NASOGASTRIC INTUBATION

Procedure
Nasogastric intubation is an essential and possibly life-saving procedure performed in cases of equine colic. For this you will need a tube, a pump and 2 buckets. The horse should be adequately restrained, with a twitch and sedation if needed. The clinician should stand on the side of the horse, with the hand closest to the horse placed on the nose, with the thumb in the nostril. The other had is used to pass the tube in the ventral meatus, using the thumb to keep it directed correctly. If a hard structure is encountered it is the ethmoidal area, and the tube should be redirected more ventrally. Once the pharynx is reached, a soft resistance is felt. The tube can be turned 180-degrees, so it’s curvature is directed dorsally. The horse is stimulated to swallow by gentle to-and-fro movement, or by blowing in the tube. It is helpful to keep the horse’s head flexed at the pole. Once the horse swallows, the tube is pushed in the esophagus. It is helpful to blow into the tube to dilate the esophagus and facilitate insertion. If the horse coughs, the tube is withdrawn and the procedure repeated until it is correctly positioned. There are three ways to indicate that the tube is correctly placed in the esophagus: gentle suction should elicit a negative pressure, shaking of the trachea should not elicit a rattle, or seeing it go down the esophagus. Direct observation is the safest method. The tube is advanced until it is in the stomach (14th rib). If difficulty is encountered in passing the cardia, 60 ml of mepivacaine can be injected into the tube. Once in place, if there is no spontaneous reflux, the horse must be refluxed. Medication should never be administered by nasogastric tube to a horse with colic without checking first for reflux. For this, the tube is filled with water using a pump, and the end of the tube is then directed downwards to verify for presence of gastric contents. It is useful to subtract the amount pumped in from the amount obtained, to get “net” reflux. The tube is removed by first occluding it (thumb on the end, or folding it) to prevent its contents from spilling out in the pharynx and possibly the trachea as it is withdrawn. Gentle traction is then applied in a direction parallel to the nose. If bleeding is encountered, a towel can be placed over the horses nose. The bleeding, even if severe, is self-limiting.

Interpretation
Nasogastric reflux is not normal. Occasionally a small amount of reflux (1 liter or less) is obtained if a horse had had a tube in place for a long time. When reflux is obtained, the amount, character and timing in relationship to the onset of colic is noted. In addition, the response to gastric decompression should be noted.

Typically, reflux refers to small intestinal ileus, either functional or mechanical. Lesions of the proximal small intestine produce large amounts of reflux early in relationship to the onset of the colic. With lesions of the distal small intestine (ileum) initially no reflux is obtained, and as the condition persists, reflux is obtained but usually several hours after the onset of the colic. Occasionally, large colon disease can be associated with reflux, if the colonic distention exerts pressure on the duodenum as it curves over the base of the cecum. Foul-smelling, fermented, or bloody, copious reflux is associated with anterior enteritis. With intestinal obstruction, the reflux is usually composed of fresh feed material and intestinal secretions. Reflux originating from the small intestine will be alkaline whereas reflux composed of gastric secretions will be acid. Since outflow obstruction is rare in horses, measurement of pH is usually not performed.

Response to gastric decompression is important information. Horses with functional ileus will show relief of pain, and the heart rate will decrease in response to decompression. Horses with a mechanical obstruction usually will remain painful, although some horses will also respond. The rest of the examination must then be considered, in deciding whether functional or mechanical ileus is present. The amount of reflux obtained should be noted, as this factors in to ongoing losses and the volume of fluids given intravenously will need to be adjusted accordingly. Horses with functional ileus will need gastric decompression usually every 4 hours, although if severe, every 2 hours may be required.

The nasogastric tube should be left in place only as long as required, as some horses will develop pharyngeal and laryngeal irritation associated with its presence. [Hardy, 1992 #1] These horses will then be painful when swallowing, when feeding is resumed.
ABDOMINOCENTESIS

This procedure is important in the evaluation of abdominal disease, whether it is colic, weight loss, or post-operative problems.

Procedure

Materials needed
18g 1.5” needle,
Teat canula,
Bitch catheter
Dialysis catheter
Sterile gloves
EDTA and culture tubes

Method

A 2x2” area is clipped and prepped approximately 3-cm caudal to the xyphoid, and 1-2 cm to the right of midline. With sterile gloved hands, an 18-g needle is inserted through the skin, and gently advanced into the abdomen. If fluid is not obtained, another needle can be inserted next to the first one. If no fluid is obtained, a bitch catheter, canula, or dialysis catheter can be tried. It can be difficult to obtain fluid from very dehydrated horses.

To insert a teat canula, bitch catheter or dialysis catheter, a small bleb of local anesthetic is placed at the site. A 15g scalpel blade is used to puncture the skin and abdominal wall, using sterile technique. The chosen device is then inserted in the abdomen. Two points of resistance will be encountered: as the device goes through the abdominal wall, and as it goes through the peritoneum. The fluid is collected in EDTA (shaken out of the tube to avoid excessive amount in the sample) and if cloudy, in a culture tube.

Interpretation

Normal values for abdominocentesis are: total protein <2.5 g/dl, WBC < 5000 cells/uL. On cytology, neutrophils comprise approximately 40% of cells, the rest being lymphocytes, macrophage and peritoneal cells.

With intestinal strangulation, the protein will increase first (in the first 1-2 hours) such that the fluid will be clear but more yellow. After 3-4 hours of strangulation, RBC will also leak, and the fluid will take on an orange color. After 6 hours or more, WBC will increase gradually, with the progression of intestinal necrosis.

Common problems:

-How to differentiate enterocentesis from intestinal rupture.

Enterocentesis sometimes occurs and needs to be differentiated from intestinal rupture. With enterocentesis, cytology will reveal plant material, bacteria, and debris, but no cells. The horse’s clinical condition will not be consistent with rupture, although in early rupture, clinical signs may not reflect rupture (2-4 hours are necessary for manifestation of signs). Cytology of abdominal fluid with intestinal rupture will show neutrophils, bacteria, and bacteria that have been phagocytized by neutrophils.

-How to differentiate blood contamination from internal hemorrhage.

Blood contamination can occur from the procedure, and needs to be differentiated from internal hemorrhage, or severely devitalized bowel. Blood from skin vessels will usually swirl in the sample and will spin down when centrifuged, leaving the sample clear. If an abdominal vessel is punctured, blood will also spin down. All fresh blood contamination will show platelets, which will not be present with blood older than 12 hours. If the spleen is accidentally punctured, centrifugation will reveal a PCV higher than the peripheral PCV. In internal hemorrhage, blood will be hemolyzed, such that the supernatant will be reddish after centrifugation; there will be no platelets, and there will be erythrophagocytosis. Ultrasonography will also reveal fluid swirling in the abdomen. Excess EDTA in the sample will falsely elevate the total protein. When performing an abdominocentesis, it is useful to shake out the EDTA from the tube, to avoid this sampling error.

-How to differentiate peritonitis for normal post-operative changes?

Abdominal surgery will increase the total protein (TP) and white blood cell (WBC) for some time after surgery. Typically, if there was no enterotomy, the WBC will be markedly increased for approximately 4 to 7 days, and return to normal by 14 days. The TP may remain elevated for 3 to 4 weeks after surgery. Neutrophils will appear
non-degenerate. After an enterotomy and/or an anastomosis, degenerate neutrophils and occasional bacteria may be seen in the first 12 to 24 hours. Subsequently, the WBC count will remain elevated for approximately 2 weeks, but on cytology the neutrophils will appear non-degenerate and there will be no bacteria. The TP will remain elevated for 1 month after surgery. If septic peritonitis is present, clinical signs will be consistent with bacterial infection (fever, depression, anorexia, ileus, pain, endotoxemia). The WBC and TP will be markedly elevated. On cytology greater than 90% of cells will be neutrophils, and they will appear degenerate. Free and phagocytized bacteria will be seen.

**TROCHARIZATION**

Trocarization is useful to decompress the abdomen when abdominal compartment syndrome is present (severe distention associated with pain and dyspnea).

**Procedure**

**Materials needed**
- 14g 51/4-inch catheter
- Local anesthetic
- Gloves
- Extension tubing
- Small water container (syringe case works)

Trocarization should only be performed for large colon distention, never to decompress the small intestine. Before deciding to trocarize it is important to identify the segment of intestine that is involved. In adult horses, this can be done by rectal palpation. In foals or small horses, radiographs and/or ultrasound can be used. The distended segment of large colon must also be close to the body wall so it can safely be reached.

**Method**

The most common site for trocarization is the right upper flank area, just cranial to the greater trochanter, at the location of the cecal base. A 4 x 4 cm square is clipped, prepped and infiltrated with local anesthetic. With gloved hand the 14-g catheter with an extension tubing is inserted perpendicular to the skin. The end of the extension is placed in water so that gas bubbles are seen when the tip of the catheter is correctly positioned. When gas is obtained, the trocar part of the catheter is slightly withdrawn, to avoid laceration of the bowel. The catheter may need to be repositioned several times, when gas is not obtained. After decompression, the trocar is removed, and an antibiotic (usually gentamicin) is infused as the catheter is withdrawn.

Peritonitis and local abscessation are the two most common problems encountered after trocarization. The horse is observed for 24 hours for signs of peritonitis. If peritonitis is suspected, it is confirmed with abdominocentesis, and the horse systemic broad-spectrum antibiotics are administered until resolved. If a local abscess develops, it can be drained externally.

**DEALING WITH RECTAL TEARS**

Rectal tears are one of the most serious conditions encountered, and are cause for many liability cases. The most important part is prevention but if a rectal tear should occur, appropriate and timely referral can result in a successful outcome.

**Classification and location**

Rectal tears are classified by the number of layers involved, and by their cranio-caudal location.

- Grade I: involves the mucosa and submucosa only
- Grade II: involves the muscularis, with a mucosal-submucosal hernia
- Grade III: involves the mucosa, submucosa and muscularis, leaving the serosal layer intact
  - In the case of a grade III tear located in the retroperitoneal area, there is no serosa, so the tear is complete and extends perirectally.
- Grade IV: involves the mucosa, submucosa, muscularis and serosa. There is potential for fecal contamination of the abdomen.
Most tears resulting from rectal palpation are located dorsally within the peritoneal cavity and extend into the mesocolon.

**Diagnosis**
A rectal tear is suspected when there is sudden loss of resistance during palpation, and when copious amount of fresh blood is present on the rectal sleeve. Blood tinged mucous usually indicates mucosal irritation only. If suspected, it is essential to immediately assess the severity of the tear, and to take measures to initiate treatment or referral.
To assess the tear, the horse should be sedated, and an epidural performed if there is any straining. Propantheline bromide can be given to decrease peristalsis. A speculum should not be used, as it will tend to make the tear worse. Digital palpation (bare handed is better) is carefully performed to palpate the tear. A thin flap of tissue indicates only mucosal tear. If a large cavity with a thin membrane is present, then a grade III is present. If intestine can be palpated, the tear is a grade 4.

**Management**

Management: Grade I and II
Grade I and II tears can be managed medically with antibiotics and a laxative diet (oil, grass) and analgesics (flunixin) to facilitate defecation.

Management Grade III and IV
These tears should be referred to a surgical facility. However, before referral it is essential to prevent fecal contamination of the tear during transportation. Rectal packing is highly recommended to achieve this goal. The horse is sedated, and an epidural is performed, using a combination of xylazine and mepivacaine. A tampon composed of 6.5 cm stockinet filled with cotton is inserted until located cranial to the tear, and the anus is occluded with a purse-string suture. The horse is also given systemic broad-spectrum antibiotics, flunixin meglumine, and appropriate tetanus prophylaxis. In a retrospective study, prevention of fecal contamination of Grade III and IV tears during referral was the determinant factor for successful outcome in horses with rectal tears.

**Options for repair**
Once at the referral facility, the tear is reassessed to ensure that no further damage occurred during transportation. An abdominocentesis is performed to determine the presence of peritonitis. Following these assessments, the following options are available:

- Grade III tears, retroperitoneal, no fecal contamination into the cavity: Primary repair by a rectal approach can be attempted, using one-handed ties. The horse is watched carefully for development of a perirectal abscess.

- Grade III tears, retroperitoneal, presence of fecal contamination into the cavity: The tear can be packed with iodine-soaked gauze and the cavity cleaned out daily. In mares, an option is to drain the cavity into the vagina and to close the tear primarily. A laxative diet is provided, with additional laxatives such as mineral oil. These horses are often painful when defecating, so analgesics are provided as needed. The most serious complication of retroperitoneal tears is development of an abscess that will migrate forward into the abdominal cavity (point of least resistance). This is must be prevented, and is achieved by ensuring appropriate drainage into the rectum or vagina.

- Grade III and IV tears, peritoneal, fairly caudal:
  **Primary repair**
  - Through a rectal approach can be attempted. There is a report of successful primary repair of a Grade IV tear using a linear stapling device. This approach implies that fecal contamination of the abdomen is minor to none.
  - Through a ventral midline approach, followed by an antimesenteric incision in the caudal small colon and repair through the lumen. The abdominal approach is very caudal and involves separating the udder in mares or a preputial reflection in males. This approach has the advantage of allowing to empty the large colon, thus reducing fecal load.

- **Fecal diversion**
  - Insertion of a rectal liner. Rectal liners are made from a plastic ring to which is glued a rectal sleeve. The liner is sutured to the small colon mucosa, via an enterotomy, and the sleeve protects the tear during healing. The ring is sloughed in about 10 days, with normal mucosal turnover.
Colostomy. Loop colostomy is recommended to maintain patency of the distal segment. The colostomy is performed as the first step, and after healing of the tear, colonic continuity is reestablished.

In all fecal diversion procedures, an attempt should be made to also close or approximate the tear. If large, it is possible that it heals with a fistula.

DEALING WITH POST-CASTRATION EVISCERATION

Risk factors
Post-castration evisceration is always a risk following open castrations, but the risk is increased in certain breeds with large inguinal rings, or after castration of an adult stallion. Standardbred horses and Belgians are at greater risk, because they have larger inguinal rings.

Identification
Evisceration of omentum or small intestine can occur, and is first identified by a structure hanging out of the surgical incision. It is important to instruct the owner to keep the horse quiet, and to support the eviscerated structure with a towel, to avoid further stretching or damage. Examination will quickly reveal what structure is involved so that treatment can be initiated.

Treatment
Omental evisceration
A rectal palpation should be performed to ensure that only omentum is involved. A short-term general anesthetic is given. The omentum and scrotum are cleaned and prepped, and the omental segment is emasculated. The scrotum is packed with gauze and closed, and the horse is given systemic antibiotics. The packing can be removed after 2 days, and antibiotics are continued for 24 hours after removal of the pack.

Small intestinal evisceration.
A short-term general anesthetic is given. The intestine is copiously lavaged and examined for damage. If avulsion of mesenteric vessels or strangulation has occurred, requiring resection, the scrotum is sutured closed and the horse is referred to a surgical facility. If the intestine is cleaned and appears healthy, it is replaced in the abdomen. To replace the intestine in the abdomen, the internal inguinal ring often must be cut. Care must be made that the intestine is replaced with the abdomen through the inguinal canal, and not through a separate iatrogenic opening. If the herniation cannot be reduced confidently, the scrotum is packed and the horse is referred. If the herniation can be reduced, the inguinal canal and scrotum are packed with sterile gauze, and the scrotum is sutured closed (leaving a short segment of gauze exposed). Systemic broad-spectrum antibiotics are administered, and the horse is monitored closely for development of colic or ileus, indicating that intestinal devitalization is present. Should that occur, the horse needs to be referred to a surgical facility for an abdominal exploratory. If the horse progresses well, the packing can be removed in 48 hours, and the antibiotics discontinued 24 hours after removal of the packing.