Titre : Fibrillation atriale paroxystique : ablation, résultats, complications

Orateur : Serge BOVEDA
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Fibrillation Atriale Paroxystique : ablation, résultats, complications

DIU Rythmologie – Paris, le 25/01/12

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1. A disease with bad consequences

RR de patients en FA comparé avec des patients sans FA

ACC/AHA/ESC 2006 Guidelines for the Management of Patients With Atrial Fibrillation

Go et al, JAMA 2001
Mortality, Morbidity, and Quality of Life after Circumferential Pulmonary Vein Ablation for Atrial Fibrillation
Outcomes from a Controlled Nonrandomized Long-term Study
Pappone C et al. J Am Coll Cardiol 2003

Afib ablation: is it THE Solution?

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Ablation Group (n = 589)</th>
<th>Medical Group (n = 582)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)</td>
<td>65 ± 9*</td>
<td>65 ± 10</td>
<td>0.99</td>
</tr>
<tr>
<td>Male gender (%)</td>
<td>58</td>
<td>59</td>
<td>0.95</td>
</tr>
<tr>
<td>Follow-up duration, median (range), (days)</td>
<td>861 (161-1491)</td>
<td>911 (179-1505)</td>
<td>0.22</td>
</tr>
</tbody>
</table>

- “Pulmonary vein ablation improves mortality, morbidity, and QoL as compared with medical therapy”
- “Our findings pave the way for randomized trials to prospect a wider application of ablation for AF”

All patients should be ablated...
Afib ablation: theoretical aspects

Haissaguerre M et al. NEJM 1998
Afib ablation: theoretical aspects

Foyer

FA
Afib ablation: theoretical aspects
2 Afib ablation: theoretical aspects
**Strategy of Afib ablation**

Initiation

- Paroxysmal
- Persistent

Primary focuses (95% PV)

Focal ablation

Sustained

- LA substrate

Altered Tissue

Linear lesions
Afib ablation: theoretical aspects
Afib ablation: theoretical aspects

- Kuck, Pappone
- Lasso + Irrigated
- 3-D + Irrigated
- Single shot tools

Bordeaux 2000
Bordeaux 1999
Bordeaux 2001
3 Afib ablation: technical aspects

Decapolar Lasso Catheter for PV mapping
Afib ablation: technical aspects

VPSD

VPSG

VPID

VPIG
Afib ablation: technical aspects

A. Typical
   AF N = 16
   Control N = 18

B. Short Common Left Trunk
   N = 7 (including 3 of D)
   N = 5 (including 2 of D)

C. Long Common Left Trunk
   N = 2
   N = 2

D. Right Middle PV
   AF N = 4
   Control N = 3

E. Two Right Middle PVs
   N = 1
   N = 0

F. Right Middle PV and Right “upper” PV
   N = 1
   N = 1

Bilan anatomique des veines pulmonaires

Angiographie per-procédure, IRM, TDM multibarrettes +++ :
END-POINTS

• All 4 veins deconnection assessed by the absence of PV potential at the ostium of each vein

• Control of the 4 veins just before removing the catheters (frequent recurrences +++)

Afib ablation: technical aspects
Right superior PV before/after RF
Left superior PV before/after RF
LIPV disconnection
Follow-up

- Holter just after the procedure, after 3, 6 and 12 months

- Warfarin at least during 6 months in case of afib recurrences
Why still so much recurrences?
Nowadays:

Carto 3®
Circumferential PVI

Arentz T. Circulation 2007
PV Isolation: the larger the better?

Ostial segmental PVI = small isolation

Circumferential Isolation = large isolation

Arentz et al. Circulation 2007
PV Isolation: the larger the better!!!

Arentz et al. Small or large isolation areas around the PVs. Circulation 2007

![Graph showing arrhythmia free survival over months with different isolation areas.](chart.png)
### 3 Afib Ablation: Technical Aspects

#### Single Shot Tools for Paroxysmal AFib

<table>
<thead>
<tr>
<th>Catheter Description</th>
<th>Medtronic - Ablation Frontiers</th>
<th>Medtronic - CryoCath Arctic Front</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Bard</strong> High Density Mesh Ablator</td>
<td>Pulmonary Vein Ablation Catheter</td>
</tr>
<tr>
<td></td>
<td><img src="Bard_image.png" alt="Bard Image" /></td>
<td><img src="Medtronic_image.png" alt="Medtronic Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Pulsed RF</th>
<th>Phased RF</th>
<th>Cryothermal Energy</th>
</tr>
</thead>
</table>

| System Description | Controller distributes power sequentially to the electrodes of the HDMA, using temperature information from catheter to control RF power delivery. Electrodes can be activated in each of 4 quadrants | Generator can selectively deliver energy in bipolar, unipolar, or combination modes to any or all of the 8 catheter electrodes—based on patient requirements | Console controls the delivery of the liquid refrigerant to the catheter, recovers the warmed refrigerant vapor under constant vacuum, and disposes of the refrigerant through the hospital scavenging system |

<table>
<thead>
<tr>
<th>Catheter Positioning</th>
<th>Channel steerable sheath</th>
<th>Over-the-wire system</th>
<th>Over-the-wire system</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mapping</th>
<th>Yes</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>
PVAC: pulmonary vein ablation catheter
PAF Typical baseline ECG
Afib coming from RSPV
LSPV before RF ablation
LSPV after first RF application: 1st degree PV block
LSPV after RF ablation

vpsg post rf
Pacing inside LSPV showing LA dissociation
Pacing inside LIPV: still connected…

v pig non deconnectee
LIPV pre RF ablation
LIPV post RF ablation
RSPV pre RF ablation
RSPV dissociation after RF ablation
RIPV pre RF ablation
RIPV post RF ablation
Cryoablation - Methods

- 240 sec per application

- At least 2 applications per vein with good occlusion achieved during venography, through ϑ < -40°

- Size of the balloon :
  - 28 mm or 23 mm according to :
    - the PV diameter (CT scan > or < 15/16 mm),
    - Gender: Women, low BMI : 23 mm ++
    - Size of the RSPV
Cryoablation is it superior to radiofrequency ablation?

- Less endocardial disruption
- Preservation of underlying tissue architecture
- Reduce platelet and clotting activation
- And thrombus formation

> thromboembolism

If the diameter of the PVs is >15 mm ➔ 28 mm balloon
Achieve in the LSPV, isolation at 35 s freeze during CS pacing
Paroxysmal AF, Achieve® in the LSPV, without pacing
- Where is the A potential?
- Where is the venous potential? where is the ventricular potential?
During cryo ablation at 15 sec
## Afib ablation : results

### Parox AF ablation: success rate

*Meta-analysis of catheter ablation studies*

<table>
<thead>
<tr>
<th>Ablation method</th>
<th>Patients</th>
<th>Paroxysmal AF</th>
<th>SHD</th>
<th>6-mo cure</th>
<th>6-mo OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>443</td>
<td>75 %</td>
<td>26 %</td>
<td>33 %</td>
<td>55 %</td>
</tr>
<tr>
<td>Focal</td>
<td>508</td>
<td>81 %</td>
<td>35 %</td>
<td>54 %</td>
<td>71 %</td>
</tr>
<tr>
<td>Isolation</td>
<td>2,187</td>
<td>83 %</td>
<td>36 %</td>
<td>62 %</td>
<td>75 %</td>
</tr>
<tr>
<td>Circumferential (all)</td>
<td>15,455</td>
<td>68 %</td>
<td>37 %</td>
<td>64 %</td>
<td>74 %</td>
</tr>
<tr>
<td>Circumferential (LACA, WACA)</td>
<td>2,449</td>
<td>65 %</td>
<td>37 %</td>
<td>59 %</td>
<td>72 %</td>
</tr>
<tr>
<td>Circumferential (PVAI)</td>
<td>11,132</td>
<td>68 %</td>
<td>42 %</td>
<td>67 %</td>
<td>76 %</td>
</tr>
<tr>
<td>Substrate ablation (CFAE)</td>
<td>559</td>
<td>51 %</td>
<td>49 %</td>
<td>75 %</td>
<td>87 %</td>
</tr>
<tr>
<td>Total</td>
<td>23,626</td>
<td>61 %</td>
<td>55 %</td>
<td>63 %</td>
<td>75 %</td>
</tr>
</tbody>
</table>

*The VeniceChart international consensus document*
## PAF Ablation: Randomized Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Reference</th>
<th>Patients (n)</th>
<th>Age, years</th>
<th>Type of AF</th>
<th>Previous use of AAD</th>
<th>Ablation technique</th>
<th>Repeat ablation in the ablation group</th>
<th>Crossed to ablation in the AAD group</th>
<th>AF free at 1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jais et al. 2008 (A4 study)</td>
<td>I 33</td>
<td>112</td>
<td>51 ± 11</td>
<td>Paroxysmal</td>
<td>≥1</td>
<td>PV1 ± LA lines ± CTI ablation</td>
<td>Mean 1.8 ± 0.8, median 2 per patient</td>
<td>63%</td>
<td>89%      23%</td>
</tr>
<tr>
<td>Forleo et al. 2008</td>
<td>Online</td>
<td>70</td>
<td>63 ± 9 (ablation) 65 ± 6 (AAD)</td>
<td>Paroxysmal, persistent</td>
<td>≥1</td>
<td>PV1 ± LA lines ± CTI ablation</td>
<td>Not stated</td>
<td>Not stated</td>
<td>80% 43%</td>
</tr>
<tr>
<td>Wilber et al. 2010 (Thermocool)</td>
<td>96</td>
<td>167</td>
<td>55.5 (ablation) 56.1 (AAD)</td>
<td>Paroxysmal</td>
<td>≥1 (mean 1.3)</td>
<td>PV1 ± LA lines ± CFAEs ± CTI ablation ± RA lines</td>
<td>12.6% within 00 days after 1st procedure</td>
<td>59%&lt;sup&gt;c&lt;/sup&gt;</td>
<td>66% 16%</td>
</tr>
<tr>
<td>Packer et al. 2010 (STOP-AF)</td>
<td>Online</td>
<td>245</td>
<td>56.7 (ablation) 56.4 (AAD)</td>
<td>Paroxysmal</td>
<td>≥1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>Cryo-PV1 ± LA lines</td>
<td>19% within 90 days after 1st procedure</td>
<td>79%</td>
<td>69.9% 7.3%</td>
</tr>
</tbody>
</table>

AF - ESC Guidelines, EHJ 2010
Inclusions:
Patients >2 AF episodes in 2 months w ECG doc. of 1 Rx Failure of > 1 AA Rx

AA Rx failure n=304
Randomized 2:1 to ablation vs. Drug Rx

Screening Exclusion n=46

Consent withdrawal n=7
Screening failure n=6

Cryoballoon ablation n=163

Blanking period (90 day)
Redo ablation n=31

Drug Rx n=82

Drug optimization 90 days

Follow-up 1,3,6,9, &12 mo
Holters Weekly TTM

Cross-over n=65
Primary Effectiveness Analysis
Treatment Success

CRYO  69.9%  114/163

P<0.001

vs 7.3% (SE 2.9%)

DMUG Rx  7.3%  6/82

30 days

KM estimate  68.6% (SE 3.9%) vs 7.3% (SE 2.9%)
Afib ablation : CP results

- RF Persist Afib
- RF Parox Afib
<table>
<thead>
<tr>
<th></th>
<th>Success without AAD</th>
<th>Success with AAD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Paroxysmal Afib</strong></td>
<td>72 %</td>
<td>80 %</td>
</tr>
<tr>
<td>Persistent/ Afib (1 year)</td>
<td>52 %</td>
<td>63 %</td>
</tr>
</tbody>
</table>
Afib ablation: elderly patients

Zado et al., J Cardiovasc Electrophysiol 2008
In patients with documented focal induction of non-permanent AF and absence of structural heart disease, PVI is as effective in athletes as in other patients.
Accès Percutané

Complications « locales » : Fistule artério/veineuse, Hématome fémoral

Manipulation cathéters / Ponction Transeptale

Perforation cardiaque / Tamponnade ; Perforation du sinus coronaire ; lésion aortique…

Energie Délivrée

Perforation cardiaque / Tamponnade ; Lésion valvulaire ; AVC ; Fistule oesophagienne…

Afib ablation : complications
Afib ablation: complications

Verma A et al. (Circulation 2005;112:1214-1231)

Global risk between 2 and 3% (higher for persistent Afib?...)
**Afib ablation: complications**

AVC: incidence = 0 à 4%

- ACT 300-350 (per-op + post-op)
- Surveillance clinique per-op + post-op
- Stroke center / Fibrinolyse

*Troughton R, Heart 2003*

*Dixit S, Heart Rhythm 2007*
Tamponnade : incidence = 1.2 à 6%...

- Drainage sous-xyphoïdien
- Chirurgie +++

Wu R, J Cardiovasc Electrophysiol 2002
Fistule atrio œsophagienne : incidence < 0.25% / Mortalité = 50%...
Afib ablation: complications

PV stenosis: up to 15% / Severe >70%: 1-3%

Sra J, J Interv Card Electrophysiol 2008
Asymptomatic PV stenosis 3 months after ablation...
6 Looking at the Guidelines

Indication for LA Catheter Ablation

- Catheter ablation for paroxysmal AF should be considered in symptomatic patients who have previously failed a trial of antiarrhythmic medication.
- Ablation of persistent symptomatic AF that is refractory to antiarrhythmic therapy should be considered a treatment option.
- Catheter ablation of AF may be considered prior to antiarrhythmic drug therapy in symptomatic patients despite adequate rate control with paroxysmal symptomatic AF and no significant underlying heart disease.

- No or minimal heart disease (including HT without LVH)
  - Paroxysmal AF
  - Persistent AF
    - Dronedarone
    - Flecaïnide
    - Propafenone
    - Sotalol
  - Catheter ablation for AF
    - Amiodarone

[Source: www.escardio.org]
# Looking at the Guidelines

## 2011 ACCF/AHA/HRS Focused Update on the Management of Patients With Atrial Fibrillation (Updating the 2006 Guideline)

**A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines**

<table>
<thead>
<tr>
<th>2006 Recommendations</th>
<th>2011 Focused Update Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class I</strong></td>
<td><strong>Class IIb</strong></td>
</tr>
<tr>
<td>Before initiating antiarrhythmic drug therapy, treatment of precipitating or reversible causes of AF is recommended. <em>(Level of Evidence: C)</em></td>
<td>1. Before initiating antiarrhythmic drug therapy, treatment of precipitating or reversible causes of AF is recommended. <em>(Level of Evidence: C)</em></td>
</tr>
<tr>
<td></td>
<td>2. Catheter ablation performed in experienced centers is useful in maintaining sinus rhythm in selected patients with significantly symptomatic, paroxysmal AF who have failed treatment with an antiarrhythmic drug and have normal or mildly dilated left atria, normal or mildly reduced LV function, and no severe pulmonary disease. <em>(Level of Evidence: A)</em></td>
</tr>
<tr>
<td></td>
<td>1. Catheter ablation may be reasonable to treat symptomatic paroxysmal AF in patients with significant left atrial dilatation or with significant LV dysfunction. <em>(Level of Evidence: A)</em></td>
</tr>
</tbody>
</table>
Should we ablate before?

Catheter ablation of atrial fibrillation as first-line therapy—a single-centre experience

Hildegard Tanner*, Karol Makowski, Laurent Roten, Jens Seiler, Nicola Schwick, Christian Müller, Jürg Fuhrer, and Etienne Delacrétaz

This suggests that the selection of patients for the invasive strategy should be considered at an earlier stage of the disease, even before AAD.
Take Home Message

1. Symptomatic parox Afib ablation after AAD failure is a IIa / I indication with a 75% success and 2-3% complication rates.

2. Afib ablation is cost-effective in these patients.

3. Persistent Afib ablation remains challenging, with long fluoro exposure time, higher morbidity and lower success rates...

4. Afib type, absence of SHD, LA enlargement, LA fibrosis/SRM seem to be important factors for a better outcome after ablation.

5. ...try to ablate before Afib becomes persistent.

6. ...at earlier stages of the disease.

7. ...but not before AAD treatment : IIb indication...