Evaluation of leak pressure and closure time of interrupted vs. continuous double layer esophagotomy closure

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Background
• Foreign body retrieval is the most common indication for esophageal surgery in dogs1
• Esophageal surgeries carry a higher incidence rate of complications than any other portion of the GI tract2
• Common complications: incisional dehiscence, stricture formation, regurgitation, and aspiration pneumonia1-4
• Optimizing closure can improve mucosal apposition and reduce incisional tension thus reducing complications2-5
• There is currently no definite consensus on the proper method of esophagotomy closure
• Double layer closure patterns lead to better healing and higher postoperative leak pressure, but are technically challenging and slow relative to single layer patterns6

Method
• Segments of intrathoracic esophagus were harvested from 28 healthy 8-9 week old swine.
• A cylindrical foreign body was passed through the lumen and positioned in the center of the segment.
• Each end of each segment was occluded and suspended with Rochester Pean forceps.
• Longitudinal 3-cm esophagotomy incisions were performed and the foreign body was removed.
• Two catheters were placed through the wall of the esophagus into the lumen; one connected to a fluid pump and the other to a pressure transducer.
• The incisions were closed according to their assigned group:
  • Group 1: Double layer simple interrupted closure
  • Group 2: Double layer simple continuous closure
• The time taken to close and postoperative leak pressure was recorded and compared between groups.

Hypothesis
• Double layer simple continuous closure will be faster to complete than double layer simple interrupted.
• Double layer simple continuous closure will achieve a similar leak pressure as double layer simple interrupted.

Simple interrupted takes more time to close

Figure 1: Comparison of closure time between simple interrupted (SI) and simple continuous (SC) closure patterns. Mean ± standard deviation closure times were 19.2 min ± 2.0 min for Group 1 (SI) and 14.7 min ± 1.5 min for Group 2 (SC) (P < 0.01).

Simple interrupted achieves lower leak pressures

Figure 2: Comparison of postoperative leak pressure between simple interrupted (SI) and simple continuous (SC) closure patterns. Median (range) leak pressure was 16.0 mmHg (5.4-54.9 mmHg) for Group 1 (SI) and 38.7 mmHg (11.29-81.9 mmHg) for Group 2 (SC) (P = 0.03).

Conclusions
• The simple continuous pattern was significantly faster than the simple interrupted pattern while maintaining a better immediate seal as shown by the significantly higher median leak pressure
• The double layer simple continuous closure pattern may be superior to simple interrupted closure for repair of an esophageal incision or tear

Future Directions
• Further study in a live animal model is necessary to assess the effect of inflammation and the healing process across closure patterns
• Anatomic structural differences between species may warrant additional study using tissue from other species
• Assessment of closure patterns in other surgical procedures of the esophagus such as an esophageal resection
• Effect of the passage of a bolus on incision failure

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References