Scanning the Literature

by Joseph Breault, MD, and David Lee, MD

Is It Worth Endoscoping Coins Out of a Child's Esophagus?

Soprano JV, Mandl KD. Four strategies for the management of esophageal coins in children.
Pediatrics. 2000; 105(1):e5.

Objective: To compare clinical outcomes and costs under 4 strategies for the management of esophageal coins in children.
Methods: We developed a decision analysis model of 4 possible strategies for managing esophageal coins: 1) endoscopic removal under general anesthesia; 2) esophageal bougienage, 3) an outpatient 12- to 24-hour observation period to allow spontaneous coin passage; and 4) an inpatient observation period. Probabilities of success and complication rates for endoscopy and esophageal bougienage were obtained from published data. The probability of spontaneous coin passage was derived from chart review data at our institution. Costs were calculated from charges using a cost-to-charge ratio of .72. Hypothetical patients included in the model were those with a single esophageal coin presenting within 24 hours of ingestion, with no respiratory compromise on presentation and with no previous history of esophageal disease. Strategy-specific outcomes were overall complication rate and total cost in dollars per patient. Sensitivity analyses were performed to account for variations in the data.
Results: The esophageal bougienage strategy resulted in no complications and a total cost per patient of $382, which represents a marginal advantage of $2915 per patient compared with the endoscopic removal strategy. On sensitivity analysis over the range of success and complication rates of bougienage, this strategy maintained a considerable decrease in both overall complications and total cost per patient compared with all other strategies. Both outpatient and inpatient observation strategies had overall complication rates of 4.2% compared with the complication rate of 5.8% for the endoscopy strategy. The total cost per patient under these strategies was $2439 for the outpatient and $3141 for the inpatient strategy, representing a marginal advantage of $858 and $156 per patient, respectively, compared with the endoscopy strategy. Both observation strategies maintained a lower overall complication rate compared with endoscopy in the sensitivity analysis. The outpatient observation strategy maintained a marginal advantage of $645 to $1257 per patient compared with endoscopy; however, the inpatient observation strategy total cost per patient surpassed that of endoscopy at a spontaneous passage rate < 23%.
Conclusions: Given the high success and low complication rates reported for esophageal bougienage, substantial savings in overall complications and costs would be expected with the use of this procedure. With spontaneous rates >23%, either an outpatient or an inpatient observation strategy would reduce costs and complications, compared with endoscopic removal of all esophageal coins.

Comments:

Decision analysis models are more common in journals today. A hypothetical subject is used, and a decision tree is formulated to describe the possible choices and consequences until the eventual outcomes are reached at each branch. The probability and cost of each branch on the tree is determined by a literature search and costs are from the author's institution, in this case Children's Hospital in Boston. Sensitivity analysis is used to account for variations in the data culled from the literature or institution. This consists of varying the values over the 95% confidence interval (CI) range of the data.

For example, esophageal bougienage (a procedure that involves a single pass of a Hurst bougie dilator from the mouth to the stomach with the unsedated patient sitting upright) had a

success rate of 100% (95% CI: 94%-100%) and a complication rate of 0% (95% CI: 0%-4%). This procedure would be used in the 72% of children who did not spontaneously pass the esophageal coins into the stomach in 12 hours after ingestion. This is the cheapest of the 4 alternatives at $382 per patient with no complications. Outpatient observation had a 4.2% complication rate and a $2439 per patient cost.

Unfortunately, the esophageal bougienage data are based on only 77 children (there are only 2 published studies). It will take time before there are more studies of this apparently most cost-effective approach before we know if the success and complication rates worsen. For now, the best approach appears to be to use this minimally invasive technique rather than endoscopy with general anesthesia or observation as inpatient or outpatient.

For those interested in decision analysis methods, this article is a helpful introduction.

Is TURP an Outdated BPH Treatment of the Prostate? Not Yet.

Djavan B, Madersbacher S, Klingler HC, et al. Outcome analysis of minimally invasive treatments for benign prostatic hyperplasia. Tech Urol 1999; 5:12-20.

The armamentarium of minimally invasive treatment modalities for patients with benign prostatic hyperplasia has increased steadily during the past decade. The energy sources used range from microwaves and radiofrequency waves to high-intensity focused ultrasound, with laser vaporization/coagulation/resection and electrosurgical techniques. The large amount of data available allow some conclusions to be drawn concerning the present role of the "gold standard" TURP among the minimally invasive procedures. Although the subjective response after TURP and other minimally invasive procedures is comparable, improvements of flow and urodynamic parameters usually are more pronounced after TURP. Failure rates requiring reintervention (usually TURP) are considerable. Minimally invasive procedures lead to a shift of morbidity from the intraoperative phase, which is reduced (risk of bleeding, TUR syndrome, transfusion) to the postoperative phase. This period is characterized by prolonged urinary retention (ILC, VLAP), significant dysuria (VLAP, TUVP), and nycturia. Recent advances in electrosurgical techniques, such as band TURP loops that facilitate coagulation due to the longer contact time between the electrode and the tissue, have the potential to convert TURP into a less invasive procedure. Finally, high-energy TUMT seems to offer a truly minimally invasive treatment combining efficacy and the need for topical anesthesia only. However, due to a lack of homogeneity of criteria for patient recruitment, parameters of evaluation, and adequate follow-up, accurate guidelines for appropriate patient management have not been established yet.

Comments:

This review article looks at a variety of minimally invasive treatments for benign prostatic hyperplasia (BPH). Just the right amount of detail is given to understand each treatment's complications, benefits, and limitations. Although some minimally invasive treatments seem to rival outcomes with transurethral resection of the prostate (TURP) in the short run, eventual failure rates are higher. TURP still appears to be the best alternative for most people with BPH if medical treatment fails. This may change in the coming decade as further advances in this area push the envelope.

Does GERD + 2 Months of PPIs = Surgery?

Nessen SC, Holcomb J, Tonkinson B, et al. Early laparoscopic Nissen fundoplication for recurrent reflux esophagitis: a cost-effective alternative to omeprazole.
JSLS 1999; 3:103-106.

Background: Eighty percent of patients treated medically for gastroesophageal reflux disease (GERD) relapse after treatment. Many of these patients require indefinite treatment with omeprazole to prevent recurrence. Nissen fundoplication has been shown to be effective, safe and cost effective in the

management of gastroesophageal reflux disease. We suggest a treatment algorithm, which encourages early surgical intervention in cases of recurrent esophagitis after a previously successful two-month course of omeprazole.

Methods: We have offered laparoscopic Nissen fundoplication since 1993. Patients who received Nissen fundoplication since 1990 were asked to report return to baseline activity, medications, and lifestyle changes. Concurrent chart review of patients treated with omeprazole was conducted to analyze cost.

Results: Patients receiving laparoscopic Nissen fundoplication were discharged significantly sooner and spent significantly less time convalescing when compared to those who underwent open Nissen fundoplication. Laparoscopic Nissen fundoplication became cost effective at 1.5 to 2 years when compared to omeprazole.

Conclusion: Based on cost analysis, patient satisfaction, acceptable complication rate, and efficient use of time and resources, we recommend laparoscopic Nissen fundoplication as the appropriate treatment in patients who develop recurrent esophagitis after a two-month treatment with omeprazole.

Comments:

Most of us in primary care have some patients with gastroesophageal reflux disease (GERD) that have failed conservative treatment with lifestyle changes, H2 blockers, treatment of *H. Pylori* if present, and a few months of proton pump inhibitors (PPIs). They often do well on their PPIs for a few months, but when it is changed back to an H2 blocker they again have GERD symptoms. These patients have usually already seen the gastroenterologist, had an EGD to rule out anything more worrisome, had follow-up tests to insure cure of *H. Pylori*, and have been labeled as needing indefinate PPIs at a cost of perhaps $1500 a year. The minimally invasive approach to Nissan fundoplication became cost-effective in 1.5 - 2 years in this study. It may be warranted to review the list of our patients on chronic PPIs to see how many of them might benefit from this cost-effective, minimally invasive option.

What Causes Atrial Fibrillation After Coronary Artery Bypass Grafting?

Cohn WE, Sirois CA, Johnson RG. Atrial fibrillation after minimally invasive coronary artery bypass grafting: A retrospective matched study.
J Thorac Cardiovasc Surg 1999; 117:298-301.

Background: Atrial fibrillation after cardiac operations is a source of morbidity and resource consumption. Various factors common to cardiac operations have been cited as causal. Comparison of the incidences of atrial fibrillation after conventional cardiac operations and minimally invasive cardiac operations may provide some insight into the mechanisms of this complication.

Methods: All patients undergoing minimally invasive direct coronary artery bypass grafting from January 26, 1996, through September 17, 1997, were evaluated for the occurrence of in-hospital postoperative atrial fibrillation. Data from these 55 patients were compared with data from a control cohort of patients undergoing conventional, solitary coronary artery bypass grafting. Each patient undergoing minimally invasive direct coronary artery bypass grafting was matched by age (+/- 3 years) and date of operation (+/- 7 days) with a patient undergoing conventional coronary artery bypass grafting.

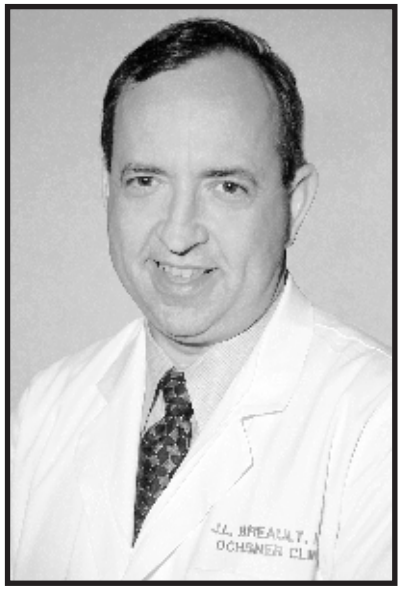
Results: During the period since the advent of minimally invasive direct coronary artery bypass grafting at our institution, the incidence of postoperative atrial fibrillation has been slightly lower among the patients undergoing this form of coronary artery bypass grafting (26%) than among the total population of patients undergoing conventional coronary artery bypass grafting (34%). Comparison of the age-matched groups, however, showed the incidence to be slightly but not significantly greater in the minimally invasive direct coronary artery bypass grafting cohort (13/55, 24%) than in the conventional coronary artery bypass grafting cohort (11/55, 20%; P =. 6). The minimally invasive direct coronary artery bypass grafting group was less likely to be discharged with antiarrhythmic therapy than was the conventional coronary artery bypass grafting group (6 versus 10; P =.006).

Conclusions: According to these data, mechanisms traditionally implicated in atrial fibrillation after coronary artery bypass grafting, such as the use of cardiopulmonary

bypass, mechanical manipulation of the atrium, and atrial ischemia, are not causal but may be related to the duration of the arrhythmic complication. Strategies directed toward management and reduction of the incidence of postoperative atrial fibrillation should be focused accordingly.

Comments:

This retrospective case controlled study investigated the apparently smaller incidence of postoperative atrial fibrillation (AF) after the minimally invasive direct coronary artery bypass grafting (CABG) compared with conventional, solitary CABG. Based only on the matching of age and date of operation, the apparent difference was wiped out and not significant. AF occurs in up to 31.9% of cases, is even higher in older cohorts, and tends to lengthen postoperative hospital stays. The etiology of AF after CABG is unknown but thought to be related to atrial cannulation, cardiopulmonary bypass, or cardioplegic preservation. Since none of these factors applies to those undergoing minimally invasive direct CABG, research efforts can be focused elsewhere to understand the etiology of post-CABG AF. This is an interesting basic science insight gained from these minimally invasive methods.



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Endoscopic Surgery Versus Open Surgery for Common Surgical Conditions

Primary care physicians are often asked by their patients to give recommendations on common surgical conditions. Open surgery using traditional, established techniques has always been the gold standard of general surgery in the past. The introduction of endoscopy into surgical practice over 10 years ago created a revolution in the surgical field. The sweeping success of laparoscopic cholecystectomy produced public and academic frenzy about minimally invasive surgery and early predictions that most operations would be performed laparoscopically within a few years. However, endoscopic surgery has so far yielded more questions than answers.

In general, endoscopic surgery provides less postoperative pain and faster recovery to full physical function than open surgery and appears to be more patient friendly. These benefits must be balanced against questionable improvement in outcome over traditional open approaches, the effect of the surgeon's learning curve for new procedures, new complications arising from laparoscopy, and lack of standardized techniques. Currently there is strong evidence that laparoscopic cholecystectomy and fundoplication are both feasible with the incidence of complications, morbidity, and mortality similar to that for the open technique. Significant advantages include less postoperative pain, shorter hospital stay, and earlier return to normal activities. Clinical data on endoscopic surgery for other common surgical conditions remain inconclusive and debatable. The following *Scanning the Literature* section reviews clinical trials on laparoscopic treatment for acute appendicitis and inguinal hernia.

Lapararoscopic Surgery for Acute Appendicitis?

Kald A, Kullman E, Anderberg B, et al. Cost-minimisation analysis of laparoscopic and open appendicectomy. Eur J Surg 1999;165:579-582.

Objective: To compare the direct and indirect costs of laparoscopic and open appendicectomy.
Design: Randomised study.
Setting: University hospital, Sweden.
Main Outcome Measures: Total costs for a defined period of time for each option.
Results: 102 patients were randomised and 99 were included in the final analysis. All patients had completely recovered within two months of operation. Disposable extra material used for the laparoscopic operation and longer operating time raised its median cost by SEK 912 and 1785, respectively. The mean duration of hospital stay, period off work (indirect costs), and time to complete recovery did not differ between the groups.
Conclusion: Laparoscopic appendicectomy has higher direct costs than open operation and is not as cost-effective when the longterm outcome is the same in both groups.

Hellberg A, Rudberg C, Kullman E, et al. Prospective randomized multicentre study of laparoscopic versus open appendicectomy. Brit J Surgery 1999;86:48-53.

Background: A prospective randomized multicentre study was performed to compare the outcome of laparoscopic and open appendicectomy in patients with suspected acute appendicitis.
Methods: A total of 523 patients was randomized, but because of 23 withdrawals the outcome in 500 patients is reported, 244 in the laparoscopic group and 256 in the open group.
Results: Patients having laparoscopic appendicectomy recovered more quickly than those having open surgery (13 *versus* 21 days, $P < 0.001$). There was no significant difference in duration of sick leave after operation (laparoscopic group 11 days *versus* open group 14 days). Postoperative pain (at 24 h, 7 days and 14 days) was less after laparoscopic operations and a functional index 1 week after operation was more favourable in these patients ($P < 0.001$). Operating time was significantly longer in the laparoscopic group (60 *versus* 35 min, $P < 0.01$). Hospital stay and complications did not differ between the groups. Thirty laparoscopic procedures (12 percent) were converted to open appendicectomy.
Conclusion: Laparoscopic appendicectomy is as safe as open appendicectomy and has the advantage of allowing a quicker recovery.

Comments:

Open appendectomy has been the gold standard for the treatment of acute appendicitis for more than a century. It is considered safe and effective with low morbidity, short length of hospitalization, and minimal discomfort after hospital discharge. However, less than 70% of patients with right lower quadrant pain actually have appendiceal disease. Recently the laparoscopic approach has been advocated as the solution to the diagnostic and therapeutic difficulties associated with open appendectomy. Hellberg et al conducted a prospective randomized multicenter study of laparoscopic versus open appendectomy. As expected, this study of 500 patients revealed faster recovery time, less postoperative pain, and better functional index 1 week after operation in the laparoscopic group. However, there was considerable variation among the participating centers. Although hospital stay and complications did not differ between the groups, operating time was significantly longer in the laparoscopic group. In another study, Kald et al performed a cost-minimization analysis of laparoscopic and open appendectomy. This small randomized study of 99 patients found no difference in the mean duration of hospital stay, period off work, and time to recovery between the groups, but a significant increase in median total cost for the laparoscopic group due to longer operating time and extra laparoscopic material cost. Review of other controlled studies consistently shows longer operating time and minimal reduction in hospital stay at the benefit of earlier return to normal activity. In addition, methodological flaws limit the generalization of acute appendicitis in the real world. It appears that open appendectomy is still the procedure of choice in the community setting.

Laparoscopic Surgery for Hernia Repair?

The MRC Laparoscopic Groin Hernia Trial Group. Laparoscopic versus open repair of groin hernia: a randomised comparison. Lancet 1999;354:185-90.

Background: Repair of a groin hernia is one of the most common elective operations performed in general surgery. Our aim was to compare laparoscopic repair with open repair of groin hernia.

Methods: 928 patients with groin hernia, from 26 hospitals in the UK and Ireland, were randomly assigned to laparoscopic repair (n = 468) or to open hernia repair (n = 460, of which 433 were tension-free mesh repairs). Patients were clinically assessed at 1 week and 1 year after surgery, and were sent questionnaires at 3 months and 1 year. The primary endpoints were: complications; return to usual activities of social life (as the most generally applicable example of return to usual activities); hernia recurrence; groin pain that persisted at 1 year; and costs to the health services. All analyses were by intention to treat.

Findings: At 1 week, at least one complication was found in 108 (29.9%) patients allocated to laparoscopic repair and in 155 (43.5%) patients allocated to open repair (95% CI for difference –20.6% to –6.6%, $p < 0.001$). There were three serious surgical complications all of which occurred in the laparoscopic group. Patients in the laparoscopic group returned to the usual activities of social life sooner than the patients in the open repair group (10 [IQR 7-12] *vs* 14 [7-28] days, $p = 0.004$). At 1 year after the operation, the laparoscopic group had a lower rate of persistent groin pain than those who had open repair (28.7% *vs* 36.7% [95% CI for difference –14.7% to –1.4%], $p = 0.018$). However, all seven hernia recurrences occurred in the laparoscopic group and not in the open repair group (1.9% *vs* 0.0% [95% CI for difference 0.5% to 3.4%], $p = 0.017$).

Interpretation: Although laparoscopic hernia repair has advantages for patients, concerns about safety indicate that open repair is the more appropriate option for the general surgeon. Our findings lend support to the move towards laparoscopic hernia surgery becoming part of the domain of specialist surgeons.

Juul P. Christensen K. Randomized clinical trial of laparoscopic versus open inguinal hernia repair. Brit J Surg 1999; 86:316-319.

Background: Several studies have suggested that better results are obtained after laparoscopic repair of inguinal hernia than after conventional operation. This is most obvious for bilateral and recurrent hernias but less accepted for primary unilateral hernias.

Methods: This was a randomized clinical trial comparing transabdominal preperitoneal laparoscopic repair with the Shouldice technique in patients with primary unilateral hernia. Some 138 patients were randomized to laparoscopic hernia repair and 130 to open surgical repair.

Results: The complication rates in the two groups were similar. In the laparoscopic group the patients returned to work more rapidly with a median time of 13 *versus* 18 days ($P < 0.005$) and had a shorter period of analgesia intake with a median time of 2.1 *versus* 2.7 days ($P < 0.02$). The follow-up was 97.8 per cent complete. At a median of 12 months, four recurrences (2.9 per cent) were detected in the laparoscopic group and three (2.3 per cent) in the open group.

Conclusion: This study shows that in patients with a primary unilateral hernia laparoscopic repair results in less postoperative pain and a quicker recovery than open repair.

Commentary:

Equally controversial is the role of laparoscopic inguinal hernia repair. Inguinal hernia is one of the most common elective operations in general surgery. However, long-term follow-up studies have indicated a failure rate of up to 30% with sutured hernia repair. It was postulated that laparoscopic inguinal hernia repair would reduce recurrence, especially in bilateral and recurrent hernias. One large randomized multicenter trial by Leim et al (NEJM 1997;336:1541-1547) showed a 3% recurrence rate for the laparoscopic group versus 6% for the open surgery group with a mean follow-up of 607 days. However, this study was criticized for using a suboptimal open surgery group that included various

types of techniques. Recently, a lower recurrence has been demonstrated over a longer period with the use of open, tension-free repairs with mesh prostheses, but some suggest that the prosthetic material may be unnecessary in some hernias and recommend tailoring the repair to the type of hernia and patient.

Juul and Christensen use uniform data on primary single hernias in men to compare laparoscopic repair with Shouldice repair for primary unilateral hernia repair. No difference in the rates of recurrences and complications was reported between the two groups, but the median follow-up was just 12 months. The study did show, however, that the laparoscopic group had less postoperative pain and quicker recovery, which lends support for the use of laparoscopic surgery pending the report of long-term recurrence rates. The MRC laparoscopic groin hernia trial group randomly assigned 468 patients to laparoscopic repair and 460 to open hernia repair (of which 433 were tension-free mesh repairs). The laparoscopic hernia repair group was associated with faster recovery and less persistent groin pain at 1-year follow-up, but with more serious complications and recurrences, and higher cost. The authors recommended open repair as the better option for the general surgeon due to safety concerns, which suggests the learning curve for laparoscopic hernia repair is rather long. These studies taken together with previous studies indicate that there are inadequate long-term recurrence data, lack of standardized technique, and the presence of individual learning curve. The role of laparoscopic hernia repair is still open to debate.

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