Surgical Maze procedure as a treatment for atrial fibrillation: a meta-analysis of randomized controlled trials
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CRD summary
This review concluded that surgical Maze procedures were associated with a decrease in atrial fibrillation within 12 months of surgery without an increase in length of hospital stay, perioperative complications or mortality in patients with atrial fibrillation. The possibility of publication bias and lack of information on the quality of included trials creates some uncertainty about the robustness of the authors' conclusions.

Authors' objectives
To assess the efficacy and safety of the surgical Maze and modified Maze procedures compared with pharmacologic therapy for the elimination of atrial fibrillation.

Searching
MEDLINE and the Cochrane Library were searched for articles published since January 1993. Search terms were reported, but the search end date was not specified. The Food and Drug Administration website and ClinicalTrials.gov were also searched, as well as the bibliographies of identified studies. Only studies written in English and published in a peer-reviewed publication were sought.

Study selection
Randomised controlled trials (RCTs) that compared modified or traditional surgical Maze procedure with pharmacologic therapy in patients with atrial fibrillation undergoing primary cardiac or valvular surgery were eligible for inclusion. Trials were required to have at least six months follow-up and at least ten patients in the control group.

The primary outcomes of interest were freedom from atrial fibrillation within 12 months and a composite outcome of freedom from atrial fibrillation and from use of an anti-arrhythmic drug.

The included trials used a traditional or modified Maze procedure; the treatment received by the control groups varied between trials including amiodarone, sotalol, Digitalis or quinidine. Post-procedure monitoring and anticoagulation regimens varied widely between trials. The included trials enrolled only patients with persistent or permanent atrial fibrillation, except for one trial that also included patients with paroxysmal atrial fibrillation. The mean age of participants ranged from 49.4 to 69.5 years in the Maze arms, with a similar range in the control arms; 48.1% of participants were male. The mean duration of atrial fibrillation ranged from 3.8 months to 66.1 months in the Maze arms. The included trials were published between 2001 and 2007.

The authors did not state how many reviewers performed the study selection.

Assessment of study quality
The authors appeared to have assessed whether trials used blinded outcome assessment but did not state how the assessment was performed.

Data extraction
Two reviewers independently extracted data and a third investigator adjudicated any discrepancies. Data were extracted in order to calculate the odds ratio (OR) and 95% confidence intervals (CIs), except for mortality for which the likelihood ratio was calculated. Data were extracted on an intention-to-treat basis.

Methods of synthesis
Trials were pooled for each outcome using both a fixed-effect and random-effects model. Heterogeneity was assessed using Cochran's Q statistic.
Results of the review
Nine RCTs were included (n=472 patients). None of the trials used a blinded method of outcome assessment.

Surgical Maze procedures significantly increased the odds of freedom from atrial fibrillation within 12 months of the procedure compared with control, based on both the random-effects and fixed-effect model. There was statistically significant heterogeneity (p=0.003). Based on the random-effects model the odds ratio was 5.22 (95% CI 1.71 to 15.88; five RCTs).

There was no significant difference between the two groups for the composite endpoint of freedom from atrial fibrillation and anti-arrhythmic drugs (OR 1.78, 95% CI 0.73 to 4.34; two RCTs) or for all-cause mortality (maximum likelihood estimate 0.004, 95% CI -0.046 to 0.052; eight RCTs).

Operative mortality rate was slightly higher for the Maze group than the control group (4% for Maze procedure versus 3.3% for control).

The mean length of hospital stay was similar between the two groups (five RCTs): 13.76 days for the Maze procedure group and 13.6 days for the control group.

Complications were not reported by all the trials but (based on available data) the two groups were similar in the rate of major complications, thromboembolic events, surgical revision and requirement for a permanent pacemaker.

Authors' conclusions
When performed in addition to cardiac surgery, surgical Maze procedures were associated with a decrease in atrial fibrillation within 12 months of surgery without significant increase in mean length of hospital stay, perioperative complications, and operative or all-cause mortality in patients with valvular atrial fibrillation.

CRD commentary
There were clearly stated inclusion criteria for the review. A number of relevant sources were searched for studies, but the restriction to English language studies and published data may have resulted in relevant studies being missed from the review. Appropriate methods were used to reduce error and bias in data extraction, but it was unclear whether similar methods were used for study selection.

Details were reported on whether the primary trials used blinded outcome assessment, although the criteria used were unclear and other important aspects of quality (such as allocation concealment) were not assessed. The analysis seemed appropriate; statistical heterogeneity was assessed, although sources of heterogeneity were not explored, possibly due to the small number of trials in the analysis. There appeared to considerable variability between trials in population and intervention characteristics.

The possibility of publication bias and lack of information on the risk of bias in the included trials creates some uncertainty about the robustness of the authors' conclusions.

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

Research: The authors stated that large multi-centre RCTs are required to assess the long-term efficacy and safety of surgical Maze procedures for the maintenance of sinus rhythm.

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