

Effect of preoperative biliary drainage on malignant obstructive jaundice: A meta-analysis

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Abstract

AIM: To evaluate the effect of preoperative biliary drainage (PBD) on obstructive jaundice resulting from malignant tumors.

METHODS: According to the requirements of Cochrane systematic review, studies in the English language were retrieved from MEDLINE and Embase databases from 1995 to 2009 with the key word "preoperative biliary drainage". Two reviewers independently screened the eligible studies, evaluated their academic level and extracted the data from the eligible studies confirmed by cross-checking. Data about patients with and without PBD after resection of malignant tumors were processed for meta-analysis using the Stata 9.2 software, including postoperative mortality, incidence of postoperative pancreatic and bile leakage, abdominal abscess, delayed gastric emptying and incision infection.

RESULTS: Fourteen retrospective cohort studies involving 1826 patients with malignant obstructive jaundice accorded with our inclusion criteria, and were included in meta-analysis. Their baseline characteristics were comparable in all the studies. No significant difference was found in combined risk ratio (RR) of postoperative mortality and incidence of pancreatic and bile leakage, abdominal abscess, delayed gastric emptying between patients with and without PBD. However, the combined RR for the incidence of postoperative incision infection was improved better in patients with PBD than in those without PBD ($P < 0.05$).

CONCLUSION: PBD cannot significantly reduce the postoperative mortality and complications of malignant obstructive jaundice, and therefore should not be used as a preoperative routine procedure for malignant obstructive jaundice.

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Key words: Malignant obstructive jaundice; Preoperative biliary drainage; Meta-analysis; Mortality; Incidence of complications

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INTRODUCTION

Surgery for patients with malignant obstructive jaundice carries an increased risk of postoperative complications

and a high mortality rate^[1,2] and preoperative hyperbilirubinemia is considered an important risk factor for postoperative complications and death. Hyperbilirubinemia due to obstructive jaundice damages hepatic function, clearance of circulating endotoxins, coagulation system, immune function, and gastrointestinal barrier^[3-6]. To avoid the poor outcome, preoperative biliary drainage (PBD) has been used to reduce the postoperative morbidity and mortality of these patients. However, PBD has also many drawbacks, such as biliary stent-induced bacterial contamination and risk of cholangitis due to clogging. In addition, biliary stenting generates a severe inflammatory response in the bile duct which may increase the risk of bile leakage at the biliodigestive anastomosis. Since 1970s, several randomized and retrospective studies have compared the effect of PBD and surgery without PBD on malignant obstructive jaundice^[7,8]. However, it is difficult to find evidence that routine PBD improves the outcome of patients with malignant obstructive jaundice in clinical practice.

Despite the scarcity of clinical evidence, most patients with malignant obstructive jaundice undergo either percutaneous transhepatic or internal PBD in many centers. This meta-analysis was to evaluate the effect of PBD on malignant obstructive jaundice.

MATERIALS AND METHODS

Search strategy and selection criteria

Studies on obstructive jaundice in the English language were retrieved from MEDLINE and Embase databases from 1995 to 2009 with the key word “preoperative biliary drainage”. The primary selection criteria for meta-analysis included patients with malignant obstructive jaundice, those with or without PBD, and those with their postoperative mortality and incidence of complications assessed. The exclusion criteria were patients who underwent different surgical procedures, and those with other severe diseases unrelated to obstructive jaundice. The included studies were reviewed by two independent reviewers, with disagreements settled by group discussion.

Data extraction

Data were independently extracted by two investigators in a standard form. The concordance rate between the two investigators was 100%. Following information was extracted from all included publications including study group, year, number of included patients, type of drainage, postoperative mortality, incidence of postoperative pancreatic and bile leakage, abdominal abscess, delayed gastric emptying and incision infection

Analysis of methodological quality

Methodological quality was analyzed as previously described^[8].

Statistical methods

Stata 9.2 software was used in meta-analysis of the data. Effect measures of interest were relative risks for cohort

Table 1 Characteristics of 14 studies included in this study

Study	Yr	Type of drainage	Patients (n)
Hochwald <i>et al</i> ^[9]	1999	Internal and external	71
Martignoni <i>et al</i> ^[10]	2001	Internal and external	30
Pisters <i>et al</i> ^[11]	2001	Internal and external	255
Srivastava <i>et al</i> ^[12]	2001	Internal and external	95
Hodul <i>et al</i> ^[13]	2003	Internal	212
Pešková <i>et al</i> ^[14]	2005	Internal	304
dos Santos <i>et al</i> ^[15]	2005	Internal	53
Tsai <i>et al</i> ^[16]	2006	Internal and external	303
Barnett <i>et al</i> ^[17]	2006	Internal	104
Bhati <i>et al</i> ^[18]	2007	Internal	50
Choi <i>et al</i> ^[19]	2008	Internal and external	49
Ferrero <i>et al</i> ^[20]	2009	Internal and external	60
Abdullah <i>et al</i> ^[21]	2009	Internal and external	82
Li <i>et al</i> ^[22]	2009	Internal and external	140
Total			1826

studies and corresponding 95% CI. Estimates of intervention effect on malignant obstructive jaundice were expressed as relative risks using a fixed effect model. χ^2 test or Fisher's exact test was used to calculate the probability values when appropriate. Pooled effect was estimated using a random-effect model. Publication bias was evaluated by funnel plots and Egger test.

RESULTS

Fourteen retrospective cohort studies that were relevant and eligible were retrieved according to the selection and exclusion criteria (Table 1). Of the 1826 patients with malignant obstructive jaundice included in the studies, 1028 were subjected to PBD and 798 were subjected to surgery but not to PBD. Furthermore, only internal PBD was used in 5 out of the 14 studies, and both internal and external PBD were described in the other 9 studies.

Overall mortality

No significant difference was observed in postoperative death rate reported in 9 studies between patients with or without PBD [risk ratio (RR) = 0.996, 95% CI: 0.669-1.484, Figure 1].

Incidence of postoperative pancreatic leakage

The incidence of postoperative pancreatic leakage was reported in 10 studies (Figure 2A). In our study, PBD intervention did not reduce the incidence of pancreatic leakage in patients without PBD (RR = 0.792, 95% CI: 0.478-1.311).

Incidence of postoperative bile leakage

The incidence of postoperative bile leakage was reported in 10 studies with no significant difference observed between experimental and control groups (RR = 0.935, 95% CI: 0.576-1.518, Figure 2B).

Incidence of postoperative incision infection

The incidence of postoperative incision infection was reported in 9 studies. A significant difference was observed

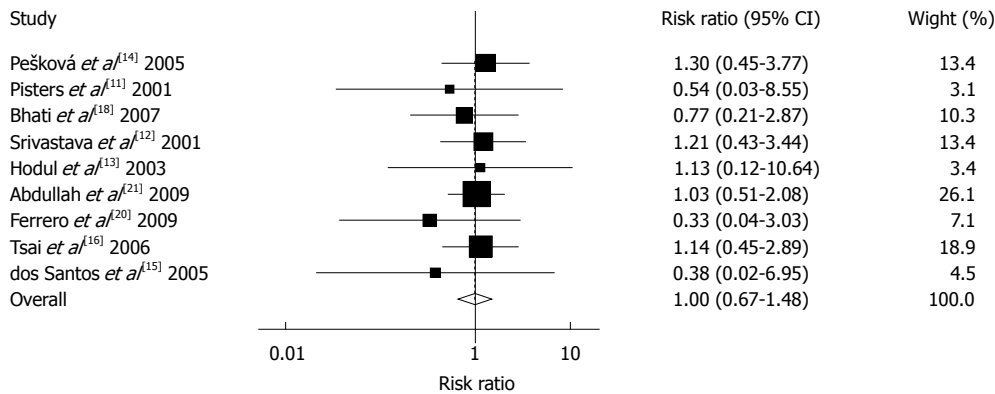
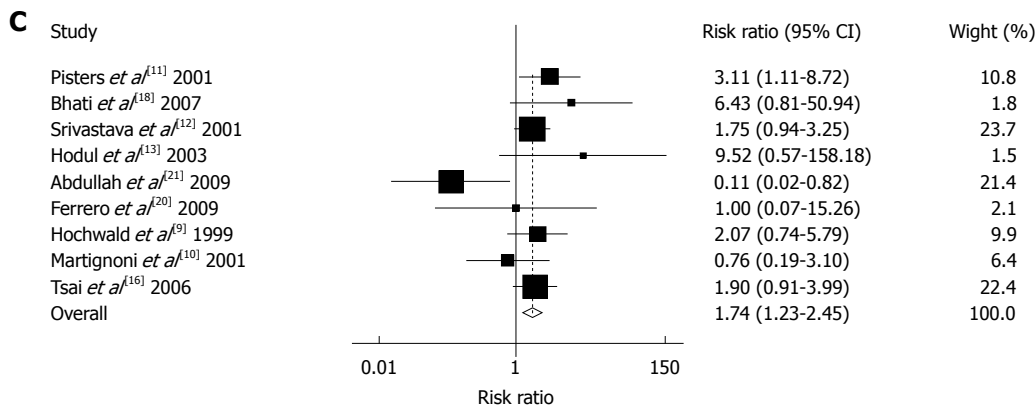
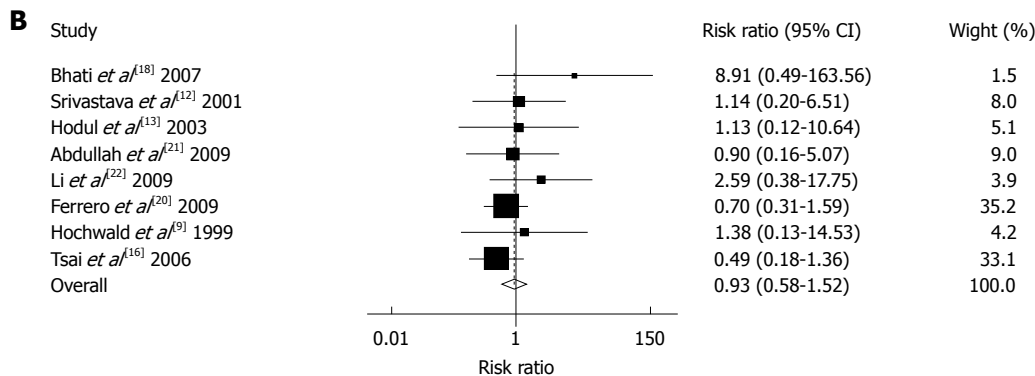
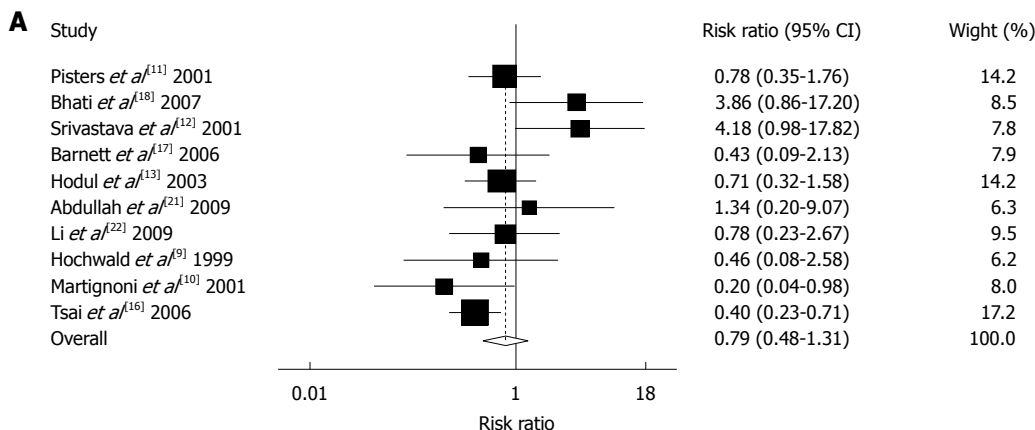


Figure 1 Overall mortality of patients with or without preoperative biliary drainage. Estimates of preoperative biliary drainage (PBD) effects of each study are presented on a log scale along with the 95% CI. The weight of each study is reflected by the size of square. The open diamond represents the global estimate of the PBD effect along with the 95% CI (random-effects model).



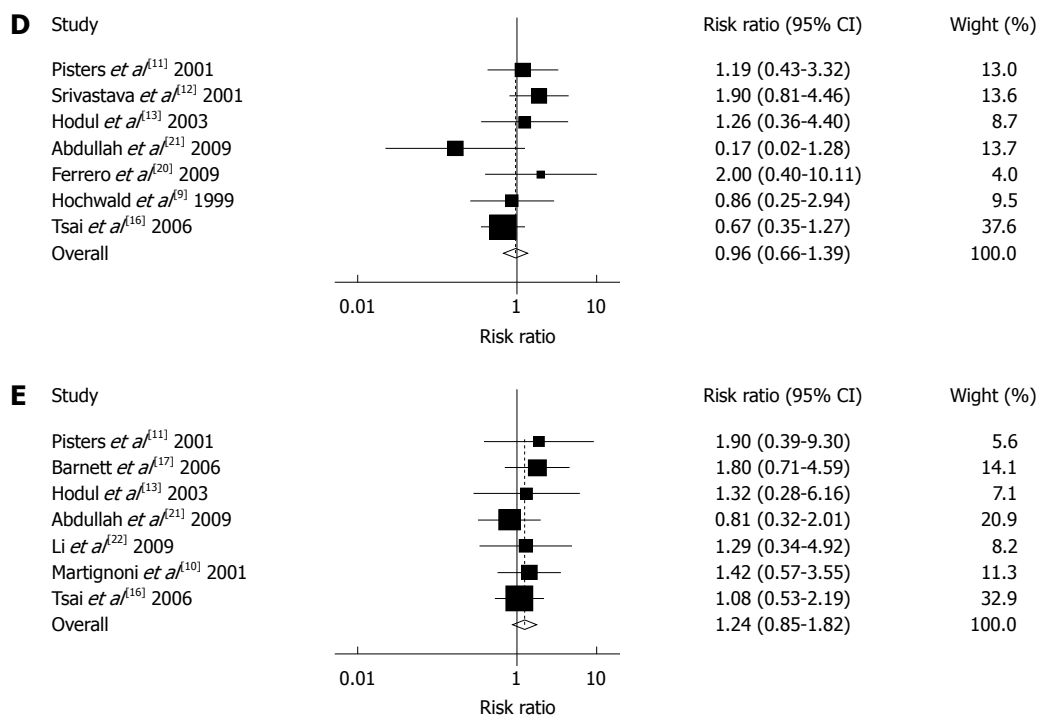


Figure 2 Incidence of postoperative pancreatic leakage (A), postoperative bile leakage (B), postoperative incision infection (C), postoperative abdominal abscess (D), and postoperative delayed gastric emptying (E). Estimates of preoperative biliary drainage (PBD) effect in each study are presented on a log scale along with the 95% CI. The weight of each study is reflected by the size of square. The open diamond represents the global estimate of the PBD effect along with the 95% CI (random-effects model).

between surgical patients with or without PBD (RR = 1.736, 95% CI: 1.229-2.450, *P* < 0.05, Figure 2C).

Incidence of postoperative abdominal abscess

The incidence of postoperative abdominal abscess in patients with or without PBD was reported in 9 studies. PBD could not decrease the postoperative abdominal abscess compared with surgery (RR = 0.957, 95% CI: 0.658-1.392, Figure 2D).

Incidence of postoperative delayed gastric emptying

The incidence of delayed postoperative gastric emptying was reported in 7 studies with no significant difference observed between patients with or without PBD (RR = 1.242, 95% CI: 0.849-1.819, Figure 2E).

DISCUSSION

Biliary obstruction has been identified to be an important risk factor for tumor which may result in alterations of glycogen metabolism, impaired hepatic and renal functions, decreased cell-mediated immunity, increased circulating endotoxins, and depressed synthesis of homeostasis factors^[23,24]. These factors can decrease the tolerance of patients to anesthesia and surgery, leading to increasing operative risks. For these reasons, in 1935, Whipple *et al*^[25] performed a staged surgery with a preliminary bypass to reduce jaundice and improve hepatic functions. In 1978, Nakayama *et al*^[26] found that the operative mortality is significantly reduced after PBD. Since then, more and more

investigators have accepted the concept that PBD can improve the hepatic functions of patients with malignant obstructive jaundice^[27-31].

With the great advances in surgical techniques and perioperative management, the postoperative complication rate has been dramatically declined in recent years. Whether PBD is still valuable in surgery for malignant obstructive jaundice is questioned by many experts. Several prospective randomized and retrospective studies compared the effect of PBD with surgery without PBD on malignant obstructive jaundice and showed that PBD cannot improve the postoperative outcome but can increase the overall complication rate^[32-35]. Although the controversy involves the indication of PBD for malignant obstructive jaundice, some centers still believe that PBD can improve the outcome for some time. To date, whether PBD should routinely be performed for malignant obstructive jaundice is still in debate. One of the reasons why the reported results are distinct is that the overwhelming majority of clinical trials were retrospective and some included heterogeneous groups of patients as well as a variety of different surgical procedures. Thus, unrecognized bias and differences in selection of patients may have affected the results. Another reason is that PBD failing to benefit patients with malignant obstructive jaundice may have a relatively short length of drainage, usually 2-3 wk. In fact, proliferation and fibrosis of bile duct epithelium may take 4-6 wk to recover, and avoid postoperative complications and impaired liver metabolism.

In the present study, the postoperative mortality, the

incidence of postoperative pancreatic and bile leakage, abdominal abscess, and delayed gastric emptying were not significantly different in patients with or without PBD, whereas the incidence of postoperative incision infection was significantly different in patients with or without PBD, which is consistent with other reports^[33,36,37]. Povoski *et al.*^[33] reviewed the effect of PBD and found that PBD has no beneficial effect on the postoperative outcome. In contrast, Trede *et al.*^[36] showed that the postoperative morbidity is significantly reduced in patients after internal PBD following pancreaticoduodenectomy. Lygidakis *et al.*^[37] also reported that the postoperative morbidity of obstructive jaundice is significantly decreased after internal PBD following pancreaticoduodenectomy. Due to the selective bias in choice of PBD, a well-selected subgroup of patients may benefit from PBD. Moreover, most patients with PBD, experiencing other serious diseases secondary to biliary obstruction, are in a relatively poorer condition than those undergoing surgery. Experimental and clinical evidence has shown that external PBD cannot improve the outcome of surgery, while internal PBD may have a beneficial effect because it can restore the nutritional and immune function^[7]. Since internal PBD can significantly reduce the number of postoperative laparotomies for bleeding, anastomotic leakage and abscess, many centers support the view that internal PBD reduces the morbidity rate of obstructive jaundice in patients undergoing surgery. However, Lai *et al.*^[38] did not support the routine use of internal PBD because of procedure-related complications, mainly cholangitis. In addition, biliary drainage for a proximal tumor with intrahepatic stenosis of the bile duct is also different from that for a distal obstruction. Therefore, various confounding factors affecting the prognosis should be taken into consideration in future clinical investigations.

In conclusion, there is no convincing evidence that supports the view that routine PBD improves postoperative outcome in patients with malignant obstructive jaundice. PBD has its own complications that partially cancel out its benefits. More randomized controlled trials are needed to identify patients who may benefit from PBD.

COMMENTS

Background

Preoperative hyperbilirubinemia in patients with malignant obstructive jaundice is considered an important risk factor for postoperative complications and death. Therefore, preoperative biliary drainage (PBD) has been used to reduce postoperative morbidity and mortality of such patients.

Research frontiers

Since 1970s, several randomized and retrospective studies have compared the effect of PBD with non-PBD on malignant obstructive jaundice. However, it is difficult to find convincing evidence that routine PBD can improve the outcome of patients with malignant obstructive jaundice in clinical practice.

Innovations and breakthroughs

To date, there is no convincing evidence that supports the view that routine PBD improves postoperative outcomes of patients with malignant obstructive jaundice. This is the first meta-analysis of the recent studies concerning the effect of PBD on malignant obstructive jaundice.

Applications

The present meta-analysis indicated that PBD could not significantly reduce the postoperative mortality and the complications of malignant obstructive jaundice. Therefore, PBD may not be regarded as a preoperative routine measure for malignant obstructive jaundice.

Peer review

A meta-analysis of the effect of PBD on malignant obstructive jaundice was performed by reviewing the publications between 1995 and 2009. The authors drew a conclusion that PBD may not be regarded as a preoperative routine measure for malignant obstructive jaundice. This is a very interesting topic for hepatologists and other digestive experts.

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