

Are horses that undergo an exploratory laparotomy for correction of a right dorsal displacement of the large colon predisposed to post operative colic, compared to other forms of large colon displacement?

L. J. SMITH*† and T. S. MAIR

Bell Equine Veterinary Clinic, Butchers Lane, Mereworth, Kent ME18 5GS; and †Equine Referral Hospital, Royal Veterinary College, Hawkshead Lane, North Mymms, Hertfordshire AL9 7TA, UK.

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Summary

Reason for performing study: It is a clinical impression that horses diagnosed with a right dorsal displacement (RDD) of the large colon, are more likely to suffer from recurrent episodes of colic post operatively, compared to other forms of nonstrangulating large colon displacement.

Objectives: To investigate whether the type of nonstrangulating large colon displacement identified at exploratory laparotomy would influence long-term outcome.

Hypothesis: Horses identified with a RDD of the large colon at exploratory laparotomy would be more likely to experience recurrent episodes of post operative colic than other types of displacement.

Materials and methods: Medical records for horses undergoing an exploratory laparotomy, from 2000–2008, for a nonstrangulating large colon displacement were reviewed. Data retrieved included: subject details, previous medical history, details of current episodes of colic, results of preoperative examination, surgical findings and procedures, post operative management and complications. Follow-up information was obtained by reference to computerised clinical records and by telephone questionnaire administered to the horse's owner or carer, and included details of any colic episodes exhibited by the horse after discharge and whether a repeat celiotomy had been required to resolve the colic episodes.

Results: There were 165 surgeries identified, in 154 horses. It was found that those horses with RDD were significantly more likely to experience recurrent episodes of colic requiring veterinary intervention post operatively compared to other types of displacement.

Clinical relevance: Long-term prognosis and likelihood of post operative complications is an important consideration for both owners and veterinarians.

Introduction

Displacement or volvulus of the large colon in the horse is a

common cause of colic, accounting for 33.7% of horses undergoing an exploratory laparotomy in one study (Mair and Smith 2005a). The large colon is freely mobile within the abdomen due to its sparse mesenteric attachments (Hackett 2002; Rakestraw and Hardy 2006), with mobility limited only by attachments to the caecum (caeco-colic fold) and the transverse colon (dorsal attachment of the right dorsal colon and duodenocolic fold). A displacement is considered to be nonstrangulating if it is moved sufficiently out of its normal orientation that it forms a functional obstruction (either complete or partial) of the lumen of the large colon, without compromising vascular integrity. Four main types of nonstrangulating displacement of the large colon have been identified: left dorsal displacement (LDD, nephrosplenic entrapment or renosplenic entrapment), right dorsal displacement (RDD), retroflexion of the pelvic flexure and nonstrangulating volvulus of the large colon (Hackett 2002; Rakestraw and Hardy 2006; Hardy 2008).

Although the prognosis for surgical correction is considered to be excellent, as long as no vascular compromise has occurred (Hackett 2002; Rakestraw and Hardy 2006), it is recognised that recurrent displacement can manifest itself post operatively, sometimes as quickly as within 48 h of the original surgery (Hardy 2008). Repeat laparotomy, either in the immediate post operative period or subsequent to discharge from the hospital, has been recognised as a significant factor in long-term post operative survival for both small and large intestinal lesions (Mair and Smith 2005b; Proudman *et al.* 2005). It is a clinical impression that horses, diagnosed with a RDD of the large colon, are more likely to suffer from recurrent episodes of colic post operatively, compared to other forms of nonstrangulating large colon displacement. However, although there are data published on the long-term survival for horses undergoing surgery for large intestinal disease (Proudman *et al.* 2005), there are no published data that either support or refute this theory.

The purpose of this study was to perform a retrospective analysis of all horses that had undergone an exploratory laparotomy for correction of a large colon displacement over an 8-year period in one private equine hospital, in order to investigate the prevalence of post operative colic.

*Author to whom correspondence should be addressed.
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Materials and methods

Case records

Case records of all horses that underwent an exploratory laparotomy for the investigation of acute abdominal discomfort at the Bell Equine Veterinary Clinic from January 2000–July 2008 were reviewed. Those cases where a large colon displacement (LDD, RDD, nonstrangulating volvulus, retroflexion of the pelvic flexure) was identified at surgery were evaluated. Information retrieved from the case records included subject details, previous medical history, details of current episodes of colic, results of preoperative examination, surgical findings and procedures, post operative management and complications. Any horse that had already undergone an exploratory laparotomy for colic, prior to the commencement of the study period, was excluded.

For horses discharged alive from the hospital, follow-up information was obtained by reference to computerised clinical records and by telephone questionnaire administered to the horse's owner or carer. A minimum of 6 months of follow-up information was available in all cases; and included details of any colic episodes exhibited by the horse after discharge (i.e. recurrent colic) and whether a repeat celiotomy had been required to resolve the colic episodes.

Statistical analysis

Data were entered into a statistics program (WinPepi 6.3). Chi-squared² or Fisher's exact analyses was performed on discreet data as appropriate, with results considered statistically significant at $P < 0.05$.

Results

Overall, 628 horses underwent 683 exploratory laparotomies for investigation of acute abdominal discomfort during the study period of interest. Of these cases, 153 (24.4%) were diagnosed with a displacement of the large colon at exploratory laparotomy and were, therefore, eligible for inclusion in the study. Only one horse (0.6%) was reported to have suffered from repeated episodes of colic necessitating veterinary intervention prior to undergoing an exploratory laparotomy.

These 153 horses underwent 164 exploratory laparotomies, therefore 11 surgeries (6.7%) were horses undergoing repeat laparotomies subsequent to successful discharge from the hospital after the original surgery during the study period. Of the 164 surgeries performed to correct a displacement of the large colon, the majority of horses were diagnosed with a RDD (Table 1). Mean follow-up period available for investigation was 4.5 years (range: 0.5–8.75 years). The one horse that had experienced repeated episodes of colic preoperatively was diagnosed with an RDD at exploratory laparotomy. No further episodes of colic were reported in the follow-up period.

When comparing those horses diagnosed with RDD with those diagnosed with any other form of nonstrangulating displacement at exploratory laparotomy, it was found that those horses with RDD were significantly more likely to experience recurrent episodes of colic requiring veterinary intervention post operatively ($P = 0.012$). When considering specific types of nonstrangulating displacement, it was found that horses with RDD were significantly more likely to experience recurrent episodes of colic requiring veterinary intervention post operatively than LDD ($P = 0.028$) or nonstrangulating volvulus ($P = 0.016$). However, they were no more likely to experience recurrent post operative colic compared to those horses diagnosed with retroflexion of the pelvic flexure ($P > 0.05$).

Although a high proportion (45.5%) of horses diagnosed with retroflexion of the pelvic flexure required veterinary attention for recurrent episodes of colic post operatively, they were no more likely to suffer colic than those horses diagnosed with other forms of nonstrangulating displacements, either when considered individually or as a whole ($P > 0.05$).

No one type of nonstrangulating displacement was associated with a decreased likelihood of long-term survival having survived to discharge from the hospital, when compared to all the other types of displacement ($P > 0.05$).

Of the 2 horses that underwent a second surgery following diagnosis of a nonstrangulating volvulus, one horse was diagnosed subsequently with a recurrence of a volvulus and the other horse was diagnosed with RDD. Of the 9 horses, diagnosed with RDD at the original surgery, the majority ($n = 6$) at repeat laparotomy were diagnosed with a recurrence of RDD, with 3 horses being diagnosed with a large colon volvulus. Short- and long-term survival were not found to be affected significantly when looking at those horses that had a second laparotomy performed, after being successfully discharged from the hospital after the original surgery, comparing either RDD or retroflexion of the pelvic flexure to all other types of colic.

Discussion

Although it has been suspected that those horses diagnosed with a RDD of the large colon at an exploratory laparotomy are more likely to suffer from recurrent episodes of colic post operatively, no previous study has investigated this specifically. The recurrence rate of LDD has previously been reported in some case series, ranging from 7.5% (Baird *et al.* 1991) to 22.2% (Markel *et al.* 1985). The current study concurred with the findings of the study by Hardy *et al.* (2000), with a recurrence rate of approximately 8%. In addition, one study looked at the recurrence rate in broodmares undergoing exploratory laparotomy for either RDD or large colon volvulus; the recurrence rate was found to be 15%, although no distinction was made between the 2 different types of large colon displacement (Hance and Embertson 1992). However, only those horses undergoing an exploratory laparotomy were

TABLE 1: Different nonstrangulating large intestinal displacements identified at exploratory laparotomy and follow-up information of 153 cases

| Type of displacement | No. diagnosed (%) | No. with recurrent colic (%) | No. undergoing >1 laparotomy for colic | Euthanasia at 1st surgery | Euthanasia at 2nd surgery | Euthanasia due to recurrent colic, without 2nd surgery |
|------------------------------------|-------------------|------------------------------|--|---------------------------|---------------------------|--|
| Left dorsal displacement | 12 (7.8) | 1 (8.3) | 0 | 0 | 0 | 0 |
| Right dorsal displacement | 86 (56.2) | 36 (41.9) | 9 (10.5) | 0 | 5 (5.8) | 2 (2.3) |
| Retroflexion of the pelvic flexure | 11 (7.2) | 5 (45.5) | 0 | 0 | 0 | 1 (9.1) |
| Nonstrangulating volvulus | 44 (28.8) | 9 (20.5) | 2 (4.5) | 0 | 1 (2.3) | 6 (13.6) |

included in the study, not taking into account those experiencing repeated episodes of colic requiring only medical intervention where a large colon displacement was suspected. The results from this study confirm the observation that those horses diagnosed with RDD are more likely to suffer from repeated episodes of colic following recovery from surgery compared to other forms of nonstrangulating large colon displacement, in particular LDD; however, the requirement for a repeat laparotomy was lower than the rate previously reported.

When considering those horses that underwent a repeat laparotomy, only those diagnosed with either RDD or nonstrangulating volvulus underwent a second surgery. Although there was no significant effect of lesion diagnosed at first surgery, the likelihood of a horse requiring a second laparotomy, is limited due to the low numbers of horses that underwent a second surgery. No horses required a second surgery in 2 categories (LDD and retroflexion of the pelvic flexure) and of the remaining 2 types of displacement the majority of horses had undergone surgery for RDD.

It has been recognised that it is harder to make a definitive diagnosis of RDD without performing an exploratory laparotomy, due to the nonspecific nature of the rectal and ultrasonographic findings (Gardner *et al.* 2005). Horses that did not undergo an exploratory laparotomy were excluded from the study, as it was felt that it would not be possible to distinguish conclusively between the 4 types of common nonstrangulating large colon displacement, in particular a RDD, on abdominal palpation *per rectum* alone, without performing surgery.

Although this study has confirmed that recurrent colic is a more common feature in horses diagnosed with RDD, it was not possible to identify why this should be the case. RDD of the large colon is thought to occur due to retropulsion or aberrant motility of the pelvic flexure. While surgical intervention may correct the resulting displacement, it will not address any underlying problems that lead to a motility disorder, predisposing to recurrence of the original displacement. In contrast, it has been speculated that LDD may occur as a result of gas accumulation, allowing the large colon to rise dorsally in the abdomen and subsequently becoming entrapped by the nephrosplenic ligament (Hardy 2008); LDD may, therefore have a different aetiology to RDD. Hardy (2008) recommended that, to reduce the risk of early recurrence of RDD, it is important not to evacuate the large colon completely during surgery, but to leave some ingesta in the colon. This author also recommended returning affected horses to feed within 8 h of surgery, in an attempt maintain ingesta in the large colon. However, no clinical trials have been reported to support the use of these management techniques as an effective preventive treatment.

In conclusion, if a diagnosis of RDD was made during an exploratory laparotomy, in this particular equine population, it would have been advisable to warn owners of the increased likelihood of post operative episodes of colic, although long-term survival remained unaffected. Further epidemiological studies are warranted to identify subject details and management risk factors that may predispose a horse to the development of a RDD.

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