Survey of Arthroscopic Surgery for Carpal Chip Fractures in Thoroughbred Racehorses in Japan

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(Received 22 June 2000/Accepted 16 November 2000)

ABSTRACT. Medical and racing records of 155 Thoroughbred racehorses that underwent arthroscopic surgery for carpal chip fractures were investigated. Articular damage for 98.4% of the fractures was classified as G1 or G2 using McIlwraith’s criteria. The rate of return to racing after surgery was 82.6%. Evaluation of racing performance after surgery was attempted using a placing index (PI) based on race finish position. There was no significant difference in the PI distribution between horses that underwent surgery and other healthy horses.

KEY WORDS: arthroscopic surgery, racehorse, survey.

NOTE Surgery

Carpal chip fractures are the most common fractures occurring in racehorses [2, 6]. Arthroscopic removal of chip fragments is the usual treatment. Sites and types of fractures and surgical techniques have been reported in North America [3–10], and the extent of articular cartilage damage has reported to affect racing performance after surgery [6]. However, there are differences in tracks and the racing system between the United States and Japan that might affect the occurrence of this type of fracture.

This study reports the relationship between the site of fracture and articular damage with carpal chip fractures and racing performance after surgery in Thoroughbred racehorses in Japan.

Arthroscopic surgery was performed on 155 Thoroughbred racehorses with carpal chip fractures at the Ritto Training Center of the Japan Racing Association between 1993 and 1995. Surgical procedures were performed as described by McIlwraith [6]. Informations including age, sex, racing class, fracture site, rate of return to racing, days to first start, number of starts before and after surgery, race finish position of all races, reason for retirement, and carpal disorders after surgery were obtained from the Japan Racing Information System III (JARIS III). Articular damage associated with 184 fractures in 155 horses using McIlwraith’s criteria for articular damage were classified as grade G1-G4 using analysis of videotape recorded during surgery; G1, minimal articular cartilage fibrillation or fragmentation at the edge of the defect left by the fragment, extending no more than 5 mm from the fracture line; G2, articular cartilage degeneration > 5 mm back from the defect and including up to 30% of the articular surface of that bone; G3, loss of 50% of the articular cartilage from the affected carpal bone; G4, severe loss of bone associated with the fracture.

Of the 155 horses undergoing surgery, 106 (68.4%) were males, 46 (29.7%) were females and 3 (1.9%) were geldings. Surgery was performed more frequently in males than in females. Thirty-six horses (23.2%) were 2 years of age and 88 (56.8%) were 3 years of age. Two- and 3-year-old horses comprised 80% of the population. The sites of fracture were at the distal end of the radius in 88 horses (47.8%), the radial carpal bone in 52 (28.6%), third carpal bone in 26 (14.1%), and intermediate carpal bone in 18 (9.8%). Thirty-three horses had fractures at two or more sites.

Articular damage in 153 fractures (83.2%) was classified as G1, 28 (15.2%) as G2, 3 (1.6%) as G3 and none as G4. Fractures at the distal end of the radius had only G1 articular damage, while at the radial carpal bone 21 fractures (40.4%) had G2 damage and 2 (3.8%) had G3 damage, and at the third carpal bone 6 (23.1%) had G2 damage and 1 (3.8%) had G3 damage (Table 1).

Of 155 horses that underwent surgery, 128 (82.6%) participated in at least one race after surgery. The median interval from fracture to first start was 248 days. The median number of starts following surgery was 6.3 races.

Following surgery, 23 horses (14.8%) had carpal arthritus diagnosed radiographically and clinically. Six of these horses (23.1%) had fractures of the third carpal bone, 10 (19.2%) of the radial carpal bone, 10 (11.4%) at the distal end of the radius, and 2 (11.1%) had intermediate carpal bone fractures. Carpal arthritus tended to occur at higher rates with fractures in the radial and third carpal bone than with the distal end of the radius or intermediate carpal bone. Twenty-five horses (16.1%) sustained another carpal frac-

Table 1. Relation between sites of fracture and articular damage in 155 horses

<table>
<thead>
<tr>
<th>Sites of Fracture</th>
<th>G1</th>
<th>G2</th>
<th>G3</th>
<th>G4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal end of radius</td>
<td>88</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Radial carpal bone</td>
<td>29</td>
<td>21</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Intermediate carpal bone</td>
<td>17</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Third carpal bone</td>
<td>19</td>
<td>6</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

a) Grade of articular damage.

b) Number of horses.
ture later after recovering from their initial injury.

Approximately 50% of arthroscopic surgery performed was for chips on the distal end of the radius. This reflects the fact that 67% of carpal fractures occur in this location in Japan [2]. This contrasts with studies reporting that in the United States the most common site for chip fractures in the carpus was at the distal radial carpal bone [7, 8, 10]. The reason for this difference is not clear, it is however likely associated with the difference in track conditions between the United States and Japan.

Using McIlwraith’s criteria for articular damage, 98.4% was classified as G1 or G2. Those relatively mild articular damage are reflected in the fact that 82.6% of treated horses returned to racing. The high rate of return to racing is in accord with a previous report [6] that the extent of articular cartilage damage affects racing performance after surgery. The result compares favorably with a North American study in which only 74% of 176 horses returned to racing [4].

Fractures in the radial and third carpal bones tended to have greater articular damage than those in the distal end of the radius. This may be due to morphological features of these bones where the radiocarpal joint moves dramatically from the flexed position to the stretched. In addition, because the tip of the radius sticks out into the radiocarpal joint, there may be greater stress in that small area resulting in a greater chip and smaller articular damage. In contrast, in the intercarpal joint the stress is absorbed over a larger area because the joint does not move over a wide range, possibly resulting in a smaller chip and greater articular damage [1].

Carpal arthritis or subsequent carpal fracture occurred in nearly 15% of treated horses following surgery. Some of these problems may be attributed to inadequate rest or returning to training too early.

Racing performance after surgery was estimated using a placing index (PI) that we designed based on race finish position. The PI is computed as follows:

\[
PI = \frac{-\text{placing}}{2} + \frac{\text{Number of starters} + 1}{2}
\]

PI of the median placing in a race is 0, and a positive value results if the placing were higher than the median and a negative value if it were lower. The theoretical PI value would be the probability distribution of PI of all horses in all races after surgery. Statistical significance between the distribution of PI in the horses that underwent surgery and the theoretical PI value was analyzed with a chi-square test. This analysis was also applied to horses with G1 and G2 articular damage. The racing results were followed up to 1996 (one to three years post-surgery).

For all races in which the 155 horses started after surgery, PI of treated horses was compared with the theoretical PI, which was calculated from all horses that started in the same race. The PI for treated horses was not significantly different from the theoretical PI (p > 0.05) (Fig. 1). There was also no significant difference in horses with G1 or G2 articular damage.

The best way to evaluate the effects of surgery on racing performance may be compared surgical and non-surgical cases in horses with fractures. However, it is difficult to collect data on non-surgical cases of carpal chip fractures. In addition, the evaluation of racing performance is complicated by various factors such as race distance and track conditions. It is thus impossible to compare racing performance simply. One report estimated racing performance by race finish position and purse value of five races before and after
surgery [4]. However, horses were compared only by their placing and adjustments were not made for numbers of horses started the race. Additionally, the purse value was distorted by the inclusion of one horse that ran in a stakes race. We evaluated racing performance of treated horses using race finish position as an index also, but the number of horses starting in each race was considered as well. It may be also possible to take into account the quality of the other horses in the field by comparing them with treated horses. In the races following surgery, there was no significant difference in the PI distribution between treated horses and other starters. These results suggest that the treated horses after surgery had racing performances similar to those of other healthy horses.

In this study, we used PI as an index to evaluate performance after surgery. However, as there are many factors that affect racing performance, recovery from the fracture and a horse’s racing performance may not always match. It may, therefore, be difficult to evaluate the effectiveness of surgery using only the PI, but it may be useful in evaluating how horses raced following surgery.

REFERENCES