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REVIEW ARTICLE

Re-appraisal of prophylactic drainage in uncomplicated liver resections: a systematic review and meta-analysis

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Abstract

Aim: The benefit of prophylactic drainage after uncomplicated hepatectomy remains controversial. The aim of this study was to update the existing evidence on the role of prophylactic drainage following uncomplicated liver resection.

Methods: Cochrane, Medline (Pubmed), and Embase were searched. The Medline search strategy was adopted for all other databases. A grey literature search was performed. Meta-analyses were performed with Review Manager 5.3. Primary outcomes were mortality and ascitic leak, secondary outcomes were infected intra-abdominal collection, chest infection, wound infection of the surgical incision, biliary fistula, and length of stay.

Results: The incidence of ascitic leak was higher in the drained group (Odds Ratio = 3.33 [95% Confidence Interval: 1.66–5.28]). Infected intra-abdominal collections, wound infections, chest infections, biliary fistula, length of stay and mortality were not statistically different between groups.

Conclusions: The routine utilisation of drains after elective uncomplicated liver resection does not translate into a lower incidence of postoperative complications. Therefore, based on the current available evidence, routine abdominal drainage is not recommended in elective uncomplicated hepatectomy.

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Introduction

In 1989, Franco D. *et al.* reported for the first time a no-drain management in elective hepatectomy and showed that prophylactic drainage was not necessary after uncomplicated hepatectomy.[1] Subsequently, studies reporting on outcomes following liver trauma surgery showed a correlation between drains and ascending infections or septic complications.[2]

Gurusamy KS. *et al.* published a meta-analysis on 5 randomised controlled trials (RCTs) including 465 patients and concluded that there was no evidence for the routine use of prophylactic drains in elective hepatectomy.[3–8] Since that time, further RCT with 200 patients has been published[9] founding no significant differences in postoperative morbidity between groups with or without abdominal drainage. However, drainage after elective hepatectomy is still widely applied in the current practice irrespective of the extent of resection and of the underlying liver diseases and seems to be more experienced-based rather than evidence-based. A multi-institutional analysis of 1041 patients reported frequency of use 54%, 564 of 1041 patients had placed drains at the operator's discretion. The cohort of drained patients demonstrated increased complications (56% vs 44%; $p < 0.001$), bile leaks (7.3% vs 4.2%; $p = 0.048$), and 30-days readmissions (16.4% vs 8%; $p < 0.001$) comparing to the non-drained cohort.[10]

Thus, the objective of the present systematic review and meta-analysis was to re-evaluate the current literature in order to update the evidence supporting or discouraging the routine use of prophylactic drainage following hepatectomy.

Methods

The PRISMA statements checklist for reporting a systematic review and meta-analysis was followed. The terms liver resection and hepatectomy have been used liberally as a synonymous.

Literature search

Using the search terms prophylactic, intraabdominal, drainage or drain, liver resection and elective hepatectomy, a systematic review of the literature was performed using the Cochrane, Embase, and Medline (Pubmed) databases from March 1986 to March 2016. The authors performed a grey literature search of the following clinical trial registry websites: National Health Service-The National Research Register; clinicaltrials.gov; current Controlled Trials; and NEAR website. Only English literature was searched.

The research was conducted independently by PG, EH and DA; subsequently the authors compared their results. Reference lists from relevant articles were crosschecked manually. Any disagreement between the examiners was resolved by consensus.

Study selection and inclusion criteria

Only RCTs were eligible for inclusion, irrespective of the type of operation (i.e. major or minor hepatectomy) and the type of drain. Different types of co-interventions, such as different types of glues and coagulators, were also eligible for inclusion, if they have been used equally in both groups. Only adult populations were considered. Major hepatectomy was defined as any resection of three or more liver segments according to Couinaud's nomenclature.[11]

Exclusion criteria

Case control studies and quasi-randomised trials were excluded.

Data extraction

After independent evaluation by PG, EH and DA, the following data were extracted from the included studies: name of authors; study design; number of patients included in the drained and non-drained group; age; type of operation; percentage of cirrhotic patients [Table 1]. The primary outcome measures were: thirty day postoperative mortality, ascitic leak (as reported by authors). The secondary outcomes were: infected abdominal collections, wound infection of the surgical incision (as reported by authors), biliary fistula (as reported by authors) chest infections, and length of stay.

Assessment of methodological quality of RCTs

RCTs were evaluated according to an adequate generation of allocation sequence, allocation concealment, follow-up procedures, intention-to-treat analysis, and sample size calculation (adequate, unclear and inadequate). RCTs that had adequate generation of allocation sequence, allocation concealment and adequate follow-up procedures were categorised as studies of high methodological quality.

Sensitivity analysis and risk of bias in included studies

Sensitivity analysis was performed with the aim of determining the significance of the results. For the overall incidence of infected intra-abdominal collections, ascitic leak, chest infections, wound infections, length of hospital stay and mortality, the combined Odds Ratio (OR) was calculated using both a fixed-effect model and a random-effects model, and the results were compared.

Statistical analysis

Review Manager 5.3 software (Cochrane collaboration, Oxford, England) was used for all statistical analyses. Considering that patients were selected by different surgical teams and operated in different centres, a random-effects model was applied. I^2 test was used for heterogeneity assessment, and values of more than 50% were considered significant. Dichotomous variables were analysed and assessed by calculating the OR with 95% confidence interval (CI); an OR < 1 favoured the drained cohort. Continuous variables were analysed by calculating the weighted mean difference (WMD). The Mantel–Haenszel method was used to combine the OR for the outcomes of interest; Peto OR was used when necessary. In case of discrepancy between the two models both results were reported. Publication bias and sensitivity analysis were performed.[12]

Results

Out of 346 articles identified by searching the current literature, only 6 RCTs were eligible for inclusion [Fig. 1, Table 1].

Table 1 Study characteristics

Author, year, country	Number of patients D/ND	Age D/ND	Major hepatectomy D/ND (%)	Cirrhotic patients D/ND (%)	Type of drain	Ascitic leak D/ND n (%)	Mortality D/ND n (%)
Belghiti J 1993, France	42–39	47–51	14 (33)–11 (28)	8 (19)–11 (28)	Closed suction	0 (0)–1 (2.56)	1 (2.38)–1 (2.56)
Fong Y, 1996, USA	60–60	57–57	44 (73)–43 (72)	4 (6)–2 (3)	Closed suction	0 (0)–2 (3.33)	2 (3.3)–2 (3.3)
Fuster J, 2004, Spain	20–20	60–58	0 (0)–0(0)	20 (100)–20 (100)	Closed suction	2 (10)–0 (0)	0–0
Liu CL 2004, China	52–52	53–52	33 (63)–29 (56)	37 (71)–32 (62)	Closed suction	29 (55.76)–8 (15.4)	3 (6)–1 (2)
Sun HC 2006, China	60–60	50–49	27 (45)–22 (37)	37 (62)–44 (73)	Closed suction	15 (25)–0 (60)	0–1 (2)
Kim YI 2014, Korea	100–100	56–54	64 (64)–66 (66)	53 (53)–55 (55)	Closed suction	4 (4)–1 (1)	0–0
Total 665	334–331		182 (27)–171 (26)	107 (16)–164 (25)		51 (15.26)–19 (5.74)	6 (1.79)–5 (1.51)