

OHTAC Recommendation

Advanced Electrophysiologic Mapping and Catheter Ablation for the treatment of complex cardiac arrhythmias

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OHTAC Ontario
Health Technology
Advisory Committee



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The Ontario Health Technology Advisory Committee (OHTAC) met on December 16, 2005 and reviewed the effectiveness of catheter ablation guided by advanced electrophysiologic mapping for the treatment of complex cardiac arrhythmias (primarily atrial fibrillation).

An arrhythmia is a deviation from the normal rate or rhythm of heartbeat resulting from abnormal electrical activity inside the heart. The first line treatment for arrhythmias is drug therapy. When these drugs fail, destruction of the diseased heart tissues that cause the arrhythmias can be performed using radiofrequency energy delivered via a percutaneous catheter guided by x-ray fluoroscopy. This procedure, known as conventional catheter ablation, has been shown to be effective in treating simple arrhythmias, but not complex arrhythmias. Advanced non-fluoroscopic mapping systems have been developed to provide 3-dimensional images of anatomical and electrical information detailing the complexity of arrhythmias of the heart.

OHTAC Findings:

Based on a review of electrophysiologic mapping and catheter ablation presented by the Medical Advisory Secretariat (MAS), OHTAC found that atrial fibrillation is the most prevalent complex arrhythmias affecting 0.8% of Ontarians 20 to 79 years old, resulting in increased risks of stroke and congestive heart failure. Approximately half of these patients are resistant to or intolerant of anti-arrhythmic drugs. Clinical experts in the province estimate that between 10%-25% of these drug-refractory patients could potentially benefit from ablation. Based on these figures, an estimated 2,230 to 11,500 residents of Ontario with drug-refractory atrial fibrillation may benefit from catheter ablation.

Catheter ablation using advanced mapping systems is effective in treating patients with drug-refractory atrial fibrillation. Randomized controlled trials (RCT) comparing medical therapy to catheter ablation with advanced mapping systems showed that patients who received catheter ablation were significantly more likely to be free from arrhythmia more than 1 year after the intervention compared to patients treated with medical therapy alone.

Compared to fluoroscopy-guided ablation, non-fluoroscopic advanced mapping systems significantly reduced radiation exposure, which is a concern in the ablation

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of complex arrhythmias since such procedures usually last 4 hours or longer. While a limited number of small randomized controlled trials failed to detect significant differences in the effectiveness of ablation guided by advanced mapping system compared to ablation guided by x-ray fluoroscopy, these studies did not have sufficient sample size to detect such differences. All recent studies on the ablation of atrial fibrillation used an advanced mapping system. Ontario experts advised the Medical Advisory Secretariat that large randomized controlled trials are not likely to be forthcoming because they believe it to be unethical to randomize patients to fluoroscopy-guided ablation when more advanced systems can provide safer integrated anatomical and electrical information. Although there is a lack of RCT evidence on the effectiveness of advanced mapping system in atrial fibrillation ablation, a large observational study of advanced mapping-guided pulmonary vein ablation in 589 patients with drug refractory atrial fibrillation reported good results (84%, 79%, and 78% of patients did not have recurrence of atrial fibrillation at one, two, and three years respectively after the procedure).

Ablation of complex arrhythmias is performed in electrophysiology laboratories and requires electrophysiologists (with special training), nurses and anesthesiologists. The rate of long-term success of ablation (arrhythmia free with or without drugs) at a centre has been shown to improve with increasing number of procedures performed.

MAS also reviewed the literature on surgical ablation. Surgical ablation does not require mapping because the heart is visualized directly or with the assistance of a scope. There is high quality evidence supporting the use of surgical ablation in patients with atrial fibrillation who are undergoing concomitant heart surgery (usually for mitral valve replacement or repair). According to clinical experts in the province, it is currently standard practice to treat patients with atrial fibrillation who require concomitant heart surgery with surgical ablation. These patients represent less than 1% of the atrial fibrillation population in Ontario. However, at this time there is insufficient evidence to make a recommendation regarding surgical ablation in patients with lone, drug-refractory atrial fibrillation (i.e. those who do not require concomitant heart surgery).

Expert Advice:

- All five Ontario experts contacted indicated that an advanced mapping system is essential for the treatment of complex cardiac arrhythmias, such as atrial fibrillation, arrhythmias associated with congenital heart conditions and

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ventricular tachycardia (Table 1 outlines the specific conditions that require advanced mapping).

- Experts agreed that simple arrhythmias such as typical atrial flutter and Wolf-Parkinson-White syndrome can be effectively treated with fluoroscopy-guided ablation and this is current practice in Ontario for these conditions.
- Experts informed MAS that eight of the cardiac centres in Ontario have at least one advanced mapping system; however, the use of these systems has been restricted due to a gap between the cost of the procedure (\$6,000 to \$7,000 for the catheters alone) and current MOHLTC per case funding (\$2,600 per procedure regardless of mapping system).

Table 1: Role of Advanced Mapping Systems based on Arrhythmia

Limited role for advanced mapping (high conventional success rate)	Advanced mapping shortens procedure, limits fluoroscopy, or enhances success	Advanced mapping extremely helpful or essential
AVNRT	Typical atrial flutter	Macroreentrant atrial arrhythmias after surgical correction of congenital heart disease
Accessory pathway ablations	Idiopathic ventricular tachycardia (RVOT, LVOT, fascicular VT)	Transient/multiple focal atrial tachycardia
AV junction ablations for rate control in atrial fibrillation	Repeat ablation after previously failed attempt	Atrial fibrillation; linear lesion for atrial compartmentalization procedure; also useful, but role less defined for encircling pulmonary vein isolation and non-pulmonary focal localization.
	Hemodynamically stable VT (non-idiopathic)	Hemodynamically unstable VT

AVNRT = Atrial ventricular nodal reentrant tachycardia

VT = Ventricular tachycardia

RVOT = Right ventricular outflow tract tachycardia

LVOT = Left ventricular outflow tract tachycardia

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Economic Analysis

Based on available statistical and cost data, MAS determined that:

- Among complex arrhythmias, atrial fibrillation has the greatest unmet need for catheter ablation using advanced mapping systems.
- An estimated minimum of 2,230 additional ablations using an advanced mapping system is required to meet the prevalent need of atrial fibrillation (for those 20-79 years).
- If MOHLTC implements the additional procedures over 5 years, an estimated upfront budget impact of \$5 million to \$6 million per year can be expected.
- When saving from the avoidance of anti-arrhythmic drugs is taken into consideration, the net budget impact is estimated at \$4.9 million in the first year, decreasing to an estimated \$3.7 million in the fifth year.

OHTAC Recommendations:

Based on the above findings, OHTAC recommended:

- Use of advanced mapping in the ablation of complex arrhythmias, particularly drug-refractory atrial fibrillation, according to specific indications
- Increased access to ablation with advanced mapping so the prevalent population with drug-refractory atrial fibrillation can be treated over 5 years
- Restricting ablation of complex arrhythmias using advanced mapping to designated cardiac and pediatric centres that have the necessary expertise and critical volume to:
 - Increase the success rate of ablation
 - Minimize the necessity for drug therapy after ablation
 - Minimize the need for subsequent reablation procedures