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A cross-sectional study of colic and rate of return to racing in Thoroughbreds at Seoul Racecourse in Korea between 2010 and 2020

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ABSTRACT

Background: The incidence of colic and the outcomes of colic surgery have not been surveyed in racetracks in Korea.
Objectives: This study examined the incidence, mortality, and case fatality of colic and investigated the effects of age and sex after an exploratory celiotomy on the long-term survival rate (return to racing), subsequent racing performance, and career longevity.
Methods: The incidence, mortality, and case fatalities of colic were examined over an 11-year period. The records of 40 horses that had undergone a celiotomy, after participating in at least one race and 75 race-matched control horses were analyzed. The racing performance and career length of the horses that returned to racing post-surgery were compared with a control group.
Results: The annual incidence, fatality rate of colic, and annual mortality rate at Seoul Racecourse were 6.5, 2.8 per 100 horse-years, and 0.2 deaths cases per 100 horse-years, respectively. Of the 40 horses that underwent colic surgery, 26 (65%) returned to racing. The likelihood of returning to racing decreased with increasing age of the horses, and geldings had a lower probability of returning. While the performance in the five preoperative races between the two groups was not significantly different, a significant decrease in racing performance was observed after the surgery date ($p < 0.01$). Horses that underwent colic surgery did not show a significant decrease in career length.
Conclusions: Surgical treatment for colic at the age of three and four years had a negative impact on the racing performance. On the other hand, there was no significant difference in career longevity between the two groups.

Keywords: Colic; laparotomy; athletic performance; horses; celiotomy

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Conflict of Interest

The authors declare no conflicts of interest.

INTRODUCTION

Assessing the incidence of a disease in a population is crucial for understanding its etiology and potential treatments [1]. Previous studies described the incidence and possible risk factors of colic [2-10], but few have examined incidence of colic in Korea or the horses' post-operative racing performance. All racehorses in training and racing are stabled at the Seoul Racecourse, and all veterinary records are maintained centrally. The racecourse equine population is well-suited for population studies because it is subject to consistent housing, husbandry practices, disease control, and veterinary care.

Providing horses with access to pasture two to three times a month may decrease the risk of colic. Diet and changes in diet were found to be significant risk factors for colic [4]. Horses younger than two or older than ten years have a lower risk of colic [4]. The performance of Thoroughbreds was not affected after colic surgery [5,6] unless they were juvenile at the time of surgery [7].

The Thoroughbred racehorse population at Seoul Racecourse is between two and ten years old, and they are housed in stable conditions with no access to pasture. Horses commence their racing career from the age of two or three and continue until retirement, typically for performance- or health-related reasons. Horse racing in Seoul consists entirely of flat racing, with racing conducted every weekend throughout the year.

The racehorse trainer is responsible for all horse husbandry and care, including identifying and reporting illnesses to the resident veterinary surgeons. All clinical care is provided by veterinary surgeons registered with the Korea Racing Authority, and all veterinary treatments are recorded electronically.

The current study examined the medical and race records of Thoroughbred racehorses stabled at Seoul Racecourse between 2010 and 2020 to determine the incidence, the mortality and the case fatality of colic, the rate of return to racing, and career longevity after colic surgery.

MATERIALS AND METHODS

Study population

The study population included all Thoroughbreds racing and training at Seoul Racecourse between 2010 and 2020. Other Korean racecourses were excluded from the study because the race conditions and track surfaces can affect the race performance and results.

Case and control selection

The selection of the cases and controls and the statistical analysis were modified according to previous equine studies [5,11-13]. The surgical group comprised 40 Thoroughbred racehorses with at least one race start between 2010 and 2020 that were admitted to the equine hospital at Seoul Racecourse for colic symptoms, subsequently undergoing one celiotomy. The period from 2010 to 2020 was selected to ensure consistency because the same surgeon performed colic surgeries on all horses during that time frame. During the study period, there were 73 surgical case horses, but 29 horses had not raced before surgery, and four horses required multiple surgeries; both groups were excluded. Horses that underwent multiple surgeries

were excluded to avoid potential complications and confounding factors in analyzing their return to racing.

A race-matched control group (n = 75) was formed by selecting two horses from the last race in which each horse from the surgical group competed before their colic surgery. Age, sex, and racing class significantly impacted the race results and starts [14]. Accordingly, the control horses closest in placing to the surgical horse were selected based on age and sex. If an exact age/sex match was not possible, they were selected on either age or sex. If a horse that underwent surgery won or ran last (in the race before surgery), only one horse was selected for the control group (**Table 1**). A control group of horses within a one to two-year age difference or another sex was chosen (n = 14) if no suitable age or sex match was available.

Medical records review

The medical records of the surgical cases included the sex, age, and site of the primary gastrointestinal tract lesion. All race records were obtained from the Korea Racing Authority database system. In cases where the horses did not resume racing after surgery, the trainer or owner was contacted by phone to determine the reason behind their decision.

Data collection

The average racing career of Thoroughbred horses is 730 days, calculated as the date of arrival at the racecourse until the official time of retirement (when the horses is deregistered). Short-term survival was defined as the period from surgery until discharge from the hospital.

The outcomes examined included returning to racing, racing performance, and career length. Returning to racing was defined as having one or more race starts in the postoperative period. The subject horse's placing and the total number of runners in the race for five starts immediately before and after surgery were recorded for each case and control. The postoperative career length was defined as the period of racing activity after surgery until retirement.

Statistical analysis

Two study designs were used: a case-control study to identify the risk factors for non-return to racing surgical horses and a cohort study to longitudinally compare the race performance and career longevity of horses in the surgical group with horses in a race-matched control group. For the case-control study, binomial logistic regression analysis on 1,000 bootstrap samples (probability to enter = 0.05 and probability to remove = 0.1) [15] was used to evaluate the association with age and sex for return to racing, with the exposure variable being surgery. The strength of association in the return to racing between the surgical and race-matched control groups was calculated using the odds ratio (OR). The goodness of fit was determined using the Hosmer-Lemeshow test, and the variance of the model was assessed using Nagelkerke R^2. Chi-square analysis on 1,000 bootstrap samples (probability to enter = 0.05 and probability to remove = 0.1) was used to select the independent influence

Table 1. Selection of surgery group and race-matched control group in the study

Variables	Surgery group	Race matched control group
Period	2010–2020	2010–2020
Selection criteria	Colic surgery (n = 73)	1. Two horses closest in placing to the surgical horse (n = 80) 2. Age/sex matched
Exclusion	1. No racing history prior to surgery (n = 29) 2. Multiple colic surgery episodes (n = 4)	In the case of the first or the last place, only the nearest one was selected (n = 5)
Final selection	n = 40	n = 75

factor. Because of the low sample size over some horse age bands, data was allocated to three groups: ≤ 3 years old, 4 years old, and ≥ 5 years old. Chi-square analysis on 1,000 bootstrap samples (probability to enter = 0.05 and probability to remove = 0.1) was also applied to the race-matched control group to determine if there was a baseline effect of sex or age on the rate of returning to racing.

The career longevity of the horses after the surgery date was investigated using Kaplan-Meier analysis. All statistical tests were performed with IBM Statistical Product and Service Solutions (SPSS) software version 21 (SPSS, USA), and the significance was set to $p < 0.05$.

The performance data was standardized by categorizing the results from 1 to 10 based on the conversion of placings to the inverse proportion (rate of placings per the number of runners). For example, if a horse finished first in a race with 10 runners, its inverse proportion would be 10. If it finished in tenth place, its inverse proportion would be 1. Horses with higher scores performed better, regardless of the number of runners in the race. The preoperative period was analyzed to validate that the race-matched control group had been adequately matched. An analysis of the race performance excluded horses that did not return to racing. Data normality was determined using a Shapiro-Wilk test. The significance was set to $p < 0.05$. The outcome variables were analyzed using a Wilcoxon signed-rank test to determine if there were differences before or after surgery within each group. A Mann-Whitney *U* test was conducted to determine if there were differences between groups before and after surgery. Furthermore, to account for the effects of increasing age through the study period, a Wilcoxon signed-rank test was performed between before and after surgery within the age group both in surgical and race-matched control groups, respectively. Statistical analysis of performance data was undertaken using Python 3.

Ethical animal research

Research ethics informed consent for the inclusion of animals in this study was not required.

RESULTS

The records of 28,238 horses that resided at Seoul Racecourse between 2010 and 2020 were examined. The mean annual population was 2,567 (range 2,355–2,752). A total of 1,849 horses suffered colic, and 51 horses died due to colic over the period, representing an annual incidence rate and case fatality rate of 6.5 per 100 horse years and 2.8 per 100 horse years, respectively, and a mortality rate of 0.2 deaths per 100 horse-years. **Table 2** lists the number of horses receiving either medical or surgical treatment, along with their respective outcomes. Throughout the 11-year study period, the survival rate for horses diagnosed with colic was 97.2%. In the medical group of 1,776 horses, the short-term survival was 98.1% (the case fatality rate in the medical group was 1.9%). Of the 1,849 colic cases, 3.9% of horses (73) required surgical intervention and had a short-term survival of 76.7% (the case fatality rate in the surgical group was 23.3%).

Features of patients and race-matched control horses

The records of 40 horses that ran at least one race before surgery were reviewed. The ages ranged from two to six years at the time of surgery, with a mean of 3.9 years. The numbers of horses in each age category were 22 (55.0%) ≤ three years old, 11 (27.5%) four years old, and seven (17.5%) ≥ five years old. The sex profile was 23 (57.5%) males, 10 (25.0%) females,

and 7 (17.5%) geldings. The lesions of 37 (92.5%) were in the large intestine, and three (7.5%) were in the small intestine. The sex profile of horses with small intestinal lesions was two

Table 2. Summary of the treatment and outcome of colic episodes between 2010 and 2020

Year	Treatment	Sex	Subtotal	No. of colic cases per year (incidence, case fatality, mortality/100 horse-years) Sex percentage
2010 (No. of registered horses: 2,355)	Medical only (survived/died)	M	38/3	153 (6.5, 4.6, 0.3)
		G	46/1	
		F	61/2	
	Medical and surgery (survived/died)	M	1/1	M: 28.1
		G	0/0	G: 30.7
		F	0/0	F: 41.2
2011 (No. of registered horses: 2,447)	Medical only (survived/died)	M	41/2	152 (6.2, 3.9, 0.2)
		G	43/1	
		F	59/3	
	Medical and surgery (survived/died)	M	1/0	M: 28.9
		G	0/0	G: 28.9
		F	2/0	F: 42.1
2012 (No. of registered horses: 2,511)	Medical only (survived/died)	M	52/0	155 (6.2, 1.9, 0.1)
		G	54/0	
		F	43/2	
	Medical and surgery (survived/died)	M	1/1	M: 34.8
		G	2/0	G: 36.1
		F	0/0	F: 29.0
2013 (No. of registered horses: 2,523)	Medical only (survived/died)	M	52/2	165 (6.5, 3.6, 0.2)
		G	41/0	
		F	58/1	
	Medical and surgery (survived/died)	M	3/0	M: 34.5
		G	3/1	G: 27.3
		F	2/2	F: 38.2
2014 (No. of registered horses: 2,611)	Medical only (survived/died)	M	50/0	168 (6.4, 1.2, 0.1)
		G	53/1	
		F	60/0	
	Medical and surgery (survived/died)	M	0/0	M: 29.8
		G	2/1	G: 33.9
		F	1/0	F: 36.3
2015 (No. of registered horses: 2,605)	Medical only (survived/died)	M	59/0	172 (6.6, 2.3, 0.2)
		G	47/0	
		F	59/0	
	Medical and surgery (survived/died)	M	0/2	M: 35.5
		G	0/2	G: 28.5
		F	3/0	F: 36.0
2016 (No. of registered horses: 2,605)	Medical only (survived/died)	M	46/4	162 (6.2, 4.3, 0.3)
		G	44/2	
		F	59/1	
	Medical and surgery (survived/died)	M	3/0	M: 32.7
		G	2/0	G: 29.6
		F	1/0	F: 37.7
2017 (No. of registered horses: 2,610)	Medical only (survived/died)	M	33/2	132 (5.1, 3.0, 0.2)
		G	40/1	
		F	53/0	
	Medical and surgery (survived/died)	M	1/1	M: 28.0
		G	1/0	G: 31.8
		F	0/0	F: 40.2
2018 (No. of registered horses: 2,631)	Medical only (survived/died)	M	44/2	159 (6.0, 3.1, 0.2)
		G	43/1	
		F	55/1	
	Medical and surgery (survived/died)	M	7/0	M: 33.3
		G	3/1	G: 30.2
		F	2/0	F: 36.5

(continued to the next page)

Table 2. (Continued) Summary of the treatment and outcome of colic episodes between 2010 and 2020

Year	Treatment	Sex	Subtotal	No. of colic cases per year (incidence, case fatality, mortality/100 horse-years) Sex percentage
2019 (No. of registered horses: 2,752)	Medical only (survived/died)	M	55/0	178
		G	58/0	(6.5, 2.8, 0.2)
		F	52/0	
	Medical and surgery (survived/died)	M	5/4	M: 36.0
		G	2/0	G: 33.7
		F	1/1	F: 30.3
2020 (No. of registered horses: 2,588)	Medical only (survived/died)	M	99/0	253
		G	55/0	(9.8, 0.8, 0.1)
		F	90/2	
	Medical and surgery (survived/died)	M	2/0	M: 39.9
		G	2/0	G: 22.5
		F	3/0	F: 37.5
Average No. of registered horses per year: 2,567	Total No. of medical only: 1,776 (98.1[a])			Total No. of colic case horses: 1,849
	Total No. of medical and surgery: 73 (76.7[b])			Average No. of colic case horses per year: 168
				Average incidence per 100 horse-years: 6.5
				Average case fatality per 100 horse-years: 2.8 (short-term survival rate, 97.2[c])
				Average mortality per 100 horse-years: 0.2
				Average sex percentage: M: 33.4, G: 29.9, F: 36.7

M, male; G, gelding; F, female.
[a]Short-term survival rate in the medical treatment only. The total number of horses that died in the medical treatment was only 34.
[b]Short-term survival rate in medical and surgical treatment. The total number of horses that died in the medical and surgical treatment was only 17.
[c]Overall short-term survival rate in colic case horses. The total number of horses that died was 51.

(67%) geldings and one (33%) male. **Table 3** lists the surgical group and the race-matched control group. The sex profile of horses with large intestinal lesions was 22 (59.5%) males, 10 (27.0%) females, and five (13.5%) geldings. **Table 4** lists the surgical group according to lesion and sex.

Table 3. Summary of the surgical group and the race-matched control group

Variables	Surgical group		Race-matched control group	
	No. of horses (%)	No. of horses returned to racing (%)	No. of horses (%)	No. of horses returned to racing (%)
Age				
≤ 3 years old	22 (55.0)	17 (77.3)	43 (57.3)	43 (100.0)
4 years old	11 (27.5)	7 (63.6)	18 (24.0)	17 (94.4)
≥ 5 years old	7 (17.5)	2 (28.6)	14 (18.7)	12 (85.7)
Total	40 (100.0)	26 (65.0)	75 (100.0)	72 (96.0)
Sex				
Male	23 (57.5)	18 (78.3)	22 (29.3)	20 (90.9)
Gelding	7 (17.5)	1 (14.3)	19 (25.3)	18 (94.7)
Female	10 (25.0)	7 (70.0)	34 (45.3)	34 (100.0)
Total	40 (100.0)	26 (65.0)	75 (100.0)	72 (96.0)
Lesion				
Small intestine	3 (7.5)	1 (33.3)		
Large intestine	37 (92.5)	25 (67.6)		
Total	40 (100.0)	26 (65.0)		

Table 4. Summary of the surgical group by lesion and sex

Variables	Small intestine	Large intestine
Male	1 (33.3)	22 (59.5)
Gelding	2 (66.7)	5 (13.5)
Female	0 (0.0)	10 (27.0)
Total	3 (100.0)	37 (100.0)

Values are presented as number (%).

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Of the 40 horses that underwent colic surgery, 26 (65%) horses returned to racing. Among them, 77.3% of horses aged three years or younger (17 out of 22), 63.6% of four-year-old horses (seven out of 11), and 28.6% of horses aged five or older (two out of seven) returned to racing. The return for racing varied between the sexes, with seven out of 10 (70.0%) females, one out of seven (14.3%) geldings, and 18 out of 23 (78.3%) males returning.

A higher proportion of horses that had undergone surgery for colic related to the large intestine returned to racing (25 out of 37 [67.6%]) compared to those with small intestine lesions (one out of three [33.3%]). On the other hand, the number of cases with small intestinal lesions was very low (n = 3).

Of the 40 surgical case horses, 14 horses that underwent surgery did not race after surgery. Seven horses died postoperatively due to complications. The short-term survival rate for the 40 surgical case horses was 82.5%. Telephone contact was made with the owners or trainers of the seven horses discharged but did not race. Three were retired with no attempt to return them to training, and one was retired for breeding purposes. Three horses recommenced training but were subsequently retired because of musculoskeletal injury (n = 2) or pneumonia (n = 1).

The race-matched control group consisted of 75 horses. Among them, 43 out of 43 (100.0%) horses aged three or younger, 17 out of 18 (94.4%) four-year-olds, and 12 out of 14 (85.7%) five-year-olds or older continued racing. Furthermore, 34 out of 34 (100.0%) females, 18 out of 19 (94.7%) geldings, and 20 out of 22 (90.9%) males continued racing from the race-matched control group.

Factors influencing return to racing and career longevity

Twenty-six out of 40 (65%) horses that underwent surgery returned to racing. Seventy-two out of 75 (96%) race-matched control horses (OR, 0.81; $p = 0.002$) continued their racing careers. The logistic regression model based on sex and age for the return to racing fitted well (Hosmer-Lemeshow test, $p = 0.741$, Nagelkerke $R^2 = 0.301$). The effect of the site of the intestinal lesions on return to racing was not analyzed because the number of horses with a small intestine lesion was small (n = 3). No significant effect of age or sex on the return to racing after surgery was identified.

Bootstrapping-based χ^2 tests revealed a significant association between sexes and the return to racing in the surgical group ($\chi^2 = 9.801$, $p = 0.007$). Males and females were more likely to return to racing than geldings in the surgical group. On the other hand, age ($\chi^2 = 5.549$, $p = 0.062$) did not have a significant effect on the return to racing. In the race-matched control group, sex ($\chi^2 = 1.001$, $p = 0.606$) or age ($\chi^2 = 2.995$, $p = 0.224$) did not affect the continuance of racing.

Application of Kaplan-Meier statistics revealed no significant difference in career longevity between horses that underwent surgery and the race-matched control horses. The median and average career length after surgery were 564.0 and 648.7 days, respectively, whereas the median and average career length for the race-matched control group were 548.0 and 643.6 days, respectively. The log-rank test for equality of career length between the surgery group and race-matched control group showed no significant difference.

Postoperative racing performance

A comparison was made between the five preoperative and five postoperative racing performances of the surgical and race-matched control groups to evaluate the effect of colic surgery on racing performance. An analysis of the performance of the five preoperative races by a Mann-Whitney test between the surgical and race-matched control groups confirmed that the race-matched control group was adequately matched. On the other hand, there was a significant decrease in the performance of surgical horses after the surgery date compared to the control horses ($p < 0.01$) (**Fig. 1**). Horses that underwent surgery at the age of three ($p < 0.01$) and four ($p < 0.0001$) showed a significant decrease in performance (**Fig. 2**), while male horses also showed a significant decrease in performance ($p < 0.001$) (**Fig. 3**).

DISCUSSION

The study identified an incidence rate of colic of 6.5 per 100 horse-years, which is in line with a study of Thoroughbred training in the Flat premises in the United Kingdom (UK) at 7.13 per 100 horse-years [2] and the annual national incidence of colic in the United States (US) horse population at 4.2 per 100 horse-years [3].

The reported case fatality rate in a previous study of Thoroughbreds in UK training premises was 3.9%. The case fatality rate from colic at 2.8% in this survey was lower than the UK Thoroughbred study [2] and 11% in a national estimation in the US [3]. The case fatality rate of 23.3% in the surgically-treated group and 1.9% in the medically-treated group in this study was lower than the 55.5% and 5.9% in the UK Thoroughbred study, respectively [2]. The lower case fatality rate in this study for the medically-treated group is likely related to the rapid veterinary attention the horses receive following the detection of clinical signs. The lower-case fatality in the surgically-treated group is believed to be related to the high

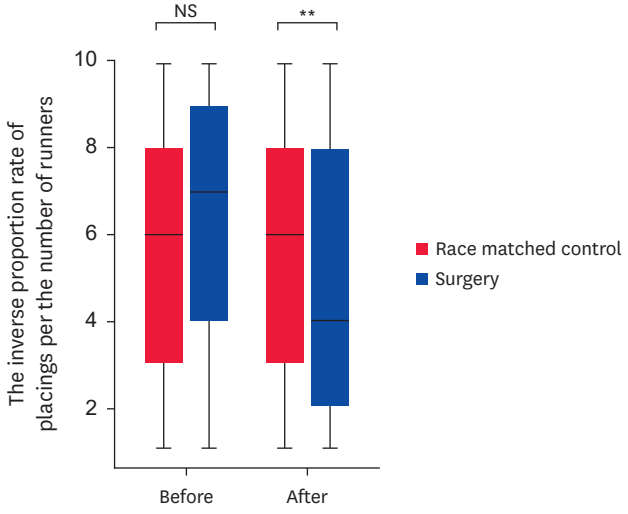

Fig. 1. Boxplots illustrating the racing performance categorized from 1 to 10 based on the conversion of placings to the inverse proportion (rate of placings per the number of runners) (mean ± SD) before or after the surgical treatment of colic. It shows a significant decrease in the racing performance of the surgical group compared to the race-matched control group after surgery.
NS, not significant.
$^{**}p < 0.01$.

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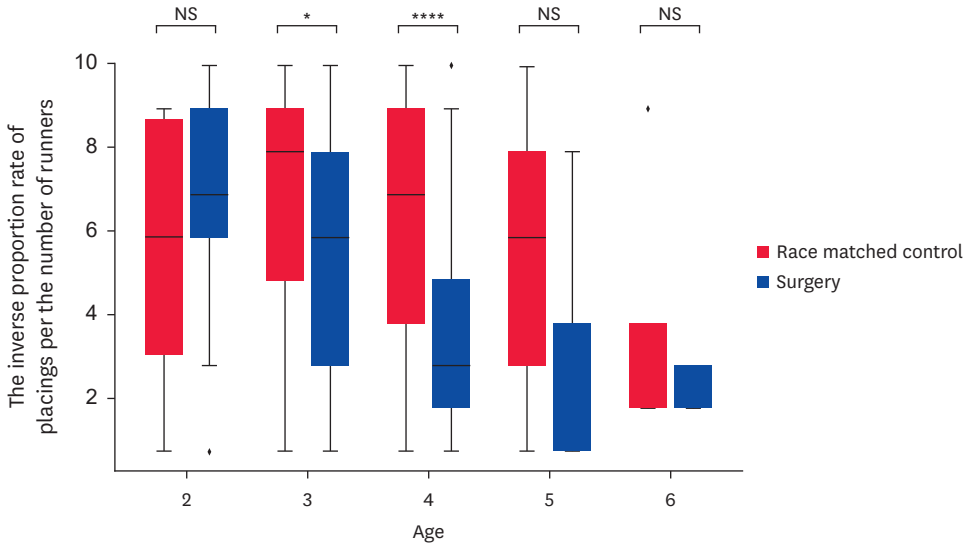

Fig. 2. Boxplots illustrating the racing performance categorized from 1 to 10 based on the conversion of placings to the inverse proportion (rate of placings per the number of runners) (mean ± SD) before or after the surgical treatment of colic. It shows a significant decrease in the racing performance of the 3 and 4 years old subgroup of the surgical group after surgery compared to before surgery. There were no significant differences in the racing performance of all age groups in the race-matched control group after surgery (graph not shown).
NS, not significant.
*$p < 0.05$; ****$p < 0.0001$.

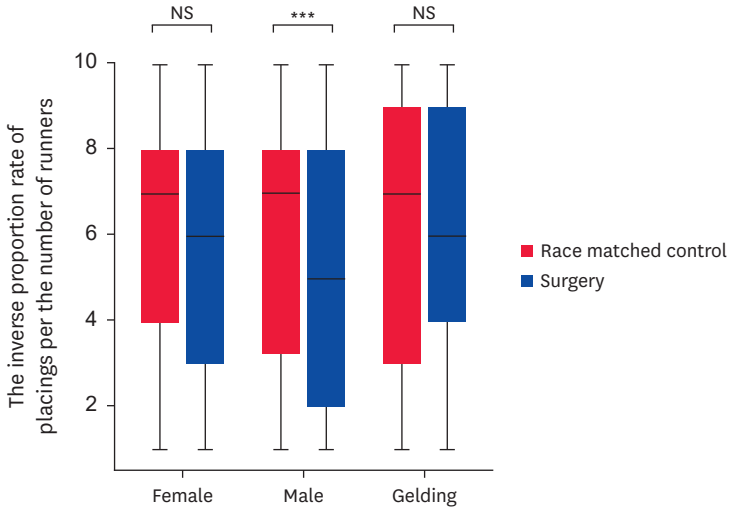

Fig. 3. Boxplots illustrating racing performance categorized from 1 to 10 based on the conversion of placings to the inverse proportion (rate of placings per the number of runners) (mean ± SD) before or after the surgical treatment of colic. It shows a significant decrease in the racing performance of the male subgroup of the surgical group after surgery compared to before surgery. There were no significant differences in the racing performance of the sex subgroups in the race-matched control group after surgery (graph not shown).
NS, not significant.
***$p < 0.001$.

proportion of lesions involving the large intestine [8,9] and the availability of an on-site veterinary hospital at the race track, enabling rapid access to surgical intervention.

The proportion of colic cases requiring surgical intervention in this study was 3.9% and could reach 5.8% if all non-surviving horses that had received medical treatment also had surgery.

The proportion of colic cases requiring surgical intervention in this study is in line with the 4.3% reported in the UK Thoroughbred study and as high as 8.3% if all non-surviving horses that had received medical treatment also had surgery [2]. The proportion of colic events resulting in surgery of Thoroughbreds both in this study and the UK study [2] was higher than the national estimation of 1.4% in the US [3].

The short-term survival rate after surgery reported in this study was 76.7%, which fell within the range of 59%–85% reported in other studies [7,16]. The short-term survival rate in the present study may be associated with the easier accessibility to surgical facilities, allowing for earlier invention and the fact that most lesions involved the large intestine.

The proportion of horses that returned to racing in the surgical group was 65%, while 96% of the race-matched control group continued racing following the surgical date of the case horses. In a similar study in the US [5], the return to racing rate after colic surgery was 69.4% and 73.5% in the race-matched control group. While the return to racing rate was similar across the two countries, the difference in the race-matched control group between Korea and the US is surprising.

This phenomenon may be attributed to economic factors associated with the racing environment, such as the substantially higher prize money per race in Korea (3.7 times greater than in the US, according to the International Federation of Horseracing Authority Annual report: www.horseracingintfed.com), as well as other structural factors unique to the racing industries in different regions.

Although the analysis identified that geldings had a lower rate of return to racing, the authors attributed this to the small sample size of geldings in the surgical group. A larger sample size of subgroups in the surgical group would be necessary to ascertain whether this result represents a significant difference.

There was no correlation identified between the age and the likelihood of returning to racing after surgery, which is consistent with a previous study reporting that age was not associated with prognosis [9,10]. Nevertheless, the raw data suggests that younger horses may have a better chance of returning to racing, with a p value of 0.062. On the other hand, given the small sample size of age subgroups in the surgical group, further investigation with a larger sample size would be needed to confirm if there is a significant correlation.

This study did not analyze the site of gastrointestinal tract lesions because of the large differences in the number of horses between the various lesion groups, making an analysis of the subgroups less meaningful.

Racing data, as the measure of post-surgery performance, is useful because it is quantitative and well-documented. The prize money earned has been used in other studies [6]. The authors excluded this parameter in this study because of the changes in prizemoney in Korea during the 11-year period examined.

An analysis of the performance data revealed a significant decrease in racing performance when colic surgery was performed at three or four years old. Previous studies reported that 4.5-year-old is the peak performing age [17,18]. The negative impact of colic surgery on the racing performance during the peak career period or when racing performance is improving

towards the peak is supported by the authors' clinical and racing impressions. The possible reasons for the decreased performance include changes in physiology after the recovery period and altered training management during the recovery period.

Career longevity was similar in the two groups, suggesting that celiotomy does not shorten a horse's racing career as long as horses survive surgery and return to racing. The current study controlled for the influence of surgical skill because all surgeries were performed by a single primary surgeon.

Although the small sample size was a major limitation of this study, the authors concluded that the incidence, case fatality, and mortality of colic in racehorses and the rate of return to racing after colic surgery aligned with or were better than other countries [2,3,5].

A correlation was observed between postoperative racing performance and the age at the time of surgery and sex. The postoperative racing performance of horses in this study was impacted when colic surgery was performed on horses aged three or four years, as well as the sex of the horse, which differs from the findings of other Thoroughbred studies conducted in other countries [5,6]. The limited sample sizes of the specific subsets within the surgical group may have influenced the results of this study, highlighting the need for future studies with larger sample sizes to confirm these findings. The length of the postoperative racing careers of the horses in the surgery group was similar to the race-matched control group. This study showed that horses that underwent surgical treatment for colic could return to racing and continue racing. Nevertheless, surgical treatment at three or four years old could adversely influence the racing performance.

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