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Originalni naučni rad

RETROSPEKTIVNO ISPITIVANJE PATOLOGIJE MALOG KOLONA KOD 72 KONJA

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Kratak sadržaj

U radu su retrospektivno prezentovani dijagnostika, konzervativno i hirurško lečenje različnih patologija na malom kolonu kod 72 konja, koji su primljeni sa abdominalnim bolom (kolikom) na veterinarsku kliniku „Novi Vek" Moskovske državne akademije za veterinarstvo i biotehnologiju (po imenu Skrabina). Pregledi su vršeni u periodu 2007-2019. godina kada je primljeno i pregledano 1810 količnih konja od kojih je kod 72 utvrđena patologija na malom kolonu što čini 3,97% svih slučajeva. Najveći uzrok patologije malog kolona bile su opstipacije fecesom u 49 slučajeva. Od ukupno 72 hospitalizovana i lečena konja njih 62 je uspešno izlečeno što čini 86,1%.

Ključne riječi: mali kolon, konji, opstipacija, abdominalne kolike

UVOD

Mali ili silazni kolon konja (lat. *colon descedens*) predstavlja završni deo intestinalnog trakta, koji kod konja dostiže dužinu 2 metra. Navedeni kolon je relativno pokretljiv unutar kaudalnog abdomena, koji na nivou karličnih kostiju prelazi u fiksirani rektum. Mali kolon konja poseduje relativno dugački mezenterijum, koji pored krvnih sadrži mnogobrojne nervne i limfatične sudove. Na ovom delu intestinalnog trakta konja odvija se završna resorpcija vode i formiraju karakteristične strukture fecesa ovih životinja (Kovač, 2010).

Dijagnostika i lečenje različitih patologija ovog dela intestinalnog trakta konja su retko ispitivani (Ruggles and Ross, 1991; Bont i sar., 2013). Glavne metode dijagnostike su rektalno i ultrazvučno ispitivanje abdomena konja (Freeman i sar., 2001; Kovač i sar., 2018). Pri sumnji na enterolite malog kolona primenjuje se rendgensko ispitivanje (Yarbrough i sar., 1994). Cilj ovog retrospektivnog ispitivanja je utvrđivanje učestalosti pojavljivanja patologije malog kolona u opštoj populaciji gastrointestinalnih bolesti konja, pojasniti optimalne metode lečenja, kao i utvrditi moguću prognozu izlečenja.

MATERIJALI I METODE

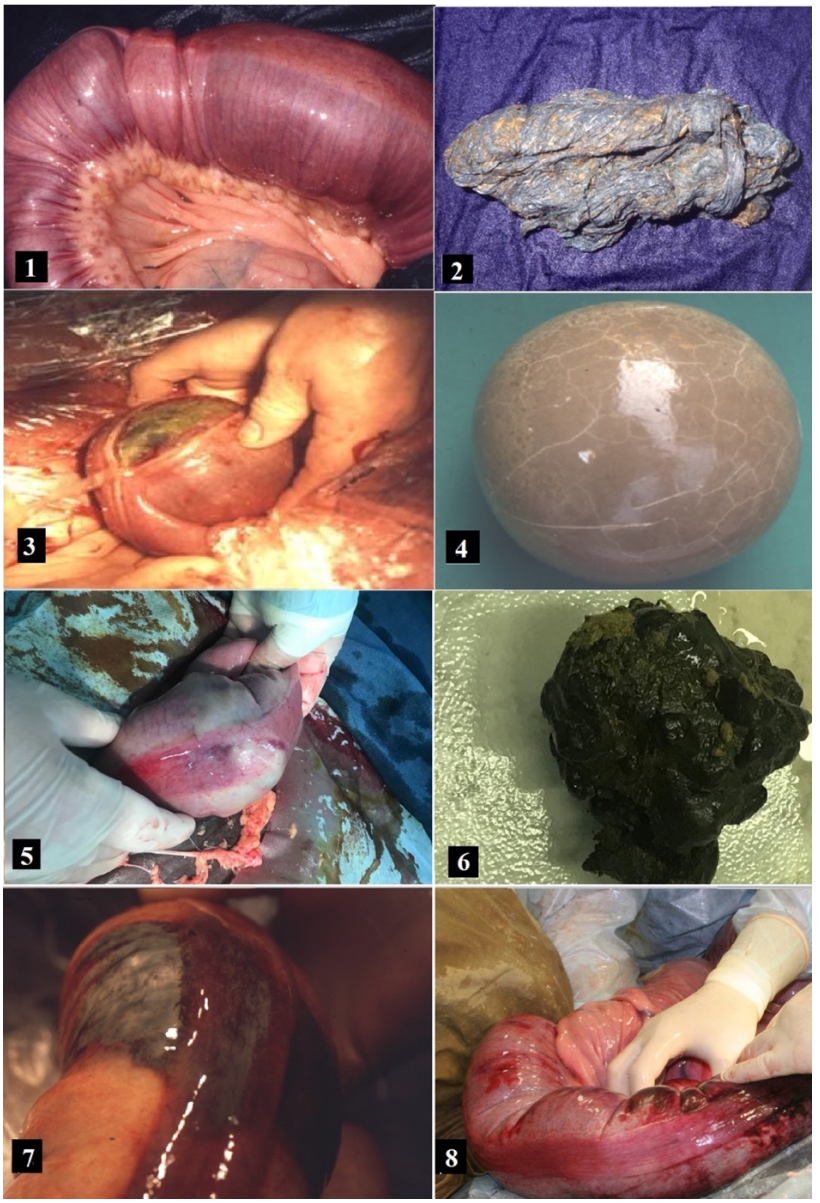
U periodu 2007-2019. na veterinarsku kliniku „Novi Vek“ Moskovske državne akademije za veterinarstvo i biotehnologiju (po imenu Skrabina) bilo je primljeno na lečenje 1810 konja sa različitim patologijama gastrointestinalnog trakta koji su pokazivali različiti stepen abdominalne boli (kolika). Svi konji pri prijemu na kliniku su klinički ispitivani, kroz merenje frekvencije srčanog rada i disajne frekvencije, telesne temperature i auskultacije peristaltičnih šumova. Sprovedeno je kod svih konja i laboratorijsko ispitivanje krvnih parametara: hematokrit, koncentracija ukupnih proteina, broj leukocita i acido-bazni status krvi (pH, hidrokarbonatna koncentracija, parcijalni pritisak O_2 i CO_2). Navedeni parametri krvi su ispitivani na aparatu Medicon CA620 (Dablin, Irska). Osim toga kod svih konja je izvršeno rektalno i ultrazvučno ispitivanje abdomena, kao i želudačno sondiranje. Po potrebi, gde dijagnoza nije bila jasna bile su sprovedene i druge dijagnostičke procedure, kao na primer abdominocinteza, laparoskopsko ispitivanje i dijagnostička laparotomija.

Posle postavljanja dijagnoze količnog oboljenja, opredeljivalo se za metodu konzervativnog ili hirurškog lečenja. Za hirurški metod lečenja u opštoj inhalacionoj narkozi je bilo izabrano 390 konja, ostali konji su lečeni konzervativnim metodama lečenja.

Statistička analiza kliničkih i laboratorijskih parametara je bila provedena na softveru „Statistics Analysis System (SAS)“. Kvantitativni parametri su uporedjivani sa studentovim t-testom. Kvalitativni parametri su upoređivani sa Hi-kvadrat testom. Multivarijantna logistička regresija se koristila za opredeljenje uticaja trajanja bolesti na faktor preživljavanja oboljelih životinja.

REZULTATI

Kod 72 od 1810 količnih konja je utvrđena patologija na malom kolonu (3.97% svih slučajeva). Patologije su uključivale opstipaciju (zatvor, konstipacija) malog kolona fecesom (49 slučaja), opstipaciju malog kolona s plastikom (1 slučaj) (slika 1. i 2.) opstipaciju malog kolona s enterolitom (4 slučaja) (slika 3., 4., 5. i 6.), parazitska tromboembolija (nekrotični infarkt) zida malog kolona (6 slučajeva) (slika 7. i 8.), rascepljenje mezenterijuma malog kolona (4 slučaja), trauma (perforacija) zida malog kolona nakon ždrebljenja ili rektalnog ispitivanja (4 slučaja), invaginacija malog kolona (2 slučaja) i strangulacija lipomom (2 slučaja). U 8 konja bila je utvrđena multipna patologija na malom kolonu (kao npr. opstipacija sa povredom mezenterijuma). Na hemijskom ispitivanju sastava enterolita (metodom IR spektrometrije) u jednog konja gde je bilo provedeno takvo ispitivanje moglo se utvrditi da je on formiran na 80% od struvita (MgNH4PO4 * 6H2O) i na 20% od karbonatapatita (Ca10(PO4)CO3CH)6 (OH)2.



Slike 1-8: Intraoperativne patologije malog kolona u konja
Slika 1. i 2. – Obstipacija malog kolona sa plastikom
Slika 3., 4., 5. i 6. – Obstipacija malog kolona sa enterolitom
Slika 7. i 8. – Tromboembolične promene (nekroza) zida malog kolona

Nije bila utvrđena zavisnost patologije na malom kolonu od pola životinje. Od zatvora malog kolona signifikantno češće su obolevali mlađi orlovski ili arapski konji (kao i druge minijaturne pasmine konja). Osobito novorođena ždrebad su često imala opstipaciju malog kolona u formi mekonijum konstipacije (18 životinja).

U tabeli 1. su predstavljeni podaci kliničkih i laboratorijskih ispitivanja krvi pri samom prijemu na veterinarsku kliniku, pre početka lečenja.

Tabela 1. Klinički i laboratorijski parametri krvi kod bolesti malog kolona konja

Patologija	Srčana frekvencija (udara/min)	Temperatura (°C)	Protein i plazme (g/l)	Hematokrit (l/l)	Koncentracija leukocita (109/l)	Koncentracija bikarbonata (mmol/l)
Opstipacija malog kolona fecesom (n=51)	58,43 ± 5,67	37,12 ± 0,28	69,56 ±7,23	0,42 ±0,03	5,61 ±2,06	25,18 ±3,97
Opstipacija malog kolona enterolitom (n=3)	54,43 ± 3,17	37,91 ±0,38	72,16 ±5,73	0,44 ±0,02	6,92 ±4,14	23,16 ±4,03
Parazitska tromboebolija zida malog kolona (n=6)	43,14 ± 5,40	38,95 ± 0,51	58,34 ±8,17	0,46 ±0,05	10,40 ±0,75	25,07 ±7,62
Povreda mezenteriju ma malog kolona (n=4)	44,92 ± 5,32	37,29 ± 0,25	66,34 ±12,40	0,30 ±0,04	5,37 ±1,02	27,79 ±6,35
Perforacija zida malog kolona i rektuma (n=4)	94,91 ±12,25	38,54 ± 0,55	42,12 ±11,34	0,62 ±0,05	4,80 ±0,64	19,68 ±3,20
Invaginacija malog kolona (n=2)	66,42 ±16,38	38,53 ±0,53	78,48 ±10,50	0,46 ±0,04	9,97 ±2,50	27,06 ±6,52
Strangulacija lipomom malog kolona (n=2)	80,44 ±10,36	38,02 ± 0,45	54,32 ±9,80	0,54 ±0,01	9,31 ±2,65	21,09 ±6,30

Klinički i laboratorijski parametri krvi su bili u zavisnosti od specifične patologije i osobito od vremena nastanka oboljenja do dolaska na veterinarsku kliniku. Što je više vremena

prošlo od nastanka kolika, konji su imali veći stepen endotoksičnog šoka, tim su bile veće promene ispitivanih kliničkih i laboratorijskih parametara. Kako se može videti iz tabele, povišenje srčane frekvencije i hematokrita je osobito bilo izraženo kod konja sa perforacijom zida malog kolona i sa strangulacionim lipomom. Razlog ovoj pojavi je bio vezan za visoki stepen peritonitisa. Povišenje temperature i koncentracije leukocita je bilo nađeno jedino kod konja sa parazitskom tromboembolijom zida malog kolona i invaginacijom malog kolona.

Konji koji su imali patologiju na malom kolonu su pokazivali različiti stepen abdominalnog bola (kolike), što je bilo u direktnoj zavisnosti od same specifične patologije, vremena trajanja samog količnog oboljenja i takođe od ranije primenjivanih analgetičkih preparata pre dolaska na veterinarsku kliniku. Najveći stepen boli su pokazivali konji koji su imali strangulaciju malog kolona pendulirajućim lipomom. Ni kod jednog ispitivanog konja sa patologijom malog kolona nije bio primećen želudačni refluks.

Preduzete su specifične metode lečenja kod različitih patologija malog kolona. Zatvor (opstipacija) malog kolona sa fecesnim masama se u većini slučajeva moglo uspešno lečiti peroralnom primenom laksantivnih preparata (parafinsko ulje i 4% rastvarom natrijum sulfata) i rektalnim ispiranjem (klizmom). Takvom metodom je bilo izlečeno 34 od 49 životinja. U slučaju da se konzervativnim metodama u roku 24-36 časova nije postigao uspeh, sprovodilo se hirurško lečenje u opštoj narkozi. Za vreme medijalne laparotomije izvlačio se mali kolon i sprovodila manuelna masaža dela malog kolona, uz istovremeno rektalno ispiranje sa vodom kroz dugu sondu koja se uvlačila kroz rektum u mali kolon.

Ostale patologije malog kolona su se isključivo lečile hirurškim putem kroz medijalnu laparotomiju. Izabrana hirurška metoda je bila u zavisnosti od specifične patologije malog kolona. Opstrukcija malog kolona sa enterolitima ili drugim stranim telom se lečio putem reza malog kolona na mestu opstrukcije, strogo antimezenterijalno na mestu pružanja poprečne tenije i opreznog izvlačenja enterolita. Posle, rez na malom kolonu se zašivao šavom po Šmidenu i Lembertu. Zatvaranje reza obično se vršilo sintetičkim monofilamentom polidioksanom ili vikrilom (2-0). Pri većim povredama mezenterijuma i tromboembolije zida kolona kod dva konja, vršila se resekcija i anastomoza malog kolona. Kod jednog konja sa visokim stepenom povrede mezenterijuma malog kolona proizašlo je krvarenje i smrt za vreme operativnog procesa.

Pri strangulaciji lipomom malog kolona na početku se vršilo rasecanje dela stabla lipoma što je automatski „oslobodilo“ zahvaćeni deo malog kolona. Kod jednog takvog konja patološki proces nije dugo trajao i kako nije nastala nekroza zida malog kolona, sprovodila se jednostavna manuelna masaža crevnog sadržaja. U drugom slučaju strangulacije lipomom malog kolona kod konja koji je sa kašnjenjem doveden na kliniku utvrđen je visoki stepen ishemične nekroze zida malog kolona. Iz nemogućnosti sprovođenja resekcije izvršena je intraoperativna eutanazija oboljele životinje. Intraoperativno bili su eutanazirani i konji sa perforacijom zida malog kolona i rektuma (4 slučaja), jer su pogođene životinje zbog popadanja fecesa u abdomen imale visoki stepen peritonitisa.

U našem operativnom materijalu bile su dve životinje sa invaginacijom malog kolona. Kod jedne takve životinje desio se prolapsus recti (invaginacio rectalis), kao posledica visokog stepena rascepa mezenterijuma malog kolona. Takva životinja je bila eutanazirana. Kod drugog konja sa invaginacijom malog kolona se uspela intraoperativno manuelno ispraviti invaginacija.

Kod svih konja koji su bili operisani, sprovodila se standardna postoperativna terapija (primenjivanje infuzione terapije, antibiotika, nesteroidnih antiinflamatornih preparata i prokinetika) (Kovač i sar., 2020). Tokom postoperativne hospitalizacije 3 konja su bila eutanazirana ili su uginula zbog septičnog peritonitisa, endotoksemije i adhezivnog ileusa. Druge postoperativne komplikacije kao što su povišenje temperature, prolazna dijareja i infekcija hirurškog reza abdomena su se uspešno lečile. Na taj način, od ukupnog broja konja sa patologijom malog kolona 62 životinje su bili izlečene i bile otpuštene kao zdrave sa klinike (86,1 %).

DISKUSIJA

Zaključno sa današnjim danom opisane su 72 patologije gastrointestinalnog trakta kod konja (Kovač, 2010). Oboljenja malog kolona konja retko se dešavaju, kako po našim ispitivanjima od opšteg broja zabilježenih konja sa kolikama, na mali kolon otpada oko 3,97% svih slučajeva. Najčešće oboljenje malog kolona konja je zatvor (opstipacija) koji može biti izazvan čistim fekalnim masama, a takođe „stranim“ telom, kao npr. intestinalnim konkrementom (kamen) i plastikom (Keller and Horney, 1985). U našem ispitujućem materijalu nismo mogli konstatovali fitobezoare i tumore koji takođe mogu izazvati obstrukciju malog kolona (Dart i sar., 1992). Vrlo često dolazi do konstipacija prvim fecesom novorođenih žrebadi, tkzv. „mekonijum opstipacija“. Faktori koji dovode do opstipacije malog kolona s fecesom kod odraslih konja su različiti: narušavanje inervacije malog kolona, nedovoljni unos vode (zimski period vremena), karies zuba (loše žvakanje sena) i duže vreme bez primenjivanja antiparazitskih preparata (Edwards, 1997).

Opstipacija malog kolona enterolitima je dobro dokumentovani uzrok crevne opstrukcije kod konja. Faktori rizika povezani sa razvojem enterolita uključuju: geografski položaj (najviše se javlja kod konja koji se nalaze na livadama sa visokom koncentracijom peska, kao npr. kod konja u Kaliforniji i Floridi) (Hassel i sar., 1999). Najviše se dešava kod ždrebadi arapske pasmine, koji se hrane senom lucerke i piju vodu sa visokim sadržajem magnezijuma i drugih teških metala (Hassel i sar., 2004). Na osnovu našeg ispitivanja, prognoza hirurškog izlečenja enterolita i drugih formi opstipacije malog kolona konja je dobra (u poređenju sa drugim patologijama tankog intestinuma) u slučaju da se brzo postavi dijagnoza i izvrši na vreme lečenje takvih konja (Kovač i sar., 2015; Kovač i sar., 2018; Kovač i sar., 2019). Na osnovu našeg dugovremenog ispitivanja postoperativni (paralitični) ileus pri patologiji malog kolona se praktično ne deševa kod konja, u poređenju sa patologijama na tankom crevu (Kovač i sar., 2020). Međutim, ako se desila nekroza creva usled dugog stajanja enterolita potrebna je resekcija malog kolona (pored odstranjenja enterolita). U takvom slučaju, prognoza izlečenja se rapidno pogoršava, zbog mogućeg razvoja peritonitisa i ponovne opstrukcije fecesnim masama na mestu nove anastomoze

(Prange i sar., 2010). Iz tog razloga, prilikom postavke anastomoze je važno ne suviše smanjivati poprečni razmer malog kolona.

U našim slučajevima količnih konja relativno često smo nailazili na nekrozu zida malog kolona (tromboemnolična kolika) koja je uzrokovana arteritisom, koji je posljedica migracije larve Strongylus vulgaris (Dart i sar., 1992). Takvi oboljeli konji imaju blage simptome kolika, povećanu temperaturu i leukocitozu i vrlo često se, po našem iskustvu veoma zakašnjelo dovode na kliniku.

Najteže, i vrlo često smrtonosno oboljenje malog kolona su opširne povrede (rascepi) mezenterijuma i osobito potpuni rascep zida malog kolona i rektuma koji dovodi do brzog razvića smrtonosnog peritonitisa. Takva patologija se najčešće dešava pri neopreznom rektalnom ispitivanju količnih konja, tj. izazvane veterinarskom intervencijom.

ZAKLJUČAK

Oboljenja malog kolona retko se dešavaju. Po našim ispitivanjima od opšteg broja privedenih konja na kliniku sa kolikama (1810 životinja), na mali kolon otpada 72 slučaja (3,97%). Najčešće patologije na malom kolonu konja su opstipacija malog kolona praćena sa parazitskom tromboembolijom i perforacijom crevnog zida, rascepljenje mezenterijuma, invaginacija i strangulacija lipomom malog kolona. Bolesti malog kolona konja imaju dobru prognozu izlečenja ako se na vreme postavi dijagnoza i preduzmu pravovremene konzervativne i hirurške metode lečenja.

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Original Scientific Paper

RETROSPECTIVE EXAMINATION OF SMALL COLON PATHOLOGY IN 72 HORSES

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Abstract

The paper retrospectively presents diagnostics, conservative and surgical treatment of various small colon pathologies in 72 horses, which were admitted with abdominal pain (colic) to the Veterinary clinic "Novi Vek" of the Moscow State Academy of Veterinary Medicine and Biotechnology (named Skrabina). Examinations were performed from the year 2007 to 2019, when 1810 colic horses were received and examined, of which 72 horses, i.e. 3.97% of all cases, were diagnosed with a small colon pathology. The most frequent cause of a small colon pathology was constipation that was diagnosed in 49 cases. Out of 72 hospitalized and treated horses, 62 horses, i.e. 86.1%, were successfully cured.
Key words: small colon, horses, constipation, abdominal colic

INTRODUCTION

The small or descending colon of horses (lat. *colon descedens*) represents the final part of the intestinal tract, which in horses reaches a length of 2 meters. The mentioned colon is relatively mobile inside the caudal abdomen and passes into the fixed rectum at the level of the pelvic bones. The small colon of horses has a relatively long mesentery, which, in addition to blood vessels, contains numerous nerve and lymphatic vessels. In this part of the intestinal tract of horses, the final resorption of water occurs and the characteristic structures of the feces are formed (Kovač, 2010).

Diagnosis and treatment of various pathologies of this part of the intestinal tract of horses have been rarely examined (Ruggles and Ross, 1991; Bont et al., 2013). The main diagnostic methods are rectal and ultrasound examination of the horse's abdomen (Freeman et al., 2001; Kovač et al., 2018). When small colon enterolites are suspected, an X-ray examination is used (Yarbrough et al., 1994). The aim of this retrospective study is to determine the frequency of occurrence of small colon pathology in the general population of equine gastrointestinal diseases, to clarify optimal treatment methods, as well as to determine the possible prognosis of cure.

MATERIALS AND METHODS

One thousand eight hundred ten horses with various pathologies of the gastrointestinal tract that showed different degrees of abdominal pain (colic), were admitted to be treated, at the Veterinary clinic "Novi Vek" of the Moscow State Academy of Veterinary Medicine and Biotechnology (named Skrabina). All horses were clinically examined on admission to the clinic, through measurement of heart and respiratory rate, body temperature, and auscultation of peristaltic murmurs. Laboratory testing of blood parameters was performed in all horses: hematocrit, total protein concentration, leukocyte count, and acid-base blood status (pH, hydrocarbonate concentration, the partial pressure of O_2 and CO_2). These blood parameters were tested on a Medicon CA620 (Dublin, Ireland). Besides, all horses underwent rectal and ultrasound examination of the abdomen, as well as gastric sounding. If necessary, where the diagnosis was not clear, other diagnostic procedures were performed, such as abdominocynthesis, laparoscopic examination, and diagnostic laparotomy.

After the diagnosis of colic disease, the method of conservative or surgical treatment was chosen. Three hundred ninety horses were selected for the surgical method of treatment in general inhalation anesthesia, the other horses were treated with conservative methods of treatment.

Statistical analysis clinical and laboratory parameters were performed on the software "Statistics Analysis System (SAS)". Quantitative parameters were compared using the Student's t-test. Qualitative parameters were compared with the Chi-square test. Multivariate logistic regression was used to determine the influence of disease duration on the survival factor of diseased animals.

RESULTS

In seventy-two horses, out of 1810 colic horses, small colon pathology was found (3.97% of all cases). Pathologies included constipation of the small colon with feces (49 cases), constipation of the small colon with plastic (1 case) (figure 1. and 2.) constipation of the small colon with enterolite (4 cases) (figure 3., 4., 5. and 6.), parasitic thromboembolism (necrotic infarction) of the small colon wall (6 cases) (figure 7. and 8.), cleft mesentery of the small colon (4 cases), trauma (perforation) of the small colon wall after foaling or rectal examination (4 cases), invagination of the small colon (2 cases) and lipoma strangulation (2 cases). Multiple pathologies on a small colon (such as constipation with mesenteric injury) was found in 8 horses. Chemical analysis of the composition of enteroliths (by IR spectrometry), done in one horse in which such a test was performed, showed that it was formed on 80% of struvite (MgNH4PO4. 6H2O) and on 20% of carbonate apatite (Ca10 (PO4) CO3CH) 6 (OH) 2.

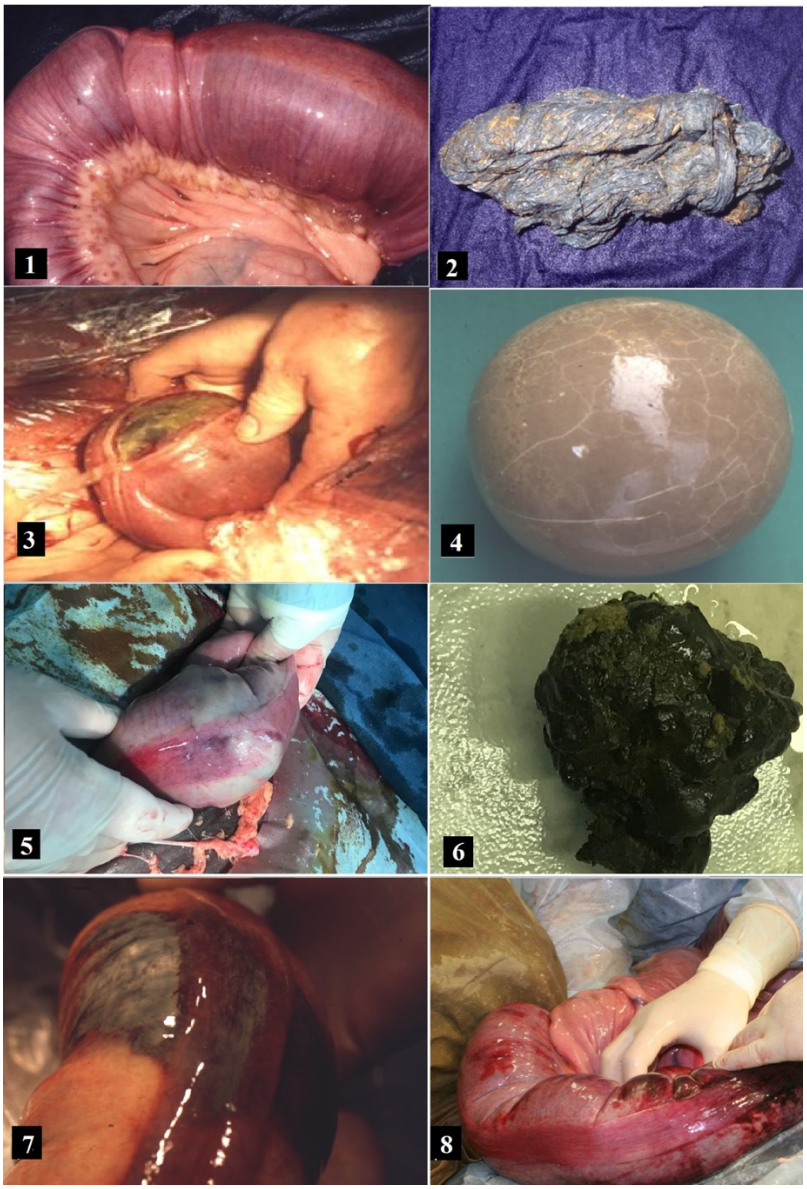

Figure 1-8. Intraoperative small colon pathologies in horses
Figure 1. and 2. – Small colon constipation with plastic
Figure 3., 4., 5. and 6. – Small colon constipation with plastic with enteroliths
Figure 7. and 8. – Tromboembolic changes (necrosis) of the small colon wall

The dependence of a small colon pathology on animal gender was not determined. Younger Oryol or Arabian horses (as well as other miniature breeds of horses) suffer from small colon constipation more often than other horses. Especially newborn foals often had small colon constipation in the form of meconium constipation (18 animals).

Table 1. presents the data of clinical and laboratory blood tests at the time of admission of horses to the veterinary clinic before they were treated.

Table 1. Clinical and blood laboratory parameters in horses with small colon disease

Pathology	Heart rate (beats/min)	Temperature (°C)	Plasma proteins (g/l)	Hematocrit (l/l)	Leucocyte concentration (10^9/l)	Bicarbonate concentration (mmol/l)
Small colon constipation with feces (n=51)	58.43 ± 5.67	37.12 ± 0.28	69.56 ±7.23	0.42 ±0.03	5.61 ±2.06	25.18 ±3.97
Small colon constipation with enterolith (n=3)	54.43 ± 3.17	37.91 ±0.38	72.16 ±5.73	0.44 ±0.02	6.92 ±4.14	23.16 ±4.03
Parasitic thromboembolism of the small colon wall (n=6)	43.14 ± 5.40	38.95 ± 0.51	58.34 ±8.17	0.46 ±0.05	10.40 ±0.75	25.07 ±7.62
Injury of the mesentery of the small colon (n=4)	44.92 ± 5.32	37.29 ± 0.25	66.34 ±12.40	0.30 ±0.04	5.37 ±1.02	27.79 ±6.35
Perforation of the wall of the small colon and rectum (n=4)	94.91 ±12.25	38.54 ± 0.55	42.12 ±11.34	0.62 ±0.05	4.80 ±0.64	19.68 ±3.20
Small colon intussusception (n=2)	66.42 ±16.38	38.53 ±0.53	78.48 ±10.50	0.46 ±0.04	9.97 ±2.50	27.06 ±6.52
Strangulation of small colon lipoma (n=2)	80.44 ±10.36	38.02 ± 0.45	54.32 ±9.80	0.54 ±0.01	9.31 ±2.65	21.09 ±6.30

Clinical and blood laboratory parameters results depended on the specific pathology and especially on the time between the onset of the disease and the arrival at the veterinary clinic. If more time elapsed since the onset of colic, horses had a higher degree of endotoxic

shock, and thus the greater changes in the examined clinical and laboratory parameters were observed. As can be seen from the table, the increase in heart rate and hematocrit was particularly pronounced in horses with perforation of the wall of the small colon and with strangulation lipoma. The reason for this phenomenon was related to the high degree of peritonitis. Leukocyte concentration evaluation and higher temperature were found only in horses with parasitic thromboembolism of the small colon wall and intussusception of the small colon.

Horses that had a small colon pathology showed different degrees of abdominal pain (colic), which was directly dependent on the specific pathology, the duration of the colic disease, and also on previously used analgesic preparations before admission to the veterinary clinic. The greatest degree of pain was shown by horses that had small colon strangulation with pendulating lipoma. Gastric reflux was not observed in any of the examined horses with small colon pathology.

Specific treatment methods have been undertaken for various small colon pathologies. Small colon constipation with fecal masses could in most cases be successfully treated by oral administration of laxative preparations (paraffin oil and 4% sodium sulfate solution) and rectal lavage (enema). This method cured 34 of the 49 animals. In case the conservative methods did not succeed within 24-36 hours, surgical treatment was performed under general anesthesia. During the medial laparotomy, a small colon was extracted and a manual massage of a part of the small colon was performed, with simultaneous rectal rinsing with water through a long probe that was inserted through the rectum into the small colon.

Other pathologies of the small colon were treated exclusively by surgery through medial laparotomy. The chosen surgical method depended on the specific pathology of the small colon. Obstruction of the small colon with enteroliths or other foreign bodies was treated by the incision of the small colon at the site of obstruction, strictly antimesenteric at the site of transverse tenion followed by careful extraction of enterolith. Afterward, the incision on the small colon was sutured using Schmiden and Lembert pattern. The closure was usually performed with a synthetic monofilament polydioxanone or vicryl (2-0). In case of major injuries of the mesentery and thromboembolism of the colon wall in two horses, resection and anastomosis of the small colon were performed. One horse with a high degree of injury of the mesentery of the small colon suffered bleeding and died during the operative process.

During the strangulation of the small colon strangulation by the lipoma, at the beginning, a part of the lipoma tree was dissected, which automatically "released" the affected part of the small colon. In one such horse, the pathological process did not last long, and as necrosis of the wall of the small colon did not occur, a simple manual massage of the intestinal contents was performed. In the second case of small colon strangulation by lipoma in a horse that was admitted to the clinic with a delay, a high degree of ischemic necrosis of the small colon wall was found. Due to the impossibility of resection,

intraoperative euthanasia of the diseased animal was performed. Horses with perforation of the wall of the small colon and rectum were also euthanized intraoperatively (4 cases), because the affected animals had a high degree of peritonitis due to feces falling into the abdomen.

In our material for surgery, there were two animals with small colon invagination. In one such animal, rectal prolapse (invaginatio rectalis) occurred as a consequence of a high degree of cleft in the mesentery of the small colon, and animal was euthanized. In another horse with intussusception, a small colon intussusception was able to be manually corrected intraoperatively.

All postoperative horses underwent standard postoperative therapy (infusion therapy, antibiotics, nonsteroidal anti-inflammatory drugs, and prokinetics) (Kovač et al., 2020). During postoperative hospitalization, 3 horses were euthanized or died due to septic peritonitis, endotoxemia, and adhesive ileus. Other postoperative complications such as fever, transient diarrhea, and the infection of the surgical incision of the abdominal have been successfully treated. Thus, out of the total number of horses with small colon pathology, 62 animals were cured and discharged as healthy from the clinic (86.1%).

DISCUSSION

Until today, 72 pathologies of the gastrointestinal tract in horses have been described (Kovač, 2010). Small colon diseases of horses rarely occur, as according to our research out of the total number of recorded horses with colic, the small colon pathology accounts for about 3.97% of all cases. The most common disease of the small colon is constipation, which can be caused by pure fecal masses, as well as a "foreign" body, such as intestinal concretions (stones) and plastics (Keller and Horney, 1985). In our examined material, we could not find phytobezoars and tumors that can also cause small colon obstruction (Dart et al., 1992). Very often, constipation occurs in the first feces of newborn foals, the so-called "meconium constipation". Factors that lead to constipation of the small colon with feces in adult horses are different: impaired innervation of the small colon, insufficient water intake (winter), tooth caries (poor chewing of hay), and prolonged use of antiparasitic drugs (Edwards, 1997).

The small colon constipation with enteroliths is a well-documented cause of intestinal obstruction in horses. Risk factors associated with the development of enteroliths include geographical location (most common in horses grazing in meadows with a high abundance of sand, such as horses in California and Florida) (Hassel et al., 1999). It occurs most often in foals of the Arabian breed, which are fed with by alfalfa hay and drink water with a high content of magnesium and other heavy metals (Hassel et al., 2004). Based on our examination, the prognosis of surgical cure of enteroliths and other forms of small colon constipation in horses is good (compared to other small intestine pathologies) in case of rapid diagnosis and timely treatment of such horses (Kovač et al., 2015; Kovač et al., 2018; Kovač et al., 2019). Based on our long-term examination, postoperative (paralytic) ileus in

the small colon pathology practically does not occur in horses, compared to small intestine pathologies (Kovač et al., 2020). However, if intestinal necrosis has occurred due to the prolonged presence of enteroliths, small colon resection is required (in addition to removal of enteroliths). In such a case, the prognosis of healing deteriorates rapidly, due to the possible development of peritonitis and re-obstruction by fecal masses at the site of the new anastomosis (Prange et al., 2010). For that reason, when setting up an anastomosis, it is important not to reduce the transverse size of the small colon too much.

In our cases of colic horses, necrosis of the small colon wall (thromboembolic colic) caused by arthritis was relatively often detected, as a result of the larva *Strongylus vulgaris* migration (Dart et al., 1992). Such diseased horses have mild symptoms of colic, fever and leukocytosis, and very often, according to our experience, are brought to the clinic very late.

The most severe, and very often a deadly disease of the small colon is extensive injuries (splits) of the mesentery and especially a complete rupture of the wall of the small colon and rectum, which leads to the rapid development of deadly peritonitis. Usually, such pathology occurs during the careless rectal examination of colic horses, i.e. is caused by the veterinary intervention.

CONCLUSION

According to our examinations, small colon diseases rarely occur, since, out of the total number of horses brought to the clinic with colic (1810 animals) the small colon diseases accounted for 72 cases (3.97%). The most common small colon pathologies in horses are small colon constipations combined with parasitic thromboembolism and perforation of the intestinal wall, cleavage of the mesentery, intussusception, and strangulation of small colon lipoma. Small colon diseases in horses have a good prognosis if they are diagnosed in time and timely conservative and surgical methods of treatment are undertaken.

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