

Association between cribbing and entrapment of the small intestine in the epiploic foramen in horses: 68 cases (1991–2002)

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Objective—To determine whether there was an association between a history of cribbing and epiploic foramen entrapment (EFE) of the small intestine in horses.

Design—Retrospective study.

Animals—68 horses examined at the University of Illinois or the University of Liverpool veterinary teaching hospitals.

Procedure—For horses examined at the University of Illinois that underwent surgery because of strangulating small intestine lesions, information about cribbing was obtained through telephone calls with owners. For horses examined at the University of Liverpool that underwent surgery for colic for any reason, information about cribbing was obtained through a preoperative questionnaire.

Results—13 of 19 (68%) horses with EFE examined at the University of Illinois had a history of cribbing, compared with only 2 of 34 (6%) horses with other strangulating small intestine lesions (odds ratio, 34.7; 95% confidence interval, 6.2 to 194.6). Similarly, 24 of 49 (49%) horses with EFE examined at the University of Liverpool had a history of cribbing, compared with 72 of 687 (10.5%) horses with colic caused by other lesions (odds ratio, 8.2; 95% confidence interval, 4.5 to 15.1).

Conclusions and Clinical Relevance—Results suggest that there may be an association between cribbing and EFE in horses, with horses with a history of cribbing more likely to have EFE than horses without such a history. (*J Am Vet Med Assoc* 2004;224:562–564)

Information from epidemiologic studies of colic in horses may help practitioners recognize horses at risk for certain lesions¹ and provide some guidelines for identifying horses that would benefit from prompt surgical treatment.^{2,3} Such studies may also help to identify potential postoperative problems related to and the prognosis for horses with specific types of colic.^{4,5}

Entrapment of the small intestine in the epiploic foramen is the second most common cause of strangulation of the small intestine in horses undergoing celiotomy, representing 5% to 7.7% of horses undergo-

ing celiotomy for colic^a and 14% to 19% of all small intestinal lesions in horses.⁶⁻⁸ The prevalence of epiploic foramen entrapment (EFE) appears to be greater in Thoroughbreds than in horses of other breeds^{6,7} and in geldings than in mares^a; however, there does not appear to be an age predisposition.⁸ Epidemiologic studies^{4,5} have shown that horses that undergo surgery for EFE have a higher risk of requiring a second surgery than are horses that undergo surgery for colic of other causes and have a significantly reduced probability of survival, compared with horses with other strangulating lesions of the small intestine.

Cribbing is an oral behavior in which a horse grasps a fixed object with its incisor teeth and simultaneously flexes its neck, contracts the neck muscles, and draws air into the cranial part of the esophagus with an audible grunt.^{9,10} Its prevalence varies among equine populations, with reported rates ranging from 2.8%¹¹ to 10.5%.¹⁰ This behavior has anecdotally been associated with flatulent colic² and dental problems associated with excessive wearing of the incisor teeth.¹² Cribbing is also reported to be associated with gastric inflammation and ulceration in young horses,¹³ equine motor neuron disease,¹⁴ and colonic impaction.¹

The authors have observed that a large proportion of horses that underwent surgery for EFE at the University of Illinois seemed to crib while hospitalized after surgery, whereas this vice seemed to be considerably rarer in horses that underwent colic surgery for other reasons at the same institution. Therefore, we hypothesize that horses that crib are at greater risk for developing EFE than are horses that do not. The purpose of the study reported here was to determine whether horses that crib are at risk for EFE.

Criteria for Selection of Cases

Data for the study were obtained from the medical records of 2 university-level veterinary teaching hospitals: the University of Illinois Veterinary Teaching Hospital and the University of Liverpool Veterinary Teaching Hospital. All horses that underwent exploratory celiotomy at the University of Illinois Veterinary Teaching Hospital because of strangulating small intestine lesions between 1994 and 2002 were considered for inclusion in the study. Horses that were < 1 year of age, that were undergoing celiotomy to treat eventration, or whose owners could not be contacted for follow-up information were excluded. In addition, all horses with colic that underwent exploratory celiotomy at the University of Liverpool Veterinary Teaching Hospital between 1991 and 2001 were included in the study, regardless of age or lesion.

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Differences in selection criteria between the 2 hospital populations were intended to allow application of the findings to all horses undergoing surgery because of colic and to horses undergoing surgery because of colic caused by small intestinal diseases.

Procedures

For purposes of this study, cribbing was defined as cribbing, crib-biting, and windsucking. For horses examined at the University of Illinois that were included in the study, information about cribbing was obtained through follow-up telephone calls to owners. Owners were specifically asked whether their horses had a history of cribbing prior to undergoing surgery for EFE. The purpose of asking the question was not stated until after the owner had answered, and no respondent changed an answer after he or she was informed about the purpose of the question. For horses examined at the University of Liverpool, owners were questioned about cribbing in a preoperative questionnaire and horses were excluded from the study if this question was not answered.

Data analysis—For each study population, preoperative cribbing behavior in horses with EFE was compared with preoperative cribbing behavior in the control population. For the University of Illinois, the control population consisted of horses undergoing exploratory celiotomy because of colic caused by strangulating small intestine lesions other than EFE. For the University of Liverpool, the control population consisted of horses undergoing exploratory celiotomy because of colic of any cause other than EFE. Data were analyzed by use of Fisher exact tests; **odds ratios (ORs)** and their **95% confidence intervals (CIs)** were calculated. Values of $P < 0.05$ were considered significant.

Results

During the study period, 19 horses underwent exploratory celiotomy at the University of Illinois because of EFE and 34 horses underwent exploratory celiotomy because of other strangulating small intestine lesions. The proportion of horses with EFE reported to have engaged in cribbing prior to surgery (13/19; 68%) was significantly ($P < 0.001$) higher than the proportion of horses with other strangulating small intestine lesions that cribbed (2/34; 6%). The OR (34.7; 95% CI, 6.2 to 194.6) indicated that for horses with strangulating small intestine lesions, horses with a history of cribbing were approximately 35 times as likely to have EFE as were horses without such a history. Overall, 7 of the 19 (37%) horses that underwent surgery because of EFE were observed to crib during the postoperative hospitalization period, whereas none of the control horses were observed to crib while hospitalized after surgery.

Owners of 49 of 71 horses undergoing surgery at the University of Liverpool because of EFE and of 687 of 1,262 horses undergoing surgery for colic of other causes provided information on preoperative cribbing behavior of their horses. The proportion of horses with EFE reported to have engaged in cribbing prior to surgery (24/49; 49%) was significantly ($P < 0.001$) higher than the proportion of horses with colic of other causes that

cribbed (72/687; 10.4%). The OR (8.2; 95% CI, 4.5 to 15.1) indicated that among horses with colic, those with a history of cribbing were approximately 8 times as likely to have EFE as were horses without such a history.

Discussion

Results of the present study suggest that there may be an association between cribbing and EFE in horses. However, our results do not allow us to postulate a cause-and-effect relationship, and cribbing might not play a direct role in causing EFE. Rather, cribbing could be associated with EFE through management practices, temperament, or other factors that predispose to both conditions. For instance, horses that crib might be managed differently than horses that do not, and such differences in management practices could predispose to EFE. Also, the present study did not adjust for other factors that have been shown to predispose to colic, such as age, diet changes, and breed. On the other hand, cribbing might have a more direct role in the pathogenesis of EFE, as for instance, altered intra-abdominal pressure during the maneuver could force the small intestine towards the epiploic foramen.

There is considerable controversy about whether cribbing truly causes aerophagia,^{12,15} and the role of air in the small intestine in the pathogenesis of EFE is unknown. Horses may crib for > 8 hours a day,¹⁶ and the short column of air that remains in the proximal part of the esophagus after cribbing can be carried to the stomach with a food bolus.¹⁷ However, substantial quantities of air are not swallowed during cribbing, and cribbers are not considered to truly be aerophagic.¹⁷

A seasonal predisposition to EFE has been reported, with EFE being more common between December and April in 1 study^a and with 73.5% of EFE cases occurring between November and March in a separate study.^b In addition, the prevalence of cribbing has been shown to be reduced by increasing time spent out of the stable and increasing the amount of exercise.^{16,18} The seasonal distribution reported for EFE may reflect times of the year when horses spend more time stabled and, hence, are more likely to exhibit cribbing behavior. Cribbing has been shown to be more common in some breeds of horses, particularly Thoroughbreds,^{11,18} and this could also partly be explained by differences in stabling time and amount of exercise.^{6,7,19} Cribbing is also dependent on various management factors, including methods of weaning and feeding.^{19,20}

In the present study, the proportions of horses in the 2 control populations that cribbed were within ranges reported for horses in general.^{10,11} The higher proportion in the University of Liverpool control population could reflect a higher proportion of cribbers in the general population of horses in that area or could be explained by inclusion of horses with any type of colic, some of which could have colic related to cribbing.¹ In the University of Illinois control population, only horses with strangulating small intestine lesions were included because they were comparable to horses with EFE in many respects, especially the intestinal segments involved.

Data were collected by different methods for the 2 hospital populations, and each method could have different sets of limitations. For horses treated at the

University of Liverpool, errors could have arisen because of confusion about questions on the preoperative questionnaire or because the individual transporting the horse was not the owner and not familiar with the horse's habits. Similarly, recall error could have affected responses for horses treated at the University of Illinois. In both instances, the control population should have minimized the impact of such errors. Also, the finding that 7 of 19 (37%) horses with EFE treated at the University of Illinois cribbed during the postoperative hospitalization period supported our results.

What role exclusion criteria for horses examined at the University of Illinois may have had on results is unknown, but this would appear to have been minor. Horses < 1 year old were excluded because a small number of young horses underwent surgery for strangulating small intestine lesions before they were old enough to establish whether they would or would not crib. Also, none of the horses with EFE were < 1 year old, so inclusion of young horses in the control group would have spuriously increased the OR in favor of an association between cribbing and EFE. Horses that had a celiotomy to treat eventration were excluded because colic was not the initial complaint, and these horses, therefore, differed from horses with EFE. Also, the number of these horses with small intestine involvement was probably too small to alter the outcome of the study. Exclusion of horses whose owners could not be contacted for follow-up information was not related to outcome or to a difference in effort to contact owners in 1 category compared with the other. Effects of this exclusion on our results are unknown.

Although decisions to perform surgery on horses with colic do not depend on preoperative identification of the lesion, recognition that certain horses may be at risk for certain lesions can facilitate diagnosis and treatment. A history of cribbing could be included with other information to increase the preoperative suspicion of EFE, with full awareness that cribbing alone might not directly cause this form of colic. Because results of the present study were obtained in 2 countries with different methods for data collection and different control groups, they should be applicable to horses in general.

^aScheidemann W. *Beitrag zur Diagnostik und Therapie de Kolic des Pferdes. Die Hernia Foraminis omentalis*. DVM thesis, Department of Equine and Small Animal Medicine and Department of Jurisprudence, Ludwig-Maximilian University, Munich, Germany, 1989.

^bArcher DC, Proudman CJ, Smith J, et al. Epiploic foramen entrapment of the small intestine: a review of 68 cases (1991–2001) (abstr), in *Proceedings*. 7th Equine Colic Res Symp 2002;93.

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