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SURGICAL CORRECTION OF ACQUIRED FLEXURAL DEFORMITIES OF THE METACARPOPHALANGEAL AND DISTAL INTERPHALANGEAL JOINTS IN HORSES

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SUMMARY

Sixteen horses with acquired flexural deformity of the metacarpophalangeal (MCP) and distal interphalangeal (DIP) joints were evaluated and classified according to their severity into mild (N= 7), moderate (N = 4), and severe (N = 5). Evaluations for the tendon affected and the severity lesions of the deformity were based on clinical and radiographical examinations. Cases with mild deformities were treated with corrective trimming and shoeing. Cases with moderate deformities were treated with surgical transection of the check ligaments of the deep and/or superficial digital flexor tendon and corrective trimming. Tenotomy of the superficial or deep digital flexor tendons was performed in the severely affected cases, followed by corrective trimming and cast application. In this long term study, all horses with mild, and two horses with moderate lesions regained to normal conformations and proved useful at work. Two cases with severe lesions showed little response whereas the rest of the horses were unable to resume work.

KEYWORDS: Acquired flexural deformities, metacarpophalangeal joint, interphalangeal joint, horses

INTRODUCTION

Acquired flexural deformities (AFDs) commonly involved areas include carpal, metacarpophalangeal (MCP) and distal interphalangeal (DIP) The condition can be unilateral or bilateral and it develops after birth until the second year of life as flexure deformities in joint Facklman 1979, Metcalf et al 1982, Wagner et al 1985). Flexural deformity of the DIP joint refers to contracture of the deep digital flexor tendon whereas flexural deformity of the MCP joint refers to a contracture of the superficial digital flexor tendon. It has been reported that the condition is usually seen in the DIP joints in growing foals between the ages of 2 and 8 months and in the MCP joints between the

ages of 8 and 18 months (Wagner 1990a and b).

The common causes of acquired flexural deformities in horses include a genetic propensity for rapid growth, poor nutritional management, and pain in the limb. Overfeeding and imbalanced rations in young growing foals that have an inherent potential for rapid physical development can lead to flexural deformity (McIlwraith and James 1982, McIlwraith and Robertson 1998). Any pain in the limb of a growing foal results in altered load bearing on that limb and that may cause contraction to the flexor muscles and consequently leads to this syndrome. Pain can arise from other developmental disorders such as physitis and osteochondritis dissecans or from other diseases such as septic arthritis, soft tissue wounds and hoof infections. In addition, there are other factors that have been thought to develop AFDs in foals. It has been reported that young horses place one foot forward and one back when eating from the ground and that the club foot occurs on the one that is placed back (Beeman 1990).

AFDs of the DIP joint and the MCP joint differ in clinical presentation (McIlwraith & Fessler 1978, Rooney 1966). Early clinical signs of AFD of the DIP joint include pointed projection at the coronary band and failure of the heels to contact the ground after trimming. In order to gain more accurate prognosis and treatment, this deformity has been subdivided into stages I and II (McIlwraith and Fessler 1978). The condition is considered stage I when the dorsal aspect of the hoof does not pass beyond the vertical line, whereas stage II refers to the condition in which the dorsal aspect of the hoof passes beyond the vertical line. The clinical signs of flexural deformity of the MCP joints appear gradually with the leg first becoming upright, then flexed forward at the joint. With this condition, the dorsal angle of the MCP joint increases and the joint appears to flex forward and the foot may be in a normal position or have an elevated heel. A knuckled over fetlock can be seen in a very worse condition.

Although clinical signs are often enough to make a diagnosis of flexural deformity, radiography is essential element that can be performed prior to determine a prognosis and prescribing the appropriate treatment. Therefore, radiographs should be taken as part of the initial diagnostic workup. Lesions seen on radiography vary depending on the duration and severity of the flexure deformity. In mild cases, the fetlock joint appears upright with slight abnormality changes in the joint. In case of coffin joint, the radiographic changes that can be seen include a slight subluxation in the joint with the proximal second phalanx angled cranially. A correlation was reported between the radiographic changes and clinical severity in foals with flexural deformity in the DIP joints (Arnbjerg 1988). Osseous changes in the proximal and distal sesamoids, distal third aspect of the metacarpal bone, and distal phalanx have been described in moderate and severe cases (Blackwell 1982, Metcalf et al 1982, Fackelman 1983, Fackelman et al 1983, Wagner 1990 a).

Surgical corrections of DDF contracture at early stages has been indicated at pathogenesis of acquired flexural deformities for cases that show signs of chronic pain including contraction in the flexor muscles and consequently alters position of

joints (Rooney 1966).

The objective of the present study was to determine the appropriate treatment for the flexure deformity of the DIP and MCP joints in horses according to the clinical signs of flexural deformity and radiographic evaluation of the affected joints and to evaluate the horses after a long follow up monitoring.

MATERIALS AND METHODS

Horses

Sixteen horses with AFD of the DIP and MCP joints were used in this study. The ages of all horses were less than 24 months. Each horse was examined with special attention was given to the digit and hoof regions of the forelimbs. In order to determine the axial alignment of the metacarpus and phalanges and to identify the osteoarthritic changes, radiography was performed to the MCP and DIP joints.

Clinically, the cases were divided into three groups depending on the tendon involved and the severity of the conditions.

Group I: Cases including those having shortening in the DDFT and clinically had upright heels and the dorsal surface of the hooves did not pass beyond the vertical line.

Group II: Cases that include those which had straight to cranial flexion of the MCP joints in standing position. The MCP joints were flexed cranially (camping) at all times.

Group III: Cases that showed mixed contracture of the DDFT and SDFT. There were marked flexion of the MCP joints cranially and poping of the pastern.

Surgical correction procedure

Desmotomy of the inferior and superior check ligaments was performed with the horse under general anesthesia and in lateral recumbency similar to what was described by Turner and McIlwraith (1989). Postoperatively, the limb was bandaged from the proximal end of the radius (in case of superior check ligament desmotomy) or metacarpus (in case of inferior check ligament desmotomy) to the coronary band for 5 days. The hooves were trimmed to normal conformation and the sutures were removed after 12 to 14 days.

Tenotomy of the SDFT and DDFT was performed in the way similar to what was reported by Turner and McIlwraith (1989). Corrective shoeing varied according to the individual requirements but was usually directed at spreading the heels by the application of bar shoes with branches that were tapered abaxially. Shoes with caudally extended branches were used with the cases that postoperatively showed dorsiflexion of the toe.

The response to treatment was estimated from visual assessment of MCP angle improvement during the immediate postoperative period, radiographic evaluation of angle change and owner satisfaction concerning fetlock angulation 1 to 2

years postoperatively.

Statistical analysis

Mean and standard deviation were calculated for each parameter in each group. Analysis of variance (ANOVA) was used to determine the differences in the dependent variables among the three groups, and the significance level was set at $P< 0.05$. Statistical analysis was achieved using SAS program.

RESULTS

Table 1 showed the breed, age at onset, age at treatment, affected limb(s), affected tendon(s), applied treatment and the result of the treatment.

Case BO	Breed	Age at Onset (months)	Age at treatment (months)	Affected limb (s)	Affected tendons	Applied treatment	Result
Mi 1	Thoroughbred	6	11	Bilateral	DDF	Conservative	Good
Mi 2	Thoroughbred	10	14	Bilateral	DDF	Conservative	Good
Mi 3	Thoroughbred	9	12	Unilateral	DDF	Conservative	Good
Mi 4	Arabian	4	7	Bilateral	DDF	Conservative	Good
Mi 5	Thoroughbred	8	10	Unilateral	DDF	Conservative	Good
Mi 6	Toroughbred	11	15	Bilateral	DDF	Conservative	Good
Mi 7	Arabian	6	9	Bilateral	DDF+SDF	Conservative	Good
MO1	Thoroughbred	8	11	Unilateral	DDF+SDF	ICL, SCL desmotomy	Good
MO2	Thoroughbred	16	20	Bilateral	DDF	ICL desmotomy	Fair
MO3	Thoroughbred	9	16	Bilateral	DDF+SDF	ICL, SCL desmotomy	Good
MO4	Arabian	11	16	Bilateral	DDF+SDF	ICL desmotomy+ hoof trim	Poor
SE 1	Thoroughbred	18	22	Bilateral	DDF	DDF tenotomy	Fair
SE 2	Thoroughbred	12	19	Bilateral	DDF+SDF	DDF & SDF tenotomy	Bad
SE 3	Thoroughbred	16	20	Unilateral	DDF	DDF tenotomy	Fair
SE 4	Arabian	15	20	Bilateral	DDF+SDF	DDF & SDF tenotomy	Bad
SE 5	Thoroughbred	19	24	Bilateral	DDF	DDF tentomy	Bad

Mi = mild Mo = moderate SE = severe
ICL= inferior check ligament SCL = superior check ligament

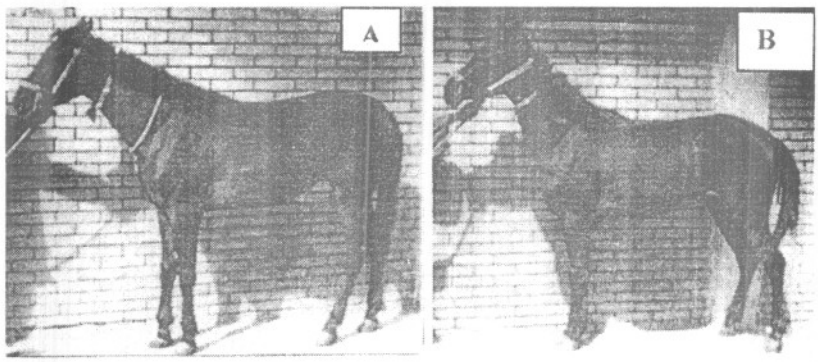

Fig1. Slight bilateral SDF contracture. A: before treatment, B: post treatment

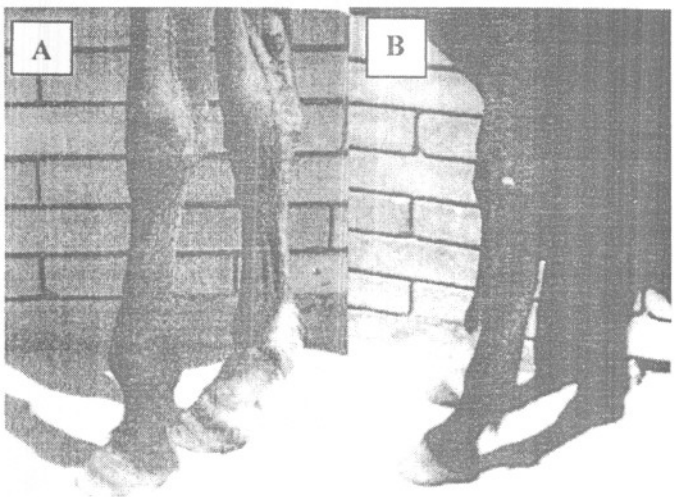

Fig 2. Moderate unilateral SDF contracture. A: before treatment, B: post treatment

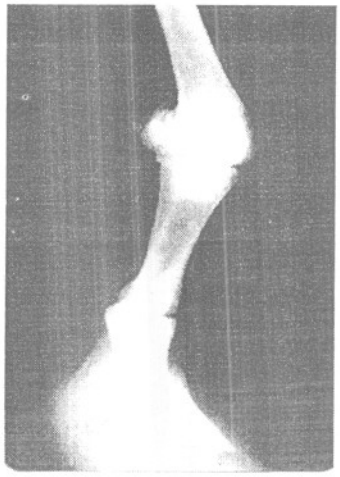

Fig 3. Radiograph for a severe case of MCP joint flexural deformity

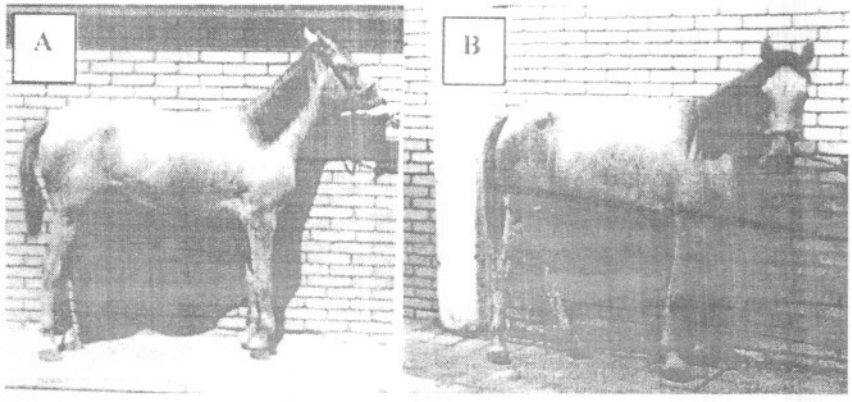

Fig4. Severe bilateral SDF and DDF contracture. A: pre treatment, B: post treatment

DISCUSSION

The present study showed that the acquired flexural deformities of DIP joints were observed several months later than what have been reported by Wagner (1990a and b). Wagner (1990ab) has reported that the acquired flexural deformity is usually occurred in the DIP joints in growing foals between the ages of 2 and 8 months. The present study showed that the mean age of horses affected with acquired flexural deformity of DIP was 12 months. The delay of starting training of the foals may be one main reason that might explain the delay occurred of having the condition in DIP joints of horses in the present study. On the other hand, the average age of horses affected with acquired flexural deformities of MCP joints was 8.5 months and this follows the reported mean age (Wagner 1990a and b). The present study also showed that the mean age of horses affected with both joints

(DIP and MCP) was 10.6 months. The present study showed that 78% of cases with flexural deformities of DIP joints were presented with the condition occurred in both forelimbs.

The horse ages were significantly different among the groups (P = 0.001). The average ages of horses presented with signs of group I (mild), II (moderate), and III (severe) were 7.71 ± 2.49, 11 ± 3.5 and 16 ± 2.73, respectively. This might indicate that horses in group I may be developed if not treated to group II and group II can be altered into group III.

The breed of horses has an effect on the incidence of acquired flexural deformities. In this study, twelve horses were Thoroughbred and four were Arabian horses. This may indicate that Thoroughbred horses may be highly predisposed to be affected with the condition. However, the main cause for having this problem highly in Thoroughbreds is unknown whether it is related to either genetic or environment reasons or both.

There are three forms of acquired or postnatal flexural deformities of the distal interphalangeal and metacarpophlangeal joints of the fore limb of young horses. These are primary DDF contracture, SDF contracture and combined DDF and SDF contractures. After two years postoperatively follow up, the results of treatment were significantly different among the groups (P = 0.02). All horses with mild and two horses with moderate lesions regained to normal conformations and proved useful at work. Two cases with severe lesions showed little response whereas the rest of the horses were unable to resume work.

This study proved that conservative methods of treatment including dietary changes, exercise and hoof trimming should be considered especially if the affected animal is presented early to the hospital. Cases with mild degree of fetlock flexural deformities responded to the conservative methods of therapy either by raising the heels or by corrective trimming and shoeing (Fig 1). It was thought that raising the heel creates a relative relaxation of the DDF tension which in turn leads to selective overloading of the remaining support structures (Fackelman 1979). Nevertheless, there is no significant difference in strain in either the superficial digital flexor tendon or suspensory ligament with changing hoof angle due to the mean tendon strain in the DDF tendon changes with hoof angle (Rooney 1966, Lochner et al 1980). Cases with mild degree of flexure deformities of the DIP joint had the heels trimmed short so that tension is placed on the flexor tendon in order to inverse myostatic reflex (Lochner et al 1980). A profound reduction in feed intake for rapidly growing horses has also been recommended (Turner and McIlwraith 1989).

In cases with moderate contracture of both DDF and SDF tendons that were treated with desmotomies of both check ligaments, visual assessment of angle change one week after surgery was good in about 67% of cases and 33% of them were fair to poor. The mean angle change measured on the radiographs was about 12-15 degrees. In the case with poor response, the limbs recontracted to presurgical angles. This recontracture developed 2 to

5 months post surgery.

It has been reported that the results of surgical treatment of flexure deformities of the MCP joint or SDF and DDF contracture are less predictable than for flexure deformities of the DIP joint (Fackelman 1979). Superficial flexor tenotomy is simple and not as drastic in terms of cosmotic appearance as deep flexor tenotomy (Fackelman 1983, Shively 1983).

In the present work, good results were found after superior check ligament desmotomy (Fig 2). Other studies have showed disappointed results from this surgery (Turner and McIlwraith, 1989). The surgical technique is more difficult than inferior check ligament desmotomy as recontracture and carpal canal problems may develop postoperatively (McIlwraith 1982).

Both clinical signs and radiography were important to evaluate severe cases (Fig 3 & 4). DDF tenotomy is indicated for severe long standing cases of DDF contracture (Fackelman et al 1983). In the present work, DDF tenotomy alone or with SDF tenotomy performed to correct the flexural deformities in some animals while in others fibrosis and contraction of the joint capsule and associated ligaments did not permit proper realignment. The cosmetic appearance following tenotomy is sometimes unsatisfactory and the functional ability of the limb is often limited because of the drastic nature of the surgery (Harris 1979, Turner and McIlwraith 1989). In this study, satisfactory cosmetic and functional results following DDF tenotomy have been obtained in only 40% of cases (Fig 4). It has been reported that the cosmetic appearance improves with the distal approach in comparison with the mid cannon approach (Harris 1979, McIlwraith 1982). However, wider separation of the transected tendon ends is of concern with later function (Lochner et al 1980, Fackelman et al 1983). The average time between the initial appearance of the severe conditions and the time of starting treatment was five months. This was a long duration and it might be the reason for having a guarded prognosis for those cases.

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الإصلاح الجراحى للشذوذات الإنقباضية المكتسبه فى مفصلى المشطى السلامى (الرمانة) وبين السلامى القاصى (التابوت)

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ص ب ١٤٨٢ النعيم - المملكة العربية السعودية

لقد تم تقديم ١٦ حصان مصابة بالشذوذات الإنقباضية المكتسبة فى مفصلى المشطى السلامى (الرمانة) وبين السلامى القاصى (التابوت) . قسمت الحيوانات على حسب شدة الحالة إلى خفيفة (٧ حيوانات) متوسطة (٤ حيوانات) وشديدة (٥ حيوانات) تم تقييم شدة الإصابة ونوع الوتر المصاب إعتماداً على التشخيص الإكلينيكى والإشعاعى . تم علاة الحالات الخفيفة بتحسين التقليم للحافر وإستخدام الحذاوى المناسبة . بالنسبة للحالات المتوسطة فقد تم علاجها عن طريق القطع الجراحى لأحد أو كلا رباطى الوترين الإصبعيين الفابضين السطحى والغائر مع تحسين تقليم الحافر فى الحالات الشديدة تم القطع الجراحى للوتر الإصبعى القابض السطحى أو الوتر الإصبعى القابض الغائر مع تحسين تقليم الحافر ثم إستخدام الجبيرة الجبسية . جميع الحالات البسيطه وإثنين من الحالات المتوسطة رجعت إلى حالتها الطبيعية من حيث التناسق والإداء الوظيفى . هناك حالتين من الحالات الشديدة أظهرت تحسن طفيف بينما باقى الخيل لم تستجب للعلاج .