed that foals with incomplete ossification of the tarsal bones and greater than 30% collapse of the third and central tarsal bones had a poorer outcome than did similar foals with less than 30% collapse, thereby stressing the importance of early recognition and treatment.

Conflicting results regarding the significance of the location of the pivot point and the presence of radiographic abnormalities in cases of carpal deformities have been published. According to one study, the more radiographic abnormalities that are seen distal to the distal radial physis and the more distal the location of
the pivot point is, the poorer is the prognosis.\textsuperscript{35} In another study, no such correlation could be made.\textsuperscript{36} Also, it has been demonstrated that surgical manipulation of distal radial phyleal growth can cause changes in the angles of all the carpal joints.\textsuperscript{37} Thus surgical manipulation of phyleal growth may be successful in correcting angular limb deformities originating distal to the growth plate (e.g., epiphyseal deformities). In summary, the prognosis for foals with angular deformities is generally good with the exception of foals with greater than 30\% collapse of the third and central tarsal bones. However, the age at which the foals are diagnosed and treated influences the prognosis. Deformities that are treated near or after the end of the rapid growth phase have a less favorable prognosis. This places the clinician in a dilemma. If treatment is delayed until the foal is 4 to 6 months of age, the prognosis for a successful outcome is decreased. On the other hand, if treatment is done early, many foals may receive unnecessary treatment. In Dr. Ducharme’s practice, which consists mainly of Thoroughbred racehorses, foals are evaluated within 2 weeks of birth and then every 2 to 3 weeks thereafter. Significant angular limb deformity is treated with corrective trimming and shoeing in the hope that surgical treatment will be unnecessary. If an angular limb deformity involving the metacarpo- or metatarsophalangeal joint shows no improvement within 2 to 3 weeks, surgical intervention is considered. If no improvement is seen within 2 months for a carpal or tarsal angular limb deformity, surgery is considered. This approach tends to decrease the number of foals that require phyleal bridging.

REFERENCES

20. Auer JA: Periosteal transection of the proximal phalanx in foals with angular...
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1. Which statement regarding management of congenital angular limb deformities is correct?
   a. In most foals born with mild to moderate angular limb deformities, spontaneous resolution is unlikely.
   b. In most foals born with mild to moderate angular limb deformities, spontaneous resolution occurs within 2 to 4 weeks of life.
   c. In most foals born with angular limb deformities due to carpal or tarsal bone hypoplasia, spontaneous resolution occurs within 2 to 4 weeks of life.
   d. In most foals born with angular limb deformities due to carpal or tarsal bone hypoplasia, spontaneous resolution occurs within 4 to 8 weeks of life.

2. To avoid development of a contracted foot in a foal, glue-on shoes should not be left on for longer than
   a. 2 months.
   b. 3 months.
   c. 2 weeks.
   d. none of the above

3. To allow rapid growth in young foals, tube casts should be changed at ___________ intervals.
   a. 3- to 4-day
   b. 10- to 14-day
   c. 3- to 4-week
   d. 4- to 6-week

4. Corrective ostectomy or osteotomy is
   a. preferred in treating tarsal bone hypoplasia.
   b. preferred in treating severe carpal or tarsal bone hypoplasia.
   c. generally performed before cessation of physisal growth.
   d. generally performed after cessation of physisal growth.

5. According to a recent experimental study, HCPTE was
   a. more effective than stall confinement alone in correcting carpal angular limb deformity.
   b. less effective than stall confinement alone in correcting carpal angular limb deformity.
   c. as effective as stall confinement alone in correcting carpal angular limb deformity.
   d. as effective as unlimited pasture exercise in correcting carpal angular limb deformity.
6. Which statement regarding treatment of foals with carpal bone hypoplasia is correct?
   a. Foals with carpal bone hypoplasia often require surgical treatment after an initial period of splint bandaging.
   b. Foals with valgus deformities caused by carpal bone hypoplasia should be treated with confinement and by applying a glue-on shoe with extension to the inside.
   c. Foals with valgus deformities caused by carpal bone hypoplasia should be treated with confinement and by applying a glue-on shoe with extension to the outside.
   d. Foals with carpal bone hypoplasia should be treated with splint bandaging or tube casting.

7. A 6-week-old foal with a significant varus deformity caused by asymmetric growth at the distal metatarsal growth plate in the left hindlimb is best treated with
   a. splint bandaging and confinement.
   b. confinement.
   c. corrective trimming and, possibly, shoeing as well as confinement.
   d. surgery, corrective trimming, and, possibly, shoeing as well as confinement.

8. Which statement regarding HCPTE is true?
   a. HCPTE temporarily retards longitudinal growth on the convex aspect of the deformity.
   b. HCPTE temporarily increases longitudinal growth on the concave aspect of the deformity.
   c. Foals that have undergone HCPTE require a second surgery to prevent overcorrection of the deformity.
   d. HCPTE exerts its effect for approximately 3 months.

9. Which statement regarding TPB is correct?
   a. TPB is primarily used in young foals with severe angular deformities, miniature foals, or foals with significant limb deformity after the rapid growth phase.
   b. TPB is primarily used in foals with diaphyseal deformities.
   c. Contrary to HCPTE, overcorrection has not been reported after TPB.
   d. TPB is primarily used in young foals with severe angular deformities, miniature foals, or foals with diaphyseal deformities.

10. Postoperative treatment of foals using HCPTE includes
   a. free pasture exercise because it tends to increase the rate of correction.
   b. confinement.
   c. splint bandaging.
   d. none of the above