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Qualitative and quantitative documentation of the racing performance of 461 Thoroughbred racehorses after arthroscopic removal of dorsoproximal first phalanx osteochondral fractures (1986–1995)

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Summary

The purpose of this study was to examine the longevity of postoperative careers and quality of performance of 461 Thoroughbred racehorses after arthroscopic removal of dorsoproximal first phalanx (P1) osteochondral fractures. Six hundred and 59 dorsoproximal P1 chip fractures were removed arthroscopically from 574 joints in 461 horses presented for lameness or decreased performance attributed to the chip fractures. Radiological and arthroscopic examination revealed an average of 1.43 fragment sites/horse, 1.15 fragment sites/joint and 1.25 affected joints/horse. Eighty-nine percent of the horses (411/461) raced after surgery and 82% (377/461) did so at the same or higher class. Fifty horses did not race after surgery. Sixty-eight percent of the horses raced in a Stake or Allowance race postoperatively. Data, previously undocumented, establishes that the quantity and quality of performance is not diminished after arthroscopic treatment of dorsoproximal P1 fragmentation. Surgical removal of chip fractures is a means of preserving the economic value of an injured Thoroughbred, allowing a rapid and successful return to racing at the previous level of racing performance.

Fig 1: Dorsoproximal first phalanx osteochondral fracture (arrow) as seen on an oblique radiograph of the fetlock joint.

Introduction

In the Thoroughbred racehorse, dorsoproximal first phalanx osteochondral fragmentation (P1 chip fractures) is a common occurrence. Repetitive impact of the dorsoproximal eminence of P1 against the third metacarpal/metatarsal bone during over-extension of the fetlock joint at fast exercise leads to impact damage and fragmentation of P1 (Adams 1966; Haynes 1980; Copelan and Bramlage 1983; Stashack 1987; Kawcak and McIlwraith 1994). Clinical signs of mild to moderate lameness, pain on palpation of the fracture site and fluid distention of the affected joint have been described (McIlwraith 1996). These signs are transient after high speed exercise and dissipate with lower levels of exertion, especially early in the disease process. Diagnosis of these phalangeal fractures is made through radiographic examination (Fig 1) of the fetlock joint (Adams 1966). Decreased convalescent time has made arthroscopic removal of dorsoproximal P1 chip fractures the treatment of choice (McIlwraith 1989).

Postsurgical racing prognosis for horses undergoing arthroscopic surgery for removal of dorsoproximal P1 chip fractures is described as dependent on the amount of articular cartilage degeneration and associated lesions present within the joint (Kawcak and McIlwraith 1994). However, the only data that exist document that the horses will return to race once postsurgery; the probability that the horses will return to racing at similar levels of performance and the longevity of their performance have not been defined.

This paper reports the incidence and location of dorsoproximal first phalanx osteochondral chip fragmentation in 461 Thoroughbred racehorses and analyses radiographic and

Fig 2: Quantification of the 10% radiographic magnification of fragments. The radiographic size of a 30 mm metal strip placed axially on the dorsum of the fetlock joint (arrows; radiographic measure 32 or 33 mm) is compared to that of another 30 mm metal strip placed on the surface of the radiographic cassette (not pictured; radiographic measure 30 mm). The observed 9 mm fragment should measure around 8.2 mm.

arthroscopic data and subsequent racing performance for probability of return to racing, career longevity and quality of performance.

Materials and methods

We examined hospital records for 461 Thoroughbred racehorses undergoing arthroscopic surgery for removal of dorsoproximal P1 osteochondral chip fragmentation between 1986 and 1995 at the Rood and Riddle Equine Hospital. Age, sex, surgery report, preoperative radiographs and lifetime race records were tabulated. Radiographic examination of the affected fetlock joint included dorsoproximal-palmarodistal, lateromedial, flexed lateromedial, dorsolateral-palmaromedial oblique and dorsomedial-palmarolateral oblique views. Because of the high incidence of bilateral P1 chip fractures, radiographs of the contralateral fetlock joint were obtained routinely during the initial clinical examination.

Chip location was determined from radiographs and surgery reports. Chip size was determined from the radiographs and defined as the largest chip dimension measured in any of the radiographic views, or from the intraoperative measurement of the arthroscopically removed fragment. To quantify the radiographic magnification of the fractures, two 30 mm metal strips placed on the radiographic cassette and axially on the dorsum of the fetlock joint were compared (Fig 2). All radiographic views were taken in a sample group of 13 horses to document the degree of magnification. Measurement of metal strip length was consistently 30 mm for the strip on the cassette and 32 or 33 mm for the strip on the limb for the oblique views. This 10% magnification factor has been recognised previously and was used to correct magnification of the fragments measured on the radiographs.

Fig 3: Dorsoproximal first phalanx osteochondral fragment and its fracture bed as seen upon initial arthroscopic examination of a fetlock joint (condyle of the distal metacarpus seen in the background).

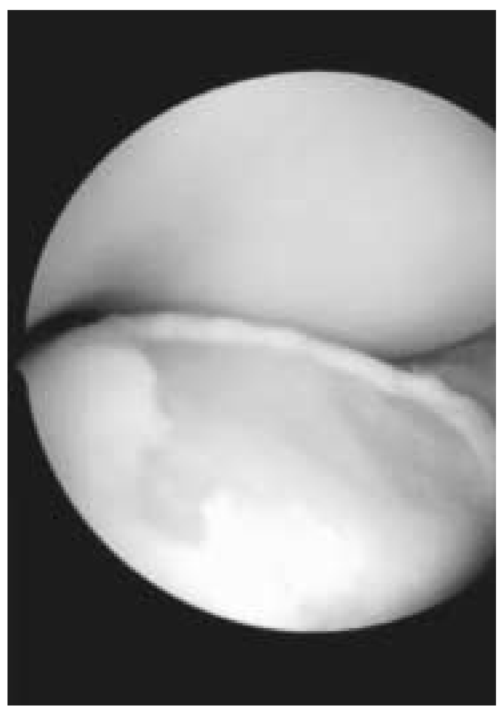

Fig 4: Arthroscopic view of the dorsoproximal eminence of the first phalanx after removal of an osteochondral fragment and debridement of the remaining fracture bed.

Pre- and postoperative race starts, racing dates, race class and money earned were obtained from the Jockey Club Information System (Equine Line 2000)[1]. Preoperative race class was established for each horse as the highest race class

TABLE 1: Incidence and location of 659 dorsoproximal P1 chip fractures in 461 Thoroughbred racehorses as a percentage of fracture location

	Total chips (%)	Total joints (%)	Medial (%)	Lateral (%)	Biaxial (%)
Right fore	245 (37)	208 (36)	185 (28)	60 (9)	37 (6)
Left fore	338 (51)	292 (51)	267 (41)	71 (11)	46 (7)
Right hind	32 (5)	31 (5)	27 (4)	5 (1)	1 (0)
Left hind	44 (7)	43 (7)	38 (6)	6 (1)	1 (0)
Total	659 (100)	574 (100)	517 (78)	142 (22)	85 (13)

achieved by the horse during its last 2 starts before the surgery date. Postoperative race class was established as the highest race class achieved by each horse after its surgery date. Time to surgery was established as the number of days between the last preoperative race and surgery date. Time to race postsurgery was established as the number of days from the surgery date to the first postoperative race. Horses were divided into 3 groups according to their racing performance: raced before and after surgery (Raced Bef, Aft), did not race before but raced after surgery (DNR Bef) and did not race after surgery (DNR Aft).

All surgeries were performed with the horse in lateral recumbency with the largest osteochondral fragment of the affected joint nearest the floor. The arthroscopic portal was created in the dorsal joint compartment opposite the fracture. The instrument portal was created near the fragment avoiding the extensor tendons. Routine intraoperative manipulations entailed isolation of the dorsal fragmentation, removal of all fragments and associated debris, and debridement of the parent bone fracture bed and any opposing damaged joint surfaces, followed by joint lavage (Figs 3, 4). Limbs were bandaged postoperatively for 30 days. Potassium penicillin (Penicillin G Potassium)[2] (22 x 10^3 iu/kg bwt i.v. q.i.d.) and gentamicin (Gentocin)[3] (6.6 mg/kg bwt i.v. s.i.d.) were administered preoperatively and continued for 24 h. Tetanus toxoid (Tetanus Toxoid)[4] (1 ml i.m.) and i.v. phenylbutazone (Phenylbutazone Injection)[5] (6.6 mg/kg bwt i.v.) were administered once on the day of surgery and phenylbutazone (Phenylbutazone Paste)[6] (2.2 mg/kg bwt *per os* b.i.d.) was continued for 10 days postoperatively. Suture removal was performed 10–12 days postoperatively. Horses were stall-rested for 2 weeks and hand-walked for 3 weeks before returning to normal activity, unless conditions within the joint were felt to merit longer convalescence.

Results

Six hundred and fifty nine dorsoproximal P1 chip fractures were removed arthroscopically from 574 joints in 461 Thoroughbred racehorses. Eighty-eight percent of all chips occurred on the forelimbs with 51% on the left forelimb, 37% on the right forelimb, 7% on the left hindlimb and 5% on the right hindlimb (Table 1).

Seventy-three percent of the horses had a chip fracture of the left fore and 53% of the right fore (Table 2). The most commonly affected site was the medial left forelimb (58%), followed by the medial right forelimb (40%), concurrently on the medial left and right forelimbs (19%), lateral left forelimb (15%), lateral right forelimb (13%), biaxially on the left forelimb (10%), medial left hindlimb (8%) and medial right hindlimb (6%) (Table 2). Five horses (1%) had a forelimb and a hindlimb affected at the same time (one yearling, three 3-year-olds and one 6-year-old). Radiological and arthroscopic examination revealed an average of 1.43 fragment sites/horse, 1.15 fragment sites/joint and 1.25 affected joints/horse.

Eighty-nine percent of the horses raced after surgery (Table 3). Eighty-two percent of all operated horses raced at the same or higher class after surgery (377/461). Two hundred and fifty eight horses raced before and after surgery, 153 raced after but not before surgery, 29 did not race after surgery and lifetime race records could not be located for 21 horses either before or after surgery.

Horses that raced before and after surgery (258) averaged 8.4 starts (median 6) and 13.3 starts (median 11); achieved earnings $48,183 (median $21,501) and $52,533 (median $18,355); and $5760/start and $3960/start, repectively. Average age at surgery was 3.1 years (median 3) (Table 4). The average time to surgery was 41 days (median 25). Average time between surgery and first postoperative start, including convalescent time and training period, was 189 days (median 169). This time to race range had a low of 58 days (high of 728 days) and 62% of these horses (160/258) raced within 6 months of surgery.

Eighty-seven percent of horses racing before and after surgery (224/258) returned to race at the same or higher class (Table 5). The average earnings/start after surgery was less than the average earnings/start before surgery in 61% of these horses

TABLE 2: Incidence and location of 659 dorsoproximal P1 chip fractures in 461 Thoroughbred racehorses as a percentage of horses affected

	Total horses (%)	Medial (%)	Lateral (%)	Biaxial (%)	Bilateral medial (%)	Bilateral lateral (%)
Right fore	245 (53)	185 (40)	60 (13)	37 (8)		
Left fore	338 (73)	267 (58)	71 (15)	46 (10)		
Right hind	32 (7)	27 (6)	5 (1)	1 (0)		
Left hind	44 (10)	38 (8)	6 (1)	1 (0)		
Total	659 (143)	517 (112)	142 (31)	85 (18)		
Forelimbs					89 (19)	19 (4)
Hindlimbs					10 (2)	1 (0)

TABLE 3: Racing performance of 461 Thoroughbred racehorses after arthroscopic removal of dorsoproximal first phalanx osteochondral fragmentation

		No. horses	% Horses
1) Raced after surgery			
a) Raced before and after surgery		258	56.0
b) Did not race before surgery		153	33.2
	Total	*411*	*89.2*
2) Did not race after surgery			
a) Did not race after surgery		29	6.3
b) No race record obtainable (considered failed)		21	4.6
	Total	*50*	*10.8*
Total		**461**	**100.0**

and greater in 32%, although the total earnings were greater after surgery in 50% (Table 6). Sixty-three percent started a Stake or Allowance race preoperatively and 82% did so postoperatively.

Horses that raced after but not before surgery (153), made an average of 13.8 starts (median 10), averaged earnings of $47,676 (median $21,470), earned $3,446/start and were age 1.6 years at surgery (median 2) (Table 4). Sixty-six percent started a Stake or Allowance race postoperatively.

Fifty horses (11%) did not race after surgery. Lifetime race records could not be obtained for 21 of these horses and were therefore considered as failures. The 29 that had preoperative racing records made an average of 11 starts (median 9), averaged earnings of $47,952 (median $13,860), earned $4345/start and were age 3.5 years at surgery (median 3) (Table 4). The average time to surgery was 44 days (median 24). Thirty percent started a Stake or Allowance race preoperatively.

Data were analysed separating those horses that were yearlings at the time of surgery from the rest of the group. Some of these horses had clinical signs and some had chip fractures removed after pretraining survey radiographs identified fragments that were felt to have a high probability of creating clinical signs. Fourteen percent (63/461) of the horses were yearlings. Fifty-five belonged to the raced after surgery but not before group and lifetime race records could not be obtained for the other eight. When the yearlings were removed, the percentage incidence and location of chip fractures data in the remaining 398 horses was unchanged. Eighty-nine percent (356/398) of the 2-year-old or older group returned to racing; 81% (322/398) did so at the same or higher class. The raced after surgery but not before group without yearlings (98), was age mean 2 years at surgery (median 2), averaged 15.3 starts (median 10), $43,339 (median $16,995) earnings, and $2837 earnings/start. Sixty-five percent started a Stake or Allowance race postoperatively.

Fifteen horses had recurrence of dorsoproximal P1 chip fractures and underwent a second arthroscopic procedure. All 15 returned to racing after their first and second surgery. Sixty-seven percent raced at a higher class of racing after the second surgery than before the first, 13% raced at the same class and 20% lowered their class.

Radiographic measurement of fragment size was performed in 224 randomly selected horses from the raced before and after surgery (123), the did not race before surgery (68), and the did not race after surgery (33) groups. The purpose of this measurement was not to determine absolute size of fragmentation but rather to determine if the size of the fragment seen radiographically or surgically (divided into large or small fragments) was of any use prognostically or whether it was of any consequence. The oblique radiographs proved to be the most consistent radiographic views for fragment visualisation and measurement. Average radiographic chip size was 5 mm (median 5.2). Measurements were grouped into 3 groups: less than 5 mm (34%), 5 mm (18%) and greater than 5 mm (48%) (Table 7). Correlation of radiographic fragment size to racing prognosis using a 2 sample *t* test assuming unequal variance showed no significant difference (P = 0.9) between chip size and racing postoperatively.

No complications related to the surgical procedure, anaesthetic period or postoperative care period that had any effect on the horse's ability to race were encountered. No joint infection, anaesthetic deaths or respiratory complications, such as pleuropneumonia, were encountered in the postoperative period. Occasionally, owners reported superficial wound infections but all resolved with suture removal and antibiotic therapy.

TABLE 4: Results on gender, age, career longevity, economic success, and quality of performance for horses in the Raced Bef, Aft, DNR Bef and DNR Aft groups

Group	Total horses	Sex F(%)	Sex C(%)	Avg. age at Sx(M)	Avg. # Starts bef(M)	Avg. # Starts aft(M)	Earnings per start Bef	Earnings per start Aft	Started Stake or Allowance Preop(%)	Started Stake or Allowance Postop(%)
Raced	258	131(51)	127(49)	3.1(3)	8.4(6)	13.3(11)	5760	3960	162(63)	211(82)
DNR Bef	153	76(50)	77 (50)	1.6 (2)	——	13.8(10)	——	3446	——	101(66)
DNR Aft	50	16(55)*	13(45)*	3.5(3)	11(9)	——	4345	——	15(30)	——
Total	461	223(50)	217(50)						177(38)	312(68)

F = filly; C = colt; Avg. = average; Sx = surgery; M = median; *No information available for 21 of the DNR Aft group; Raced Bef, Aft = Raced before and after surgery; DNR Bef = Did not race before but raced after surgery; DNR Aft = did not race after surgery.

TABLE 5: Racing performance of 258 Thoroughbred racehorses before and after arthroscopic surgery for treatment of dorsoproximal first phalanx osteochondral fragmentation

Preoperative racing class	Total horses	Change in class decrease (%)	Same (%)	Increase (%)
Maiden*	80	0 (0)	13 (16)	67 (84)
Claiming	16	0 (0)	9 (56)	7 (44)
Allowance	84	10 (12)	53 (63)	21 (25)
Stakes	78	24 (31)	54 (69)	0 (0)
Total	258	34 (13)	129 (50)	95 (37)

*Maiden class: nonwinner.

Discussion

The incidence and location of P1 chips, reported here, was similar to previous reports (Yovich and McIlwraith 1986; Kawcak and McIlwraith 1994) and did not alter the percent of horses that raced or did not race after surgery. The location or number of fragments present did not alter the probability that the horse would race, how many times it would race, nor its quality of performance as the incidence and location of the fragmentations was equally distributed among all 3 groups. As previously reported, chip fractures occurred most often on the dorsoproximal medial eminence of P1 of the left forelimb (Kawcak and McIlwraith 1994). This was true for horses in all 3 groups. This is probably related to the custom of racing and training in a counter-clockwise direction in North America as the continuous left hand turns tend to distribute the loads unevenly, increasing the stress on the left limb.

The number of chips/horse, chips/joint or affected joints/horse did not alter postsurgical racing performance. On average, there was more than one chip/horse, chip/joint or affected joint/horse in all groups. Complete radiographic or arthroscopic examination of the medial and lateral aspects of the dorsoproximal eminence of P1 is necessary not only on the clinically affected joint, but also on the contralateral fetlock joint where clinical signs may not yet be evident. Radiographic examination of all 4 fetlocks should be based only on clinical evidence as only 1% of the horses had pathology concurrently in a forelimb and a hindlimb.

Separating the chip fractures in yearlings from that of 2-year-old or older Thoroughbreds did not alter the postoperative racing performance. The higher incidence of chip fractures in the hindlimbs of yearlings was notable as 58% (44/76) of all hindlimb fragmentations were found in yearlings (14% of the population). The increased incidence of hindlimb fragmentation in yearlings over older horses may be related to the different biomechanics of exercise of yearlings. Yearlings exercise over irregular surfaces, in irregular patterns, without added weight on their backs. Only one of the 5 horses that had concurrent fore- and hindlimb pathology was a yearling.

Traumatic injury treated by arthroscopic surgery did not diminish the racing performance of horses that raced before and after surgery. The longevity of their careers was very good, with postoperative starts exceeding the preoperative number of races in most horses, and 87% of the horses returned to racing at the same or higher class. These horses had decreased earnings/start postoperatively when compared to that achieved preoperatively, but the total earnings increased. Horses' average earnings/start declines with age because the young horses have more entry-limited and purse-supplemented races. The earning potential of the 3-year-old season is often reduced by the convalescent period after surgery. This early career period of higher earning potential makes it desirable to treat conditions that reduce performance, such as P1 fragments, early, aggressively, and with minimal convalescence whenever possible to return the horse to racing quickly to take advantage of this earning power. The median convalescent period of less than 6 months in this group made maximum use of this earning period by minimising convalescence.

Having raced before surgery did not show an advantage or disadvantage in the postoperative racing performance. No difference in number of postoperative starts or race class achieved was observed between horses that had and those that had not raced before surgery. Eighty-two percent of both groups competed postoperatively in Stake and Allowance races and high quality performance was therefore maintained. Neither was there a difference in postoperative economic success between the raced and nonraced horses.

The 11% postoperative failure rate reported here is pessimistic. Other extraneous influences contributed to this

TABLE 6: Average earnings/start (Avg. $/st) after arthroscopic surgery (Sx) compared to average earnings/start before surgery (Bef Sx) for 258 Thoroughbred racehorses with dorsoproximal P1 chips (No. horses, %)

Preoperative racing class	Total horses	Avg. $/st After Sx less than ± 10% of Avg. $/st Before Sx	Avg. $/st After Sx within ± 10% of Avg. $/st Before Sx	Avg. $/st After Sx greater than ± 10% of Avg. $/st Before Sx
Maiden*	80	24 (30)	8 (10)	48 (60)
Claiming	16	12 (75)	2 (13)	2 (13)
Allowance	84	62 (74)	6 (7)	16 (19)
Stakes	78	59 (76)	3 (4)	16 (21)
Total	258	157 (61)	19 (7)	82 (32)

*Maiden class: nonwinner.

TABLE 7: Measurement of largest radiographic fragment size/horse for all 3 racing performance groups

	Total horses	Largest measured fragment/horse <5 mm (%)	5 mm (%)	>5 mm (%)
Raced Bef, Aft	123	33 (27)	20 (16)	70 (57)
DNR Bef	68	34 (50)	10 (15)	24 (35)
DNR Aft	33	8 (24)	11 (33)	14 (43)
Total	223	75 (34)	41 (18)	108 (48)

For abbreviations see Table 4.

number, e.g. change of name, incorrect records, exportation, other injuries or diseases affecting outcome. These horses that did not race after surgery were older at the time of surgery and had raced more times preoperatively. Only 30% were at the Stake and Allowance racing level prior to surgery and this may have been an influence. The lack of return to racing was not related to chip incidence, location, or size as these did not differ between the raced and unraced groups. It was impossible to determine the time at which chip fragmentation occurred for any horse and, therefore, to ascertain the period that the chip(s) had been present within the joint, potentially causing articular cartilage degeneration. However, the period for patient presentation and surgical intervention (time to surgery) for these horses that did not race after surgery was identical to that of those horses that did race postoperatively (mean 44, median 25 days from last race to surgery day).

The traumatic aetiology of this disease contributed to the recurrence of fragmentation in 15 horses. Fracture recurrence did not affect racing performance as all of these horses returned to racing after the first and second surgery. Gender did not affect career longevity, quality of performance, or economic success as a one to one sex ratio was found throughout all 3 groups. This indicates that the desire to retire fillies to become broodmares, if their performance level drops, was not an influence in this group, probably due to the high quality of their recovery.

Radiographic fragment size did not affect postsurgical racing prognosis. Forty-eight percent of the surveyed horses had at least one fragment larger than the mean and 87% of these raced after surgery. Correlation of radiographic fragment size to racing prognosis showed no significant difference ($P = 0.9$) between chip size and racing postoperatively. Any hypothesis that the smaller the chip fracture the better the prognosis is rejected by these findings.

Comparing postoperative racing performance to arthroscopic visualisation of articular cartilage health or associated intra-articular lesions was not possible from our findings. The amount of articular cartilage degeneration and associated lesions within the joint was examined initially in this study but, with few exceptions, articular cartilage damage was not severe and, when present, was managed medically with systemic and intra-articular medications such as polysulphated-glycosaminoglycans or hyaluronan. The relatively few number of failures and low incidence of significant degenerative arthritis resulted in no significant data.

The postoperative prognosis for racing performance was favourable regardless of articular cartilage lesions or associated joint pathology present at surgery. Although this was a study of consecutive cases, horses with severe degenerative joint disease were rarely selected for surgery at presentation due to their poorer prognosis and poor economic risk. Only horses where the chip fracture was felt to be the most significant pathology were considered surgical candidates. It appears that, in this group of horses, postoperative management (physical, systemic, medical, intra-articular) of synovitis, capsulitis and/or articular cartilage degeneration, in combination with surgical treatment, prevented or slowed the development of osteoarthritis and returned the affected joint to a productive status. Alhough arthroscopic signs of degeneration may be present in the clinical situation, their management carries a favourable prognosis. However, it appears prudent to select against severe radiographic degeneration on the preoperative examination. Once degenerative arthritis ensues, removal of chip fractures, even if they initiated the process, does not reverse the degeneration.

In our horses, minor or moderate signs of articular degeneration preoperatively did not prevent good performance postsurgery when treated by arthroscopic surgery and medical management of the diseased joint. The radiographic factors recommended against surgery in horses not operated were: asymmetric thinning of the joint space; severe supracondylar lysis; moderate to severe calcification of the joint capsule; flattening or lysis of the palmar metacarpal condyles; and moderate to severe loss of range of motion. Quantitative data were not available because the decision not to operate was usually made from radiographs of referring veterinarians. Periarticular osteophytes, dorsal-proximal articular lysis or proliferation and mild to moderate loss of range of motion were not seen as criteria that would discourage surgical treatment. The number of failures was so low that no correlation to radiographic appearance was possible. It is apparent that with a mean number of 8.4 starts, the 258 horses that raced prior to surgical treatment was a group of racing athletes with various stages of wear and tear present in their joints. These horses were presented because the trainers and referring veterinarians felt the chip fractures to be affecting performance. This mind-set of early removal of chip fractures to preserve the quality of the horse's performance, rather than waiting until the chip fracture is affecting the ability to perform, resulted in high quality results. Retrieval of a horse's class once the chip fracture has done permanent damage is much more difficult and sometimes impossible.

The salient features of this study that differ from previous publications include: a chip fracture/fragmentation of the dorsal proximal eminence of the first phalanx when treated arthroscopically does not diminish the quality or quantity of race performances likely to be achieved by a horse, other than the performances missed during the actual treatment; minor or moderate radiographic or arthroscopic changes associated with P1 chip fractures are manageable by medical treatment when combined with arthroscopic removal of the bone fragments; Stakes and Allowance horses are likely to remain at that level and young horses to achieve Stakes and Allowance status in spite of a P1 chip fracture (38% of our horses performed in Stakes or Allowance races preoperatively and 68%

postoperatively). Arthoscopic surgery cannot enhance ability, but can preserve racing performance by allowing horses to maintain their class and quality and by allowing them to develop their full potential.

The attitude of tolerating the chip fracture for a period, with or without medication, is counterproductive. Early removal and rapid return to performance is even more important in horses of marginal ability than horses with better class if the preservation of earning potential is the goal. Because horses with less ability can tolerate less reduction in performance level before they become uneconomical to train and race, early removal is sometimes the only way to preserve economic viability in a horse.

The expense of surgery is minimal when compared to that of training. When the costs of training are maintained while allowing the earning potential to decline, only to save the cost of surgery, the economic rationale is unjustifiable. These data show that return to racing can occur as early as 3 months and be expected less than 6 months postsurgery with preservation of earning potential. More than half of the horses in this report had already re-trained and raced within this time frame (median 169 days). One horse in this group had chip fractures removed bilaterally and returned to win the Kentucky Derby 8 months later.

Trainers often persist in training in the face of chip fractures because they are reluctant to give up control of the horse and his rehabilitation. With the methods described in this report many horses, if not most, never have to leave the trainer, as walking is begun at 14 days and exercise under saddle resumed at 35 days postoperatively. This allows the trainer to maintain oversight of the horse and minimises any loss of condition prior to resumption of routine training if desired. Importantly, no serious complications of any type were encountered during treatment. Arthroscopic removal is a safe as well as successful treatment.

The prognosis for return to racing after arthroscopic removal of a dorsoproximal P1 chip fracture is much higher (89%) than previously documented (Yovich and McIlwraith 1986; Kawcak and McIlwraith 1994). Whether or not a horse has raced prior to surgery, the class at which the horse races when the chip fracture is treated is unlikely to be diminished if the fragmentation is removed and any secondary changes treated as shown by the maintenance of racing class by 87% of the horses in this group.

Finally, the number of postoperative starts (mean 13.3, median 11), class of racing (82% same or higher), or likelihood to perform in Stakes or Allowance races (68%) is not affected by P1 chip fractures if arthroscopically removed. Although half of the horses in this group had higher total earnings after surgery than before, the average earnings/start declined because it declines as all horses age. However, the average earnings/start declined less than with many other injuries, partly because the horses missed fewer starts and were able to race in a higher number of the early career races.

Arthroscopic removal of dorsoproximal first phalanx osteochondral fragmentation allows Thoroughbred racehorses a rapid and successful return to racing at their previous or higher level of racing performance without hindering the longevity of their careers or the quality of their performance. Early surgical removal of these phalangeal chip fractures is a means of preserving the economic value of an injured Thoroughbred.

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Manufacturers' addresses

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