Objective: Compare continuous infusion vs intermittent bolus of EN (2 got RF) to dogs in CCU
- critically ill patients with impaired GI motility may tolerate CRI nutrition better
- intermittent bolus feeding represents a more physiologic method of providing calories
- hypothesis: no difference in attainment of daily caloric goals or frequency of complications in dogs receiving EN support by either CRI or intermittent bolus
- N = 54 all with either NE (11) or NG (43) tube
  - exclusion criteria: no owner consent, > 50% intestine resected, placement of feeding tube contraindicated, enteric tube already in place, EN delivered > 24 hours
- Prospective randomized clinical trial (MSU)
- continuous infusion OR intermittent bolus
- PPND (percentage of prescribed nutrition delivered) calculated every 24 hours
  - RER = 70 x BW(kg)^0.75
  - Cliniccare or Clinicare renal formula (both 1 kcal/mL)
  - Total prescribed calories = 1/3 RER, then increased by 1/3 increments every 24 hours over 72 hours and continued on full RER if hospitalization continued
  - GRVs recorded q4hrs
  - intermittent bolus over 30 minutes q4hrs
  - CRI volume confirmed and recorded q4hrs
  - % PPND = # calories administered over 24 hours / calories prescribed according to feeding protocol, then converted to % (if > 24 hours the mean was taken)
- frequencies of GI, mechanical, technical complications recorded and GRVs measured
- Rescue protocol in place - only 1/9 needed alternative method
  - if vomited or regurgitated twice over 24 hours period
• enteral feedings stopped for 12 hours then resumed at last recorded volume and rate
  • if vomit/regurgitation again, stop for another 12 hours, then start at lowest rate (1/3 RER)
  • if 24 hours protocol failed EN d/c
  • all patients requiring rescue were included in data analysis

Findings:
• PPND significantly lower in Group C than Group I, but not clinically relevant (98.4% vs 100%)
• GRVs did not statistically significantly differ ( C: 3.1 mL/kg and I: 6.3 mL/kg)
• No correlation with incidence of vomiting or regurgitation
• No difference in GI or mechanical complications
  • mechanical complications: regurgitation or vomiting the tube, occlusion of the tube, inadvertent tube removal
• CRI had more technical difficulties
  • technical complications: feeding off schedule, treatment/procedure, owner visit, walk outside > 10 minutes, operator error, equipment malfunction

Retrospective Evaluation of Partial Parenteral Nutrition in Dogs and Cats

Daniel L. Chan, Lisa M. Freeman, Mary A. Labato, and John E. Rush

The purpose of this retrospective study was to evaluate the use of partial parenteral nutrition (PPN) in dogs and cats. The medical records of all dogs and cats receiving PPN between 1994 and 1999 were reviewed to determine signalment, reasons for use of PPN, duration of PPN administration, duration of hospitalization, complications, and mortality. Complications were classified as metabolic, mechanical, or septic. One hundred twenty-seven animals (80 dogs and 47 cats) were included in the study, accounting for 443 patient days of PPN. The most common underlying diseases were pancreatitis (n = 41), gastrointestinal disease (n = 33), and hepatic disease (n = 23). Median time of hospitalization before initiation of PPN was 2.8 days (range, 0.2–10.7 days). Median duration of PPN administration was 3.0 days (range, 0.3–8.8 days). Median duration of hospitalization was 7 days (range, 2–20 days). In the 127 animals receiving PPN, 72 complications occurred. These included metabolic (n = 43), mechanical (n = 25), and septic (n = 4) complications. The most common metabolic complication was hyperglycemia (n = 19), followed by lipemia (n = 17) and hyperbilirubinemia (n = 6). Most complications were mild and did not require discontinuation of PPN. Ninety-three (73.2%) of the 127 patients were discharged. All 4 animals with septic complications were discharged from the hospital. The presence, type, and number of complications did not impact the duration of hospitalization or outcome. However, animals that received supplemental enteral nutrition survived more often than those receiving PPN exclusively. Although PPN seems to be a relatively safe method of providing nutritional support, future studies are warranted to determine its efficacy.

Key words: Cat; Dog; Intravenous feeding; Nutritional support

• retrospective study between 1994-1999
  • medical records of all dogs and cats receiving PPN between 1994 and 1999 were reviewed to determine signalment, reasons for use, duration of administration/ hospitalization, complications (metabolic/mechanical/septic), mortality.
• 127 animals, 80 dogs and 47 cats
  • 443 patient days of PPN (253 dogs and 181 cats)
• exclusions,
  • no medical record
• could not have cyclic PPN (12 hour cycles)
• supplemental enteral nutrition OK

• procedures
  • dedicated parenteral nutrition catheter (external jugular, lateral saphenous, femoral, cephalic)
  • bags and lines changes q24hrs
  • 1.2 um filter
  • RER = 70 x BW(kg)^0.75 or RER = 30 x (body weight in kg) + 70
  • illness energy requirement (IER) = 1.0-1.5 multiplier of RER
  • partial energy requirement (PER) = 50% x IER
    • 5% dextrose, 8.5% amino acids, 20% lipids
    • final calculated osmolality < 750 mosm/L
  • categorized on maximal % IER provided by enteral nutrition while receiving PPN
    • 1-25% (n=15)
    • 26-50% (n=6)
    • 51-75% (n=4)
    • 76-100% (n=4)
  • some patients (hepatic failure, severe hypoproteinemia) received a customized formulation

Table 1. Partial parenteral nutrition (PPN) formulations used based on body weight. Some animals received a customized PPN formulation.

| Body Weight (kg) | Percent of Calories from Each Component | Formulation | n
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>3-10</td>
<td>5% Dextrose</td>
<td>8.5% Amino Acids</td>
<td>20% Lipid</td>
</tr>
<tr>
<td>10-25</td>
<td>33</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>&lt;25</td>
<td>50</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Custom*</td>
<td>Variable</td>
<td>Variable</td>
<td>Variable</td>
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</tbody>
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*The specific formula was not available in the medical record for 14 animals.

Findings
• 72 complications
  • metabolic (43)
    • hyperglycemia, lipemia, hyperbilirubinemia
- increase in serum glucose, triglyceride, bilirubin, urea nitrogen, Na, Cl, Ca, phosphorous concentrations after PPN administration in a pat with a measurement initially WNL
  - animals receiving formulation A were more likely to have metabolic complications than other formulations
- mechanical (25)
  - thrombophlebitis, catheter occlusions, disconnected lines, other technical problems interfering with administration of PPN.
- septic (4)
  - clinical suspicion of sepsis and a positive catheter tip culture
  - also recorded new febrile episodes during PPN administration not attributable to underlying disease
- pancreatitis most common reason for PPN (GI and hepatobiliary also common), many patients had more than 1 reason
- Before PPN mean days no food PO 5.3 +/- 2.7 days (0.2-10.7 days in hospital prior to PPN)
  - shorter hospitalization before starting PPN in cats than in dogs
  - dogs lost significantly more weight than cats
  - no difference on total hospital stay in dogs vs cats
  - overall hospitalization time was positively correlated with the length of hospitalization prior to starting PPN
- overall mortality rates for PPN patients were 31% for dogs and 19% for cats
- more animals that received some enteral nutrition during PPN administration survived (26/29) compared to animals not receiving any enteral nutrition (67/98)
- cats more likely than dogs to have metabolic complications
- no difference in mechanical, metabolic, or septic complications were found between animals with central s peripheral catheters
- no association between outcome and species, age, complication, change in body weight, illness factor used, duration of hospitalization or length of hospitalization before starting PPN