Letters to the Editor

A Method for Accurate Collection of Bile in the Dog

To the Editor:

To meet the aims of an investigative study of bile acid metabolism, we needed an accurate method for bile collection in dogs undergoing cholecystectomy, sphincter of Oddi bypass, or both cholecystectomy and sphincter bypass. Because reported methods of bile collection did not meet the requirements for sphincter bypass, we used a T-tube that made possible the original method we describe here (Figure 1).

Adult, conditioned mongrel dogs weighing between 20-25 Kg were anesthetized with sodium thiamylal (20 mg/K) for induction and halothane and nitrous oxide (0.5-1.5%) for maintenance. The abdominal cavity was opened through a midline incision, the common bile duct was identified, and two stay sutures of 5-0 polyglycolic acid were placed in the proposed site of incision of the common bile duct. A 3 mm opening in the duct was made with a No. 11 Bard Parker blade. A T-tube made of barium-impregnated silicon material (Heyer Schulte Corp, Goleta, CA) was inserted. The outer diameter was 1.3 mm and the inner diameter 0.7 mm. The crossarm and the stem were each 30.5 cm long. When the crossarm was used simply to cannulate the common bile duct, it was cut to a length of 2.5 cm with an equal extension on each side of the stem. When the crossarm was to extend through the sphincter of Oddi, the portion of the crossarm cannulating the sphincter was 6-8 cm long depending upon the size of the animal. The tube was manipulated easily through the sphincter and its presence in the duodenum was confirmed by palpation. The opening in the common bile duct was approximated with interrupted 5-0 polyglycolic acid sutures. A piece of omentum was brought around the closure area of the bile duct and tied in place with the previously placed stay sutures. By insertion of a 22 gauge needle into the stem and with aspiration by an attached syringe, the presence of bile in the syringe confirmed patency of the tube. Positive pressure with sterile saline in the syringe allowed us to recognize any leaks in the bile duct, which were closed with 5-0 polyglycolic acid-interrupted sutures. The patency of the long crossarm could be verified at this time by feeling for the flow of saline entering the duodenum from the end of the crossarm.

Fig. 1

Diagram showing the use of a T-tube in the four models discussed: A) Bypassing the sphincter of Oddi with one side of the crossarm; B) T-tube implanted in a control dog; C) T-tube and cholecystectomy; D) T-tube, cholecystectomy and bypass of sphincter of Oddi.
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After a stab incision 2-3 cm long was made in the right flank, the muscular layers were tunneled by a blunt instrument until the peritoneal cavity was entered. The stem of the T-tube was brought out through the abdominal wall tunnel. Stay sutures of 5-0 polyester were placed in the peritoneum near the inner aspect of the tunnel and in the external oblique aponeurosis near the outer opening. After these sutures were tied down on the stem of the T-tube, it was aspirated to confirm the passage of bile. If they were tied too tightly, they restricted passage of bile. The sutures were used to prevent the stem from slipping back into the abdominal cavity when the dog moved around. The stem was then cut 6 cm from the external oblique fascia. The tip of the T-tube was bent back 0.5 cm and the bend tied with 5-0 polyester suture to prevent leakage of bile. By blunt dissection under the skin a flap was raised and a pocket made in which the stem was coiled. The skin edges were then approximated with 5-0 polyester suture.

When bile was to be collected from a dog, 1% lidocaine was injected around the right flank incision, the incision was reopened, the coiled stem recovered, the tie holding the bent end removed, and the first few drops of bile were discarded, as they represented bile already in the stem. The end of the stem was then placed in a test tube in which bile was collected. One to 3 ml of bile were collected within a 3-5 minute period. If bile flow was extremely slow, a 22 gauge blunted needle was introduced into the end of the stem and aspiration resulted in a faster collection. Following collection, the stem was flushed with 0.5 ml of sterile saline, bent back upon itself, tied, coiled, replaced in the subcutaneous pocket, and the skin was sutured. With excitable dogs, the lidocaine was reinforced by an intramuscular injection of xylazine and atropine given 20 minutes before collection time.

This procedure was carried out in 25 dogs over a six-month period with no mortality. One week after surgery, bile was collected daily for five days and again for three days sometime between the third and fourth postoperative weeks. Comparison of the bile acid turnover time in our dogs with values reported in the literature showed that our technique did not interfere with the enterohepatic circulation of bile acids.

Without question, meticulous closure of the common bile duct opening, use of the omentum to reinforce the closure, and careful anchoring of the stem are important to the success of the preparation. Because the dogs were active between collections, the importance of careful placement and anchoring of the stem must not be underestimated.

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References
A New Method for Quantitation of Lymphedema

To the Editor:
We have been studying a quantitative technique for monitoring the treatment of patients suffering from obstructive lymphedema of the extremities. In these cases, treatment consists of applying intermittent compression to the affected area over a two-week period while the patient is in the hospital. Depending on the normal size and configuration of the limb, reduction in swelling of treated areas may be subjectively classified by the physician's report of how the limb looks or by the patient's report of how it feels. While limb circumference measurement with a tape measure may record quantitative changes in the limb, especially in severely afflicted cases, this value is difficult to reproduce.

Before our studies, no attempt had been made to analyze changes in lymph fluid level or to measure tissue mass at a section of the limb, nor had a precise system been developed for this measurement. We have developed a method in our laboratory which uses a dual-energy beam of low energy photons from an isotopic source (109Cd). By studying the absorption of 88 keV and 22 keV photons from this beam as they pass through the soft tissue, we can obtain both the tissue thickness and the present muscle mass by weight. In 1975, we reported on the use of this method in body composition studies.

In order to apply this method to lymphedema patients, we assumed: 1) that retained lymph fluid is similar to lean tissue in its radiation absorption characteristics for 22 keV and 88 keV energies, since the mass absorption coefficients of the two tissue components are virtually identical; and 2) that the subjects' fat and lean composition, apart from lymph fluid, remained constant over the two-week treatment period, since the ratio of lipid to lipidfree tissue should not change measurably in this short time. Consequently, any apparent change in the fat-to-muscle ratio over the treatment span, as measured by the differential absorptiometry principle, can be ascribed to the fact that lymph fluid has been removed from the affected extremity.

In the first cases in which we applied this physical system, the quantitative results have been promising. In one patient with involvement of the right arm, absorptiometric measurements were made on the upper arm midway between the elbow and the shoulder. Pretreatment values obtained by the dual-beam system were 42% lean tissue and 152 gms total tissue mass in the measured cross-section of the arm. After treatment was completed 11 days later, the measured values for the same section were 37.5% lean tissue and 133 gms total tissue. The loss in total tissue mass indicates a lowered level of lymphedema, which is also confirmed by the decrease of lean fraction (the lymph fluid being considered as lean tissue that is no longer present).

Since January we have used the method on more patients, and the results correlate well with clinical findings. We are considering several instrumental refinements in our method and envision that it will be a useful monitoring system for lymphedema therapy and other problems related to the collection of fluid and its treatment in the extremities. In the future, we propose to report completely on this physical quantitation of treatment for lymphedema.

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References