New Technique for Tarsal Valgus Deformities Shows Promise

Many foals are born with or develop angular deformities of the tarsus. Generally, treatment involves slowing or enhancing growth of the adjacent physis. However, the methods currently employed are often more effective for treating carpal valgus deformities and tend to leave post-operative cosmetic blemishes. The objective of this study was to determine the effectiveness of a new technique using a lag screw for transphyseal bridging of the medial aspect of the distal tibial physis.

Between 2002 and 2004, the technique was performed on four female and seven male foals (10 Thoroughbreds and one American Quarter horse) that had tarsal valgus deformities (bilateral or unilateral). At lag-screw implantation, the mean age of the foals was 220 days. Hemicircumferential periosteal transection and elevation had previously been performed on three of the horses without success.

The criterion for implantation candidates was clinical evidence (visually assessed with the foals standing and at a walk) of a tarsal valgus deformity of greater than 7 degrees that had not spontaneously resolved by the time the foal was 6 months of age. The deformity was not radiographed to determine its severity.

The surgical technique used was as follows: After the horse was sedated and anesthesia was administered, a single stab incision was made over the most distal aspect of the medial malleolus down to the bone. An insertion hole parallel to the medial cortex of the tibia was then created, and the screw was inserted to bridge the medial aspect of the distal tibial physis. The screw was removed when clinical assessment found the deformity to be 80% improved (range, 39 to 89 days).

The outcome of this study was resolution of the tarsal valgus deformity with no cosmetic blemishes in all 11 horses. Witte and associates conclude that although the lag-screw technique has the potential for complications, no such problems were encountered during this study. Therefore, the authors found that the technique is a viable method of correcting tarsal valgus deformities in foals.


COMMENTARY

Every once in a while, you read a manuscript with a hypothesis that you wish you had thought of. For me, this is such a manuscript. The technique described by Witte and colleagues is a terrific yet simple idea.

Surgical correction of angular limb deformities is not new. The older surgeries attempt to use growth retardation to slow one side of the growth plate and wait for the other side to catch up, thus allowing the limb to straighten. There are two basic techniques still in use.
The first uses a large staple applied across the physiis with one branch in the metaphysis and the other in the epiphysis, thus inhibiting further growth to the stapled side. Problems with this technique are numerous. The staples may not be strong enough or may bend under the force of the foal’s growth. But worst of all, the staples can be very difficult to remove, resulting in a noticeable blemish. Because one of the most important reasons for performing this procedure is cosmesis of the foal, blemishes are unacceptable.

The second technique, screw and wire transfixation, was devised to overcome these problems. Two screws are placed in the bone needing growth retardation, one in the metaphysis and one in the epiphysis. Wire in a figure-of-eight pattern is used to bridge the two screws, with the tightness of the wire retarding growth. These devices are simple to remove, requiring only a stab incision over the head of the screw; once released, the wire can be pulled through the incision. Unfortunately, as the authors describe, the dissection used to place the device can cause seroma formation and subsequent infection. In short, this can lead to unacceptable results. Witte and associates did not describe one of the most important problems with this procedure, and that simply is the difficulty in placing a screw in the medial epiphysis of the distal tibia. There is little depth to the epiphysis in this region, allowing for no error in the depth of the screw or its orientation (Figure 1).

The article discusses hemicircumferential periosteal transection as an alternative to transphyseal bridging. Essentially, this is a releasing procedure whereby cutting the periosteum releases tension from the growth plate, allowing the growth rate of the physis to speed up, thus straightening the leg. This procedure solves the problem of cosmesis, and it is very effective but typically only on limbs where the deviation is 10 to 12 degrees or less. The procedure (and the decision to use it) must be made when the foal is very young, usually no later than 2 to 4 months of age. This means that many foals may be presented too late for hemicircumferential periosteal transection to be most effective. Also, as the authors stated and I completely agree, the procedure is ineffectual on the distal tibia. These results clearly show that there is room for improvement for correction of angular limb deformities.

In this manuscript, Witte and colleagues describe a surgical procedure for transphyseal bridging that uses a single stab incision and minimal dissection. The authors review the results on 17 legs of 11 foals. The procedure is standard lag-screw placement using radiographic control. The screw is removed when the leg shows 80% or better correction. In this study, all foals had excellent cosmetic results.

The surgery that Witte and colleagues describe is simpler than typical transphyseal bridging, and therefore one would expect fewer complications.
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Data on file.
Campbell, J.W., Ph.D., Southwest Bio-labs, Inc., Las Cruces, N.M. Study to Evaluate the General Safety of 15% Toltrazuril Sulfone (Bay Vi 9143) Oral Paste Formulation in the Target Species, the Adult Horse, February, 1999.

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than 7 degrees. However, how the authors came to this number is somewhat subjective. As they stated, radiographic assessment of the geometry of tarsal deviation has limited practicality because the bones are not vertically straight in this location. This means that visual assessment is most important. Witte and associates describe their clinical assessment as both static and dynamic, with surgical intervention being necessary when the deviation is greater than 7 degrees. Again, they do not describe how they make this measurement. I would have preferred more description of the authors’ techniques because this is an area of controversy. Any limb weakness will be noted as more flexion in the tarsus, which will make the legs look more crooked. I always appreciate more tips on assessment of these conditions because it makes it easier to document the need for the surgery.

However, a veterinary surgeon will not even evaluate the foal unless someone else has already decided that the leg is not as straight as desired, so the whole point may be moot.

The foals in this study ranged from about 4 months to 1 year of age. Clearly, this is past the optimum time for hemicircumferential periosteal transection, and bridging of the physis would be required. The surgery the authors describe is simpler than typical transphyseal bridging, and therefore one would expect fewer complications. The time to correction was about 60 days, with variation in time being dependent on the degree of deformity. I agree that this time span is expected. The authors found no cosmetic blemishes associated with the surgery, which is remarkable. I agree completely with Witte and colleagues when they describe transphyseal bridging to be associated with blemishes and that typically the more severe the deformity, the worse the blemish. Although most of these blemishes will become less noticeable as the foals grow, the blemishes will still remain.

The authors discuss the possibility of overcorrection by this technique. In addition, although it did not occur in any of these cases, the authors do mention the possibility of a permanent bridge caused by the lag screw. When I first read this report, the latter potential complication was my greatest concern. However, the more I considered the idea, the less concerned I became. The physis should not close prematurely unless it is damaged over an extensive area. Drilling one hole through this cartilage should not be enough trauma to damage it extensively. But more of these procedures will need to be performed on a variety of ages and breeds; in particular, younger horses will need to be looked at. For instance, if the procedure was performed during the most rapid physeal growth period because of a severe deformity, could it cause premature physeal closing? I agree with the authors that considering the technique and its simplicity, there should be minimal risk of overcorrection.

I would consider the possible complication of screw breakage minimal, and I do not think that using cancellous screws for this technique is appropriate because of the associated problems the authors describe.

Overall, this is an excellent manuscript describing a technique I cannot wait to try. Now I only have to find a crooked foal.

Tracy A. Turner, DVM, MS, Diplomate ACVS

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Figure 1. Radiographs showing (A) the small area of the epiphysis in which a screw (typically 0.45 to 0.55 cm in diameter) needs to be placed during a screw and wire transfixation and (B) the trajectory of a screw placed in the epiphysis (white) versus that of a screw placed in the transphyseal bridging technique described by Witte and colleagues (yellow).
LAMENESS

The Significance of Subtle Radiographic Lesions of the Medial Femorotibial Joint

In this retrospective study, the authors reviewed the medical and radiographic records of all horses at the Young-Crawford Veterinary Clinic from 1995 to 2000 and the University of Florida Veterinary Medical Teaching Hospital from 2001 to 2002 that were treated arthroscopically for lameness associated with the medial femorotibial joint(s). The criteria for inclusion specified unilateral or bilateral hindlimb lameness localized to the stifle joint based on physical findings, the presence of radiographic evidence of subtle flattening of the medial femoral condyle in one or both hind limbs, and a positive response to intra-articular anesthesia of the femorotibial joint. Excluded were horses with radiographically apparent subchondral bone cysts of the medial femoral condyle.

Specifics of the lameness evaluations included assignment of a lameness grade of 0 (no evidence of lameness) to 5 (minimal weight bearing) at the walk/trot/circle, response to hindlimb flexion, and the degree of palpable medial femoral tibial effusion noted (mild/moderate/prominent). The contour of the medial femoral condyle was assessed using the caudocranial radiographic projection and a specific grading system of 0 to 2. A grade of 0 was applied if the medial femoral condyle had no apparent radiographic lesions, a grade of 1 was applied when slight flattening of the apex of the medial condyle existed, and a grade of 2 was applied when subtle evidence of mild subchondral lucency was noted in the medial condyle.

A standard lateral arthroscopic approach to the medial femorotibial joint was used in all cases. The cartilage, medial meniscus, and cranial cruciate ligament were evaluated. Focal or extensive cartilage injuries to the weight-bearing surface of the medial femoral condyle were debrided, and the subchondral bone was treated with abrasion arthroplasty or microfracture techniques.

Horses were initially confined to a stall for 30 days after surgery and then allowed limited paddock exercise for an additional 60 days. Light exercise resumed at 90 days, and regular exercise was subsequently allowed after a minimum postoperative period of 6 months.

Fifteen horses met the criteria for inclusion in the study and were representative of three breeds (seven Warmbloods, five Quarter horses, and three Thoroughbreds). All horses were lame at examination, with lameness having lasted less than 1 week to more than 6 months. At the time of admission, 13 horses were classified with a grade 2 lameness or less, and only two horses displayed a moderate (grade 3) lameness. Intra-articular anesthesia eliminated (five horses) or improved (six horses) the lameness in the 11 horses in which it was performed. A total of 28 medial femorotibial joints were examined arthroscopically in the 15 horses. Four of the 28 joints were assigned a preoperative radiographic grade of 0, 20 were assigned a grade of 1, and the remaining four were assigned a grade of 2. The authors note that there did not appear to be a correlation between the degree of lameness observed and the assigned radiographic grades.

Abnormalities were discovered in 24 of the 28 arthroscopically evaluated joints. Cartilage and/or subchondral bone lesions were identified in all four joints assigned a grade 2 radiographic score, in 18 of 20 joints assigned a grade 1 radiographic score, and in two of the four joints thought to be radiographically normal (grade 0). Synovial effusion was a consistent clinical indicator of joint pathology, as 22 of 24 joints with cartilage lesions had effusion of the medial femorotibial joint identified before surgery.

Of the 15 horses, nine were reported to be sound and were returned to their intended use. The six horses that remained lame were found to have had serious joint pathology at the time of surgery (damage to the medial meniscus or generalized cartilage lesions).

Scott and associates demonstrate how radiographic subtleties can be an important indicator of significant underlying joint pathology.
The authors concluded that horses that had lameness attributed to the medial femorotibial joint and those with subtle radiographic lesions are likely to have cartilage and/or subchondral bone abnormalities; thus, arthroscopic evaluation is warranted.


**Commentary**

For many articular locations causing lameness in the horse, the equine practitioner must rely solely on the results of intra-articular diagnostic anesthesia and subsequent radiography of the joint in question to arrive at a diagnosis and recommendation for treatment. Recently, the availability of magnetic resonance imaging (MRI) for the lower extremities and advances in the skilled use of articular ultrasonography have expanded the abilities of the practitioner to arrive at a more sophisticated diagnosis (i.e., the presence of cartilage and/or soft-tissue damage around or within an articulation). Currently, for upper limb regions such as the stifle, the clinical examination coupled with radiographic findings remains the primary source for a diagnosis and plan of action for most practitioners.

In this study, Scott and associates demonstrate how radiographic subtleties can be an important indicator of significant underlying joint pathology. Cartilage lesions were identified arthroscopically in 91% of the horses that had a preoperative radiographic score of grade 1 or 2. Interestingly, cartilage abnormalities were also found in two of the four joints that were considered to be radiographically normal. The authors also found a correlation with the clinical findings, in that 92% of horses with cartilage lesions noted at surgery had synovial effusion of the medial femorotibial joint on the preoperative examination.

**The degree of lameness noted preoperatively did not correspond to the severity of the lesions observed intra-articularly.**

Another interesting finding was that the severity of the cartilage lesions did not correlate with the degree of lameness observed preoperatively or with the severity of the radiographic abnormalities. The authors did not find that horses with the most pronounced radiographic lesions (grade 2) had the most severe arthroscopic abnormalities. Additionally, the degree of lameness noted preoperatively did not correspond to the severity of the lesions observed intra-articularly. This may be important when deciding whether or not to pursue arthroscopic evaluation in horses that fit the radiographic and clinical criteria examined in this study. Whereas the severity of the preoperative clinical and radiographic findings may dissuade one from pursuing a surgical resolution, this study suggests that this perception may be erroneous.

Although ultrasonography was not used as a diagnostic tool in the study, this technique is gaining widespread popularity as practitioners become more skilled in its use, particularly for upper limb articulations such as the stifle. Ultrasound can be used to visualize the soft-tissue structures of the stifle joint and, in experienced hands, may aid in identifying cartilage pathology. As practitioners become more comfortable with this modality, it is likely that ultrasonography and radiography will become standard complimentary imaging techniques for evaluation of this joint. Once it becomes available for articulations of the upper limb, MRI will become the superior imaging technique for soft-tissue and cartilage lesions of the stifle.

Although the study size (n = 15) is too small to make conclusions concerning the specific treatment methods used and the ensuing results, this study does point out very well the prevalence of cartilage and/or subchondral bone abnormalities in the medial femorotibial joint of horses that could be initially perceived as relatively normal radiographic findings. A closer look may be indicated in horses with hindlimb lameness attributed to the stifle and subtle radiographic lesions of the medial femoral condyle. Coupled with the clinical findings of lameness and joint effusion, the subtleties of the radiographic findings demonstrated in this study should not be overlooked.

Patricia M. Hogan, VMD, Diplomate ACVS

**Reference**

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  AQHA ALL AMERICAN QUARTER HORSE CONGRESS
  Ohio State Fairgrounds
  Columbus, Ohio
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- **October 26–November 6**
  PCCHA LEGEND FUTURITY
  Reno Livestock Events Center
  Reno, Nevada
  www.pccha.com

### November
- **November 5–19**
  AQHA WORLD SHOW
  State Fair Park
  Oklahoma City, Oklahoma
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- **November 29–December 4**
  122ND NATIONAL HORSE SHOW
  Palm Beach Polo Equestrian Club
  Wellington, Florida
  www.stadiumjumping.com

### December
- **December 3–7**
  AAEP 51ST ANNUAL CONVENTION
  Seattle, Washington
  www.aaep.org

### January
- **January 19–21, 2006**
  8TH ANNUAL AAEP RESORT SYMPOSIUM
  Rome, Italy
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