Title

Sinusitis associated with nasogastric intubation in 3 horses.

Journal

Canadian Veterinary Journal, 55(6)

ISSN

0008-5286

Authors

Nieto, Jorge E
Yamout, Sawsan
Dechant, Julie E

Publication Date

2014-06-01

Peer reviewed

Case Report Rapport de cas

Sinusitis associated with nasogastric intubation in 3 horses

Jorge E. Nieto, Sawsan Yamout, Julie E. Dechant

Abstract — Sinusitis has not been reported as a complication of long-term nasogastric intubation in horses. We describe 3 horses that developed nosocomial sinusitis following abdominal surgery with associated perioperative nasogastric intubation. Sinusitis was suspected by the presence of malodorous discharge and confirmed by percussion, upper airway endoscopy, radiographs (n = 3), and bacterial culture (n = 1).

Résumé — Sinusite associée à l'intubation naso-gastrique chez 3 chevaux. La sinusite n'a a pas été signalée comme une complication de l'intubation naso-gastrique à long terme chez les chevaux. Nous décrivons 3 chevaux qui ont développé une sinusite nosocomiale après une chirurgie abdominale utilisant une intubation naso-gastrique péri-opératoire connexe. La sinusite a été suspectée en observant la présence d'un écoulement malodorant et confirmée par percussion, endoscopie des voies respiratoires supérieures, radiographies (n = 3) et culture bactérienne (n = 1).

(Traduit par Isabelle Vallières)

Can Vet J 2014;55:554–558

Equine sinus disease is an uncommon problem that may be primary (acute or chronic) or secondary to dental disease, sinus cyst, trauma, mycosis, neoplasia, or ethmoidal hematomas (1). In human patients sinusitis as a consequence of long-term nasogastric intubation is well-documented (2–5). A recent retrospective study from a human pediatric intensive care unit showed that patients with a tube (nasogastric, nasotracheal, orogastric or orotracheal) who developed fever were at higher risk of developing sinusitis irrespective of tube location (6). Acute bilateral sinusitis was reported in 2 horses after prolonged nasoesophageal intubation to perform a transesophageal echocardiography (7), but, to our knowledge, there are no case reports of horses developing sinusitis as a postoperative complication of colic treatment. We present 3 cases of horses that developed postoperative fever and nasal discharge and were diagnosed and treated for sinusitis.

Case descriptions

Horse 1

A 400-kg 4-year-old Morgan stallion was presented to the William R. Pritchard Veterinary Medical Teaching Hospital (WPVMT) for evaluation and treatment of cecal impaction. The horse developed signs of colic 2 d after an elective arthroscopy. The referring veterinarian treated the horse with flunixin meglumine and oral fluids and mineral oil via nasogastric intubation; however, due to continuous pain, the horse was referred for possible surgery. On admission, palpation per rectum confirmed a fluid and feed-filled cecum that crossed the mid-abdomen. Complete blood (cell) count (CBC) and serum biochemistry values were within reference ranges. A nasogastric tube was passed and 0.5 kg of magnesium sulfate in 4 L of water was administered after which the tube was removed. Continuous intravenous fluid therapy was instituted. Four hours after admission, the stallion showed signs of discomfort. A nasogastric tube was reinserted in the right nostril and 3 L of reflux were obtained. The nasogastric tube was left in place. The horse was sedated but remained uncomfortable. Based on the rectal examination findings and continuous abdominal pain non-responsive to analgesics, an exploratory laparotomy was performed. It is a policy of the hospital to place a nasogastric tube in all horses with colic that require abdominal surgery. Horses are anesthetized with the tube in place, the tube is maintained throughout the surgery and it is withdrawn before transporting the horse to the recovery room. Preoperative medication included flunixin meglumine (Banamine; Merck Animal Health, Summit, New Jersey, USA), 1 mg/kg body weight (BW), IV, penicillin G potassium (Pfizerpen; Pfizer, New York, USA), 22 000 U/kg, q6h, IV and gentamicin (Gentamicin sulfate; VetOne, Veterinary Supply, Bose, Idaho, USA), 6.6 mg/kg BW, q24h, IV. Exploration of the abdomen revealed a severely distended cecum with gas, fluid, and feed. A typhlotomy and a complete cecal bypass by ileal transection and jejunocolostomy were performed as described (8). At the end of surgery, and before transferring the horse to the recovery stall, the nasogastric tube was removed, producing

Department of Surgical and Radiological Sciences and the William R. Pritchard Veterinary Medical Teaching Hospital, School of Veterinary Medicine, University of California, Davis, California, USA.

Address all correspondence to Dr. Jorge E. Nieto; e-mail: jenieto@ucdavis.edu

significant bleeding. The right nasal cavity was sprayed with phenylephrine and packed with gauze. The gauze was sutured to the nostril and removed 8 h after recovery from anesthesia. Penicillin G potassium and gentamicin were administered for the first 3 and 6 d after surgery, respectively.

The horse developed a fever (38.7°C to 39.1°C) within 12 h after surgery. The horse passed normal feces soon after surgery, but the feces became watery 48 h after surgery. Penicillin G potassium was discontinued on day 3 due to the developing diarrhea, continuing intermittent spikes of fever, and possible antibiotic-induced colitis; however, gentamicin was continued until the horse was discharged from the hospital. The stallion developed signs of bilateral mucoid nasal discharge 36 h after surgery. A CBC at that time revealed leucopenia [3290/μL; reference range (RR): 4500 to 14 000/μL] with a normal differential cell count and normal fibrinogen (8.8 μmol/L; RR: 2.9 to 11.8 μmol/L). The horse continued to have bilateral nasal discharge that had become mucopurulent by day 5 and was worse on the right side. Throughout hospitalization, the stallion continued to intermittently spike fevers (38.9°C to 39.4°C). Daily thoracic auscultation in addition to rebreathing bag auscultations on days 3 and 5 revealed no abnormalities. A presumptive diagnosis of sinusitis was made on day 5 after sinus percussion.

Radiographs of the upper and lower respiratory tract taken on day 5 showed bilateral fluid lines in the conchofrontal and caudal maxillary sinuses. Thoracic and guttural pouch radiographs were unremarkable. Nasal endoscopy showed purulent material coming from left and right sino-nasal ostia (Figure 1). On day 6, both caudal maxillary sinuses were trephined, samples were collected for aerobic and anaerobic bacterial culture and sensitivity, and each sinus was flushed with 500 mL of sterile saline solution (0.9% NaCl). A large number of Gram-negative rods and a moderate number of Gram-positive cocci and rods were observed by direct smear. Cultures identified large numbers of *Streptococcus equi* subsp. *zooepidemicus* and small numbers of *Enterobacter cloacae.* Anaerobic cultures identified large numbers of *Fusobacterium necrophorum.*

On day 6, the horse developed incisional discharge and an abdominal bandage was applied to cover the incision. A Foley catheter was placed into each sinus and lavages continued twice a day until the patient was discharged on day 7. At the time of discharge, the horse had a rectal temperature of 39.4°C but was bright, alert, and passing normal feces. Daily fecal cultures during hospitalization were negative for *Clostridium difficile* and *Salmonella* spp. Purulent nasal discharge was still present bilaterally. The owner was instructed to flush the sinuses with saline and to clean the abdominal incision with dilute chlorhexidine twice a day. The stallion was prescribed oral chloramphenicol (Viceton; Osborn, Brooklyn Heights, Ohio, USA), 25 mg/kg BW, q8h and flunixin meglumine (Merck Animal Health). 0.6 mg/kg BW, q12h at the time of discharge. The horse continued to have fevers after discharge from the hospital. Antibacterial sensitivity results of both sinuses and abdominal incision cultures indicated highly resistant enterococcus organisms, only intermediately sensitive to chloramphenicol. Other bacteria cultured from the sinus were resistant to chloramphenicol but sensitive to ceftiofur and ceftizoxime. Three days postdischarge, oral chloramphenicol was increased (50 mg/kg BW, q8h) and 500 mg of ceftiofur (Escenel RTU; Pfizer) diluted in 20 mL of saline were infused after flushing the sinuses. The stallion's temperature was finally within normal limits 7 d after discharge. Bilateral nasal and abdominal incision discharge resolved 9 and 15 d after discharge, respectively. A CBC on day 9 revealed leucopenia (3790/μL) and hyperfibrinogemia (17.6 μmol/L) by day 15. Oral chloramphenicol was discontinued 19 d after discharge. The horse developed an abdominal hernia that was repaired with a mesh herniorrhaphy 3 mo after abdominal surgery. The horse was subsequently followed for a 10-year period with no recurrence of sinusitis observed.

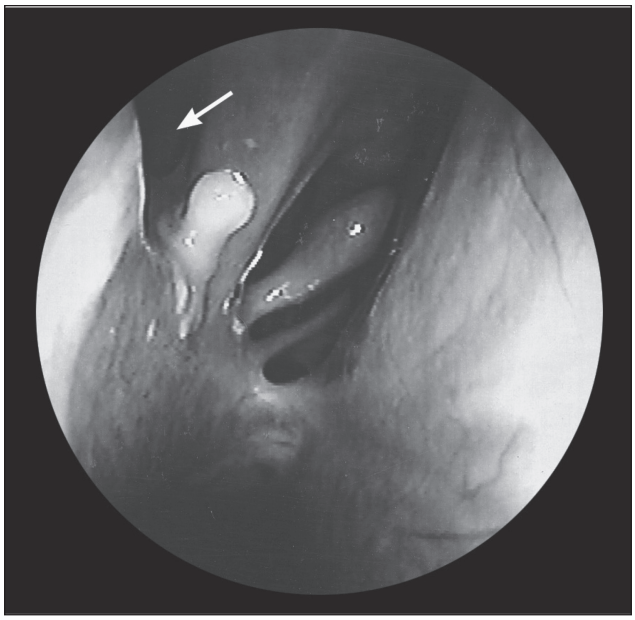

Figure 1. Endoscopy of the right nasal cavity of a horse showing purulent discharge coming from the nasomaxillary opening (arrow).

Horse 2

A 550-kg, 16-year-old Anglo Arab mare was evaluated for colic, treated with nasogastric intubation and analgesics by the referral veterinarian, and referred to the WMVMTH. On admission, the horse was in pain and palpation per rectum identified distended loops of small intestine. The stomach was intubated through the right nostril, no net gastric reflux was obtained, and the tube was secured in place. Abdominal ultrasound confirmed distended non-motile thickened loops of small intestine. Based on the physical examination and laboratory results it was decided to perform a ventral midline celiotomy. The horse was premedicated with flunixin meglumine (Merck Animal Health), 1 mg/kg BW, IV, gentamicin (VetOne), 6.6 mg/kg BW, q24h, IV, and procaine penicillin G (22 000 IU/kg; q12h, IM). Exploration of the abdomen identified 1.5 m of small intestine strangulated through a rent in the gastrosplenic ligament. The strangulated segment was resected and an end-to-end jejunojejunostomy performed. During surgery, the horse had copious amounts of gastric reflux coming out and around the nasogastric

tube. At the end of surgery, the nasogastric tube was removed and the horse transported to the recovery stall.

A nasogastric tube was placed in the recovery stall as soon as the horse recovered from anesthesia and the tube was maintained in place. The mare refluxed an average of 58 L/day during the first 4 d. On day 3, the nasogastric tube was withdrawn to challenge the mare but replaced 4 h later due to signs of abdominal pain; it was maintained due to persistent reflux.

The horse had episodes of fever (38.9°C to 39.6°C) for the first 3 d after surgery. The mare was noted to cough at 12 h after surgery but auscultation of the lungs and trachea was unremarkable. At 24 h after surgery, the horse had increased bronchovesicular sound and a thoracic ultrasound was performed. The ultrasound showed bilateral cranioventral areas of lung with irregular borders, comet tails, and a small amount of fluid accumulation. A CBC 24 h after surgery showed leucopenia (1660/μL) and hyperfibrinogenemia (14.7 μmol/L). On day 3, discharge was observed from the right nostril. Repeat thoracic ultrasonography and lung auscultation were within normal limits on day 4. On day 5, the mare had a second ventral celiotomy performed due to persistent reflux and an obtunded attitude. Adhesions proximal to the anastomosis site were transected and an adhesion membrane (Seprafilm®; Genzyme Biosurgery, Cambridge, Massachussets, USA) was placed locally on the inflamed serosa. The site of anastomosis was intact and functional. The nasogastric tube was again removed for recovery.

The horse recovered from anesthesia and a nasogastric tube was placed through the right nostril 4 h after recovery to check for reflux. Due to an increase in reflux, the nasogastric tube was maintained. The amount of reflux started to decrease by 24 h and the tube was removed 36 h after the second surgery. The horse developed bilateral malodorous thick mucous nasal discharge the day after the second surgery; a CBC at the time had normal leukocyte count (7800/μL) with persistent hyperfibrinogenemia (14.7 μmol/L). Daily thoracic auscultations after the second surgery were within normal limits. Antibiotics (procaine penicillin G and gentamicin) were administered to the horse for the 9 days of hospitalization.

The horse continued to have mucopurulent right nasal discharge. On day 9, radiographs and endoscopy showed fluid lines in the right rostral and caudal maxillary sinus (Figure 2) and purulent material coming from the nasomaxillary opening, consistent with sinusitis. The owner was given the option to treat the mare with antibiotics or trephine the sinus and treat by sinus lavages. The owner opted for the former and the mare was discharged on doxycycline (Doxycycline hyclate; Actavis Pharma, Parsippany, New Jersey, USA), 10 mg/kg BW, PO, q12h for 2 wk. Two months following discharge, telephone communication with the owner and referring veterinarian indicated that the clinical signs of sinusitis had resolved and had not returned following medical treatment.

Horse 3

An 800-kg, 6-year-old Percheron gelding was referred to the WPVMT for evaluation of abdominal pain. Prior to admission, the gelding had been treated by the referring veterinarian with nasogastric intubation and systemic analgesics. Upon admission

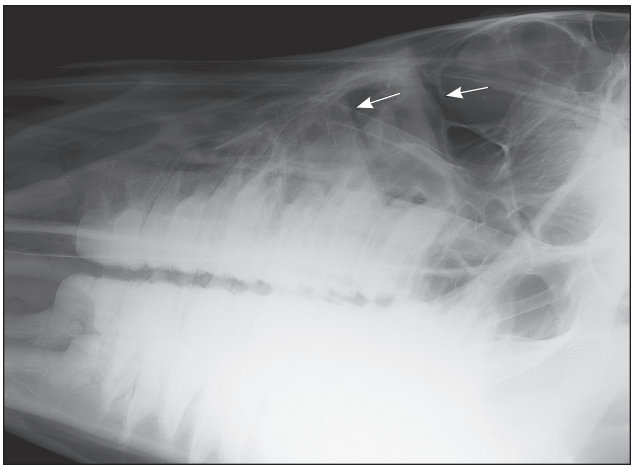

Figure 2. Lateral radiograph showing soft tissue/fluid density lines (arrows) on the right rostral and caudal maxillary sinuses, consistent with sinusitis.

the horse was violently in pain so a nasogastric tube was immediately inserted into the right nostril and the horse taken to surgery for an exploratory celiotomy. The horse was premedicated as described for horse 2. At surgery a 360° large colon volvulus was diagnosed and corrected, no colon resection was performed. Reflux was noted to pass around the nasogastric tube while the horse was anesthetized. At the end of the surgery, the nasogastric tube was removed and the horse recovered uneventfully from general anesthesia. A nasogastric tube was inserted as soon as the horse was placed in the intensive care unit; no reflux was obtained and the nasogastric tube was removed.

The horse was maintained on IV crystalloid fluids and antibiotics for 4 and 3 d, respectively. The horse developed fever (39.2°C) 12 h after surgery that lasted for 8 h. The day after surgery, auscultation of the lungs was unremarkable; the horse had normal rectal temperature, and was bright and alert. A CBC 24 h after surgery showed neutropenia (3080/μL) with moderate toxic bands (1016/μL) and leukopenia (1109/μL). On day 4 the horse stopped passing feces; a nasogastric tube was inserted to administer mineral oil, after which the tube was removed. The horse resumed passage of a significant amount of feces the following day.

On day 6, malodorous discharge from the right nostril and a peak rectal temperature of 38.6°C prior to flunixin meglumine administration were noted. Radiographs of the thorax were unremarkable. A transtracheal wash showed no signs of infection. Percussion revealed a dull sound over the maxillary sinus. Endoscopy of the upper airway indicated moderate inflammation and mucopurulent discharge flowing from the right side sino-nasal ostium into the middle meatus. Skull radiographs were obtained and fluid accumulation was observed in the right dorsal conchal, rostral and caudal maxillary, and left caudal maxillary sinuses. The horse was discharged the following day on a 2-week course of trimethoprim sulfamethoxazole (Sulfamethazole and trimethoprim tablets; Qualitest Pharmaceuticals, Huntsville, Alabama, USA), 30 mg/kg BW, PO for 2 wk. The owner indicated by telephone 2 wk after discharge that the sinusitis had responded to the medical treatment.

Discussion

Nasogastric tubes are passed frequently to allow proper administration of water, electrolytes, or laxative agents in horses with colic. Horses may also have long-term indwelling nasogastric tubes to allow removal of gastrointestinal fluid in cases of postoperative ileus. At our hospital, a nasogastric tube is always present during surgery to prevent gastric rupture. We have observed the presence of gastric reflux flowing around the stomach tube in some horses while anesthetized in dorsal recumbency, most likely due to obstruction of the tube with feed material and/or relaxation of the cardia in the presence of a full stomach. The nasogastric tube is removed prior to transporting the horse to a recovery room. The gastrointestinal reflux in the nasal cavity while the horse is in dorsal recumbency may contaminate the sinuses by gravity through the nasomaxillary opening. In addition, removal of the nasogastric tube prior to recovery may predispose the horse to sinusitis, as feed material may be deposited in the nasal cavity as the tube is pulled out while the horse is in dorsal or lateral recumbency. The presence of an indwelling nasogastric tube for long periods of time or repeatedly over time may produce acute nasal inflammation leading to restricted sinonasal drainage that allows bacterial colonization.

In humans, nosocomial sinusitis associated with fever is a common complication after long-term nasoenteric (2,9,10) or nasotracheal (3,4,10) intubation. However, orotracheal intubation has decreased the incidence of nosocomial sinusitis in adult humans significantly (2). The suggested pathogenesis of sinusitis after nasal intubation is edema of the nasal mucosa due to irritation by the tube in the nasal cavity (6). In addition, nasogastric tubes may induce mechanical obstruction of sinus ostia and impair drainage, facilitating colonization of bacteria (11). Furthermore, duration of intubation correlates with the frequency of sinusitis; 0.3% after short-term intubation (< 5 d) and 40% after long-term intubation (5).

In horses anamnesis and physical examination findings provide a high index of suspicion of sinusitis. The most common modalities for a definitive diagnosis of sinusitis are radiography and detection of exudate through the sinonasal ostia by endoscopy. Causes of sinusitis can be difficult to identify with plain radiographs. Diseased teeth as a cause of sinusitis may be missed with survey radiographs if the changes are subtle; in those situations additional diagnostics such as CT could assist in a more thorough assessment of any bony changes (12). In humans, the prevalence of nosocomial sinusitis after nasoenteric intubation is affected by the method of diagnosis: aspiration and culture from affected sinuses (11% to 13%) (2), radiography alone (25%) (2), or computed tomography (100%) (3). We confirmed the diagnosis of septic sinusitis with bacterial cultures in only 1 horse. The other 2 horses were diagnosed based on the presence of purulent discharge at the sinonasal ostia, fever, sinus percussion, upper airway endoscopy, and radiographs. Bacterial culture and sensitivity could have aided in the treatment by specific antibiotic selection in these horses.

Fevers have been reported within 3 d after intubation of human patients in intensive care (3). All horses in this report had fever and nasal discharge. One horse also had an incisional infection and another had a short-term lower respiratory problem (that had resolved by the time she developed the purulent nasal discharge) that could have contributed to or caused the fever. Furthermore, all 3 horses showed postsurgical leucopenia indicating a temporary state of immunosuppression, which could have decreased the resistance of the nasal mucosa to bacterial contamination. Factors that may have predisposed the horses in this report to develop sinusitis included the presence of reflux around the nasogastric tube, bleeding and packing the nasal passage, repetitive and extensive periods of nasogastric intubation, and the use of contaminated tubes. The nasogastric tubes used at our institution are sterilized before use; however, the referring veterinarians had intubated the horses before referral. If gastrointestinal reflux is observed around the nasogastric tube during general anesthesia, it may be beneficial to flush the nasal passages with saline, once the horse recovers from anesthesia. It is also recommended that clean and disinfected nasogastric tubes be used and that the time the nasogastric tube is left in place be limited. While conservative treatment or sinus lavage may resolve many cases of primary sinusitis in horses, the presence of inspissated pus may require sinusotomy for resolution of the problem (13,14). Therefore aggressive early therapy is recommended in cases of nosocomial sinusitis after nasogastric intubation in horses.

Although we reported only 3 horses that developed sinusitis after abdominal surgery, this number may be higher since nasal discharge is often observed after continuous or repetitive nasogastric intubation. Sinusitis should be included in the differential diagnosis of horses that have been treated with nasogastric intubation when purulent nasal discharge and/or fever of unknown origin are present. Studies investigating risk factors associated with the development of sinusitis in horses after nasogastric intubation are warranted. CVJ

References

1. Dixon PM, Parkin TD, Collins N, et al. Historical and clinical features of 200 cases of equine sinus disease. Vet Rec 2011;169:439.
2. George DL, Falk PS, Umberto Meduri G, et al. Nosocomial sinusitis in patients in the medical intensive care unit: A prospective epidemiological study. Clin Infect Dis 1998;27:463–470.
3. Hansen M, Poulsen MR, Bendixen DK, Hartmann-Andersen F. Incidence of sinusitis in patients with nasotracheal intubation. Br J Anaesth 1988;61:231–232.
4. Michelson A, Kamp HD, Schuster B. Sinusitis in long-term intubated, intensive care patients: Nasal versus oral intubation. Anaesthesist 1991; 40:100–104.
5. Pedersen J, Schurizek BA, Melsen NC, Juhl B. Sinusitis caused by nasotracheal intubation. Ugeskr Laeger 1990;152:379–381.
6. Moore BM, Blumberg K, Laguna TA, Liu M, Zielinski EE, Kurachek SC. Incidental sinusitis in a pediatric intensive care unit. Pediatr Crit Care Med 2012;13:e64–68.
7. Tremaine WH, Dixon PM. A long-term study of 277 cases of equine sinonasal disease. Part 1: Details of horses, historical, clinical and ancillary diagnostic findings. Equine Vet J 2001;33:274–282.
8. Craig DR, Pankowski RL, Car BD, Hackett RP, Erb HN. Ileocolostomy. A technique for surgical management of equine cecal impaction. Vet Surg 1987;16:451–455.
9. Baskin WN. Acute complications associated with bedside placement of feeding tubes. Nutr Clin Pract 2006;21:40–55.
10. Desmond P, Raman R, Idikula J. Effect of nasogastric tubes on the nose and maxillary sinus. Crit Care Med 1991;19:509–511.
11. Le Moal G, Lemerre D, Grollier G, Desmont C, Klossek JM, Robert R. Nosocomial sinusitis with isolation of anaerobic bacteria in ICU patients. Intensive Care Med 1999;25:1066–1071.

12. Gerard MP, Wotman KL, Komaromy AM. Infections of the head and ocular structures in the horse. Vet Clin North Am Equine Pract 2006; 22:591–631, x–xi.
13. Dixon PM, Parkin TD, Collins N, et al. Equine paranasal sinus disease: A long-term study of 200 cases (1997–2009): Treatments and long-term results of treatments. Equine Vet J 2012;44:272–276.
14. Schumacher J, Honnas C, Smith B. Paranasal sinusitis complicated by inspissated exudate in the ventral conchal sinus. Vet Surg 1987;16: 373–377.