The Ins & Outs of Tubes & Drains

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OVERVIEW

• Feeding Tubes
  – Indications & Contraindications
  – Advantages & Disadvantages
  – Materials & Techniques
  – Complications
  – How they are used
  – Maintenance/Care

• Drains
  – Indications
  – Benefits & Risks
  – Mechanisms of Drainage
  – How they are used and managed

Feeding Tubes

Why a Feeding Tube????

• Provide nutritional support
  – Prevent complications associated with disease
  – Facilitate recovery
  – Avoid complications with various therapies/surgeries

• Patient factors assisting in tube selection:
  – Location of disease
  – Length of time nutritional support needed
  – Level of patient cooperation/owner compliance
  – Risk of general anesthesia
Feeding Tubes

- Orogastric
- Nasoenteric
- Pharyngostomy
- Esophagostomy
- Gastrostomy
- Enterostomy

Orogastric Tubes

- Indications:
  - Commonly used in orphaned neonates
- Material/Technique:
  - Uses a red rubber or polyvinyl chloride tube
  - 8- to 24-Fr
  - Tube is passed through the oral cavity until the tip is in the distal esophagus or stomach
  - For proper length, the distance can be measured from the level of the last rib to the nose
- Complications
  - Aspiration pneumonia
  - Laryngeal Pharyngeal trauma
  - Not appropriate, if nutritional support is needed for more than 2 days

Nasoenteric Feeding Tubes

- Nasoenteric or Nasogastric
- Indications:
  - Debilitated patients
  - Need for short-term nutritional support
- Contraindications:
  - Patients with abnormal gag reflex, esophageal dysfunction, coma, or other co-morbidities predisposing the patient to aspiration pneumonia
  - Vomiting
- Advantages:
  - Does not require general anesthesia and rarely sedation
  - Can be performed by licensed veterinary technician
- Disadvantages:
  - Catheters have a small internal diameter
  - Commercial liquid diet rather than blended pet food
- Complications:
  - Minor, more common
    - Epistaxis, dacryocystitis, rhinitis, sneezing premature tube removal
  - Major, rare
    - Aspiration pneumonia

Nasoenteric

- Materials:
  - Small diameter (polyurethane or silicone elastomer tube)
    - 5Fr for cats and dogs <15kg
    - 8 Fr for dogs >15kg
  - Local anesthetic
    - Proparacaine 0.5% or Lidocaine 2%
  - Suture material
    - Non-absorbable monofilament (Nylon or Prolene)
    - 2-0 or 3-0
Nasoenteric • Technique:
- Nasoesophageal: Distance to the midthoracic esophagus is determined by measuring from the patient's nose to the 7th or 8th rib.
- Nasogastric: Distance to the stomach is determined by measuring from the patient's nose to the last rib.

Nasoenteric • Methods to confirm placement of the nasogastric tube:
- Negative pressure
- Inject saline and see if a cough is elicited
- Inject air and auscultate for borborygmus
- Connect tube to a capnograph
- Check the pH of the aspirated fluid
- Lateral thoracic radiograph

Pharyngostomy Tubes • Indications:
- Patients with conditions affecting the oral cavity (infection, neoplasia, trauma or surgical wound)

Pharyngostomy Tubes • Contraindications:
- Patients with pharyngeal trauma, esophageal disorders, history of vomiting or regurgitation

Pharyngostomy Tubes • Disadvantages:
- Patients, particularly cats, may be unwilling to eat voluntarily with tube in place
- Require general anesthesia

Pharyngostomy Tubes • Material/Techniques:
- Red rubber and silicone tubing
- Tube size is dependent on the patient size
  - 8- to 14- Fr for cats and small dogs
  - 12- to 28- Fr for medium and large dogs
- Distance to the midthoracic esophagus is measured so that the tip of the tube is between the 7th & 8th rib
- Does require general anesthesia
- Radiographs to confirm placement

Pharyngostomy Tubes • Complications:
- Interference with the epiglottis if the tube is placed too cranial, tube is too large or the tube is kinked
  - Results in coughing, dyspnea, aspiration pneumonia
- Regurgitation, vomiting, local infection, premature tube displacement
**Esophagostomy Tubes**

- **Indications:**
  - Patients that require long-term nutritional support
  - Patients with disease or trauma of the oral cavity or pharynx

- **Contraindications:**
  - Patients with esophageal disorders (esophageal strictures, megaesophagus, esophagitis, esophageal neoplasia) or following esophageal surgery

- **Advantages:**
  - Tubes will allow blended diets, along with liquid
  - Can be removed at any time

**Materials/Techniques:**
- 14Fr or larger diameter red rubber, polyvinyl chloride, or polyurethane tube
- Manual (unassisted) transesophageal advancement, percutaneous tube esophagostomy (needle-assisted or tube-assisted), Eld percutaneous feeding tube applicator
- Radiographs to confirm placement

**Complications:**
- **Minor:**
  - Stomal infection or abscessation, tube kinking, tube obstruction, tube displacement secondary to vomiting
- **Major:**
  - Leakage, hemorrhage

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**Gastrostomy Tubes**

- **Indications:**
  - Patients in which the oral cavity, pharynx, and esophagus must be bypassed, either due to injury, disease, obstruction, or surgery

- **Contraindications:**
  - Patients with primary gastric disease or persistent vomiting; dysfunctional esophagus; patients with abnormal motility

- **Advantages:**
  - Can be left in place for months
  - Permits administration of blended food, along with liquids

- **Disadvantages:**
  - Must be left in until stoma formed (~7-10 days)

**Materials:**
- 14- to 24-Fr
- Mushroom-tipped catheters or Foley catheters

**Methods:**
- Surgical placement
- Percutaneous Endoscopic Gastrostomy (PEG) Tube Placement
- Nonendoscopic Percutaneous Tube Placement
- Low-Profile Gastrostomy Tubes

**Complications:**
- Gastrointestinal signs (vomiting, regurgitation, diarrhea, gastroesophageal reflux), aspiration pneumonia, leakage resulting in peritonitis or peristomal inflammation or infection
- If not performed surgically: inadvertent perforation of abdominal organs (spleen), subcutaneous emphysema, pneumoperitoneum, pneumomediastinum, long tube perforation
- Tube obstruction
Enterostomy Tubes

- **Indications:**
  - Malnourished animals with a hypermetabolic condition (sepsis, pancreatitis), inadequate oral intake
  - If the stomach and/or duodenum need to be bypassed
  - Useful in patients at high risk of aspiration pneumonia (recumbent, comatose, absent gag reflex, esophageal motility disorder)

- **Contraindications:**
  - Intestinal obstructions distal to the enterostomy site

- **Advantages:**
  - Can start feedings within hours of surgery
  - Can be used for weeks to months
  - Less risk of gastroesophageal reflux
  - Decreased risk of aspiration pneumonia

- **Disadvantages:**
  - Required to stay in for ~5-7 days to form stoma

**Material:**
- Polyurethane, silicone, red rubber, polypropylene, and polyethylene
- 5 Fr in cats and dogs <15kg
- 8 Fr in dogs >15kg

**Techniques:**
- Can be placed during exploratory laparotomy, laparoscopically assisted or advanced through a gastrostomy tube (Gastrojejunostomy aka J thru G)
- Placed in the duodenum or proximally jejunum

Holstering the Tubes

- **Vetwrap Bandage**
- **Kitty or Kanine Kollars®**
- **Stockinette**
- **Vest or T-Shirt**

Vetwrap® Bandage

- **Neck wrap**
  - Nasoenteric, Esophagostomy, Pharyngostomy

- **Changed daily**
- **LABEL, LABEL, LABEL**

- **Application**
  - Telfa pad with triple antibiotic ointment
  - Esophagostomy tube
  - Cast padding
  - +/- Cling wrap
  - Vet Wrap®
Kitty or Kanine Kollar ®

- Esophagostomy, Pharyngostomy tubes
- Available in an array of sizes and colors
- Protector pads provided
- Machine wash

Stockinette

- Gastrostomy or Enteroostomy tubes
- Can be fed through hole in stockinette or secured with document clip
- Does NOT replace the need for E-collar

Putting the Tubes to Use

- What is the patient's nutritional resting energy requirement (RER)?
  - Patients <2kg
    - RER (kcal/day) = 70 x (BWkg) 0.75
  - Patients >2kg
    - RER (kcal/day) = 30 x (BWkg) 0.75 + 70
- What is the patient's nutritional daily energy requirement (DER)?
  - DER = RER x factor of life stage/disease
  - Life factor examples:
    - Weight loss = 1.0
    - Lactation = 4.0 to 8.0
    - Growth = 1.6 to 2.5
    - Altered adult = 1.4
    - Intact adult = 1.6

Vests or T-Shirts

- Gastrostomy or Enterostomy tubes
- Can be secured with document clip or just “tucked” into vest
- Does NOT replace need for E-collar
- Products available:
  - Surgi-Sox with DogLeggs
  - MPS Shirts
  - Standard human shirt
## Food selection

![Food selection](image)

<table>
<thead>
<tr>
<th>Food</th>
<th>Amount</th>
<th>Water Added</th>
<th>Kcal/mL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hill's A/D</td>
<td>1 can</td>
<td>None</td>
<td>1.2</td>
</tr>
<tr>
<td>Hill's C/D</td>
<td>½ can</td>
<td>1 ¼ cup**</td>
<td>0.62</td>
</tr>
<tr>
<td>Hill's K/D</td>
<td>½ can</td>
<td>1 ¼ cup**</td>
<td>0.9</td>
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<tr>
<td>Hill's I/D</td>
<td>½ can</td>
<td>1 ¼ cup**</td>
<td>0.62</td>
</tr>
<tr>
<td>Clinicare</td>
<td></td>
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<td>1.0</td>
</tr>
</tbody>
</table>

* 1 can is equal to 156mL
** 1 ¼ cup is equal to 284mL

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## CRI vs Intermittent Boluses??

### Intermittent and Continuous Enteral Nutrition in Critically Ill Dogs: A Prospective Randomized Trial

M. Holahan, S. Abose, J. Hauptman, C. Koenigsruegert, and A. Brown

- Michigan State University
- Journal of Veterinary Internal Medicine 2010
- **Objectives:**
  - Daily caloric goals for critically ill dogs receiving CRI vs Bolus feedings (PPND*)
  - Correlations between GRVs and frequency of vomiting and/or regurgitation
- **Methods:**
  - Feedings administered via nasoesophageal or nasogastric feeding tube
  - GRV** measured via feeding tube
  - Group C – constant rate infusion group
  - Group I – intermittent bolus group
- **Results:**
  - The PPND was significantly less (P value < .05) in Group C compared with Group I
  - There was no significant difference in GRV between the two groups

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## Example:

- 10 year old FS domestic short hair
- Current weight= 5kg
- History: 3 weeks waxing and waning appetite, intermittent vomiting for 1 year, weight loss over past year (was 8kg)
- Abdominal ultrasound revealed thickened small intestines and lymphadenopathy
- Surgical gastrointestinal and mesenteric biopsies collected- histopathology consistent with Small Cell Lymphoma
- Gastrostomy tube placed at the time of surgery
- RER (kcal/day)= 30 (5kg) + 70
  - 220 kcal/day
- DER= RER x 1.0 (weight loss)
  - 220 x 1.0 = 220 kcal/day
- Selected food= Hill's A/D
  - 1 can with no added water = 1.2 kcal/mL
  - 220 kcal/day / 1.2 kcal/mL = 183mL/day
- CRI
  - Day 1: 1/3 DER= 61mL/day
    - 2.5mL/hr
  - Day 2: 2/3 DER= 122 mL/day
    - 5mL/hr
  - Day 3: Full DER= 183mL/day
    - 7.6mL/hr
- Intermittent Boluses: Split into four feedings
  - Day 1: 1/3 DER
    - 15mL every 6 hours
  - Day 2: 2/3 DER
    - 30mL every 6 hours
  - Day 3: Full DER
    - 45mL every 6 hours

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## Daily Maintenance

- Stoma care
  - Changing dressing/coverage
  - Cleaning stoma
  - Chlorhexidine wipes
  - Triple Antibiotic Ointment
- CRI Feeding supplies
  - Change Bag and extension set daily
  - Change nutritional supplementation/liquid every 6 hours
Tube Troubleshooting

- Clogged tube???
  - Endoscopic forceps
  - Stylet
  - Carbonated liquid aka Soda

Drains

- Indications:
  - Increased dead space (large mass removal, mastectomy, amputation), increased fluid accumulation

- Benefits:
  - Removal of fluids
  - Reduction in pressure
  - Evacuation of inflammatory mediators, bacteria, unhealthy tissue and foreign material
  - Maintaining contact between tissue layers

- Passive vs Active

PASSIVE DRAINS

- "Open" draining system
- Rely on gravity, body movements, pressure differentials and overflow
- Penrose or Sump drains

- Disadvantages:
  - Risk for ascending infection
  - Cannot convert to active drain
  - Difficult to quantify and microscopically exam fluid (absorbed into bandage, skin contamination, etc)

- Maintain clean exit site

Active Drains

- "Closed" drainage system

- Advantages
  - Measuring of fluid volume
  - Microscopic examination of fluid
  - Lower incidence of ascending infection
  - Allows for greater apposition of skin to wound bed

- Complications
  - Blockage, damaged tube, pre-mature removal, pressure necrosis, etc
  - Blockage → flushing vs aspirating

- Continuous or intermittent suction
  - Manual activated vacuum drainage system
  - "Grenades" → most reliable
  - Maintains consistent suction
  - Relied on Sprouse??
  - Vacutainer blood tubes
  - Wall vacuum drainage system
**Holstering the Active Drains**
- Stockinette
- Vests or T-Shirts
- VetWrap ® bandage

**Stockinette**
- Reservoir attached via document clip, carabiner clip or tucked underneath

**Vests or T-Shirts**
- MPS and Halter Monitor vests have pockets
- Great for holding reservoir
- T-Shirts and DogLegg vests
- Secure with document clip

**Vet Wrap ® Bandage**
- Active Drains
  - Vacutainer drains!
  - Changed daily if over wound
  - Changed every other day if just for support
  - LABEL DRAINS
- Passive Drains too!
  - Cover drains
  - Collect exudate
  - Changed daily
  - Label location of drain
References

- Tobias KM, Johnston SA. Veterinary Surgery Small Animal. Edison 1, Volume II