Radial versus femoral access for coronary angiography or intervention and the impact on major bleeding and ischemic events: a systematic review and meta-analysis of randomized trials

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CRD summary
The authors concluded that, in patients undergoing coronary angiography or intervention, radial access reduced major bleeding and may also reduce ischaemic events compared with femoral access. The review was generally well conducted, but some caution may be advisable in interpreting the conclusions due to the poor quality of the included trials.

Authors' objectives
To compare rates of major bleeding, ischaemic events and death associated with radial versus femoral access for coronary angiography or intervention.

Searching
MEDLINE, EMBASE and the Cochrane Central Register of Controlled Trials (CENTRAL) were searched from 1980 up to April 2008 without language restriction. Conference abstracts from the American Heart Association, American College of Cardiology, Transcatheter Therapeutics and European Society of Cardiology (2003 to April 2008) were handsearched, as were the reference lists of systematic reviews and other studies.

Study selection
Randomised controlled trials (RCTs) that compared radial and femoral access in patients undergoing coronary angiography or intervention were eligible for inclusion. Eligible trials had to report one of the following outcomes: major bleeding (primary outcome), death, myocardial infarction, procedural time, fluoroscopy time or hospital length of stay. Major bleeding was defined using standardised criteria (i.e. fatal bleeding, intracranial haemorrhage, bleeding with a drop in haemoglobin of at least 3gm/dL or requirement for surgery). Trials that reported only components of major bleeding (such as rates of ≥3 gm/dL haemoglobin drop or transfusion) were also eligible.

About three quarters of the trials in the review included patients undergoing percutaneous coronary interventions. One third of these were primary or rescue studies, conducted in patients with acute ST-elevation myocardial infarction. A few studies were restricted to patients undergoing diagnostic angiography only and two were restricted to a geriatric population. Some routinely used femoral vascular closure devices and some used adjunctive glycoprotein IIb-IIIa inhibitors in a proportion of patients. Many of the studies were conducted in centres with advanced expertise in radial access. The standardised definition of major bleeding was used in most of the studies reporting this outcome. Other outcomes reported in the review were stroke, death/myocardial infarction/stroke as a composite, access site complications, and inability to cross the coronary lesion with wire, balloon or stent (i.e. need to puncture second arterial access site). Duration of follow up ranged from post-procedure to nine months and in most cases corresponded to hospital stay.

The authors did not state how the papers were selected for the review or how many reviewers performed the selection.

Assessment of study quality
Trial quality was assessed using the Jadad scale for randomisation, blinding of allocation and outcome assessment, and description of withdrawals. Trials that scored 3 or more points (out of 5) were considered high quality.

Validity assessment was conducted by two reviewers working independently.

Data extraction
Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated from the numbers of events in the two groups. For the primary outcome, risk differences were also calculated. For continuous data, mean differences between the two groups were calculated with 95% CIs. Outcomes were measured at the longest possible duration of follow-up.
Data were extracted by two reviewers working independently

Methods of synthesis
Dichotomous data were combined using a Peto fixed-effect model to calculate pooled ORs and absolute risk reductions. Continuous data were combined to calculate weighted mean differences using the inverse variance method. Heterogeneity was assessed using the \( \chi^2 \) and \( I^2 \) (\( \chi^2 \) p< 0.10 or \( I^2 >50\% \) denoted significant heterogeneity). Trials reporting only components of major bleeding were excluded in sensitivity analysis. A sensitivity analysis was performed using a random-effects model. Subgroup analyses were used to investigate the effects of patient age, radial expertise, indication for procedure, closure device, publication status and age of study.

Results of the review
Twenty-three RCTs (7,020 patients, range 50 to 998) were included in the review. Five used blinded allocation and none blinded assessment of outcomes. Only one trial was rated as high quality (3 points); the other trials scored only 1 or 2 points on the Jadad scale.

Radial versus femoral access: Major bleeding (18 RCTs, five with no events): Significantly fewer events occurred in the radial access group (OR 0.27, 95% CI 0.16 to 0.45). The absolute risk reduction was 1.4% (95% CI 0.7 to 2.1), with statistically significant heterogeneity (p=0.02, \( I^2 =47\% \)). In subgroup analyses, the greatest benefit was for primary or rescue surgery, with an absolute risk reduction of 3.1% (95% CI 0.01 to 5.5).

Death, myocardial infarction and/or stroke: There was no statistically significant difference between the groups for these outcomes. However, there was a non-significant trend favouring radial access for the composite of death, myocardial infarction and stroke (OR 0.71, 95% CI 0.49 to 1.01) and for death (OR 0.74, 95% CI 0.42 to 1.30).

Other outcomes: Radial access was associated with a significantly higher rate of access site crossover and significantly longer procedural and fluoroscopy times (all p<0.001), but a significantly shorter hospital length of stay (p=0.0001). Rates of inability to cross the lesion did not differ significantly between groups. Findings for procedural time had significant heterogeneity (p<0.001).

The full results of subgroup analyses were reported in the review.

Authors’ conclusions
In patients undergoing coronary angiography or intervention, radial access reduced major bleeding and may also reduce ischaemic events compared with femoral access.

CRD commentary
The objectives and inclusion criteria of the review were clear. Relevant sources were searched for studies, with no restriction by language or publication status, but the search terms were not reported. Steps were taken to minimise bias and error with more than one author independently conducting quality assessment and extracting data, but the process used for study selection was not described.

Relevant criteria were used to assess trial quality, but few details were provided about important aspects of individual trials (such as follow-up rate). Suitable statistical methods were used to combine the data, to assess for heterogeneity and explore differences between the trials (including publication status). Potential sources of bias were well addressed in the text.

The review was generally well conducted, but some caution may be advisable in interpreting the authors’ conclusions due to the poor quality of the primary trials.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that adequately powered RCTs were needed to compare cardiovascular outcomes associated with radial and femoral access for coronary intervention and to assess the impact of operator expertise in radial access.
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