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Assessing the value of routine upper gastrointestinal contrast studies following bariatric surgery: a systematic review and meta-analysis

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Abstract

BACKGROUND: Understanding both the efficacy of upper gastrointestinal (UGI) contrast studies and the factors that impact their accuracy is necessary to optimize postoperative imaging protocols. However, a consensus as to the value of UGI performed after bariatric surgery remains elusive. The objective was to determine the sensitivity and specificity of UGI conducted routinely within 2 days after bariatric surgery for detecting anastomotic leaks.

METHODS: We conducted an electronic search of MEDLINE for all English language articles published between 2003 and 2013 concerning diagnostic imaging after bariatric surgery. Nineteen studies evaluating a total of 10,139 patients met the inclusion criteria. The methodological quality of each included study was evaluated using the Quality Assessment of Diagnostic Accuracy Studies-2 procedure.

RESULTS: UGI has an overall sensitivity of .54 and a specificity of 1.00. The standard deviation of the reported sensitivities was .36. Positive and negative predictive values were .67 and .98, respectively. Sensitivity and specificity were negatively correlated.

CONCLUSIONS: The sensitivity of UGI for detecting the presence of anastomotic leaks within 2 days of bariatric surgery is moderate overall but fluctuates substantially. The negative correlation between sensitivity and specificity could indicate that the threshold used to distinguish between positive and negative test results varies between institutions. Accordingly, clinicians may consider shifting the threshold for declaring a UGI positive; treating marginal radiological evidence of leakage as presumptively positive may be a simple way to lower specificity, increase sensitivity, and in turn maximize UGI's clinical value.

Obesity and obesity-related illness impose a substantial, and increasing, burden on the US healthcare system. The Centers for Disease Control estimate the annual economic cost of obesity to be at least $147 billion dollars.[1] Morbid obesity, defined as a body mass index above 40, is

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especially problematic because this condition is disproportionately associated with severe co-occurring health problems. Moreover, epidemiological evidence suggests that the prevalence of morbid obesity has increased by at least 50% over the last decade, far outpacing the growth of moderate obesity.[2] This ominous shift in our population's weight distribution portends further increases in both the economic and human cost of obesity.

Although they represent reasonable first-line interventions, nonsurgical treatments have been shown to have limited efficacy in inducing and maintaining weight loss for morbidly obese patients.[3] In contrast, bariatric surgery is the only approach that has been shown to consistently bring about weight loss in morbidly obese patients, especially when the patient's condition has proven refractory to nonsurgical efforts.[4,5] Already, more than 200,000 bariatric surgeries are conducted each year in the United States,[6] and the continued surge in the prevalence of morbid obesity combined with the singular effectiveness of surgery in treating the condition suggest that bariatric surgical interventions will play an increasingly central role in our future attempts to control the societal costs of obesity.

A limited upper gastrointestinal series (UGI) is commonly used in connection with bariatric surgery to screen for the presence of postoperative complications, the most serious of which is an anastomotic leak. However, the optimal use of this imaging procedure remains a matter of debate—while many centers pre-emptively screen all patients postoperatively, the literature suggests that, as a matter of policy, a growing number of institutions conduct the UGI only when a complication is suspected.[7] Given the high volume of bariatric surgeries and severity of potential complications, it would seem both prudent and valuable to make an empirical determination of the accuracy of routine postoperative UGI. Several studies have conducted such an analysis using data from a single, or, at best, a small handful of, centers. However, to our knowledge, no meta-analysis of the data produced by these studies has been undertaken. The aim of this article, then, is to amalgamate previously reported results of the accuracy of routine postoperative UGI in assessing postoperative leaks and to calculate the overall sensitivity, specificity, and positive predictive value (PPV) and negative predictive value (NPV).

Patients and Methods

This review was conducted according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses.[8] The review protocol was not published in advance.

Study selection

MEDLINE (PubMed) was queried for English language, original diagnostic studies published between June 2003 and June 2013 analyzing patients who had undergone bariatric surgery. Only studies analyzing 5 or more patients were considered. The index technique was a postoperative UGI contrast study, with computed tomography (CT) or follow-up surgery used as the reference. Only studies from which it was possible to construct 2×2 tables comparing the contrast swallow results with the reference were included. The only postoperative complication considered by this analysis was anastomotic leak.

The search of MEDLINE was intended to find articles making reference to "bariatric surgery," "Roux-en-Y," "sleeve gastrectomy," "gastric bypass," "UGI," "upper GI series," and "contrast swallow." Queried terms were combined using both "OR" and "AND."

The title and abstract of each article were used to assess whether its inclusion in the study would be appropriate. For articles deemed appropriate based on the abstract, the full text was obtained and again assessed to determine appropriateness for inclusion. For articles deemed inappropriate, the reason for its exclusion was noted. Missed papers were identified by checking citation lists of the articles included in the study as well as the MEDLINE list of articles that cited the included papers.

The following data were extracted from each of the included studies: (1) study design (prospective/retrospective, consecutive/nonconsecutive patients); (2) demographic information describing the patient profile (sex, age, body mass index); (3) the set of operations performed (band/sleeve/bypass, laparoscopic/open); (4) type of reference standard (CT/surgery); and (5) outcome measures (complication identified by index, complication identified by reference).

Evaluation of methodological quality and bias in individual studies

The methodological quality and risk of bias were assessed using the Quality Assessment of Diagnostic Accuracy Studies-2 tool (QUADAS-2),[9] which was developed to aid in the appraisal of diagnostic studies included in a meta-analysis. The following 10 QUADAS-2 questions were analyzed for each included study: (1) Was a consecutive or random sample of patients enrolled?; (2) Was a case–control design avoided?; (3) Did the study avoid inappropriate exclusions?; (4) Were the index test results interpreted without knowledge of the results of the reference standard?; (5) Is the reference standard likely to correctly classify the target condition?; (6) Were the reference standard results interpreted without knowledge of the results of the index test?; (7) Was there an appropriate interval between the index test and reference standard?; (8) Did all patients receive a reference standard?; (9) Did all patients receive the same reference standard?; and (10) Were all patients included in the analysis? For each item, the study in question received a "yes" (adequate), "no" (inadequate), or "unclear" (usually indicating that the required