Clinical outcomes after ablation and pacing therapy for atrial fibrillation: a meta-analysis
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Authors' objectives
To quantify the effects of ablation and pacing therapy on measures of clinical outcome and survival, in people with medically refractory atrial tachyarrhythmias, using meta-analysis.

Searching
The search strategy included the authors' knowledge of the literature, a review of bibliographies of published reports, manual library searches, and searches of MEDLINE from January 1989 to June 1998. Studies presented as abstracts only, or those published in languages other than English, were excluded.

Study selection
Study designs of evaluations included in the review
Randomised and non-randomised trials were considered. The review included all comparative studies with full-length articles published in peer-reviewed journals. The inclusion criteria did not limit the period of exposure to the intervention, or the duration of follow-up. The average duration of follow-up of the included studies ranged from 48 days to 2.3 years.

Specific interventions included in the review
The included studies were comparative studies evaluating the use of radiofrequency catheter ablation to produce complete heart block in the setting of medically refractory atrial tachyarrhythmia, or explicit separation of radiofrequency ablation data from direct-current catheter ablation. Studies using only direct current ablation, or examining only atrioventricular (AV) nodal modification for ventricular rate slowing rather than complete AV junction ablation, were excluded.

Participants included in the review
Patients with medically refractory atrial tachyarrhythmia, including those with chronic or paroxysmal atrial fibrillation, atrial flutter or atrial tachycardia. The eligible studies comprised highly symptomatic men and women, with mean ages ranging from 59 to 73 years, and included patients with existing heart disease.

Outcomes assessed in the review
The eligible studies reported clinical outcomes before and after treatment, and/or data on total mortality or sudden death; the review's authors did not state which was the primary outcome. A total of 19 outcomes were reported; these included exercise testing, cardiac function, quality of life, symptoms and use of health care resources. The authors defined the outcome measures and the 15 specific instruments used to measure them.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the reviewers performed the selection.

Assessment of study quality
The authors do not state that they assessed quality.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction. Data were extracted on patient characteristics, i.e. gender, age, existing heart disease, duration of symptoms, New York Heart Association class; and outcomes, i.e. average follow-up, change in exercise duration, ventricular function, quality of life or symptoms, health care use, total mortality and sudden death. All measures
reported on Likert-type scales were converted to proportions.

**Methods of synthesis**

**How were the studies combined?**

Studies were combined by a meta-analysis, and a narrative synthesis was also undertaken. Estimates of the effect size and 95% confidence intervals (CIs) were made by comparing measures before and after ablation within each study, and then combining these measures across studies using a random-effects model. The survival analysis used a Kaplan-Meier model, adjusted for time, to control for the different durations of follow-up among studies. The combined 1-year mortality rates were calculated by the DerSimonian and Laird method (see Other Publications of Related Interest nos.1-3).

**How were differences between studies investigated?**

Sources of heterogeneity were not discussed by the authors of the review.

**Results of the review**

Twenty-one studies (n=1,181) were included, of which 2 were randomised; it was unclear why it was later stated that 5 randomised controlled trials (RCTs) were included. Fifteen studies (642 patients) were used in the outcome analysis, and 16 (1,073 patients) in the mortality analysis.

Clinical outcomes: a significant improvement was shown for each of the 19 outcome measures, with the exception of fractional shortening. Cardiac symptom scores, quality of life measures and health care use showed improvement in all individual studies. Fractional shortening was improved in 2 of the 3 studies. Exercise duration and ejection fraction were unchanged in 4 out of 7 studies and 5 out of 11 studies, respectively. However, the meta-analysis showed significant improvement in both measures. Effect sizes and 95% CIs were illustrated graphically for all clinical outcomes.

Mortality: the overall monthly and 1-year total mortality rates calculated for patients in the intervention group were 1.4% (95% CI: 0.04, 2.4) and 6.3% (95% CI: 5.5, 7.2), respectively.

**Authors’ conclusions**

The authors of the review conclude that in patients with refractory atrial tachyarrhythmia, ablation and pacing therapy significantly reduces cardiac symptoms and health care use while improving exercise duration, quality of life and ejection fraction. Mortality rates were comparable with findings from other studies and do not seem to be disproportionate for the characteristics of the study group.

**CRD commentary**

This was an important and clearly stated question given the prevalence of medically refractory atrial tachyarrhythmia. There is a need to develop and assess interventions; this review suggested that there were only two small RCTs in the area. All types of atrial tachyarrhythmias were included in the review.

The inclusion criteria made no mention of study design, other than that it was limited to comparative studies, and it was unclear what levels of evidence were represented. The search strategy was limited to MEDLINE (from 1989 only), bibliographies of included trials, the authors’ knowledge, and non-specific ‘manual library searches’. No attempt was made to include non-English language studies, abstracts, unpublished studies or reports, thus it is possible that other eligible studies might have been missed. However, the authors did acknowledge that their review excluded data not published in English or in combined formats, and that it included small and uncontrolled studies with a potential for bias arising from the placebo effect. There was no assessment of publication bias. No information was provided on how studies were selected, and no attempt was made to assess the quality of the included studies.

The primary data were clear and well defined. No primary hypotheses were stated for the 19 outcome measures, and little information was provided on the meta-analyses of these outcomes. Results of before-and-after studies were
pooled with non-randomised and randomised trials, heterogeneity was not discussed and no adjustments for significance were made for multiple testing. Furthermore, no comparative data were given to assess the impact of the intervention compared with a control group. No subgroup analyses were performed to assess the effects of study design, different types of tachyarrhythmias, disease severity, symptomology or period of follow-up. In addition, sensitivity analyses were not conducted to assess the effects of study quality or assumptions made in the review. The authors mentioned five RCTs in the discussion; of these, four were included, but only two were described as randomised in the methodology. Moreover, the authors did not draw attention to the better quality evidence from the RCTs.

The authors' conclusions failed to acknowledge the inadequacies of the individual studies and the review methodology. The strength of the evidence regarding the effectiveness of ablation and pacing therapy for people with highly symptomatic, medically refractory, atrial tachyarrhythmia was very weak.

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

Practice: The authors state that the use of ablation and pacing therapy is beneficial for highly symptomatic medically refractory atrial tachyarrhythmias.

Reviewer's statement: The reviewer does not support this conclusion.

Research: The authors state that it may be argued that further outcome studies are not warranted. The effect of this intervention on patients with less symptoms needs to be investigated.

Reviewer's statement: The reviewer feels that from the strength of evidence presented in this review, there is an overwhelming need to carry out appropriately designed RCTs to assess the effectiveness of this intervention in all patients regardless of symptoms.

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