Meta-analysis of the effectiveness and safety of catheter ablation of atrial fibrillation in patients with versus without left ventricular systolic dysfunction


CRD summary
The review concluded that limited data suggested patients with/without left ventricular systolic dysfunction had similar risk for recurrent atrial fibrillation/atrial tachycardia after catheter ablation, but repeat procedures were needed more often in patients with left ventricular systolic dysfunction (heart failure). Despite some review limitations, these cautious conclusions reflect the limited evidence presented and appear likely to be reliable.

Authors' objectives
To compare the rates of recurrent atrial fibrillation, atrial tachycardia, and complications after atrial fibrillation catheter ablation in those with versus without left ventricular systolic dysfunction and to summarize the impact of catheter ablation on the left ventricular ejection fraction in patients with left ventricular systolic dysfunction.

Searching
MEDLINE, EMBASE, and the Cochrane Central Register of Controlled Trials were searched to March 2009 for reports in any language; search terms were reported. Reference lists of reviews, and abstracts from American Heart Association (2007 and 2008) and Heart Rhythm Society (2007 to 2009) meetings were scanned.

Study selection
Studies of at least 25 patients with left ventricular systolic dysfunction (defined as an left ventricular ejection fraction <0.50) undergoing atrial fibrillation catheter ablation, who were followed up for at least six months, were eligible for inclusion. Studies had to report at least one of the following outcomes: recurrence of atrial fibrillation or atrial tachycardia; adverse events; and/or heart failure outcomes including changes in left ventricular ejection fraction, functional status, quality of life, or mortality.

Most included studies used a pulmonary vein isolation technique for ablation. Mean age of participants ranged from 52 to 67 years; the percentage of men ranged from 70 to 95%. All patients had recurrent symptomatic atrial fibrillation and used at least one type of anti-arrhythmic medication. The proportion of patients with paroxysmal atrial fibrillation ranged from 9 to 100%. The mean duration of atrial fibrillation ranged from 38 to 80 months. Included studies were published from 2004 to 2009.

Two reviewers independently selected studies for inclusion.

Assessment of study quality
Study quality was evaluated by assessing sample selection, baseline differences in clinical characteristics, measures taken to monitor for asymptomatic recurrence of atrial fibrillation or atrial tachycardia, blinding of outcome assessors, completeness of follow-up, and statistical methods used to minimise bias.

The authors did not state how many reviewers were involved in evaluating study quality.

Data extraction
For dichotomous variables, data were extracted to calculate risk ratios (RR) and 95% confidence intervals (CI). For continuous variables, means and standard deviations were extracted.

The authors did not state how many reviewers were involved in the data extraction process.

Methods of synthesis
Meta-analyses were performed to calculate pooled risk ratios, or mean differences, using a fixed-effect model; when significant heterogeneity was found, a random-effects model was used. The Cochran Q statistic and I² were used to assess heterogeneity. Subgroup and sensitivity analyses were performed to explore any heterogeneity found.
Results of the review

Seven observational studies (n=1,770 patients) and one randomised trial (n=81) were included in the review; four observational studies were prospective in design. Follow-up periods ranged from six to 27 months. Follow-up was complete in all studies. It appeared that two studies blinded outcome assessors. Five of the observational studies used statistical methods to allow for baseline differences between groups.

The risk ratio for recurrent atrial fibrillation or atrial tachycardia in patients with versus those without left ventricular systolic dysfunction was 1.45 (95% CI 1.20 to 1.75; five studies) after one procedure, and 1.18 (95% CI 0.92 to 1.51; seven studies) after multiple procedures. There was no evidence for heterogeneity.

Patients with left ventricular systolic dysfunction experienced an increase in the left ventricular ejection fraction (from baseline) of 0.11 (95% CI 0.07 to 0.14; eight studies), although there was significant heterogeneity ($I^2=97\%$); subgroup and sensitivity analyses did not identify the likely cause.

There were no significant differences between groups in the four studies that reported serious adverse events.

Authors’ conclusions

Patients with and without left ventricular systolic dysfunction had similar risk for recurrent atrial fibrillation or atrial tachycardia after catheter ablation, but repeat procedures were required more often in those with left ventricular systolic dysfunction. Significant improvements in left ventricular ejection fractions after ablation were observed in those with left ventricular systolic dysfunction. More conclusive evidence was needed given the limitations of included data.

CRD commentary

The review addressed a clear question and was supported by appropriate inclusion criteria. Attempts to identify relevant studies in any language were undertaken by searching relevant databases, references and recent conference proceedings, which minimised the possibility of publication and language bias. Suitable methods were employed to reduce the risk of reviewer error and bias during the selection of studies, although the authors did not report whether such methods were used to assess study quality and extract data.

Study quality was assessed and was used in interpreting the results of the review. Sufficient study details were provided. The value of the estimates obtained from pooling heterogeneous studies was questionable, although the authors thoroughly investigated the likely causes of heterogeneity.

Although the review had some limitations, the authors’ conclusions were suitably cautious in reflecting the limited evidence presented and appear likely to be reliable.

Implications of the review for practice and research

Practice: The authors stated that until more conclusive evidence was available, referral for ablation should continue to be based on symptoms of atrial fibrillation despite attempts at pharmacologic rhythm control. They added that it was premature to incorporate atrial fibrillation catheter ablation into routine clinical practice for affecting heart failure outcomes.

Research: The authors noted that five relevant trials were ongoing in 2010.

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.