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Cost-Effectiveness of Radiofrequency Ablation for Supraventricular Tachycardia in Guatemala: Patient Outcomes and Economic Analysis from a Low- to Middle-Income Country

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ABSTRACT

Background: Radiofrequency ablation (RFA) is an established but expensive treatment alternative for many forms of supraventricular tachycardia (SVT). Currently, no studies exist on the cost-effectiveness of RFA compared with that of medical treatment (MT) in adult Latin American population. **Methods:** Between 2007 and 2012, we identified 103 adults who underwent RFA for SVT in the National Unit of Cardiovascular Surgery (Unidad Nacional de Cirugía Cardiovascular [UNICAR]) in Guatemala. A decision tree was developed with all clinical outcome parameter estimates obtained from the Adult Electrophysiology Clinic. Cost data were obtained from UNICAR's administration. A cost-effectiveness analysis that evaluated costs and quality-adjusted life-years to compare interventions in terms of their incremental cost-effectiveness ratios was conducted. **Results:** The first RFA had an 83% success rate, and a cumulative success rate of 94% was achieved with a second. The cost of the RFA procedure itself was \$5411. RFA gained 1.46 quality-adjusted life-years

and saved \$7993 compared with MT for patients with SVT. This demonstrates that in Guatemala, RFA dominates MT in the management of SVT. Using assumptions based largely on the outcomes in UNICAR, we found that RFA is highly cost-effective. This is a consistent finding, even after varying assumptions about efficacy, complication rates, and quality of life. **Conclusions:** RFA dominates MT by improving quality of life and reducing expenditures when used to treat patients with severe symptoms of SVT in Guatemala. The robustness of these findings to variations in parameter assumptions suggests that these findings may hold in other similar settings.

Keywords: cost-effectiveness, quality-adjusted life year, radiofrequency ablation, supraventricular tachycardia.

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Introduction

Supraventricular tachycardias (SVTs) are a group of common rhythm disturbances. They represent the most common class of heart rhythm disorders requiring medical attention. Radiofrequency ablation (RFA) is an established but expensive treatment alternative for many forms of SVT [1]. Most cases of SVT are not life-threatening (with the exception of tachycardias for the accessory pathway such as Wolf-Parkinson-White) [2]. However, patients with severe symptoms have multiple episodes per year that require urgent medical intervention to terminate the arrhythmia; these episodes substantially diminish quality of life; therefore, the goal of therapy is to improve the patients' quality of life [3].

Costs for RFA in the pediatric population in Guatemala in 2005 were calculated to be US \$1405 for a first ablation and \$1668 for a

second in event of recurrence. The estimated cost of these ablations was demonstrated to be equal to that of continued medical therapy (MT) after 5.1 years and 3.4 times less than that of MT after 20 years [4]. Nevertheless, currently no studies exist on an adult Latin American population.

Guatemala is a lower- to middle-income country with a gross domestic product (GDP) of \$3478 per capita in 2013 [5]. The National Unit of Cardiovascular Surgery (Unidad Nacional de Cirugía Cardiovascular [UNICAR]) is the only public center with access to an advanced electrophysiology program in Guatemala, covering a population of 15,073,375 inhabitants [6]. Although no published data about the incidence of SVT in Guatemala exist, in an era in which high-tech therapies are proliferating, it is necessary to examine whether these expenses are reasonable, especially in centers and countries with limited resources and different cultural acceptance [4].

Conflict of interest: None of the authors report additional fees from Unidad Nacional de Cirugía Cardiovascular or any company per each radiofrequency ablation performed.

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<http://dx.doi.org/10.1016/j.vhri.2015.06.002>

Table 1 – Characteristics and outcomes of patients undergoing RFA in UNICAR from 2007 to 2012.

Characteristic	Value
Age at ablation (y), mean ± SD	35.78 ± 14.51
Clinical indication, n (%)	
SVT	48 (46.60)
WPW + SVT	47 (45.63)
Pre-excitation	5 (4.85)
Auricular flutter	2 (1.94)
Unifocal auricular tachycardia	1 (0.97)
Number of visits pre-RFA, mean ± SD	2.44 ± 1.01
MT pre-RFA, n (%)	
No treatment	29 (28.15)
One drug	63 (61.20)
Propafenone	36 (34.95)
Beta blocker	14 (13.60)
Amiodarone	6 (5.83)
Verapamil	5 (4.85)
Digoxin	1 (0.97)
Sotalol	1 (0.97)
Two drugs	11 (10.70)
Propafenone + amiodarone	4 (3.88)
Propafenone + beta blocker	4 (3.88)
Propafenone + digoxin	1 (0.97)
Propafenone + magnesium	1 (0.97)
Propafenone + verapamil	1 (0.97)
Hospital stay (d), mean ± SD	3.24 ± 0.31
Patients who required ICU, n (%)*	5 (4.85)
ICU stay (d), mean ± SD	2.6 ± 0.87
Postablation diagnosis, n (%)	
WPW	45 (43.69)
Classic AVRNT	23 (22.33)
Hidden accessory pathway	11 (10.68)
Double physiology of AV node without tachycardia induction	10 (9.71)
AVRNT + AFib	3 (2.91)
Atypical AVRNT	2 (1.94)
Atrial flutter	2 (1.94)
Preexcitation syndrome + AFib	2 (1.94)
Epicardic accessory pathway	2 (1.94)
AFib	1 (0.97)
Left and right auricular reentry	1 (0.97)
Auricular tachycardia	1 (0.97)
Outcomes, n (%)	
RFA initially successful	86 (83.50)
RFA failed	17 (16.50)
MT	5 (4.86)
Second RFA	12 (11.64)
Success after second ablation	97 (94.17)
Complications, n (%)	2 (1.94)
Hemodynamic instability	1 (0.97)
Major bleeding	0 (0.00)
Vascular injury*	1 (0.97)
Complete heart block	0 (0.00)
Death	0 (0.00)
Visits post-RFA, mean ± SD	2.26 ± 1.08
MT post-RFA, n (%)	
No treatment	41 (39.81)
Aspirin	30 (29.13)
Propafenone	17 (15.60)
Beta blocker	6 (5.80)
Aspirin + clopidogrel	2 (1.94)
Amiodarone	2 (1.94)
Propafenone + beta blocker	2 (1.94)

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Table 1 – continued

Characteristic	Value
Amiodarone + beta blocker	1 (0.97)
Sotalol	1 (0.97)
Propafenone + digoxin	1 (0.97)
AFib, atrial fibrillation; AV, atrioventricular; AVRNT; atrioventricular reentry nodal tachycardia; ICU; intensive care unit; MT, medical treatment; RFA, radiofrequency ablation; SVT, supraventricular tachycardia; UNICAR, Unidad Nacional de Cirugía Cardiovascular; WPW, Wolf-Parkinson-White.	
* Lesion to the internal jugular vein.	

Previous studies [7,8] have used decision modeling to show that in patients with SVT who are highly symptomatic or have monthly episodes of arrhythmia, RFA is more effective and less expensive than long-term drug therapy. In addition, ablation improved quality-adjusted life-years (QALYs) by 3.1 years and reduced expenses by US \$27,900. However, these studies are several decades old and focused on the United States. Although the procedure is highly effective, with success rates more than 90% in some centers, it has a moderate risk of complications and is relatively expensive [3,7,8].

A limitation of these analyses is that data were gathered from major centers of reference, with highly specialized success rates that often do not represent the less experienced centers, which may differ in various degrees. Furthermore, the analysis was carried out considering only one treatment drug, when in clinical practice physicians usually prescribe various drugs with prices very different from each other [7,8]. Therefore, the objectives of this study were to demonstrate the effectiveness of RFA for SVT in an adult population in Guatemala and to analyze its cost-effectiveness when compared with conventional MT.

Methods

Local Health Outcomes for RFA

We performed a retrospective study in which we reviewed the charts of adult patients (older than 18 years) with SVT who live in Guatemala and had undergone an electrophysiology study and RFA from January 2007 to April 2012. Using the data collection instrument, we gathered data on sociodemographic characteristics, diagnosis, ablation performed, health outcomes of the procedure (success and complication rates), number of follow-up visits a year, MT undertaken, and recurrence of the arrhythmia at 5 months and a year after the procedure (Table 1).

A total of 269 patients participating in the electrophysiology study were identified (Fig. 1). Of these patients, 137 were pediatric cases and an additional 29 of the remaining 132 adults were excluded. The final sample was 103 patients. The patients' demographic characteristics are presented in Table 1.

Decision Model Development

Using the available literature and the outcomes and demographic data of the remaining 103 patients, we developed a decision tree using Microsoft Excel 2013. To create the model, we generated a hypothetical group of patients who underwent either MT or RFA. Patients entered a therapy-specific subtree that simulated the probability of success, recurrence of the SVT after the initial treatment, and complication rates. The patients were considered to initiate in one arm of the tree and move forward at the next appointment 1 year later. If the treatment was not successful,

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