J Vet Clin 29(2) : 177-180 (2012)

Journal of Veterinary Clinics
www.ksvc.or.kr

A Case of New Surgical Correction of Angular Limb Deformities Using One Screw Implant & Periosteal Transection in a Thoroughbred Foal

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(Accepted: April 05, 2012)

Abstract : Angular limb deformities (ALD) are common in foals. A 30-days-old Thoroughbred foal was presented for the evaluation of severe ALD of the both forelimbs. On radiographic examination, both distal radiuses were diagnosed as valgus angular limb deformities. But the degree of deviation of right forelimb was so severe that we tried to correct one after the other. We tried new surgical correction method combination of one screw implant on medial aspect for growth retardation and periosteal transection on lateral aspect of the right forelimb. 40 days later, successfully corrected and then removed the screw. After the right forelimb correction, the periosteal transection on left forelimb was performed. We did the inhalation anesthesia using isoflurane. There were no complications such as fibrosis over the screw heads, and overcorrection that produces an opposing deformity identified. These results suggest that combination of one screw implant and periosteal transection technique is able to be a safe and effective method to correct severe ALD in the foal.

Key words **:** Angular limb deformity, one screw implant, periosteal transection, Thoroughbred neonate.

Introduction

The term of angular limb deformity (ALD) describes a deviation from the normal axis of a limb in the frontal plane (2). Two types of angular limb deformities are described in the literature: valgus and varus deformities. In a valgus deformity, the portion of the limb distal to the deformity deviates laterally. Conversely, in the varus deformity, the limb distal to the deformity deviates medially (5,7). In complete ossification at the time of birth is a major reason for development of ALD (2).

Depending on the findings of the physical and radiographic examinations, treatment regimens may include exercise; stall rest; corrective trimming; external support; surgery; growth retardation using staples, screws, wires, and bone plates; growth acceleration by periosteal transection and stripping; and combinations of these (3,4,5). However, we tried using just one screw implant and periosteal transection in a foal. It had been used with great success.

The purpose of this study is proving that combination of one screw implant and periosteal transection technique is able to be a safe and effective method to correct severe ALD in the foal.

Case

Horse

A 30-days-old Thoroughbred filly was presented for the evaluation of severe rotational and angular limb deformities of the both forelimbs. On radiographic examination, both distal radiuses were diagnosed as valgus deformities (Figs 1-2). But the degree of deviation of right forelimb was so severe that we tried to correct one after the other.

Anesthesia, Positioning and Surgical Preparation

Peri-operative antibiotics and NSAID were administered. After induction of general anesthesia with ketamine hydrochloride (KETALAR®, Yuhan Co, Korea) and maintain with isoflurane (Aerane®, Ilsung Pharmaceuticals, Korea), the foal was positioned in dorsal recumbency because both growth retarda-

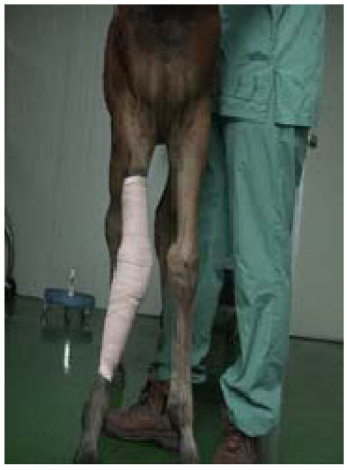

Fig 1. A foal with Angular limb deformities.

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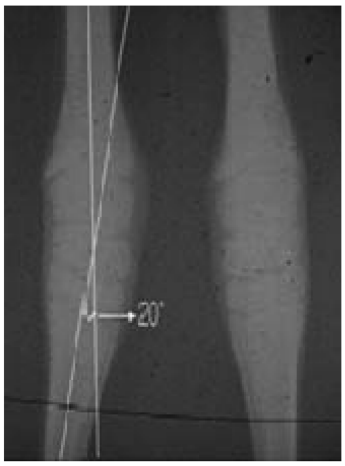

Fig 2. 20° of deviation of right limb.

tion and growth acceleration technique were used in one limb. The right forelimb was suspended and supported with an IV holder. Hair was shaved, and routine surgical preparation of the skin around the distal radius was performed. An impervious self-adhering plastic barrier drape was used so that the entire distal radius can be visualized. Meticulous aseptic technique including proper draping was applied because an implant was used.

Instrumentation

Suitable screws for the screw implant technique of the distal radius were 4.5 mm cortical screws (4.5 mm cortex screw, Synthes, USA). Screws usually were 38 mm to 45 mm in length and fully threaded. The instrumentation for insertion of the screw included a drill, 3.2 mm drill bit, drill guide, depth gauge, tap, tap sleeve, and screwdriver. A portable X-ray machine was required for intraoperative radiographs to ensure correct placement of the screw.

Surgery

Growth retardation and acceleration were performed in the foal with severe right carpal valgus deformity as follows. An implant was applied in the convex aspect of the distal radius, crossing the physis temporarily and allowing the concave aspect of the bone to continue to grow by periosteal transection, eventually correcting the deformity. The medial aspect of the distal radius was exposed and the physis was identified by probing the most prominent aspect of the radius with a 20G, 1 1/2-inch needle. A second needle was inserted into the antebrachial carpal joint to identify the limits of the medial aspect of the epiphysis of the radius. Intraoperative radiographs were made to identify correct needle placement. One stab incision to the bone was made with the scalpel blade in the center of the radius about 2 cm proximal to the physis at the medial aspect of the bone. A 3.2 mm hole was drilled through the incision disto-medially at about a 30° angle crossing the physis and directing slightly dorsally. Drilling was stopped when the distal end of the hole was halfway between the antebrachial carpal joint and the physis. The hole was tapped, measured and a 42 mm 4.5 mm cortical screw was inserted and tightened completely. Countersinking was done minimally because the bone was very soft. Intraoperative radiographs were made to ensure correct placement of the drill bit and the implant. The subcutaneous tissue was closed with a simple continuous pattern using 2-0 synthetic absorbable suture material. The stab incision was closed using 2-0 non-absorbable suture material in a simple interrupted pattern. After the right forelimb correction, the periosteal transection on left forelimb was performed.

Postoperative Care

A bandage was applied using sterile 4 × 4 gauze sponges held in place with a sterile soft conforming gauze bandage and orthopedic cotton rolls covered with an elastic adhesive bandage. The bandage was changed every 3 or 4 days, with the limb remaining bandaged for up to 14 days after the skin sutures were removed 12 days postoperatively. Systemic antibiotics and NSAID were administered for 5 days postopera-

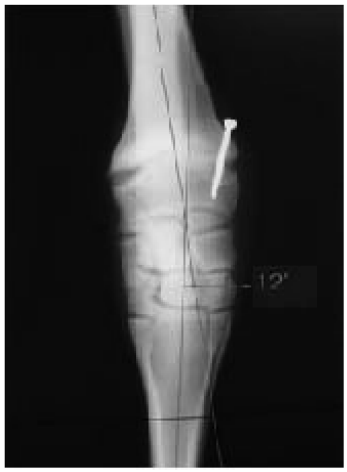

Fig 3. 12° of deviation of the limb after surgery.

Fig 4. 3° of deviation of the limb.

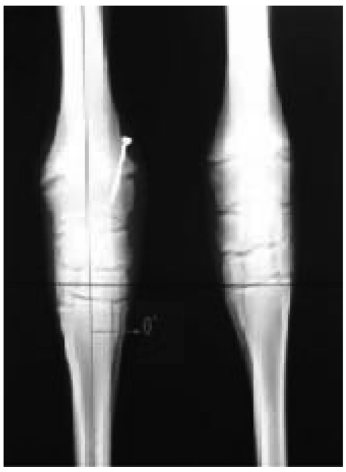

Fig 5. Almost normal angle after surgery.

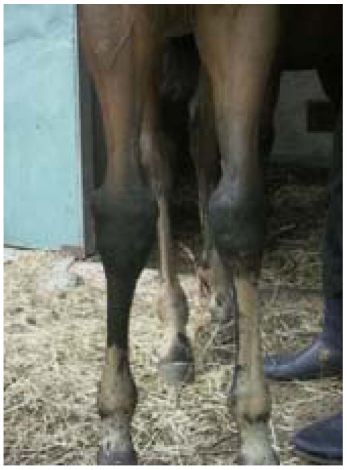

Fig 6. Successful correction.

tively. The foal was confined to a large stall for 3 weeks. Strenuous exercise was not allowed until the angular limb deformity was corrected (Figs 3-6).

Discussion

Numerous techniques for the surgical correction of ALD in horses including growth acceleration (periosteal transection), growth retardation (2 screws and wire), combination of growth acceleration and retardation, and corrective ostectomy have been reported. Implantation of a cortical bone screw into each affected epiphysis and metaphysis, has become more popular than stapling (5,6,8).

The treatment of foals in which the ALD originates at the joint itself, such as with delayed ossification of the cuboidal bone or laxity of periarticular soft tissue, is different from the treatment of ALD that originate from the physeal region (2). It is important for the practitioner to know what treatment options are available for ALD of physeal origin and to understand how to determine when and if treatment needs to be perform. Generally, allowing the foal to correct on its own with minimal intervention should be the most preferable method of therapy (9).

In more severe ALD, in which the loading has become static, the bone growth stops, and the angulation tends to get worse. In these cases, surgical intervention is required. Transphyseal bridging is performed on the convex surface to create a static compression so that bone growth is retarded on that side (6,9). The management of physeal origin angular limb deformities in foal is controversial. A recent study found that offset carpi contributed to metacarpophalageal joint problems and clinical experience suggests the carpus is also at increased risk of injury (1).

There were no complications such as fibrosis over the screw heads, and overcorrection that produces an opposing deformity identified. These results suggest that combination of one screw implant and periosteal transection technique is able to be a safe and effective method to correct severe angular limb deformities in the foal. A wide variety of orthopedic disorders can be present in the neonatal foal. Rapid and accurate diagnoses of these conditions are imperative so that the best future athletic potential can be achieved.

Conclusion

We confirm that the applicability of a new surgical correction method using combination of one screw implant and periosteal transection technique in the severe case of ALD. This is successful case of surgery under general anesthesia using inhalation of isoflurane in Korea. This new surgical technique will be helpful for horse breeders to minimize the economic loss by severe case of ALD in foals.

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Thoroughbred 망아지에서 단일나사못 장착 및 골막박리를 이용한 지세교정술

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요 약 : 다리기형(ALD)은 다리가 정중선에서 벗어나 측면으로 회전변형 된 것을 의미하고 망아지에 흔한 선천적 결손이다. 30일령의 Thoroughbred 망아지가 한국마사회 제주목장 동물병원으로 내원하였다. 방사선 검사에서 양 앞다리가 각각 외측으로 변형되었고 오른앞다리가 왼앞다리보다 심하게 회전된 것을 확인하여 단일나사고정술과 골막박리술을 이용하여 교정수술을 하였다. 40일 후 나사를 제거하였고 술부의 섬유화 및 과잉교정 등 합병증이 없이 바르게 교정되었다. 이 결과로 국내 신생망아지에 isoflurane을 이용한 흡입마취에서 단일나사고정술과 골막박리술은 안전하고 효과적인 수술임을 확인하였다.

주요어 : 골막박리술, 다리기형(ALD), 단일나사고정술, Thoroughbred 망아지