Treatment of Supraventricular Arrhythmias by Transcatheter Radiofrequency Ablation: The Experience of the Electrophysiology Unit of the University Hospital of Trieste

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Abstract: TC-RF (transcatheter radiofrequency) ablation has an important role in the treatment of SVA (supraventricular arrhythmias). The indication to TC-RF ablation is usually made to improve the patient’s quality of life through the elimination of the arrhythmic substrate. The objective of this study is to make a brief review of the literature and to report the Electrophysiology Unit experience of the Cardiovascular Department of the University Hospital of Trieste. From the study, it can be found that about one thousand of patients are visited annually in the Cardiovascular Department of the University Hospital of Trieste (1,019 ± 71/year over the past five years). The acute success rate of atrial fibrillation and flutter ablation procedures was respectively 93.9% and 97.9% with a relapse rate of 30% and 10% at 12 month. Accessory pathways and nodal atrioventricular re-entry tachycardia ablation procedures had an acute success rate of respectively 91.1% and 96.6% with a relapse rate of 10% at 12 months. The overall complication rate was 5%. Catheter ablation is an effective therapy for SVA treatment. It can often be definitive, and it is generally superior to drug therapy, with a low complication rate. The improvement in patients’ quality of life is associated with a reduced need for access to health services.

Key words: TC-RF (transcatheter radiofrequency) ablation, SVA (supraventricular arrhythmias), atrial fibrillation, atrial flutter, atrio-ventricular re-entry tachycardia, atrio-ventricular nodal re-entry tachycardia, technology assessment.

1. Introduction

SVA (supraventricular arrhythmias) have a prevalence of 2.29/1,000 and an estimated incidence of 36/100,000 new patients per year [1]. TC-RF (transcatheter radiofrequency) ablation has currently a central role in the definitive treatment of SVA. TC-RF ablation efficacy is superior to treatment with antiarrhythmic drugs and linked to a low risk of serious complications [2, 3].

Cardiac arrhythmias can be classified into idiopathic arrhythmias, which are unrelated to structural abnormalities of the heart muscle, and those generated by a specific substrate (usually myocardial scar or fibrosis) caused by congenital abnormalities, prior cardiac surgery interventions, cardiac infections, ischemic injuries, or morphological alterations due to valvular disease or cardiomyopathies. Arrhythmic source may be focal, due to one or more cell groups generating isolated or repetitive extra-stimuli, or due to re-entry circuits in which the impulse quickly rotates around an anatomical or functional electric block [4].

With the exception of Wolff Parkinson White syndrome or the incessant presentation of some SVA which may cause a reduction in contractile function (“tachycardiomyopathy”), SVA are not associated with an increased mortality. However, SVA symptoms can be significantly deleterious on the patient subjective perception of health [5]. Indication to catheter ablation...
is thus usually made to improve the patient’s quality of life through the elimination of the arrhythmic substrate.

2. Methods and Aim

We performed a brief review of the literature mainly selecting international guidelines paper, one for Europe and one for the United States. We searched the literature using the words “transcatheter radiofrequency ablation”, “atrial fibrillation”, “atrial flutter”, “atrio-ventricular re-entry tachycardia” “atrio-ventricular nodal re-entry tachycardia”. Our aim was to report our Electrophysiology Unit experience and to compare our results with the literature data.

3. Results

The Cardiovascular Department of the University Hospital of Trieste works in line to current scientific evidence and in accordance with the recommendations drawn up by the main international electrophysiology societies [2, 3].

We visit in our dedicated clinic about 1,000 of patients annually (1,019 ± 71/year over the past five years). Patients are usually sent by cardiologists for a specific evaluation of arrhythmias. Generally, atrial arrhythmias related to a substrate (cardiac disease, previous surgery) are initially treated with drug therapy (testing multiple molecules either alone or in combination); in these patients we consider ablation only if symptoms are still present and/or the antiarrhythmic drugs are ineffective or not well tolerated. On the other hand, young patients with idiopathic arrhythmias (after heart disease exclusion using echocardiogram or cardiac nuclear magnetic resonance) can be treated with radiofrequency ablation in the first instance [3].

The procedure consists in the elimination of arrhythmic substrate generating a localized coagulative necrosis using radiofrequency or, infrequently, cryoablation. We use dedicated catheter positioned through femoral venous approach (sometimes jugular or subclavian and/or femoral artery are used) in the heart chamber of interest. The intervention takes place under mild sedation, in a dedicated room equipped with: fluoroscopy (required to localize and move the electrodes in the heart); three dimensional electro-anatomical mapping system (used both for anatomical localization and arrhythmias’ electrical activation map creation); the polygraph/stimulator (for the intra-cavitary analysis of electrical signals and for the diagnostic procedures); an ultrasound system designed for transthoracic and intra-cavitary imaging; an external defibrillator. The staff consists of: two experienced doctors (one dedicated to the catheter movements within the heart, and one dedicated to diagnostic maneuvers using the polygraph/stimulator); a medical technician; two nurses with experience (for more complex ablations); a service engineer dedicated to the electro-anatomical mapping system.

The patient is usually discharged 24–48 h after the procedure. Our drug therapy management is in line with the international recommendations and reports [2, 3, 6-8]. Table 1 shows the results of ablations performed at our center between 2009 and 2015 compared with the efficacy data reported in the literature [3].

4. Complications

The overall complication rate was 5% (9.1% in AF (atrial fibrillation) ablation). Major complications occurred in 4.5% of patients treated for AF ablation (pericardial effusion/cardiac tamponade), and 2.6% (total AV (atrio-ventricular) block, femoral artery pseudoaneurysm) for the other procedures; no patient died; the remaining complications were considered “minor” (inguinal hematoma, pericarditis, venous thrombosis). This is in line with literature data [2, 3].

5. Follow-Up

The frequency of the follow-up depends on the type of arrhythmia treated. All patients are reassessed on an outpatient basis in 1–3 months or at 1, 3, 6 and 12 months after AF ablation. During these controls, late
Table 1  Results of TC-RF ablation procedures of the Cardiovascular Department of the University Hospital of Trieste compared with literature data [3].

<table>
<thead>
<tr>
<th>Arrhythmia</th>
<th>No. of patients</th>
<th>Acute success rate</th>
<th>Literature (acute success rate)</th>
<th>Relapse at 12 months</th>
<th>Literature (relapse at 12 months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AF</td>
<td>132</td>
<td>124 (93.9%)</td>
<td>&gt; 90%</td>
<td>37 (28%)</td>
<td>30%</td>
</tr>
<tr>
<td>AFL (common)</td>
<td>48</td>
<td>47 (97.9%)</td>
<td>97%</td>
<td>8 (16.7%)</td>
<td>10% (33% with AF)</td>
</tr>
<tr>
<td>AFL (not common)-AT</td>
<td>27</td>
<td>22 (81.5%)</td>
<td>73~100%</td>
<td>10 (17%)</td>
<td>7~53%</td>
</tr>
<tr>
<td>AVNRT</td>
<td>89</td>
<td>86 (96.6%)</td>
<td>96~97%</td>
<td>3 (3.4%)</td>
<td>5%</td>
</tr>
<tr>
<td>WPW</td>
<td>45</td>
<td>41 (91.1%)</td>
<td>93%</td>
<td>5 (11.1%)</td>
<td>8%</td>
</tr>
</tbody>
</table>

AF: atrial fibrillation; AFL: atrial flutter—“common” means an arrhythmia related to a right atrial circuit, present in normal hearts, “not common” indicates the other forms of arrhythmia caused by scar or fibrosis; AT: atrial tachycardia; AVNRT: atrio-ventricular nodal re-entry tachycardia; AVRT: atrio-ventricular re-entry tachycardia; WPW: wolff parkinson white.

Procedural complications are excluded, antiarrhythmic and anticoagulant therapies can be modified and, when possible, interrupted. For some arrhythmic forms (AVNRT (atrio-ventricular nodal re-entry tachycardia), AVRT (atrio-ventricular re-entry tachycardia)) after a successful ablation the patient can be considered healed and in these cases the follow-up continues only for patients with other cardiac problems or arrhythmias. For other arrhythmias, such AF, the follow-up generally continues due to the high late recurrence rate reported in the literature (about 50% of recurrences at five years).

6. Conclusions

Catheter ablation is an effective therapy for SVA treatment, particularly in the symptomatic patient with a structurally normal heart. It can be often definitive, and is generally superior to drug therapy, with a low and acceptable complication rate. The improvement in patients’ quality of life is associated with a reduced need for access to health services. For many years the Electrophysiology Unit of the University Hospital of Trieste has been providing these services in line with the indications and efficacy data reported by the international literature.

Further and larger studies are needed to test more deeply the net clinical benefit of SVA TC-RF ablation compared to drug therapy alone.

References


