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ORIGINAL ARTICLE

Remote magnetic navigation for ablation of typical atrial flutter: Long-term results☆

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KEYWORDS
Typical atrial flutter;
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Abstract
Introduction and Aim: Remote magnetic navigation has proved to be effective in the ablation of most supraventricular and ventricular arrhythmias. Initial studies reported worse results with this system compared to conventional ablation for atrial flutter. The aim of this study was to assess the acute and long-term success of atrial flutter ablation with remote magnetic navigation and to retrospectively compare the results obtained with an 8-mm tip catheter versus an irrigated catheter.
Methods: We studied 38 consecutive patients, mean age 61±15 years, 28 male, who underwent ablation of typical atrial flutter with the Niobe II remote magnetic navigation system (Stereotaxis). Ablation was performed with an 8-mm tip catheter in 17 patients and with an irrigated-tip catheter in 21 patients. Acute success was defined as the presence of bidirectional isthmus block, and long-term success as absence of symptoms and atrial flutter during Holter monitoring.
Results: Bidirectional isthmus block was achieved in 37 patients (97%), and the success rate was similar in both groups. Total procedure time was not significantly different between the groups but fluoroscopy time was shorter in the irrigated tip group (13.4±3.7 min vs. 6±4.4 min; $p<0.01$). The number of applications and total radiofrequency time did not differ. There were no complications. During a follow-up of 32±19 months there were two relapses, one in each group.
Conclusions: The Niobe II remote control system for ablation of typical atrial flutter is safe and effective in both the short and long term. The 8-mm and irrigated-tip catheters showed similar safety and efficacy.
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PALAVRAS-CHAVE
Flutter auricular típico;
Ablação por radiofrequência;
Navegação magnética;
Estereotaxia

Ablação do istmo cavo-tricúspide com sistema de navegação magnética por controlo remoto no tratamento do *flutter* auricular típico – resultados a longo prazo

Resumo
Introdução e objetivos: A ablação com sistema de navegação magnética tem demonstrado ser eficaz em vários tipos de procedimentos de ablação. Estudos iniciais apontam para uma menor eficácia deste método na ablação do istmo cavo-tricúspide. O objetivo deste estudo foi avaliar a eficácia imediata e a longo prazo deste método e comparar retrospetivamente os resultados obtidos com o cateter de 8 mm com os obtidos com o cateter irrigado.
Métodos: Estudaram-se 38 doentes consecutivos, idade média 61 ± 15 anos, 28 homens, referenciados para ablação de *flutter* típico com sistema de navegação magnética Niobe II (Stereotaxis) com um período de seguimento superior a seis meses. A ablação foi efetuada com cateter de 8 mm em 17 doentes e com cateter irrigado em 21 doentes. O sucesso imediato foi definido como presença de bloqueio ístmico bidirecional e o sucesso a longo prazo definido com ausência de sintomas e de *flutter* auricular no registo de Holter.
Resultados: O bloqueio ístmico bidirecional foi obtido em 37 doentes (97%). A taxa de sucesso foi semelhante nos dois grupos. O tempo de procedimento não diferiu entre os dois grupos, mas o tempo de fluoroscopia foi significativamente inferior no grupo com cateter irrigado (13,4 ± 3,7 min *versus* 6 ± 4,4 min; p < 0,01). O número de aplicações e o tempo de radiofrequência foram semelhantes nos dois grupos. Não foram registadas complicações. Após um período de seguimento médio de 32 ± 19 meses ocorreram duas recidivas, uma em cada grupo.
Conclusões: O sistema de navegação magnética Niobe II mostrou-se eficaz e seguro na ablação de *flutter* típico permitindo uma taxa de sucesso elevada com uma eficácia mantida a longo prazo. O cateter de 8 mm e o cateter irrigado mostraram-se igualmente eficazes e seguros.
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List of abbreviations

AF	atrial fibrillation
AFL	atrial flutter
CS	coronary sinus
CTI	cavotricuspid isthmus
IVC	inferior vena cava
MNS	magnetic navigation system
RF	radiofrequency

Introduction

Atrial flutter (AFL) is an abnormal cardiac rhythm characterized by rapid regular atrial depolarizations with a rate of approximately 300/min and regular ventricular rate. Typical AFL is the most common macroreentrant atrial tachycardia.[1] Catheter ablation of the cavotricuspid isthmus (CTI) is the treatment of choice for this arrhythmia due to its high success rate and low rate of complications compared to drug therapy, which is relatively ineffective.[2]

The Niobe magnetic navigation system (MNS) (Stereotaxis) was developed for remote control of ablation procedures, aimed at improving steering of the catheters and reducing fluoroscopy time. The system has been shown to be effective and safe in ablation of different types of supraventricular and ventricular arrhythmias, and is superior to conventional ablation for ventricular tachycardia.[3,4] In a randomized trial of ablation of supraventricular tachycardias with the Niobe system compared to manual navigation, the MNS was associated with reduced fluoroscopy time and number of radiofrequency (RF) applications.[5] However, initial studies of AFL ablation reported lower success rates than with manual steering,[6–8] which may be due to the limited contact force possible with flexible catheters.

The aim of this study was to assess the feasibility and safety of the MNS for ablation of AFL and its long-term success and to compare the results obtained with an 8-mm tip catheter versus an irrigated catheter.

Methods

Study population

Between January 2008 and October 2012, 38 consecutive patients underwent electrophysiological study and catheter ablation of typical AFL with the Niobe MNS at our institution. AFL was documented by 12-lead ECG and the patients were symptomatic despite medication. No patient was contraindicated for magnetic navigation, and all gave their written informed consent.

Electrophysiological study

Patients were assessed after six hours' fasting and antiarrhythmic medication was suspended for five half-lives; amiodarone was suspended at least one month before the

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