Surgery or stenting for colonic obstruction: A practice management guideline from the Eastern Association for the Surgery of Trauma

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BACKGROUND: Colonic obstruction is a surgical emergency, and delay in decompression results in added morbidity and mortality. Advances have led to less invasive procedures such as stenting as a bridge for definitive surgery. The aim of this article was to perform a systematic review regarding colon obstruction (malignant or benign) and to provide recommendations following the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework.

METHODS: A systematic literature review was conducted using the PubMed, EMBASE, and the Cochrane Library databases of published studies. The search was last performed on January 2, 2015. Two independent reviewers extracted the desired variables from the studies. For our meta-analysis, we used Review Manager X.6 (RevMan). Recommendations are provided using GRADE methodology. A single Population, Intervention, Comparator, Outcome (PICO) question with two outcomes was addressed as follows:
Population: in adult patients with a colonic obstruction (malignant or benign).
Intervention: should surgery be performed.
Comparator: versus endoscopic stenting.
Outcomes: decreased mortality and decreased emergency, nonplanned procedures?

RESULTS: The search yielded 210 results. Screening of the titles excluded 102 articles, leaving 108 for review. After abstract review, 71 additional articles were excluded because of failure to address the PICO questions of this guideline. Thirty-seven articles were reviewed in their entirety, of those six randomized control trials that evaluated the use of stents versus emergency surgery in colonic obstruction caused by malignant disease were included in the final qualitative review.

CONCLUSION: We conditionally recommend endoscopic, colonic stenting (if available) as initial therapy for colonic obstruction. In our review, stent use was associated with decreased mortality and rates for emergency, nonplanned procedures to include reoperations. This conditional recommendation is limited to those with malignancy because of the lack of literature supporting this practice in benign colonic disease.

KEY WORDS: Colonic obstruction; surgical treatment of colon obstruction; large bowel obstruction; guidelines; systematic review; meta-analysis.

Colonic obstruction is a surgical emergency since delay in decompression is associated with increased morbidity and mortality.[1,2] Although more commonly caused by cancer, it can present as a consequence of a benign disease, such as diverticulitis, volvulus, bezoars, or hernias.[3] Although recently, technical advances have resulted in the placement of endoscopic stents as an option for the treatment of colonic obstruction, controversy on the matter still exists.[3,4] The aim of this article was to perform a systematic review with associated meta-analyses to create a guideline that may be used to direct decision making in the care of patients with colonic obstruction. This guideline was overseen by the Practice Management Guideline Section of the Eastern Association for the Surgery of Trauma using a framework established by the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) Working Group.[5–7]

OBJECTIVES

Our Population, Intervention, Comparator, and Outcome (PICO) questions are defined as follows:

Population: initial therapy in adult patients with colonic obstruction (malignant or benign).

Intervention: surgery.

Comparator: endoscopic stenting.

Outcomes: mortality and complications resulting in emergency unplanned procedure.

PICO Question 1: In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease mortality (O)?

PICO Question 2: In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease emergency, nonplanned procedures (O)?

PATIENTS AND METHODS

Study Eligibility

Inclusion criteria consisted of articles published in the English language reporting adult patients 18 years or older, who required hospitalization for the management of colonic obstruction with surgery or endoscopic stenting. We excluded meta-analyses, case reports, letters, and reviews lacking original data.

Intervention and Comparators

We only included studies directly comparing stenting with emergency, nonplanned surgery.

Critical Outcome

As per GRADE methodology, outcomes were chosen by the team and rated in importance from 1 to 9, with scores of 7 to 9 representing critical outcomes after intervention for colonic obstruction. The critical outcome was mortality, rated a score of 9.

Secondary Outcome

Emergency, nonplanned procedures were selected as a secondary outcome because of a rated score of 7. Other outcomes considered but excluded were renal failure, length of stay, and hospital cost because of ratings of lower than 7.

Information Sources

Two professional librarians conducted a systematic search using the PubMed, EMBASE, and the Cochrane Library databases of published studies. The search was last run on January 2, 2015, and used the following Medical Subject Headings (MeSH) terms: ((“Stents”[Mesh] OR stent*[tiab]) OR (“surgery”[tiab] OR surgical*[tiab] OR “surgery” [Subheading: NoExp] OR “Digestive System Surgical Procedures”[Mesh])) AND ((“Colon”[Majr] OR “colon”[tiab] OR “colonic”[tiab])

AND ("Intestinal Obstruction"[Mesh:NoExp] OR obstruct*[tiab])) AND ("mortality" [Subheading] OR "mortality"[tiab] OR death*[tiab] OR survival[tiab]) AND ("Comparative Study" [Publication Type] OR compare*[tiab] OR compari*[tiab]). In addition to the electronic search, we hand-searched the bibliographies of recent reviews and articles accepted for this study and reviewed the ClinicalTrials.gov registry. All studies found from 1990 until the last date of the search were considered. The last search was performed in January 2015.

Selection of Studies

After completing the electronic literature search, two independent reviewers screened titles and abstracts, applying the a priori PICO inclusion criteria. Any disagreement on inclusion was resolved by consensus. The resulting studies then underwent full-text review, again by two independent reviewers, to determine appropriateness for inclusion.

Data Extraction and Management

Two independent reviewers extracted the desired variables from the studies into Microsoft Excel. For two meta-analyses, we used Review Manager X.6 (RevMan a program developed for The Cochrane Collaboration to assist authors in preparing Cochrane reviews for publication in The Cochrane Database of Systematic Reviews).

Measures of Treatment Effect

We reported the dichotomous outcomes of mortality and need for emergency, nonplanned operation as an odds ratio, with associated 95% confidence intervals and p values. The unit of analysis was individual patients.

Assessment of Heterogeneity

Potential heterogeneity exists because of population differences, different types of surgery performed, and how obstruction was defined. We examined these differences across studies to assess the clinical and methodological heterogeneity. For the meta-analyses, we used RevMan to calculate the Q statistic, and then, the I^2 statistic (%) was used to determine the proportion of variation between studies attributable to heterogeneity and categorized as low (25–49%), moderate (50–74%), or high (74–100%). We also used the χ^2 test for heterogeneity and examined the confidence intervals for overlap, with decreasing overlap representing increasing heterogeneity. If heterogeneity was moderate to high, we did not consider pooling the data to be appropriate, and we performed a qualitative narrative summary of results. Based on the methodological and clinical similarity, we performed meta-analysis for each outcome.

RESULTS

Qualitative Analysis

Initially, the search yielded 210 studies. Title-only review excluded 102 articles. Abstract review excluded another 71 articles, leaving 37 articles for full-text review. Of those 37 articles, 6 were randomized controlled trials (RCTs). These RCTs were included in the final qualitative review[8–13] (Fig. 1, CONSORT diagram). We were unable to find literature that addressed stent use in benign disease; however, we included two articles focusing on benign disease for the qualitative review.[3,14]

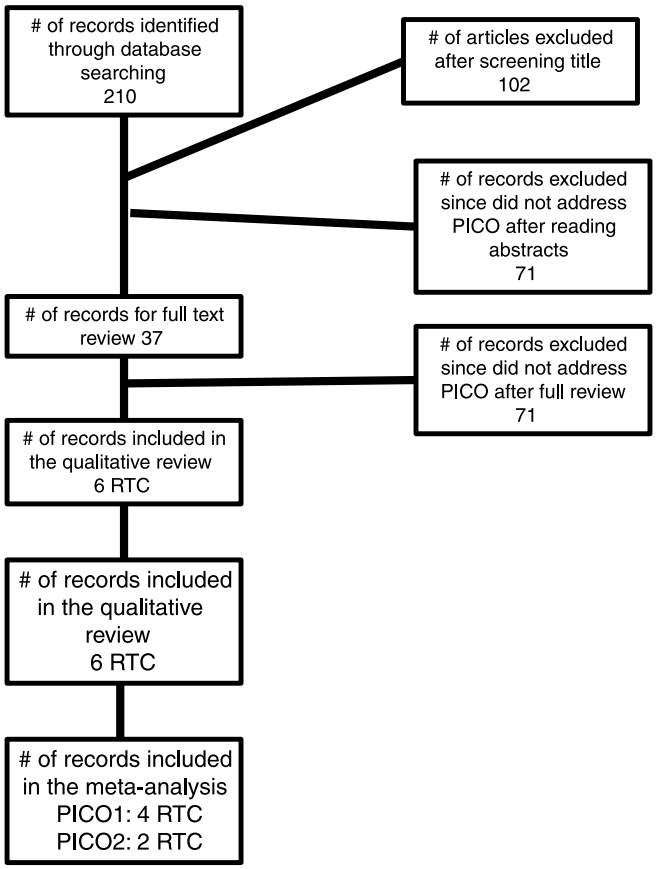

Figure 1. CONSORT diagram detailing the search and included articles in the review.

Four RCTs compared mortality between the two interventions, representing a total of 206 patients, where 94 were treated with operation and 112 were treated with endoscopic stenting. None of the articles addressed timing of intervention or benign disease indications.

Finally, we identified four studies that were appropriate for quantitative synthesis for PICO Question 1[8,11–13] and two studies for PICO Question 2[8,11] (Fig. 2).

Results Obtained for PICO Question 1

PICO Question 1: In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease mortality (O)?

Our search yielded no results addressing mortality regarding the use of stents versus emergency, nonplanned surgery for benign disease. Four RCTs compared mortality between the two interventions.[8,11–13] Alcantara et al.[8] have shown no statistically significant difference in mortality between the two groups; in their trial, there were no deaths in the stent group, and there was one death in the patients who received emergency surgery;[8] however, this was a small sample (stent, 15; surgery, 13). Van Hooft et al.[13] had a larger sample size (stent with 47 vs. surgery with 51) without a difference in mortality being detected (30-day

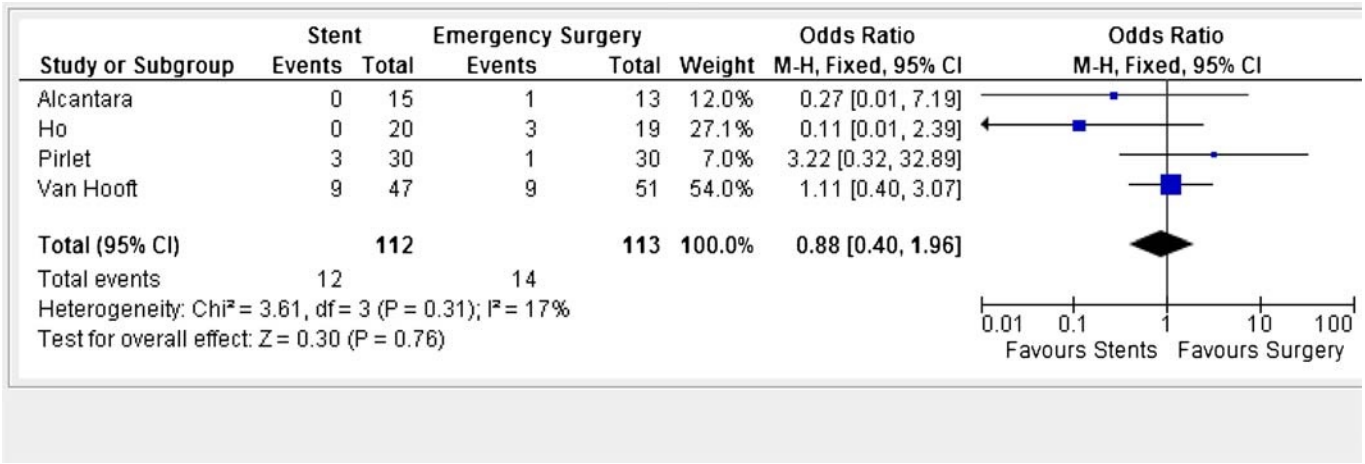

Figure 2. Forest plot for PICO Question 1.

mortality, five patients in each group). Ho et al.[11] reported an 18% increase in mortality in the emergency surgery group (three patients died in the surgery group vs. none in the patients who received a stent). Pirlet et al.[12] reported four in-hospital deaths during their study period. One patient in the surgery group died on the same day of surgery as a consequence of end-organ failure, and three patients died in the stent group as a result of the procedure (one from rapid progression of his neoplastic illness, one from mesenteric infarction, and one from septic shock and multivisceral failure after anastomotic leakage). A total of 32 patients underwent emergency surgery, and 35 received a stent in this trial. In all the RCTs, implicit is that colonic obstruction is a surgical emergency that requires prompt treatment and decompression. None of the articles addressed increased mortality by delayed therapy, either in stenting or emergency, nonplanned surgery since prompt treatment before perforation is considered in all studies as the standard of care.

Quantitative Analysis (Meta-analysis)

Comparisons between the use of stents and emergency, nonplanned surgery evaluating mortality as an outcome were found in four RCTs. Analysis of the pooled data revealed that colonic stenting trended lower mortality rates than emergency, unplanned surgery (Fig. 2). However, a mild amount of heterogeneity was found (I^2 = 17%).

Results Obtained for PICO Question 2

In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease emergency, nonplanned procedures (O)?

Qualitative Analysis

Regarding benign disease, two articles mentioned morbidity after stenting or surgery.[3,14] Köhler et al.[14] described their experience with stenting strictures secondary to inflammatory bowel disease but without mentioning strictures for diverticulitis. Immediate surgery was required in three patients secondary to perforation with stent placement, 11 patients had elective surgery after stent placement because of stent dislocation or recurrent stenosis, and 6 patients had successful placement without need for surgery.[14] This article described a series of 14 patients with anastomotic stricture, of which 9 had long-term cure with stenting. This article did not compare emergency, nonplanned surgery versus stenting for begin disease but merely described the authors' experience with stenting. Small et al.[3] described successful stent placement in 23 patients with benign disease. In this series, complications occurred in 38% of the patients including migration (n = 2), reobstruction (n = 4), and perforation (n = 2). Of these major complications, 87% occurred after 7 days. Fifteen of these patients had diverticulitis as the main reason for obstruction, two patients had strictures secondary to

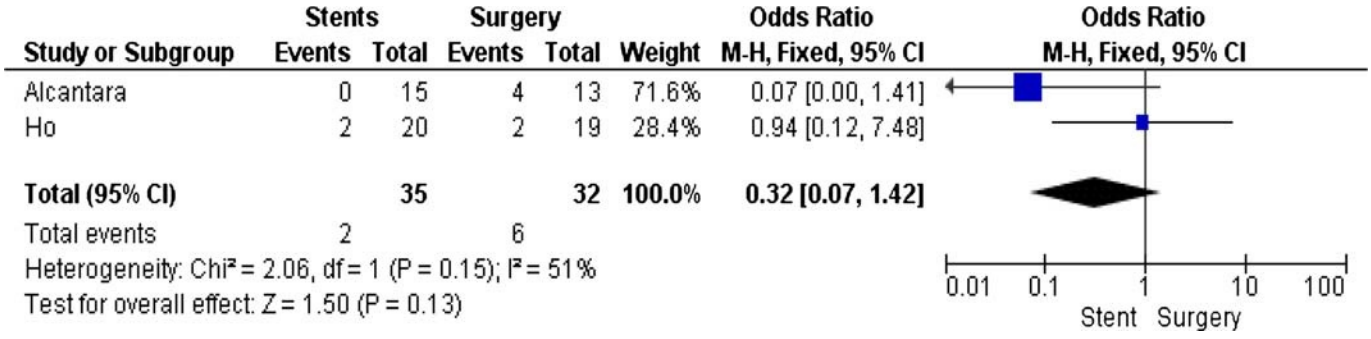

Figure 3. Forest plot for PICO Question 2.

Quality assessment							No of patients		Effect		Quality	Importance
No of studies	Design	Risk of bias	Inconsistency	Indirectness	Imprecision	Other considerations	Stents	Surgery	Relative (95% CI)	Absolute		
Colon Obstrcution Stent Vs Emergency Surgery Reduction in Mortality												
4	randomised trials	no serious risk of bias	no serious inconsistency	no serious indirectness	serious imprecision	reporting bias[1]	12/112 (10.7%)	20/94 (21.3%)	OR 0.5 (0.15 to 1.72)	94 fewer per 1000 (from 174 fewer to 105 more)	⊕⊕⊖⊖ LOW	CRITICAL
								7.7%		37 fewer per 1000 (from 65 fewer to 48 more)		
Mortality												
0	No evidence available					none	-	-	-	-		
								0%		-		

[1] only a few RTC not enough data for a strong recommendation

Figure 4. GRADE evidence table for PICO Question 1.

radiation, three patients had anastomotic strictures, two had an inflammatory stricture (etiology unknown), and one patient had Crohn's disease. This article also failed to compare emergency, nonplanned surgery with stents.

Two RCTs compared emergency, nonplanned procedures or reoperation in patients with acute colonic obstruction but only included malignant disease.[8,11] Alcantara et al.[8] showed a statistically significant difference between the stent and emergency surgery group, favoring stent placement (reoperation stent, 0 of 15; emergency surgery, 4 of 13), while Ho et al.[11] failed to support this finding (stent with 2 of 20 vs. emergency surgery with 2 of 19). However, in this study, overall complication rates were higher in the emergency surgery group (stent, 305 vs. emergency surgery, 58%). All RCTs assumed that colonic obstruction is a surgical emergency that requires prompt treatment. None of the articles addressed increased nonplanned operative interventions by delayed therapy, either in stenting or in emergency surgery.

Quantitative Analysis (Meta-analysis)

Comparisons between the use of stents and emergency surgery evaluating the necessity for reoperation or unplanned procedures as an outcome were found in two RCTs (please include the references). Analysis of the pooled data revealed that colonic stenting trended lower rates of unplanned procedures or reoperation compared with emergency surgery (Fig. 3). However, heterogeneity was at a moderate level ($I^2 = 51\%$).

Grading the Evidence

Applying the GRADE framework to the outcome of reduced mortality rates and for unplanned procedures or reoperations found no serious risk of bias, inconsistency, indirectness, or publication bias. However, studies comparing the rate of mortality for stent use versus surgery in patients with colonic obstruction included patients with only a malignant etiology for obstruction. No articles compared these techniques as applied to benign disease. All included studies were RCTs; however, the overall quality of evidence was downgraded to low secondary to the small number of studies fulfilling criteria, serious imprecision, and the large variation in outcomes. (Figs. 4 and 5, Evidence GRADE Profiles).

Recommendations

PICO Question 1: In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease mortality (O)?

PICO Question 2: In adult patients with colonic obstruction (malignant or benign) (P), should surgery (I) or endoscopic stenting (C) be performed to decrease emergency, nonplanned procedures (O)?

We conditionally recommend endoscopic, colonic stenting (if available) as the initial therapy for colonic obstruction. In our review, stent use was associated with decreased mortality and rates for emergency, nonplanned procedures to include reoperations. This conditional recommendation is limited to those with

Quality assessment							Summary of Findings			
Participants (studies) Follow up	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Overall quality of evidence	Study event rates (%)		Relative effect (95% CI)	Anticipated absolute effects
							With Control	With Colon Obstruction Re-operation		Risk with Control / Risk difference with Colon Obstruction Re-operation (95% CI)
Colon obstruction Stents Vs Emergency surgery need for re operation										
67 (2)							6/32 (18.8%)	2/35 (5.7%)	**OR 0.32** (0.07 to 1.42)	**Study population**
										188 per 1000 **119 fewer per 1000** (from 172 fewer to 59 more)
										Moderate
										207 per 1000 **130 fewer per 1000** (from 189 fewer to 63 more)

Figure 5. GRADE evidence table for PICO Question 2.

Question	Recommendation
PICO #1: In adult patients with a colonic obstruction (neoplastic or benign) (P), does stenting (I) compared with surgery decrease mortality rates (O)?	In adult patients with colonic obstruction we conditionally recommend colonic stenting vs open surgery regarding decreasing mortality . This recommendation does not apply to benign disease
PICO#2: In adult patients with a colonic obstruction (neoplastic or benign) (P), does stenting (I) compared with surgery decrease emergency, non-planned interventions (O)?	In adult patients with colonic obstruction we conditionally recommend colonic stenting vs surgery regarding decreasing need for unplanned interventions. This recommendation does not apply to benign disease

Figure 6. Summary of recommendations.

malignancy because of the lack of literature supporting this practice in benign colonic disease. Moreover, our review supports expedient intervention when the diagnosis of colonic obstruction is made because of the high complication and mortality rates associated with ischemic perforation (Fig. 6).

AUTHORSHIP

P.F., M.B.P., V.Y.P., B.B., S.L., and S.W. reviewed the articles in detail and extracted the data initially. P.F. extracted the data individually and produced the forest plots independently. P.F., M.B.P., V.Y.P., B.B., S.L., S.W., S.S., and E.H. voted on the outcomes and recommendations and participated in the writing and critical correction of the manuscript. Finally, B.R. reviewed the manuscript and data, provided critical review of the writing, performed statistical review, and provided recommendations.

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DISCLOSURE

The authors declare no conflicts of interest.

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