Effect of skeletonization of the internal thoracic artery for coronary revascularization on the incidence of sternal wound infection


CRD summary
This review concluded that skeletonised internal thoracic arteries used during coronary artery bypass grafting reduced the risk of sternal wound infection, including in people with diabetes and when bilateral grafts were used. Due to the questionable quality of included data from studies whose quality was inadequately reported (many of which were retrospective) the authors’ conclusions should be treated with caution.

Authors’ objectives
To assess any benefits of skeletonisation of internal thoracic artery used for coronary artery bypass grafting (CABG) on sternal wound infection rates, including whether benefit extends to diabetic people and any impact of skeletonising bilateral internal thoracic arteries.

Searching
MEDLINE, EMBASE and The Cochrane Library databases and Google Scholar were searched to 2008. Search terms were reported. Related articles functions were used. No language restrictions were applied.

Study selection
Comparative studies of people who underwent CABG and that assessed the effect on postoperative wound infection of skeletonising the internal thoracic artery compared to pedicaling the artery were eligible for inclusion. Studies that reported zero incidences of wound infection in both treatment groups were excluded. The primary outcome of interest was incidence of postoperative sternal wound infection (included superficial or deep sternal wound infection and mediastinitis). Secondary outcomes were to identify sternal wound infections in specific populations (such as people with diabetes or use of bilateral thoracic artery harvesting).

Some participants in the included studies had diabetes, chronic renal failure, chronic obstructive pulmonary disease or were smokers. Single and bilateral thoracic artery grafts were used. Some participants required mechanical ventilation, multiple transfusions, prolonged stay in intensive care unit or reopening of sternum because of haemorrhage.

The authors did not state how the papers were selected for the review.

Assessment of study quality
Study quality was assessed by attributing points according to reporting of 23 specific risk factors in intervention and control groups. These were based on items related to participant characteristics, intraoperative techniques and peri-operative or postoperative requirements/complications. The maximum score was 23. The median score achieved was used to divide studies according to quartiles.

The authors did not state how many reviewers performed the validity assessment.

Data extraction
Data were extracted by two reviewers independently and used to calculate odds ratio (OR) and 95% confidence intervals (CI).

Methods of synthesis
Pooled odds ratios and 95% CI were calculated using a random-effects method. Where there were no events in one arm of the study, 0.5 was added to calculations to facilitate analysis. Heterogeneity was assessed by the X² test and analysis repeated using a fixed-effect model.
Sensitivity analysis were performed based on presence of diabetes, harvesting bilateral internal thoracic arteries, classification of wound infection (superficial, deep, mediastinitis) and quality (risk) score of participants (those in top quality/risk scoring quartile). A funnel plot was used to assess publication bias.

Results of the review
Twelve studies (3,934 participants) were included: five were prospective in design (1,541 participants) and seven were retrospective (2,393 participants). One study had two treatment arms and one control group, a total of 13 comparisons were analysed. Quality (risk) scores ranged from 4 to 12 (median 6.5).

Use of skeletonised artery (compared to pedicled artery) was associated with a reduction in incidence of sternal wound infection (2.81% versus 7.15%, OR 0.41, 95% CI 0.26 to 0.64, X^2=15.26).

In sensitivity analyses skeletonised artery was associated with a reduction in sternal wound infection in people with diabetes (OR 0.20, 95% CI 0.12 to 0.34, X^2=2.16; six studies), use of bilateral thoracic arteries (OR 0.31, 95% CI 0.17 to 0.56, X^2=8.81; six studies) and use of bilateral thoracic arteries in people with diabetes (OR 0.19, 95% CI 0.10 to 0.36, X^2=2.05; five studies). When sternal wounds were classified as superficial, deep or mediastinitis, results for all groups showed a reduction in wound infection with skeletonised grafts.

When analysis was limited to studies in the top quartile of quality (risk) scores, skeletonisation was associated with a reduction in wound infection (OR 0.26, 95% CI 0.13 to 0.52, X^2=0.69; three studies).

Authors’ conclusions
Sternal wound infection decreased by 60% with use of skeletonised internal thoracic artery. The effect was greater in people with diabetes. The beneficial effect was maintained when harvesting bilateral internal thoracic arteries and (in all groupings) when sternal wounds were classified as superficial, deep and mediastinitis.

CRD commentary
The aims of this review were clearly stated in terms of inclusion criteria for participants, outcomes and intervention; those for study design were less clear. The search covered a number of relevant sources. No language restrictions were applied, which reduced risks of language bias. It was unclear whether unpublished studies were eligible and what effect this may have had on potential publication bias; the authors tested for and failed to show evidence of publication bias. Data extraction methods were aimed at reducing reviewer error or bias; it was not possible to comment on methods for study selection and quality assessment as these were not described. The authors described a quality assessment that was related to reporting of risk factors for the included participants rather than the validity of the methods and data in the included studies; therefore, it was not possible to comment on the quality of included data. The included studies were described as prospective or retrospective, but it was unclear what study methodology was used (retrospective studies are generally considered of lower quality). Methodology may have differed between studies, so it was difficult to assess whether studies should have been combined within meta-analyses. The authors assessed statistical heterogeneity and acknowledged that clinical heterogeneity may have been present between studies. The method used to include data in the analysis from one control group twice compared to two treatment groups (in one study) was not appropriate and had the potential to distort results. Details of the participants in the included studies were limited and this may have affected the generalisability of the review.

The review methods were not adequately reported. There were questions about the quality of data that came largely from retrospective studies that it appeared were not quality assessed. The authors’ conclusions should be treated with caution.

Implications of the review for practice and research
Practice: The authors stated that skeletonised internal thoracic artery grafts (including bilateral grafts) could be used without increased risk of postoperative sternal wound infections; this also applied in people with diabetes. The authors recommended that skeletonisation should qualify as a required skill within the cardiovascular surgical curriculum.
Research: The authors stated that a large RCT on skeletonisation of internal thoracic grafts used in CABG was needed, although it may not be feasible. Alternatively, future research should publish sufficient data to enable individual patient meta-analyses. Future research should accurately define and classify sternal wound infection as superficial, deep and mediastinitis. Authors should be encouraged to collect and publish data on long-term patency of skeletonised internal thoracic artery grafts.

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