Systematic review and meta-analysis of the effect of portal triad clamping on outcome after hepatic resection

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CRD summary
The review found that the routine use of portal triad clamping in patients undergoing liver resection did not offer any benefit. The authors’ conclusions seemed to reflect the evidence but, given the variability and unknown quality of the small included trials, the conclusions should be considered tentative.

Authors’ objectives
To assess the effects of portal triad clamping (PTC) on outcome after hepatic resection.

Searching
The Cochrane Library (Issue 2, 2007), MEDLINE (from 1966), EMBASE (from 1974) and the Science Citation Index (from 1945) were searched, without language restriction, up to May 2007 for relevant studies. Search terms were reported in a supplementary online appendix (not available). Reference lists of retrieved articles were scanned. Experts in the field were contacted for relevant studies.

Study selection
Eligible studies were randomised controlled trials (RCTs) that compared: continuous portal triad clamping (PTC), intermittent PTC, or PTC plus previous ischaemic preconditioning (IPC) versus no PTC; or compared PTC without previous IPC with intermittent PTC for hepatic resection. Trials were excluded if they were: of techniques that involved selective PTC and clamping of the vena cava or hepatic veins; provided insufficient data relating to the outcome variables; paediatric trials; trials that compared endoscopic or laparoscopic techniques alone or against one another.

The included trials were conducted in Italy, Switzerland, China, Hong Kong, USA and Germany. Specific details on the participants and interventions were reported in supplementary online appendix (online material could not be accessed on the journal website). The article reported that a proportion of the participants had cirrhosis.

Outcomes included postoperative overall morbidity and mortality, cardiopulmonary and hepatic morbidity, blood loss, transfusion rates, and alanine aminotransferase levels.

Two reviewers independently selected studies for inclusion, with disagreement resolved by discussion with a third reviewer.

Assessment of study quality
Trial quality was assessed using previously published criteria with a maximum score of 10. Criteria included sample size calculation, generation of allocation sequence, allocation concealment, description of protocol deviations, withdrawals and drop-outs, efficacy of randomisation, and blinding of outcome assessors.

Two reviewers independently assessed quality, with disagreement resolved by discussion with a third reviewer.

Data extraction
Two reviewers independently extracted data, with disagreements resolved by discussion with a third reviewer. Odds ratios (ORs) for dichotomous outcomes (such as postoperative morbidity and mortality) and weighted mean differences (WMDs) for continuous outcomes (such as intraoperative blood loss and postoperative alanine aminotransferase levels), along with their 95% confidence intervals (CIs), were calculated. Authors of primary trials were contacted for additional data where necessary.

Methods of synthesis
Trials were pooled in meta-analyses using a random-effects model (where data were not skewed). Overall odds ratios and weighted mean differences, with their 95% confidence intervals, were calculated. Where results were presented in the individual trials as medians and ranges, the trials were combined in a narrative synthesis. Clinical heterogeneity was explained, where appropriate and possible. Statistical heterogeneity was evaluated using the $I^2$ statistic.

Results of the review
Eight RCTs were included in the review (n=558 patients). The authors reported that the trials varied in quality, but no further details were available (supplementary online material could not be accessed on the journal website).

Portal triad clamping (PTC) versus no PTC: There was no evidence of a significant difference in morbidity or mortality for patients undergoing intermittent PTC versus no PTC (three RCTs). There was also no evidence of a significant difference in intraoperative blood loss (three of four RCTs, two of which were pooled), the proportion of patients requiring blood transfusion (four RCTs), and postoperative alanine aminotransferase levels (four RCTs) between patients treated with and without PTC; these analyses all had substantial statistical heterogeneity.

PTC plus previous ischaemic preconditioning (IPC) versus PTC without previous IPC: There was no evidence of a significant difference in postoperative overall morbidity between those having PTC plus previous IPC versus PTC alone (three RCTs), but there was substantial statistical heterogeneity. No deaths were reported. Analyses of cardiopulmonary and hepatic morbidity were not feasible and not performed. There was also no evidence of a significant difference in intraoperative blood loss (three RCTs) or proportion of patients requiring blood transfusion (three RCTs) between groups. A statistically significant reduction in alanine aminotransferase levels was found in the PTC with previous IPC group compared with the PTC without previous IPC group (WMD -179.9 units/L, 95% CI -271.5 to -88.2; three RCTs).

Intermittent PTC versus continuous PTC plus previous IPC: There was no evidence of a significant difference in postoperative morbidity, mortality, alanine aminotransferase levels or total blood loss between groups (one RCT). Patients who had PTC plus previous IPC had significantly lower blood loss during the transection period and blood loss standardised to the transection surface (figures not reported; one RCT).

Authors' conclusions
The routine use of portal triad clamping did not offer any benefit in perioperative outcomes after liver resection and was not recommended as a standard procedure.

CRD commentary
The review addressed a clear research question. Inclusion criteria appeared appropriate. A number of relevant databases were searched. Attempts were made to find additional studies by searching reference lists and contacting experts in the field. Methods designed to reduce reviewer bias and error were used at all stages of the review process.

An appropriate tool was used for quality assessment, but quality scores were not accessible, so the quality of the included trials could not be determined. There was variation in the trial populations and interventions, requiring the use of a random-effects model in the analysis of results, which gave rise to more conservative estimates. Trials were pooled in meta-analysis where possible; there was substantial statistical heterogeneity for some analyses. Sample sizes of included trials were generally small. There were wide confidence intervals for some findings.

The authors’ conclusions seemed to reflect the evidence but, given the variability and unknown quality of the small included trials, the conclusions should be considered tentative.

Implications of the review for practice and research
Practice: The authors stated that, although portal triad clamping could not be supported routinely for patients undergoing liver resection, its use should not be excluded in individual circumstances, such as complex central liver resections.

Research: The authors stated that further trials with large sample sizes are required to adequately assess safety and the optimal technique of hepatic vascular control in patients undergoing liver resection. These trials should also provide...
information on steatosis within patient groups.

**Funding**
Not stated.

**Bibliographic details**

**PubMedID**
18314921

**DOI**
10.1002/bjs.6141

**Original Paper URL**

**Additional Data URL**
http://www.springerlink.com/content/p2778683274142j5/

**Other publications of related interest**

**Indexing Status**
Subject indexing assigned by NLM

**MeSH**
Alanine Transaminase /metabolism; Blood Loss, Surgical /prevention & control; Constriction; Hepatectomy /methods; Humans; Ischemic Preconditioning /methods; Liver Diseases /enzymology /physiopathology /surgery; Multicenter Studies as Topic; Portal System /physiology; Randomized Controlled Trials as Topic; Treatment Outcome

**AccessionNumber**
12009100537

**Date bibliographic record published**
07/04/2009

**Date abstract record published**
09/02/2011

**Record Status**
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.