We are IntechOpen, the world’s leading publisher of Open Access books
Built by scientists, for scientists

6,500
Open access books available

177,000
International authors and editors

195M
Downloads

154
Countries delivered to

TOP 1%
Our authors are among the most cited scientists

12.2%
Contributors from top 500 universities

WEB OF SCIENCE™
Selection of our books indexed in the Book Citation Index in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?
Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com
Advances in the Nonpharmacological Treatment of Atrial Fibrillation

Manuel Lorenzo López Reboiro, Raul Franco Gutierrez, Laura Ramos Rúa, María del Carmen Basalo Carbajales, Laura Rodrigo Lara, Candela Fraga González, Celia Sobrado Moreiras, José Manuel Cerqueiro González and José López Castro

Abstract

Atrial fibrillation is a very frequent arrhythmia in our daily clinical practice, either isolated or associated with other heart diseases. It has high relevance as it can act as a decompensating agent of other heart diseases or damage the myocardium itself. Traditionally, the treatment of atrial fibrillation has been based on rhythm and rate control and also the treatment of its complications. To rhythm control, electrical or pharmacological cardioversion has been used, and different groups of bradycardizing drugs have been used for rate control. Anticoagulation is the most relevant treatment to prevent thromboembolic phenomena secondary to atrial fibrillation. However, with the recent development of endovascular procedures, the use of ablation to maintain sinus rhythm in this kind of patients has been increased displacing the use of other treatment strategies. Therefore, in this chapter, we would review the present evidence in the use of ablation techniques as atrial fibrillation treatment.

Keywords: atrial fibrillation, ablation, rhythm control

1. Introduction

Atrial fibrillation is the most frequent sustained cardiac arrhythmia in adults. It has two differential characteristics, one electrocardiographic and another clinical. Clinically it is characterized by an irregularly irregular pulse, due to a supraventricular tachycardia producing a chaotic atrial activity. In addition, the electrocardiogram (ECG) shows the following defining characteristics [1]:

- Irregular R-R interval
• Absence of P waves
• Irregular atrial activation (f waves)

Nowadays, the prevalence of this arrhythmia is rising due to, among to other causes, the increase in life expectancy and the effort to diagnose it [2]. In addition to the importance of this fact, AF has a special relevance resulting from its treatments and its complications, existing multiple pharmacologic treatments to control the harmful effects of this arrhythmia on patients. However, there are alternatives to pharmacological treatments that we would like to summarize in this chapter.

1.1 Types of AF

To be considered as AF, the arrhythmia must be documented by ECG and lasts >30 seconds [3]. If these two features are met, the arrhythmia is called clinical AF, and if not, the arrhythmia is considered as an rapid atrial rate episode or subclinical AF. Based on the time of evolution, the AF is classified as [4]:

• First diagnosed AF: AF has not been diagnosed before.
• Paroxysmal AF: self-terminated or cardioverted within 7 days.
• Persistent AF: AF that lasts longer than 7 days, but it is still considered rhythm control strategy.
• Permanent AF: Rate control but not rhythm control is pursued.

1.2 Predisposing factor for AF

There are a number of factors that predispose to AF, including [5–7]:

• Older age
• High blood pressure
• Type 2 diabetes mellitus
• Heart failure
• Coronary disease
• Chronic kidney disease
• Obesity
• Obstructive sleep apnea

These risk factors contribute to the damage in the atrial as changes in the structure, architecture, contractility, and electrophysiology that may lead to the dilatation, fibrosis, dysfunction, and distortion conduction in the left atrial. This cumulative damage is the substrate on which atrial fibrillation develops [8].
2. Diagnosis

Diagnosis of AF requires rhythm documentation on an ECG showing this arrhythmia lasting at least 30 seconds. There are other ways to detect AF that will require further diagnostic confirmation by performing a 12-lead ECG and interpretation by an experienced physician.

There are multiple tools that can be used to screen for atrial fibrillation:

- Blood pressure monitor
- Pulse palpation
- ECG Holter monitor
- Single-lead ECG
- Implanted cardiac devices
- Hospital telemetry/noninvasive long-term ECG monitoring
- Smartwatches
- Mobile devices

Most recently, mobile devices are increasingly being used as screening tools as they are becoming easy to use and are widely distributed among the population. These devices perform the interpretation of the electrical tracing through applications. Currently there are studies carried out by the different companies that manufacture mobile devices. (e.g., Estudio Apple Heart) [9, 10].

The opportunistic AF screening with these devices is cost-effective, but the diagnostic efforts must be done in those high-risk patients, who are those older than 65 years and at risk of stroke [9, 11].

3. Treatment

AF treatment is fundamentally based on rhythm and heart rate control and its thrombotic complications. Lately, multiple drugs and therapeutic attitudes have been developed for this purpose. In this section, we will show a few hints about nonpharmacological treatments for atrial fibrillation, often less known and used than conventional treatments, which are much more widespread.

3.1 Cardioembolic events prevention

AF increases the risk of cardioembolic events. There are several scales to quantify this risk, and the most widely used is the CHA2DS2-VASC scale. Only the patients with low risk would not need to take preventive treatment [12].

Anticoagulant treatments are the most known choice to prevent cardioembolic events secondary to AF. These include vitamin-K-dependent (AVK) and nondependent (NAVK) anticoagulants. However, there is a nonpharmacological alternative for
stroke prevention, the surgical left atrial appendage occlusion (LAAO) or exclusion. This technique has shown to be noninferior to VKA anticoagulation for stroke prevention in patients with AF and moderate risk of stroke [13].

This technique is reserved for patients with absolute contraindications to pharmacological anticoagulation. The contraindications are as follows [14]:

- Severe active bleeding
- Severe thrombocytopenia
- Severe anemia
- Very high risk of bleeding risk

There are two main techniques to LAA occlusion/exclusion, either by devices or by cardiac surgery. The last one is left as an alternative when invasive treatment is to be performed, such as cardiac surgery for another cause or when surgical ablation of AF is performed [15].

These techniques has the advantage that they will not require subsequent anticoagulation, so they are exempt from the hemorrhagic complications derived from anticoagulant treatment maintained over time. On the other hand, these patients will need antiplatelet treatment for life [16].

3.2 Rate control therapy in atrial fibrillation

This is one of the mainstay established in the AF control. As the name suggests, this measure aims to control the patient's heart rate without attempting to restore sinus rhythm, allowing AF to remain.

However, there is a serious controversy among the targets set out because to date it has not been established which attitude is more favorable for the patient, strict heart rate (HR) control <80 bpm, or a more permissive one <110 bpm [17]. Nevertheless, there is certainty that the heart rate should be controlled at the acute moment when it produces hemodynamic instability as quickly as possible and with fewer side effects for the patient.

Pharmacological treatments are the first-line treatments, and there is a wide range of therapeutic families from which to choose the best alternative. When pharmacological treatment fails, there is another alternative, such as atrioventricular node ablation and subsequent implantation of a pacemaker [18]. The efficacy of the procedure improves when the pacemaker is implanted a few weeks before the AV nodal ablation, and the initial pacing rate after ablation is set at 70–90 bpm [19].

Within this technique there are variants because in patients with permanent AF hospitalized due to heart failure, it can be considered the implantation of resynchronization devices or even the His bundle pacing [19, 20].

3.3 Rhythm control therapy in atrial fibrillation

This is the last mainstay we will deal with in this review. As in the previous section, there are several pharmacological treatments approved for this purpose, but we also have available nonpharmacological treatments with proved efficacy.
The fundamental purpose to rhythm control is to reduce symptoms related to AF and improve patients’ quality of life. In addition, it reduces the AF progression rate and the deleterious anatomopathological changes caused by AF on the myocardium [21, 22].

Among the nonpharmacological options to try to keep patients in sinus rhythm, we would like to outline the electrical cardioversion, AF ablation, and AF surgery.

3.3.1 Electrical cardioversion

This technique has the advantage of allowing immediate cardioversion, which makes it the technique of choice in patients with hemodynamically unstable AF, although it is also used for elective cardioversion. It is faster and more effective than pharmacological cardioversion [23, 24].

Electrical cardioversion is performed with directly and synchronous biphasic defibrillators with maximum power and placing the electrodes in an anteroposterior position [23, 25].

This is a painful procedure, and it is not exempt from complications. For this reason, the patient must be properly sedated and monitored in order to be able to handle any incidents that may arise [26].

This is a very effective technique, but there are factors that increase the risk of recurrence after cardioversion [27]:

- Older age
- Female sex
- Previous failed cardioversion
- Chronic obstructive pulmonary disease
- Renal failure
- Structural cardiopathy
- Heart failure
- Dilated left atria

3.3.2 Catheter ablation of AF

Catheter ablation is a recognized technique for preventing AF recurrence, but there are several factors that increase the risk of failure [28, 29]:

- Older age
- Renal disease
- Left atrial size
- AF duration
• AF substrate in an MRI study

• Intensive control of AF risk factors could decrease the AF recurrence rate after ablation [30].

The aim of ablation is to improve patients’ symptoms and quality of life, as it has not demonstrated in general population to reduce neither patients’ mortality nor preventing cardioembolic events or bleedings related to pharmacologic treatment [31]. However, it has shown benefits in selected population as they are patients with heart failure and depressed ventricular ejection fraction and also when AF-mediated tachycardia induced cardiomyopathy is suspected, because in these cases can improve the left ventricular function [31, 32].

Therefore, the indications for catheter ablation of AF are as follows:

• Second-line treatment after anti-arrhythmic medications

• Paroxysmal or recurrent AF in patients without recurrence risk factors

Ablation versus pharmacological treatment as first-line treatment of paroxysmal AF has shown to have a lower recurrent atrial arrhythmias rate, similar risk of serious adverse events, and lower consumption of healthcare resources [33].

The technique consists of the complete electrical pulmonary veins isolation by sequential ablation with radiofrequency or cryoablation around the atroventricular junction or with single-discharge devices, although electrical isolation is very difficult, so if the point of origin of the arrhythmia is not detected, more extensive ablations tend to be performed [34, 35]. The procedure is not exempted of complications, even though they are unfrequent: periprocedure death, esophageal perforation, thromboembolism, cardiac tamponade, pulmonary veins stenosis, phrenic nerve permanent paralysis... [36].

3.3.3 AF surgery

The technique of choice is the COX procedure, which, like ablation, has an impact on patients’ quality of life, but not on the other indicators [37]. Recurrence risk factors are also overlappable to those of AF catheter ablation.

AF surgery is usually performed in the context of other cardiac surgery, such as mitral valve repair, but can also be performed in isolation demonstrating less need for repeat procedure than in cases where ablation was performed, but with longer hospital stays and more frequent complications [38, 39].

Surgery can also be concomitantly performed with ablation, improving the results respect to both techniques separately, but having more complications than when ablation is done alone [24].

4. Summary of AF treatments

• Thrombotic events prevention:

  a. Left atrial appendage occlusion or exclusion: recommended in patients with contraindications to anticoagulation therapies.
• Rate control:
  
a. Atrioventricular node ablation and subsequent implantation of a pacemaker: recommended in selected patients when pharmacologic treatment is ineffective or contraindicated.

b. Rhythm control:
   
i. Electric cardioversion:
   1. Urgent: performed in patients with hemodynamic instability
   2. Elective: performed in patients in whom pharmacological treatment has failed

ii. Catheter ablation:
   1. Second-line therapy after pharmacologic treatment
   2. First-line treatment in selected patients

iii. AF surgery: recommended in patients who are already undergoing cardiac surgery for another reason. For example, mitral valve prosthetic replacement.

iv. Hybrid technique of AF surgery and ablation: recommended for refractory cases.

5. Conclusion

After this review, we can conclude that the procedures of choice for the treatment of atrial fibrillation are the less invasive, so the fundamental pillar remains pharmacological treatments. However, there are a number of alternatives that can be used when pharmacological treatments fail, when they are contraindicated or in electively, so we have to keep them in mind to enrich our therapeutic arsenal. Moreover, these techniques are a safe and effective solution and are widely supported by the literature.

Conflict of interest

The authors declare no conflict of interest.
Author details

Manuel Lorenzo López Reboiro1*, Raul Franco Gutierrez2, Laura Ramos Rúa3, María del Carmen Basalo Carbajales4, Laura Rodrigo Lara3, Candela Fraga González2, Celia Sobrado Moreiras1, José Manuel Cerqueiro González2 and José López Castro1

1 Internal Medicine Department, Public Hospital Monforte de Lemos, Lugo, Spain
2 Cardiology Department, University Hospital Lucus Augusti, Lugo, Spain
3 Neurology Department, University Hospital Lucus Augusti, Lugo, Spain
4 Cardiology Department, University Hospital Bellvitge, L’Hospitalet de Llobregat, Barcelona, Spain
5 Internal Medicine Department, University Hospital Ourense, Ourense, Spain
6 Internal Medicine Department, University Hospital Lucus Augusti, Lugo, Spain

*Address all correspondence to: manuel.lorenzo.lopez.reboiro@sergas.es

IntechOpen

© 2022 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/3.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
References


Atrial Fibrillation - Diagnosis and Management in the 21st Century

2019;140(22):1834-1850. DOI: 10.1161/CIRCULATIONAHA.119.040267


