Surveillance of arteriovenous hemodialysis access: a systematic review and meta-analysis

CRD summary
The review concluded that very low-quality evidence that yielded imprecise results suggested a potentially beneficial effect of arteriovenous access surveillance followed by interventions to restore patency in patients who received haemodialysis. In light of several review limitations, the authors' conclusions should be interpreted with caution.

Authors' objectives
To determine the extent to which proactive vascular access monitoring affects the incidence of arteriovenous access thrombosis and abandonment compared with clinical monitoring.

Searching
MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials (CENTRAL), SCOPUS and Web of Science were searched for studies in any language to March 2007 (literature was monitored for studies published after this date); search terms were not reported. Further relevant studies were sought by using Science Citation Index, consulting experts and screening bibliographies of included trials. The authors stated that they searched for unpublished studies.

Study selection
Randomised controlled trials (RCTs) and cohort studies that compared an active monitoring group (periodic evaluation of access using tests that may involve special instrumentation, for which an abnormal result suggested access dysfunction) with a control group (usual clinical monitoring, with intervention only when clinical indications of dysfunction developed) in patients who received haemodialysis were eligible for inclusion. Usual clinical monitoring could include swelling of the arm, presence of collateral veins, prolonged bleeding after needle withdrawal or altered characteristics of pulse or thrill in a graft. RCTs that recruited only participants with abnormal surveillance results treated with either a vascular intervention (angioplasty or surgical revision) or usual clinical monitoring were also eligible for inclusion. Outcomes of interest were thrombosis and access abandonment.

All patients in the included studies had chronic haemodialysis and received only prosthetic (eight studies), autogenous access (two studies) or either type of access (two studies). Most interventions were ultrasound based. There was wide variation in surveillance frequencies. Most control methods featured assessment of clinical criteria, physical examinations, ultrasound or no monitoring.

Two reviewers independently selected studies for inclusion. Disagreements were resolved by consensus or arbitration.

Assessment of study quality
Two reviewers independently assessed study quality using the following criteria: allocation concealment; blinding (of patients, care givers, outcome assessors and data collectors); funding; and losses to follow-up.

Data extraction
Two reviewers independently extracted data in order to calculate risk ratios (RR) with 95% confidence intervals (CI). Study authors were contacted when there was missing data.

Methods of synthesis
Meta-analyses of of pooled risk ratios were performed using a random-effects model. Heterogeneity was assessed using the $I^2$ statistic. Subgroups analyses were planned to investigate the effects of gender, age, presence of diabetes mellitus, access type, study design and surveillance method.

Results of the review
The authors reported that 12 original studies were included in the review: nine on surveillance (n=1,363, range of follow-up six to 28 months); and three on vascular interventions (n=207, range of follow-up 12 to 15 months). Ten studies...
were RCTs and two were prospective cohort studies. Overall reporting of blinding and allocation concealment was poor. Where reported, all studies but one lost less than 10% of participants to follow-up.

Surveillance versus monitoring: Access surveillance resulted in a non-significant reduction in incidence of access thrombosis (RR 0.82, 95% CI 0.58 to 1.16, I²=37%; seven studies) and access abandonment (RR 0.80, 95% CI 0.51 to 1.25, I²=60%; six studies).

Vascular intervention versus monitoring: Intervention resulted in a statistically significant reduction in incidence of thrombosis (RR 0.53, 95% CI 0.36 to 0.76, I²=0%; three studies), but not on incidence of abandonment (RR 0.76, 95% CI 0.43 to 1.37, I²=70%; three studies).

No significant differences in effect were found for subgroup analyses of access type, study design and surveillance method. There were insufficient data to carry out other planned analyses.

Authors' conclusions

Very low-quality evidence that yielded imprecise results suggested a potentially beneficial effect of arteriovenous access surveillance followed by interventions to restore patency. This inference was weak and required randomised trials of arteriovenous access surveillance versus clinical monitoring for rejection or confirmation.

CRD commentary

The review addressed a clear question and was supported by appropriate inclusion criteria. It should be noted that neither the review title nor objectives covered the efficacy of vascular interventions aspect of the review. Attempts to identify all relevant studies in any language were undertaken by searching electronic databases and other methods. Search terms were not reported, but the authors stated that an expert reference librarian conducted the search. Suitable methods were employed to reduce the risks of reviewer error and bias throughout the review.

The table of study details was difficult to interpret. Although the authors reported that 12 original studies were included in the review, it appeared that 13 were tabulated and analysed. Participant numbers were presented in the table only for the surveillance groups (numbers for both groups were presented in the forest plots, but it appeared that not all these related to whole populations, which made it difficult to determine the review's total sample size). Study quality was adequately assessed (but for only 12 of the 13 studies) and the results were used to inform the interpretation of the review findings. However, the conclusion that the overall evidence was of very low quality seemed questionable. Appropriate methods were used to perform meta-analyses and assess heterogeneity. Despite the cautious nature of the authors' conclusions, they appeared somewhat questionable in light of the analyses conducted (which could also be interpreted as indicating no discernible effect). This was because the two main analyses, in addition to being non-significant, seemed to rely heavily either on an observational study or a poor-quality RCT (which appeared from the forest plot to account for the statistical heterogeneity). In view of the limitations mentioned, the authors' conclusions should be interpreted with caution.

Implications of the review for practice and research

Practice: The authors stated that implications for practice were discussed in an accompanying clinical practice guideline (no further details were provided).

Research: The authors stated that further studies to determine the relative efficacy and financial benefit of arteriovenous access surveillance versus clinical monitoring were needed to strengthen the inferences about the relative efficacy of this intervention.

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