Locoregional anesthesia for endovascular aneurysm repair
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CRD summary
The review concluded that there were no significant differences in 30-day mortality or completion endoleak for locoregional anaesthesia or regional anaesthesia versus general anaesthesia for endovascular aneurysm repair, but locoregional anaesthesia had shorter operative time and hospital stay, reduced intensive care requirements and fewer postoperative complications. The limited low quality evidence needed confirmation with randomised studies.

Authors' objectives
To compare the effectiveness and adverse events of locoregional anaesthesia, regional anaesthesia and general anaesthesia for endovascular aneurysm repair.

Searching
MEDLINE, EMBASE, Web of Science, Web of Science Proceedings and The Cochrane Library (2011 Issue 4) were searched to November 2011; search terms were reported. The bibliographies of relevant studies were also searched.

Study selection
Studies that compared outcomes for patients who underwent endovascular aneurysm repair operated under general, locoregional or regional anaesthetic were eligible for inclusion. Outcomes had to be reported for the different types of anaesthesia. Locoregional anaesthetic was defined as topical anaesthesia with intravenous sedation; regional anaesthetic, as spinal or epidural anaesthesia; and general anaesthetic, as standard induction and maintenance agents. Primary outcome was 30-day mortality and secondary outcomes included comorbidity, perioperative data (completion endoleak, percutaneous femoral access, operative time, intraoperative fluid requirements and need for a blood transfusion), and postoperative data (requirement for intensive care, postoperative complications and length of hospital stay). A study which separated results by patient risk profile was excluded.

Half of the studies had exclusion criteria related to the intervention or patients, mostly in the locoregional anaesthetic group (retroperitoneal approach, groin re-exploration, patient choice, BMI above 30 kg/m², anxiety, severe chronic obstructive pulmonary disease or history of difficult airway management). The anaesthetic agents used for locoregional anaesthetic were lidocaine or bupivacaine (one study); two studies reported using propofol or midazolam for sedation and one used a fentanyl bolus for analgesia. The same drugs but more commonly bupivacaine were used for regional anaesthetic and also ropivacaine and tetracaine, with administration described as epidural, intrathecal, spinal or paravertebral blockage. The drugs used for general anaesthetic were very varied. Details including dosages and premedication were reported.

The authors reported that two independent reviewers performed the search and two reviewers performed the selection of studies for inclusion.

Assessment of study quality
Methodological quality was assessed using Scottish Intercollegiate Guidelines Network (SIGN) checklists and then each study was assigned with a SIGN level of evidence. The authors did not clearly report how many reviewers performed quality assessment.

Data extraction
Data were extracted in duplicate, with disagreements resolved by consensus. Numbers of events were used to calculate odds ratios (OR) with 95% confidence intervals (CI) and mean differences with 95% confidence intervals were calculated for continuous data.

Methods of synthesis
Results were pooled using a random-effects model (DerSimonian-Laird) to give odds ratios with 95% confidence intervals or weighted mean differences (WMD) with 95% confidence intervals. Between-study heterogeneity was
determined using the Cochrane Q and $I^2$ statistics. Publication bias was assessed using Egger's test and visually using funnel plots. Meta-analyses were also performed to assess differences for confounding factors relating to patient selection such as age, sex or comorbidity.

**Results of the review**

Ten studies were identified (13,428 participants, range 25 to 6,009) including four prospective series (12,229 participants, range 239 to 6,009) and six retrospective series (1,199 participants, range 25 to 522). Participant numbers taken from Table 1 - the authors reported a total of 13,459 participants. The SIGN level of evidence for all the included studies was 2-, described as studies with a high risk of confounding bias or chance and a significant risk that the relationship was not causal.

**Primary outcome**

There were no significant differences in 30-day mortality for locoregional anaesthetic versus general anaesthetic ($I^2$=0%); regional anaesthetic versus general anaesthetic ($I^2$=0%; with significant publication bias); or locoregional anaesthetic versus regional anaesthetic ($I^2$=0%). Total six studies.

For perioperative outcomes, there were no significant differences for all three comparisons for completion endoleak (total five studies; $I^2$ range 62% to 90%). Operating time (eight studies) was significantly shorter for locoregional anaesthetic versus general anaesthetic (WMD -0.54 min, 95% CI -0.87 to -0.22; $I^2$=92%) and regional anaesthetic versus general anaesthetic (WMD -0.2 min, 95% CI -0.39 to -0.11; $I^2$=69%) but not for locoregional anaesthetic versus regional anaesthetic. Fluid requirement (four studies) was significantly lower for locoregional anaesthetic versus general anaesthetic but not for the other comparisons. Percutaneous endovascular aneurysm repair and need for a blood transfusion (OR 0.70, 95% CI 0.53 to 0.91) were significantly less likely for regional anaesthetic versus general anaesthetic but not for the other comparisons.

For postoperative outcomes, length of stay was significantly shorter for all comparisons: locoregional anaesthetic versus general anaesthetic (WMD -0.27 day, 95% CI -0.43 to -0.10; $I^2$=63%), regional anaesthetic versus general anaesthetic (WMD -0.13 day, 95% CI -0.17 to -0.08; $I^2$=0%) and locoregional anaesthetic versus regional anaesthetic (WMD -0.17 day, 95% CI -0.30 to -0.04; $I^2$=38%). Overall morbidity was also significantly reduced for all comparisons: locoregional anaesthetic versus general anaesthetic, regional anaesthetic versus general anaesthetic and locoregional anaesthetic versus regional anaesthetic; and so was the requirement for intensive care: locoregional anaesthetic versus general anaesthetic (OR 0.13, 95% CI 0.07 to 0.23; $I^2$=0%), regional anaesthetic versus general anaesthetic (OR 0.47, 95% CI 0.38 to 0.58; $I^2$=0%) and locoregional anaesthetic versus regional anaesthetic (OR 0.24, 95% CI 0.12 to 0.49; $I^2$=0%). There was a significantly lower risk of access vessel complications for locoregional anaesthetic versus general anaesthetic, and locoregional anaesthetic versus regional anaesthetic, but not for regional anaesthetic versus general anaesthetic.

Results were also reported for the meta-analysis for patient selection.

**Authors' conclusions**

Data presented was encouraging in selected patients, but it was derived from non-randomised studies. There was no difference for locoregional anaesthetic or regional anaesthetic versus general anaesthetic for endovascular aneurysm repair in 30-day mortality or completion endoleak but locoregional anaesthetic had shorter operative time, shorter hospital stay, reduced requirement for intensive care and fewer postoperative complications. Pooled differences were predominately clinically insignificant and further studies were needed.

**CRD commentary**

The review addressed a well-defined question in terms of study design, participants, interventions and relevant outcomes. The search was adequate but it was not clear whether studies published in languages other than English were included, so relevant studies could have been missed. Assessment indicated evidence of publication bias. Study quality was assessed using suitable criteria for non-randomised studies but conclusions were based on levels of evidence alone. Efforts were made to avoid error and bias throughout most of the review process. Relevant study detail was provided. The authors commented that some relevant data was missing since it was not provided in the included studies.
The synthesis seemed appropriate but the numbers of studies contributing to each meta-analysis was not clearly reported and frequently units were also not reported. Many meta-analyses had a high level of heterogeneity but not the primary outcome. The results need confirmation with suitable randomised studies due to the low quality and limited evidence, which was recommended by the authors.

**Implications of the review for practice and research**

**Practice:** The authors noted that the evidence supported the use of general anaesthetic for technically challenging cases since there was a lower risk of access complications.

**Research:** The authors recommended that unbiased prospective randomised studies were required to compare locoregional anaesthetic/regional anaesthetic with general anaesthetic for endovascular aneurysm repair, clarify potential benefits of locoregional anaesthetic/regional anaesthetic, and identify the subgroups that would derive greatest benefit. Future studies should provide more patient detail such as BMI, including morphological complexity and the rate of conservative management. The apparent higher major morbidity in general anaesthetic patients than locoregional anaesthetic/regional anaesthetic patients in highly selected populations needed further investigation. Future studies should assess postoperative mortality and long term re-intervention rate rather than 30-day mortality.

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