

Microwave ablation for atrial fibrillation in association with other cardiac surgery

Interventional procedures guidance

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1 Guidance

- 1.1 Current evidence on the safety and efficacy of microwave ablation for atrial fibrillation in association with other cardiac surgery appears adequate to support the use of this procedure provided that the normal arrangements are in place for consent, audit and clinical governance.
- 1.2 Patient selection and follow-up should be carried out by a multidisciplinary team. Cardiac surgeons undertaking this procedure should have specific training in the use of microwave energy equipment.

2 The procedure

2.1 Indications

- 2.1.1 Atrial fibrillation is the irregular and rapid beating of the upper two chambers of the heart (the atria). It may be classified as paroxysmal, persistent or permanent. It is the most common type of arrhythmia and the incidence increases markedly with age. Patients with atrial fibrillation may be asymptomatic or they may have symptoms such as palpitations, dizziness and breathlessness. They also have an increased risk of stroke as a result of blood clots forming in the left atrium and then embolising to the brain.
- 2.1.2 Atrial fibrillation usually occurs in the absence of structural heart disease. However, if structural heart disease is present, it is most commonly mitral stenosis.
- 2.1.3 Conservative treatments include medication, electrical cardioversion to control the heart rhythm and anticoagulants to prevent the formation of blood clots. The conventional surgical approach, known as the Cox maze procedure, involves making multiple, strategically placed incisions in both atria to isolate and stop the abnormal electrical impulses. Alternative methods of creating lesions in the atria by ablation have been developed, using energy sources such as radiofrequency, cryotherapy and ultrasound.

2.2 Outline of the procedure

- 2.2.1 Microwave ablation for atrial fibrillation is typically carried out in patients undergoing concomitant open heart surgery (often mitral valve replacement or repair). The procedure uses thermal damage, rather than incisions, to block impulse conduction. The heat generated by a flexible microwave probe coagulates the heart tissue, forming linear scars or lesions that disrupt the transmission of the abnormal electrical impulses. The procedure may be carried out on both atria or on the left atrium only. It can be performed from within or outside the atrium.

2.3 Efficacy

- 2.3.1 In one randomised controlled trial, patients treated with open heart surgery and microwave ablation were compared with those treated with open heart surgery alone. Immediately after the surgery, 92% (22/24) of patients who had microwave ablation were in sinus rhythm compared with 32% (6/19) of patients in the control group ($p = 0.05$). At 12 months, 80% (12/15) of patients who had microwave ablation were in sinus rhythm compared with 33% (3/9) of control patients ($p < 0.05$). A non-randomised controlled trial reported that 62% (84/136) of patients treated with microwave ablation were in sinus rhythm at 12 months, compared with 10% (5/51) of patients having heart surgery without microwave ablation ($p = 0.0001$). A second non-randomised controlled trial that compared patients who had microwave ablation with those who had radiofrequency ablation reported no significant difference in the number of patients in sinus rhythm at 12 months; the results were 59% (13/22) for the microwave ablation group and 57% (8/14) for the radiofrequency ablation group.
- 2.3.2 Case series reported that 61% (25/41) and 76% (32/42) of patients who had microwave ablation were in sinus rhythm immediately after surgery. In a further case series, 62% (74/119) of patients were in sinus rhythm at 12-month follow-up. For more details, refer to the Sources of evidence.
- 2.3.3 The Specialist Advisors considered this procedure to be a variation on the Cox maze technique.

2.4 Safety

- 2.4.1 This procedure is performed during open heart surgery; therefore it is difficult to differentiate the complications that relate specifically to microwave ablation.
- 2.4.2 The main complications reported were in-hospital mortality and the requirement for a permanent pacemaker. In the randomised controlled trial, the in-hospital mortality was 4% (1/24) for patients treated with microwave ablation and heart surgery, compared with 5% (1/19) for patients who had heart surgery only. Four other studies reported in-

hospital mortality rates, which ranged from 0% (0/42) to 4% (1/23). Four studies reported the proportion of patients who needed a permanent pacemaker; this ranged from 0% (0/41) to 23% (46/202). One study reported additional complications of bleeding in 9% (2/23) of patients; the need for an intra-aortic balloon pump in 4% (1/23); transient low cardiac output in 4% (1/23); and severe systemic inflammatory response syndrome in 4% (1/23). For more details, refer to the Sources of evidence.

- 2.4.3 The Specialist Advisors listed the potential adverse events as oesophageal injury, heart block, intra-operative myocardial infarction and excessive tissue damage.

2.5 Other comments

- 2.5.1 Most of the data were on patients having mitral valve surgery. There was only limited evidence on the efficacy of microwave ablation when performed with other procedures such as coronary artery bypass grafting.
- 2.5.2 This procedure appears to be more efficacious in patients whose atrial fibrillation has been of short duration (less than 1 year).
- 2.5.3 It was noted that there are variations in technique and microwave energy settings used for this procedure. It was also noted that it may be difficult to determine when full-thickness ablation has been achieved.

3 Further information

- 3.1 NICE has published [interventional procedures guidance on radiofrequency ablation for atrial fibrillation](#) and [cryoablation for atrial fibrillation](#). NICE is also currently developing a guideline for the diagnosis and treatment of atrial fibrillation [now published as [Atrial fibrillation: diagnosis and management](#)].

Sources of evidence

The evidence considered by the Interventional Procedures Advisory Committee is described in the following document.

[Interventional procedure overview of microwave ablation for atrial fibrillation in association with other cardiac surgery](#), December 2004.

Information for patients

NICE has produced [information on this procedure for the public](#). It explains the nature of the procedure and the guidance issued by NICE, and has been written with patient consent in mind.

Update information

Minor changes since publication

January 2012: minor maintenance.

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Endorsing organisation

This guidance has been endorsed by [Healthcare Improvement Scotland](#).