# Atriyal fibrilasyonu için hastanın hazırlanması ve antikoagülasyonu

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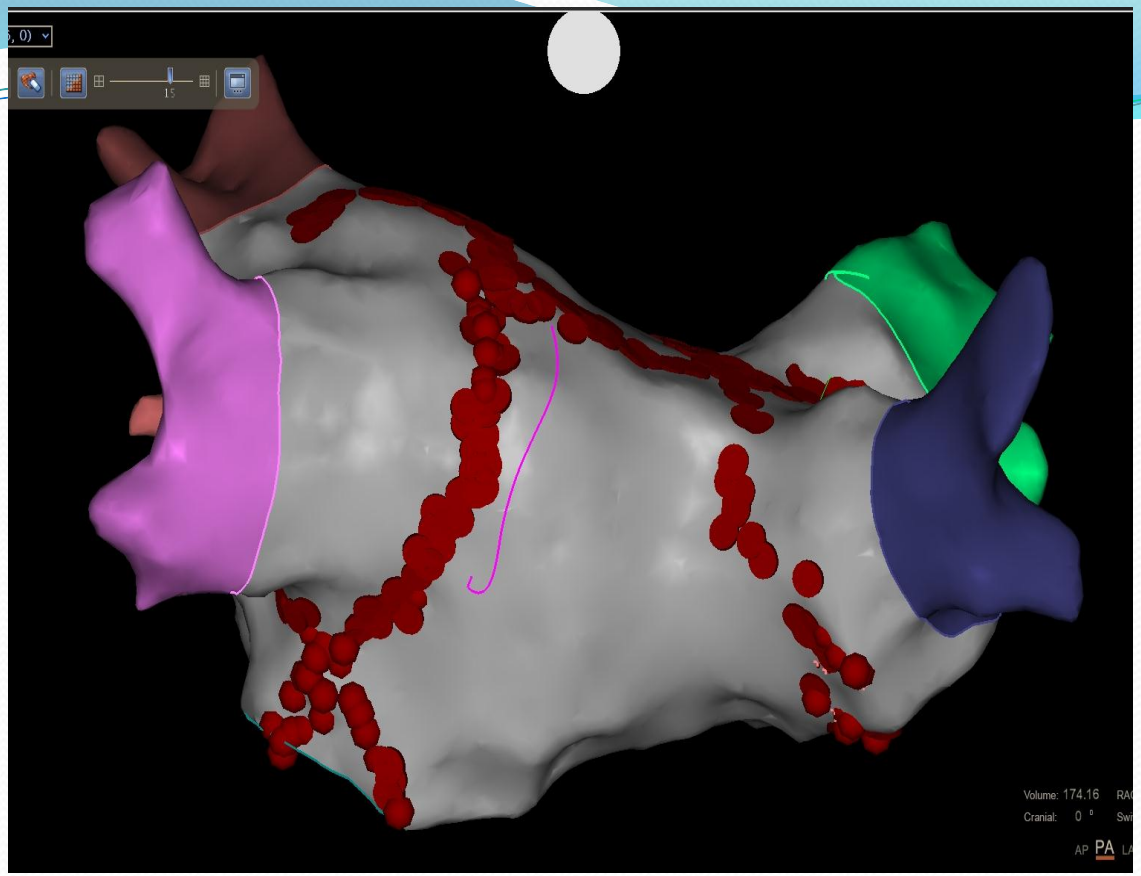



- Sinüs ritmini sağlamada AF ablasyonu antiaritmiklerden üstündür
- Ancak işlemin embolik ve hemorajik komplikasyonları vardır

# AF ablasyonu hazırlığı

- Klinik değerlendirme
- Anatomik değerlendirme
- Antiaritmik tedavi
- Antikoagülasyon

# Klinik değerlendirme

- Ablasyon endikasyonu?
  - Semptom?
  - AF türü
  - Paroksismal AF: Atakların sıklığı, süresi, ve presipite eden faktörler
  - Persistan AF: AF esnasında kalp hızı (istirahatte, eforla, gece, gündüz, 24 saat ortalaması)
- Eşlik eden hastalıklar:
  - Kalp yetmezliği, Kapak hst, Tiroid hst, KBY, HT, DM, KAH
- CHADS-VASC skoru

# Anatomik değerlendirme

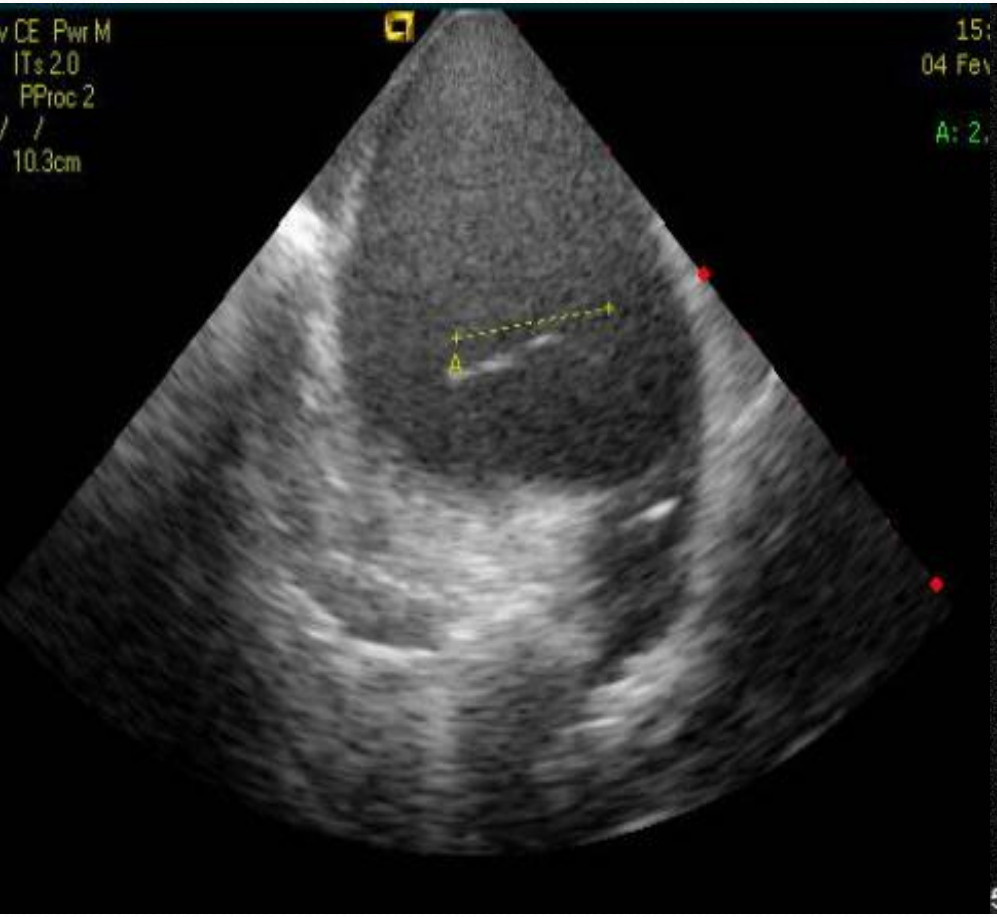
- **Ekokardiyografi** : EF, LA, LAA, Kapaklar, IAS
- **TEE** : LAA, PV, Trombüs?
- **Tomografi** : PV, LA, LAA, Trombüs?
- **MRI** : Skar?, PV, LA, LAA, PV, Trombüs?

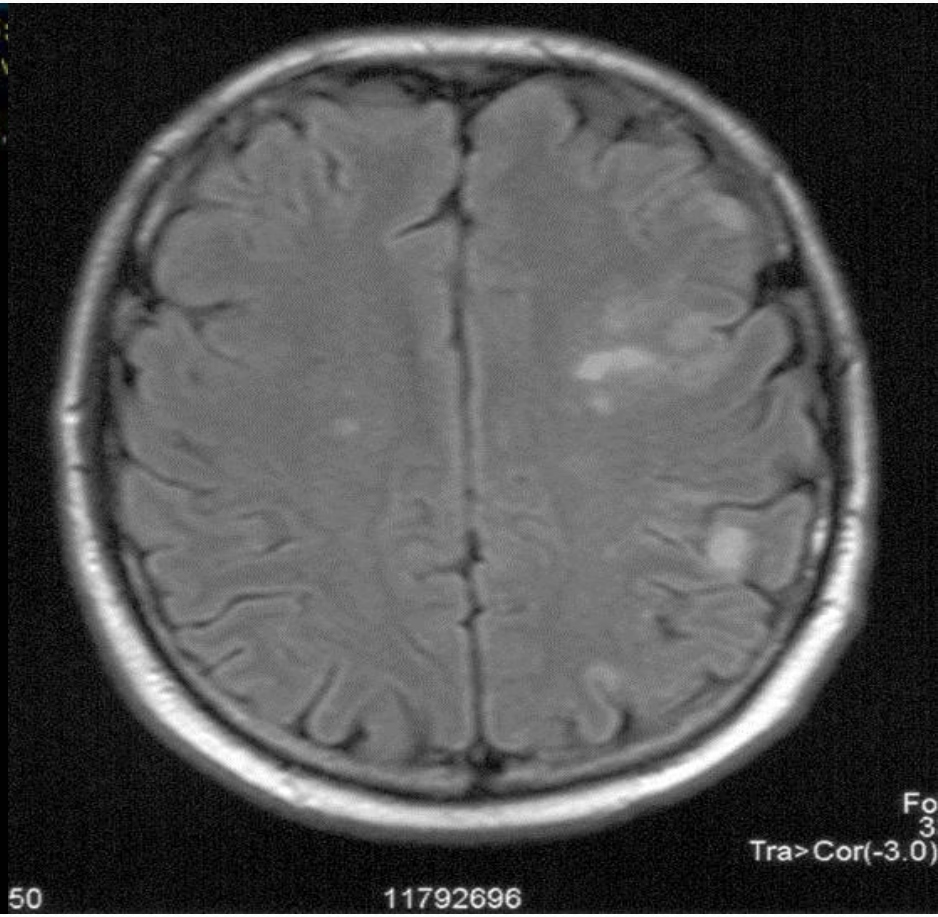
# Antiaritmikler

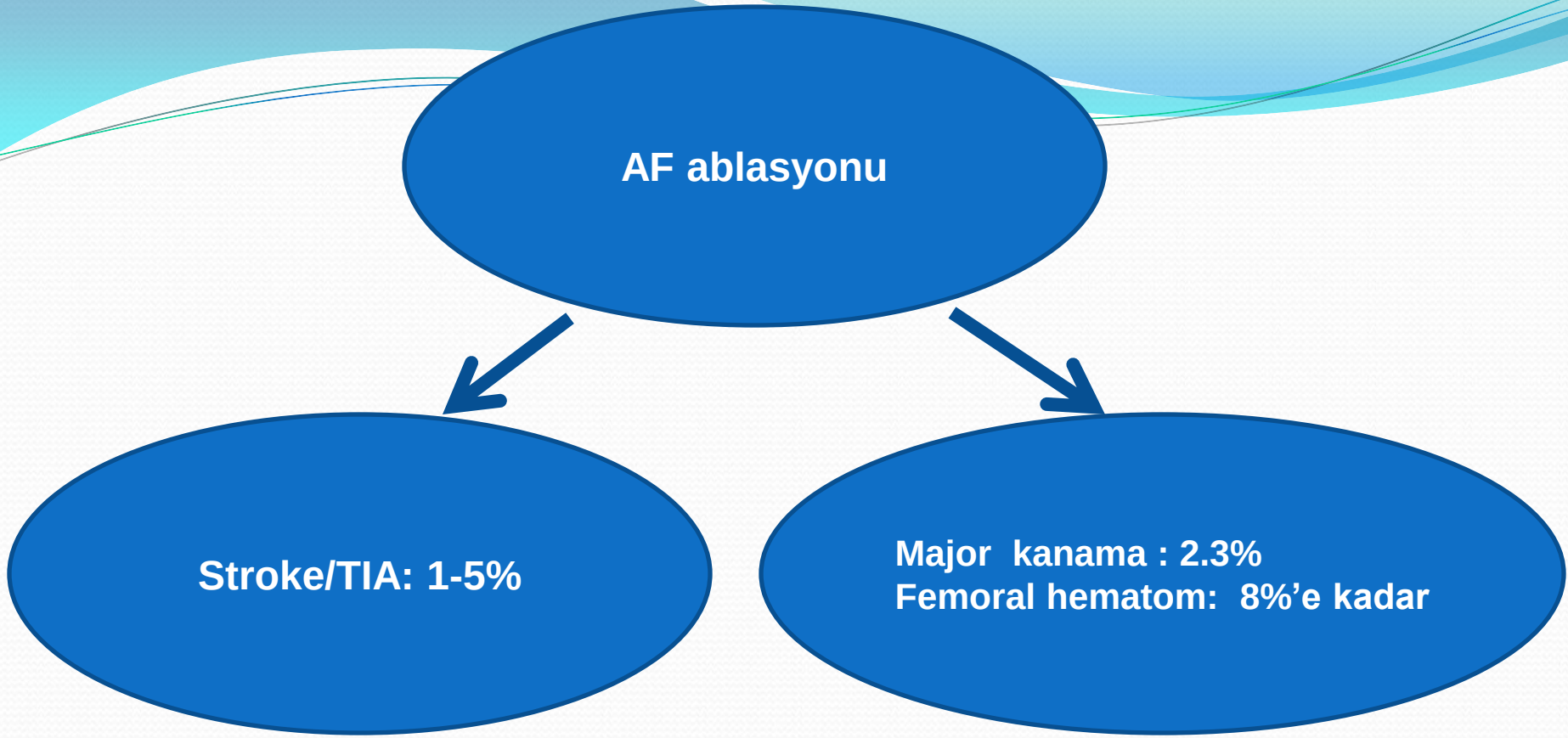
- Amiodaronun işlemden 4-6 ay önce diğer tüm antiaritmiklerin ise işlemden 3-5 gün önce kesilmesi önerilmektedir.
- Amidarone kesilen hastalarda ablasyondan 5 gün önce kesilmek şartıyla tikosin başlanabilir*.

* How to ablate long-standing persistent atrial fibrillation? Biase LG, Santangeli P, Natale A. Curr Opin cardiol 2013,28:26-35.

# Antikoagülasyon






# Periprocedural antikoagülasyon

- En düşük tromboembolik risk
- En düşük kanama riski

# AF ve Embolik risk

- AF protrombotiktir !
- Ablasyon işlemi protrombotiktir !
  - Endotel hasarı
  - Char oluşumu
  - LA/LAA da mevcut olan trombüs
  - Kateter ve sheath üzerinde trombüs
    - Trombüs henüz sağ atriyumda transseptal girişime hazırlanırken dahi oluşabilir!
  - Ablasyon sonrası atrial stunning
- Peri-ablasyon döneminde embolik risk artmaktadır (embolik riski düşük kabul edilen hastalarda dahi)


1. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation
2. 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation.

# Stroke-TIA

- Serebroembolik olay: 1-5%
- Ablasyon esnasında TCD ile çok sayıda “mikroembolik sinyal” tespit edilmektedir. *
  - Ablasyon esnasında çok sayıda mikroembolizasyon olmaktadır.
  - Ancak bunların çoğu önemli klinik sorun oluşturmayan mikrobubble’lardır.

* Fethi Kilicaslan, Atul Verma et. al.
Transcranial Doppler detection of microembolic signals during pulmonary vein antrum isolation: implications for titration of radiofrequency energy.
J Cardiovasc Electrophysiol.2006 May;17(5):495-501.

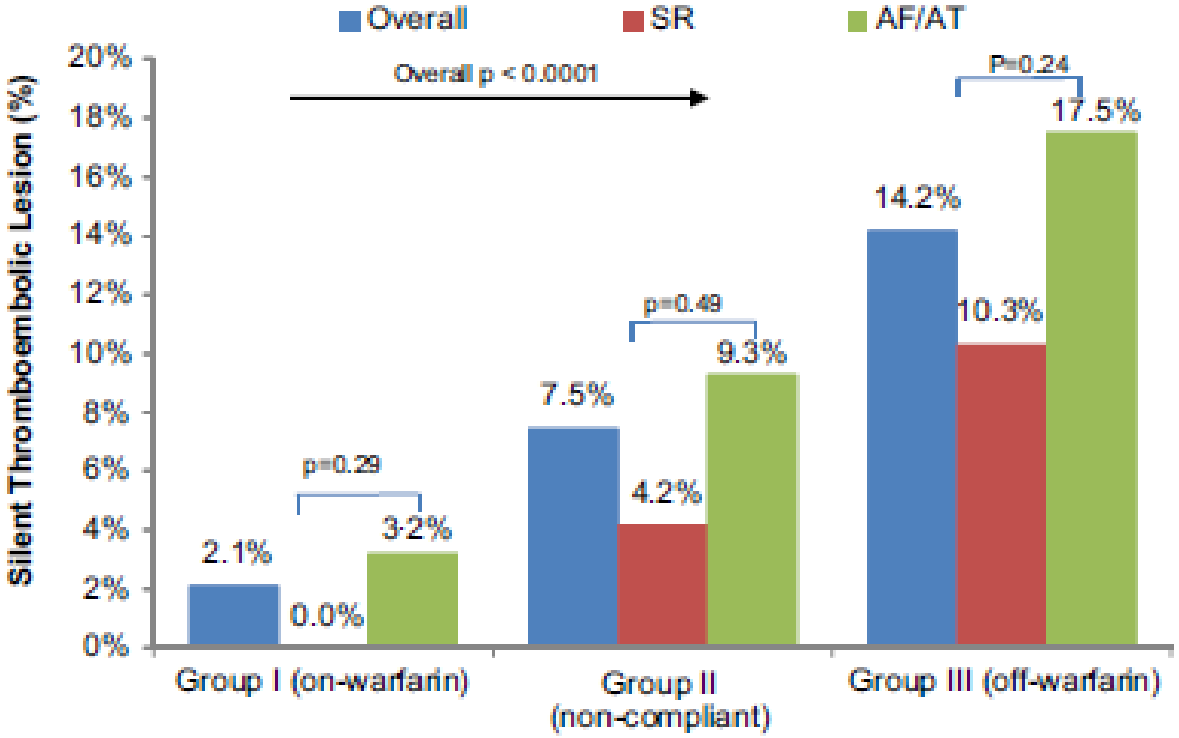



**Figure 1** Incidence of silent cerebral ischemia in the 3 groups sorted by rhythm on the day of the procedure. AF = atrial fibrillation; AT = atrial tachycardia; SR = sinus rhythm.

Does periprocedural anticoagulation management of atrial fibrillation affect the prevalence of silent thromboembolic lesion detected by diffusion cerebral magnetic resonance imaging in patients undergoing radiofrequency atrial fibrillation ablation with open irrigated catheters? Results from a prospective multicenter study.
Biase LD, Gaita F et.al. Heart Rhythm 2014;11:791-798.

# AF ablasyonunda Antikoagülasyon

- Ablasyon öncesi
- Ablasyon esnasında
- Ablasyon sonrasında

- AF ablasyonunda antikoagülasyon kılavuzları kardiyoversiyondaki kılavuzlara benzer
- AF>48 saat ise (veya süresi bilinmiyorsa)
  - Ablasyondan önce en az 3 hafta (4-6 hafta)
  - Ablasyondan sonra 2-3 ay

2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation.

# İşlem öncesi antikoagülasyon

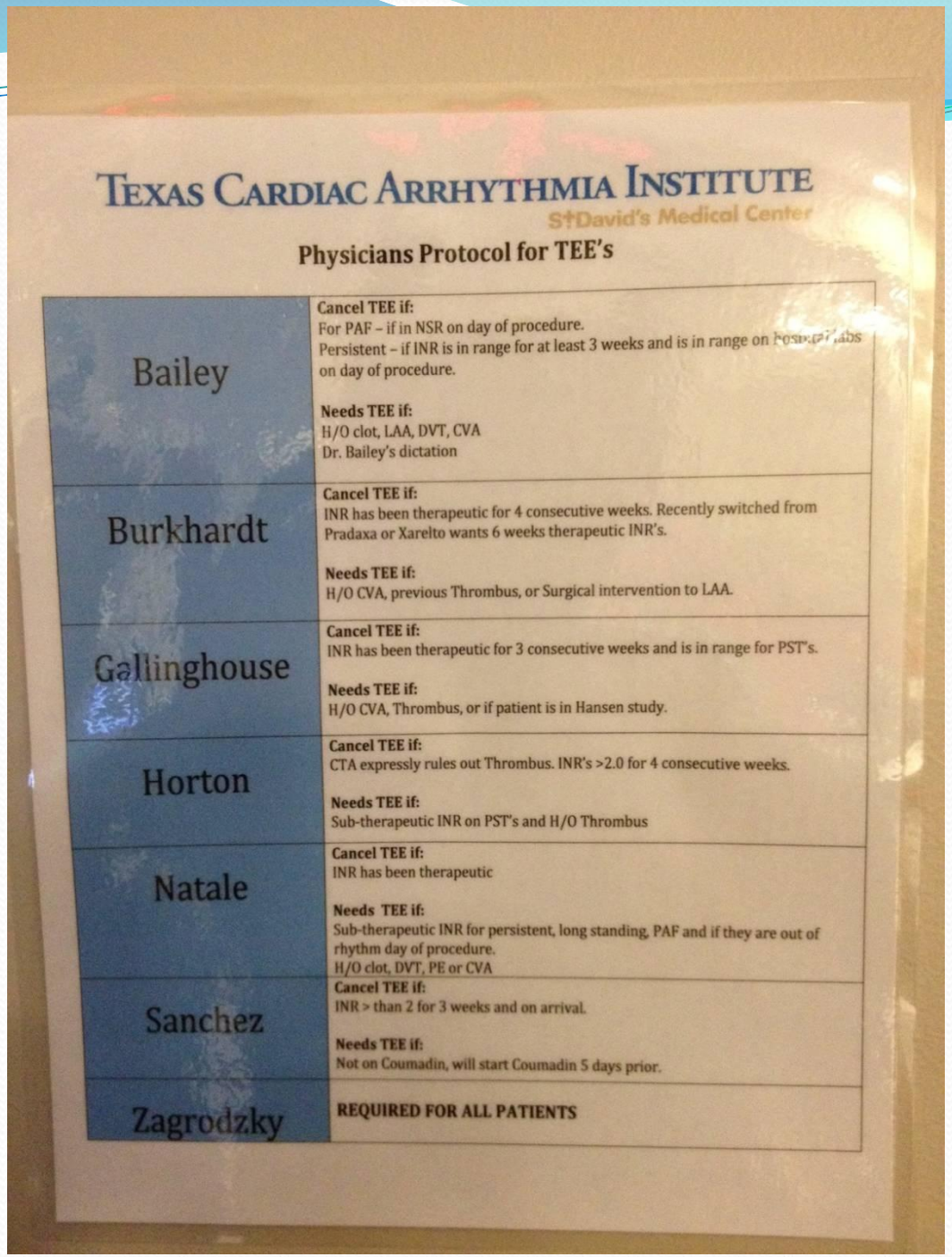
- **Ablasyondan önce 3 hafta antikoagülasyon**
  - Stroke riski orta/yüksek olan hastalarda:
    - Coumadine (INR 2-3)
    - NOACs
  - Stroke riski düşük olan hastalarda ?

**Venice Chart International Consensus Document on Atrial Fibrillation Ablation: 2011 Update**

# İşlem öncesi TEE

- Persistan AF olan veya embolik riski yüksek olan hastalarda ablasyon öncesinde TEE veya başka metodlarla intrakardiyak trombüs araştırması önerilmektedir.
- Eğer ablasyondan öncesi 4 hafta INR terapötik düzeydeyse işlem öncesinde sinüs ritminde olan hastalarda TEE gerekmeyebilir.

**Venice Chart International Consensus Document on Atrial Fibrillation Ablation: 2011 Update**



# Texas Cardiac Arrhythmia Institute

St David's Medical Center

## Physicians Protocol for TEE's

| | |
|---|---|
| Bailey | **Cancel TEE if:**<br>For PAF – if in NSR on day of procedure.<br>Persistent – if INR is in range for at least 3 weeks and is in range on Post-PST labs on day of procedure.<br><br>**Needs TEE if:**<br>H/O clot, LAA, DVT, CVA<br>Dr. Bailey's dictation |
| Burkhardt | **Cancel TEE if:**<br>INR has been therapeutic for 4 consecutive weeks. Recently switched from Pradaxa or Xarelto wants 6 weeks therapeutic INR's.<br><br>**Needs TEE if:**<br>H/O CVA, previous Thrombus, or Surgical intervention to LAA. |
| Gallinghouse | **Cancel TEE if:**<br>INR has been therapeutic for 3 consecutive weeks and is in range for PST's.<br><br>**Needs TEE if:**<br>H/O CVA, Thrombus, or if patient is in Hansen study. |
| Horton | **Cancel TEE if:**<br>CTA expressly rules out Thrombus. INR's >2.0 for 4 consecutive weeks.<br><br>**Needs TEE if:**<br>Sub-therapeutic INR on PST's and H/O Thrombus |
| Natale | **Cancel TEE if:**<br>INR has been therapeutic<br><br>**Needs TEE if:**<br>Sub-therapeutic INR for persistent, long standing, PAF and if they are out of rhythm day of procedure.<br>H/O clot, DVT, PE or CVA |
| Sanchez | **Cancel TEE if:**<br>INR > than 2 for 3 weeks and on arrival.<br><br>**Needs TEE if:**<br>Not on Coumadin, will start Coumadin 5 days prior. |
| Zagrodzky | **REQUIRED FOR ALL PATIENTS** |

# Coumadine alan hastalarda köprüleme (bridging) strateji

- Coumadine 3-4 hafta önce başlanır
- Coumadine işlemden 3-4 gün önce kesilir
- Enoxaparin 0,5-1 mg/kg başlanır
- Enoxaparin işlemden 12 saat önce kesilir
- İşlemde iv heparin kullanılır
- İşlem sonunda protamin
- İşlemden sonra ACT<250 olunca sheathler çekilir
- Sheathler çekildikten sonra coumadine + enoxaparine başlanır
- INR>2 olunca enoxaparine kesilir

# Antikoagülasyon- ablasyon esnasında

- **Transseptal ponksiyondan hemen önce veya hemen sonra heparin**
  - Bolus (100–140 IU/kg)
  - İnfüzyon (15–18 IU/kg/saat)
  - Gerekirse ilave boluslar
  - Kateterler sol atriyumdan çıkarılınca heparin kesilir
  - Protamin
- **Hedef ACT >350–400 sn**

**Venice Chart International Consensus Document on Atrial Fibrillation Ablation: 2011 Update**

# Antikoagulation – ablasyon esnasında

- Coumadine kesilmeden AF ablasyonu yapılacaksa işlemden önce hastada tam kan değerleri ve kan grubu bilinmelidir. İşlem sabahı INR ölçülmelidir.
- Bu hastalarda;
  - İşlem sabahı cross-match yapılmış eritrosit ve taze donmuş plazmanın hazır tutulması önerilmektedir*
  - İşlem sabahı INR >3,5 ise 1-2 ünite taze donmuş plazma verilmesi önerilmektedir*

* How to ablate long-standing persistent atrial fibrillation? Biase LG, Santangeli P, Natale A. Curr Opin cardiol 2013,28:26-35.

# Coumadine kesmeden

# (terapötik INR altında) ablasyon

- INR alt sınırda olmalı (2.0-2.5)
- İlk heparin bolusu düşük olmalı (80 IU/kg)
- Hedef ACT aynı (>350-400 sn)
- Hedef ACT 'ye daha kolay ulaşılıyor
- Stroke riski ni azaltabilir
- Major kanama riski artmamaktadır
- Gerekli durumlarda kardiyak tamponad tedavisi güvenli
- Taze donmuş plazma veya faktör IX hazır olmalı

**Venice Chart International Consensus Document on Atrial Fibrillation Ablation: 2011 Update**

**Periprocedural Stroke and Management of Major Bleeding Complications in Patients Undergoing Catheter Ablation of Atrial Fibrillation: The Impact of Periprocedural Therapeutic International Normalized Ratio**

Luigi Di Biase, J. David Burkhardt, Prasant Mohanty, Javier Sanchez, Rodney Horton, G. Joseph Gallinghouse, Dhanunjay Lakkireddy, Atul Verma, Yaariv Khaykin, Richard Hongo, Steven Hao, Salwa Beheiry, Gemma Pelargonio, Antonio Dello Russo, Michela Casella, Pietro Santarelli, Pasquale Santangeli, Paul Wang, Amin Al-Ahmad, Dimpi Patel, Sakis Themistoclakis, Aldo Bonso, Antonio Rossillo, Andrea Corrado, Antonio Raviele, Jennifer E. Cummings, Robert A. Schweikert, William R. Lewis and Andrea Natale

*Circulation.* 2010;121:2550-2556; originally published online June 1, 2010;
doi: 10.1161/CIRCULATIONAHA.109.921320

**Table 2. Complications**

| Complication | Group 1 (n=2488), n (%, 95% CI) | Group 2 (n=1348), n (%, 95% CI) | Group 3 (n=2618), n (%, 95% CI) | *P*, Multiple Comparison Between Group 3 and Groups 1 and 2 |
|---|---|---|---|---|
| Stroke/TIA | 27 (1.1, 0.72–1.58) | 12 (0.9, 0.46–1.56) | 0 (0) | <0.05 |
| Minor bleeding | 498 (20, 18.3–21.9) | 256 (19, 16.7–21.5) | 105 (4, 3.3–4.9) | <0.05 |
| Major bleeding | 10 (0.4, 0.19–0.74) | 11 (0.8, 0.41%–1.46%) | 10 (0.4, 0.18–0.70) | >0.05 |
| Pericardial effusion | 11 (0.4, 0.22–0.79) | 11 (0.8, 0.41–1.46) | 12 (0.5, 0.24–0.80) | >0.05 |

**Table 3. Pericardial Effusion Management**

| | Patients off Warfarin (n=3836) | Patients on Warfarin (n=2618) | *P* |
|---|---|---|---|
| Patients with pericardial effusion, n (%, 95% CI) | 22 (0.57, 0.36–0.87) | 12 (0.46, 0.24–0.80) | 0.602 |
| Requiring pericardiocentesis, n (%, 95% CI) | 9 (0.23, 0.11–0.45) | 8 (0.31, 0.13–0.60) | 0.626 |
| Requiring fresh frozen plasma, n (%, 95% CI) | 0 | 8 (0.31, 0.13–0.60) | <0.001 |
| Median blood units for transfusion, n (%, 95% CI) | 1 (0.03, 0.00–0.15) | 3 (0.11, 0.02–0.33) | 0.043 |
| Requiring surgery, n (%, 95% CI) | 3 (0.08, 0.02–0.23) | 1 (0.04, 0.00–0.21) | 0.651 |
| Mean pericardial fluid aspiration, $cm^3$ | 700±300 | 1200±200 | <0.001 |
| Mean protamine for reversal, mg | 45±15 | 70±15 | <0.001 |

# Antikoagülasyon – Ablasyon sonrası

- İşlem sonrası erken dönemde en az 3 ay (HRS/EHRA/ECAS: 2 ay) tüm hastalarda oral antikoagülan (coumadine/NOACs) endikasyonu vardır:
  - Uzun dönem OAK endikasyonu olan hastalar
  - Uzun dönem OAK endikasyonu olmayan hastalar (Artmış peri-procedural emboli riski!)
- Uzun dönem oral antikoagülasyon CHA2DS2-VASc skoruna göre yapılmalıdır

2012 focused update of the ESC Guidelines for the management of atrial fibrillation

# NOACs

- **Dabigatran (PRADAXA ®  110 ve 150 mg tablet, 2X1)**
- **Rivaroxaban (XARELTO ®  10 mg tablet, 1X1)**
- **Apixaban (ELIQUIS ® 5 mg tablet, 2X1)**



# NOACs

- Clinical experience is limited
- May be used preprocedural
- May be started after ablation
  - Start shortly after the procedure
  - No need for bridging


1. 2012 focused update of the ESC Guidelines for the management of atrial fibrillation
2. 2012 HRS/EHRA/ECAS Expert Consensus Statement on Catheter and Surgical Ablation of Atrial Fibrillation.

# Atrial Fibrillation Trial Comparison

| Variables | RE-LY (n=18,113) | ROCKET-AF (n=14,264) | ARISTOTLE (n=18,201) |
|---|---|---|---|
| Study drug | Dabigatran 150 mg BID | Rivaroxaban 20 mg daily | Apixaban 5 mg BID |
| Comparator | Warfarin INR 2-3 | Warfarin INR 2-3 | Warfarin INR 2-3 |
| TTR (mean) | 64% | 55% | 62.2% |
| Mean Age | 71 yo | 73 yo | 70 yo |
| $CHADS_2$ score | 2.2 | 3.5 | 2.1 |
| Primary Outcome | 1.11% vs. 1.69% (p<0.001) | 2.12% vs. 2.42% (p=0.117) | 1.27% vs. 1.6% (p<0.001) |
| Major bleeding | 3.11% vs. 3.36% (p=0.31) | 3.60% vs. 3.46% (p=0.576) | 2.13% vs. 3.09% (p<0.001) |

# Characteristics of NOACs

| Variables | Dabigatran | Rivaroxaban | Apixaban |
|---|---|---|---|
| FDA approved | October 2010 | November 2011 | N/A |
| Drug Class | DTI | Factor Xa Inhibitor | Factor Xa Inhibitor |
| $T_{max}$ (hrs) | 1-3 | 2-4 | 1-3 |
| Half-life (hrs) | 14-17 | 5-9 | 8-15 |
| Dose Interval | Twice daily | Once daily | Twice daily |
| Renal | 80% | 36% | 25% |
| Renal Dose Adj. | Yes | Yes | Unlikely |
| Hepatic Impairment | No adjustment | Avoid Use | Caution / Avoid Use |
| Other AEs | Dyspepsia | N/A | N/A |
| *Possible* Monitoring | pTT, ACT | PT, anti-Xa | PT, anti-Xa |

# Advantages of NOACs

- Rapid onset of action:
  - Can be readministered shortly after hemostasis
- Short half-life:
  - Can be stopped 24 hours before the procedure
- No need for postprocedural bridging (which is associated with high risk of bleeding)
- No concern of a sub- or supratherapeutic INR
- Efficacy is at least same or superior in preventing stroke with better safety compared with coumadine.*

*Meta-analyis of efficacy and safety of new oral anticoagulants (dabigatran, rivaroxaban, apixaban) versus warfarin in patients with atrial fibrillation. Miller CS. et. al. Am J Cardiol 2012;110:453-460.

# Disadvantages of NOACs

- Lack of a specific antidote
- Need for dose adjustments in patients with renal dysfunction
  - A dose of 75 mg twice daily is recommended in patients with creatinine clearance 15–30 mL/min
  - It is also recommended to discontinue dabigatran at least 48 hours earlier before an invasive procedure in patients with renal dysfunction
- Higher cost
- Absence of a routine clinical coagulation test to confirm patient compliance

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# Feasibility and Safety of Dabigatran Versus Warfarin for Periprocedural Anticoagulation in Patients Undergoing Radiofrequency Ablation for Atrial Fibrillation

## Results From a Multicenter Prospective Registry

Dhanunjaya Lakkireddy, MD,* Yeruva Madhu Reddy, MD,* Luigi Di Biase, MD, PHD,†‡§ Subba Reddy Vanga, MD,* Pasquale Santangeli, MD,† Vijay Swarup, MD,‖ Rhea Pimentel, MD,* Moussa C. Mansour, MD,¶ Andre D'Avila, MD, PHD,# Javier E. Sanchez, MD,† J. David Burkhardt, MD,† Fadi Chalhoub, MD,¶ Prasant Mohanty, MBBS, MPH,† James Coffey, MD,# Naushad Shaik, MD,** George Monir, MD,†† Vivek Y. Reddy, MD,# Jeremy Ruskin, MD,¶ Andrea Natale, MD†§‡‡

- Dabigatran 150 mg po bid  30 days before RFA.
- Dabigatran dose was skipped on the morning of the procedure.
- Dabigatran was resumed within 3 h after hemostasis.

| Baseline Characteristics | Dabigatran (Cases) (n = 145) | Warfarin (Controls) (n = 145) | p Value |
|---|---|---|---|
| Demographics | | | |
| Age, yrs | 60.4 ± 9.6 | 60.3 ± 9.6 | 0.97 |
| Age >75 yrs | 10 (7) | 6 (4) | 0.30 |
| Sex | | | 1.00 |
| Male | 114 (79) | 114 (79) | |
| Female | 31 (21) | 31 (21) | |
| Race | | | 0.53 |
| Caucasian | 131 (90) | 134 (92) | |
| Non-Caucasian | 14 (10) | 11 (8) | |
| Medical history | | | |
| AF type | | | |
| Paroxysmal | 83 (57) | 83 (57) | 1.00 |
| Nonparoxysmal | 62 (43) | 62 (43) | |
| Redo procedure | 26 (18) | 33 (23) | 0.31 |
| Duration of AF, months (mean) | 30 ± 32 | 28 ± 29 | 0.98 |
| Heart failure | 14 (10) | 9 (6) | 0.27 |
| Hypertension | 76 (52) | 72 (50) | 0.64 |
| Diabetes | 22 (15) | 19 (13) | 0.61 |
| TIA or stroke | 5 (3) | 9 (6) | 0.27 |
| Coronary artery disease | 24 (17) | 22 (15) | 0.74 |
| Sleep apnea | 33 (23) | 26 (18) | 0.31 |
| COPD | 3 (2) | 3 (2) | 1.00 |
| Chronic renal insufficiency | 1 (1) | 2 (2) | 0.59 |
| $CHADS_2$ score | | | |
| 0 | 50 (35) | 58 (40) | 0.54 |
| 1 | 62 (43) | 60 (41) | |
| ≥2 | 33 (23) | 27 (19) | |
| $CHA_2DS_2$-VASc score | 1.6 ± 1.4 | 1.5 ± 1.3 | 0.40 |
| HAS-BLED score | 1.2 ± 0.9 | 1.1 ± 0.9 | 0.37 |
| Mean left atrial size, cm | 4.5 ± 2.5 | 4.4 ± 0.8 | 0.44 |
| Mean LVEF, % | 56 ± 10 | 56 ± 10 | 0.89 |

**Table 3** Comparison of Complications Between Patients on Dabigatran and Warfarin

| Safety Endpoints | Dabigatran (n = 145) | Warfarin (n = 145) | Total (N = 290) | p Value |
|---|---|---|---|---|
| Major bleeding complications | 9 (6) | 1 (1) | 10 (3) | 0.019 |
| Periprocedural pericardial tamponade | 6 (4) | 1 (1) | 7 (2) | 0.12 |
| Late pericardial tamponade | 3 (2) | 0 (0) | 3 (1) | 0.25 |
| Minor bleeding complications | 12 (8) | 8 (6) | 20 (7) | 0.35 |
| Groin hematoma | 6 (4) | 5 (3) | 11 (4) | 0.76 |
| Pericardial effusion without tamponade | 6 (4) | 4 (3) | 10 (3) | 0.75 |
| Total bleeding complications | 20 (14) | 9 (6) | 29 (10) | 0.031 |
| Embolic complications (CVA/TIA) | 3 (2) | 0 (0) | 3 (1) | 0.25 |
| Composite of bleeding and embolic complications | 23 (16) | 9 (6) | 32 (11) | 0.009 |

# CONCLUSIONS

- In patients undergoing AF ablation, periprocedural dabigatran use significantly increases the risk of bleeding or thromboembolic complications compared with uninterrupted warfarin therapy.

## Dabigatran vs warfarin for radiofrequency catheter ablation of atrial fibrillation

Jin-Seok Kim, MD, Fei She, MD, Krit Jongnarangsin, MD, Aman Chugh, MD, Rakesh Latchamsetty, MD, Hamid Ghanbari, MD, Thomas Crawford, MD, Mohammed Sinno, MD, Thomas Carrigan, MD, Robert Kennedy, MD, Wouter Saint-Phard, MD, Miki Yokokawa, MD, Eric Good, DO, Frank Bogun, MD, Frank Pelosi Jr, MD, Fred Morady, MD, Hakan Oral, MD

- Dabigatran 150 mg po bid 4 weeks before RFA.
- On the day before the procedure (24–30 hours preprocedure)
  - Only the morning dose of dabigatran (150mg)
  - Skip the evening dose
- On the day of the procedure
  - Skip the morning dose
- Dabigatran was resumed 4 hours after vascular hemostasis was achieved following sheath removal.

**Table 1** Clinical characteristics of study subjects

| | Dabigatran (150 mg) N = 191 | Warfarin (INR 2–3) N = 572 | *P* |
|---|---|---|---|
| Age (y) | 61 ± 10 | 61 ± 10 | .96 |
| Sex: Female | 38 (20) | 146 (26) | .12 |
| Race: Caucasian | 184 (96) | 553 (97) | .82 |
| BMI (kg/m$^2$) | 31 ± 6 | 32 ± 6 | .33 |
| Nonparoxysmal AF | 89 (47) | 296 (52) | .22 |
| Previous RFA for AF | 83 (44) | 263 (46) | .7 |
| Previous surgical maze | 6 (3.1) | 16 (2.8) | .81 |
| Coronary artery disease | 26 (14) | 82 (14) | .88 |
| Heart failure | 17 (9) | 30 (5) | .08 |
| Hypertension | 109 (57) | 332 (58) | .81 |
| Diabetes mellitus | 22 (12) | 82 (14) | .33 |
| Previous TIA or stroke | 5 (3) | 48 (8) | .006 |
| $CHADS_2$ score | 1.0 ± 0.9 | 1.1 ± 1.0 | .53 |
| $CHA_2DS_2$-VASc score | | | |
| Mean | 1.6 ± 1.3 | 1.7 ± 1.3 | .8 |
| 0 | 43 (22) | 115 (20) | .48 |
| 1 | 51 (27) | 179 (31) | .23 |
| ≥2 | 97 (51) | 278 (49) | .6 |
| HAS-BLED score | 1.0 ± 0.9 | 1.1 ± 0.9 | .11 |
| LA size (mm) | 43 ± 7 | 44 ± 7 | .1 |
| LVEF (%) | 58 ± 9 | 57 ± 11 | .32 |
| INR | 1.1 ± 0.1 | 2.4 ± 0.3 | <.001 |
| Serum creatinine (mg/dL) | 0.9 ± 0.2 | 0.9 ± 0.3 | .64 |
| eGFR (mL/min/1.73 m$^2$) | 81 ± 17 | 84 ± 22 | .1 |
| Medications | | | |
| Aspirin | 64 (34) | 220 (39) | .3 |
| Clopidogrel | 4 (2) | 27 (5) | .14 |
| ACE inhibitor or ARB | 73 (38) | 232 (41) | .71 |
| Beta-blocker | 116 (61) | 394 (69) | .08 |
| Calcium-channel blocker | 54 (28) | 182 (32) | .45 |
| Amiodarone | 11 (6) | 41 (7) | .55 |
| Statins | 68 (36) | 305 (53) | <.001 |
| Antiacids or PPI | 75 (39) | 266 (47) | .13 |

**Table 2** Complications.

| Complications | Dabigatran (N = 191) | Warfarin (N = 572) | *P* |
|---|---|---|---|
| Hemorrhagic complications | 9 (4.7) | 31 (5.4) | .85 |
| Major bleeding complications | 4 (2.1) | 12 (2.1) | 1 |
| Cardiac tamponade | 2 (1) | 7 (1.2) | 1 |
| Vascular complications | 2 (1) | 5 (0.9) | 1 |
| Minor bleeding complications | 5 (2.6) | 19 (3.3) | .81 |
| Groin hematoma | 4 (2.1) | 19 (3.3) | .47 |
| Pericardial effusion without tamponade | 1 (0.5) | 0 | .25 |
| Thromboembolic complications | | | |
| Stroke or TIA | 0 | 0 | 1 |

## Dabigatran vs warfarin for radiofrequency catheter ablation of atrial fibrillation

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# CONCLUSIONS

- When held for approximately 24 hours before the procedure and resumed 4 hours after vascular hemostasis, dabigatran appears to be as safe and effective as uninterrupted warfarin for periprocedural anticoagulation in patients undergoing RFA of AF.

**Table 1** Comparison of Baseline Demographics, Clinical Parameters, and Medication Use Between Patients on Rivaroxaban and Warfarin

| Baseline Characteristic | Group: Rivaroxaban (N = 321) | Group: Warfarin (N = 321) | p Value |
|---|---|---|---|
| Mean age (yrs) | 63 ± 10 | 63 ± 10 | 0.98 |
| Mean body mass index (kg/m$^2$) | 30 ± 6 | 30 ± 6 | 0.162 |
| Male (%) | 221 (69) | 221 (69) | 1.00 |
| Caucasian (%) | 277 (86) | 292 (91) | 0.06 |
| Paroxysmal atrial fibrillation (%) | 164 (51) | 164 (51) | 1.00 |
| Duration of atrial fibrillation, months | 42 (20–81) | 48 (22–84) | 0.243 |
| Re-do procedure (%) | 88 (27) | 74 (23) | 0.203 |
| Heart failures (%) | 30 (7) | 23 (6) | 0.315 |
| Hypertension (%) | 177 (55) | 199 (62) | 0.078 |
| Age >75 yrs (%) | 41 (13) | 41 (13) | 1.00 |
| Diabetes (%) | 59 (18) | 64 (20) | 0.616 |
| Transient ischemic attacks or stroke (%) | 34 (11) | 26 (8) | 0.278 |
| Coronary artery disease (%) | 60 (19) | 67 (21) | 0.488 |
| Peripheral artery disease (%) | 17 (5) | 25 (8) | 0.202 |
| Sleep apnea (%) | 74 (23) | 79 (25) | 0.643 |
| Chronic obstructive pulmonary disease (%) | 24 (8) | 30 (9) | 0.414 |
| Chronic renal insufficiency (%) | 8 (3) | 9 (3) | 1.00 |
| Serum creatinine | 0.845 ± 0.25 | 0.874 ± 0.23 | 0.126 |
| $CHADS_2$ score | 1.16 ± 1.0 | 1.18 ± 1.0 | 0.876 |
| Median $CHADS_2$ score | 1 (0–2) | 1 (0–2) | 0.737 |
| $CHA_2DS_2VASc$ score | 2.17 ± 1.6 | 2.21 ± 1.5 | 0.781 |
| Median $CHA_2DS_2VASc$ score | 2 (1–3) | 2 (1–3) | 0.808 |
| HAS-BLED score | 1.47 ± 0.9 | 1.70 ± 1.0 | 0.032 |
| Left atrial size, cm | 4.4 ± 0.8 | 4.3 ± 0.8 | 0.114 |
| % of left ventricular ejection fraction | 58 ± 8 | 57 ± 8 | 0.184 |
| Aspirin (%) | 98 (31) | 84 (26) | 0.220 |
| Clopidogrel (%) | 22 (7) | 15 (5) | 0.236 |
| Beta blocker (%) | 186 (58) | 192 (60) | 0.630 |
| Calcium channel blocker (%) | 90 (27) | 74 (23) | 0.148 |

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Heart Rhythm Disorders

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**Table 2** Comparison of Procedural Variables Between Patients on Rivaroxaban and Warfarin

| Procedural Variables | Group: Rivaroxaban (N = 321) | Group: Warfarin (N = 321) | p Value |
|---|---|---|---|
| Sinus rhythm on arrival at the laboratory (%) | 209 (65) | 228 (71) | 0.110 |
| Ablation of CFAE/posterior wall | 116 (36) | 125 (39) | 0.463 |
| Additional linear lesions including right atrium (%) | 101 (31) | 118 (37) | 0.157 |
| Cardioversion during procedure (%) | 102 (32) | 90 (28) | 0.300 |
| Acute PV Isolation (%) | 317 (99) | 314 (99) | 1.00 |
| Procedural time, min | 195 ± 62 | 198 ± 66 | 0.550 |
| Fluoroscopy time, min | 49 ± 20 | 51 ± 30 | 0.320 |
| RF time, min | 56 ± 25 | 58 ± 29 | 0.349 |

**Table 3** Comparison of Complications between Rivaroxaban and Warfarin

| Complication | Rivaroxaban (N = 321) | Warfarin (N = 321) | Total (N = 642) | p Value |
|---|---|---|---|---|
| Major bleeding (%) | 5 (1.6) | 7 (2.2) | 12 (1.9) | 0.772 |
| Early cardiac tamponade (%) | 2 (0.6) | 4 (1.2) | 6 (0.9) | |
| Delayed cardiac tamponade (%) | 1 (0.3) | 0 (0) | 1 (0.2) | |
| ≥Moderate access site hematomas (%) | 2 (0.6) | 3 (0.9) | 5 (0.8) | |
| Minor bleeding complications (%) | 16 (5.0) | 19 (5.9) | 35 (5.5) | 0.602 |
| <Moderate access site hematoma (%) | 13 (4.0) | 18 (5.6) | 31 (4.8) | |
| Insignificant pericardial effusions (%) | 3 (0.9) | 1 (0.3) | 4 (0.6) | |
| All bleeding complications (%) | 21 (6.5) | 26 (8.1) | 47 (7.3) | 0.449 |
| Thromboembolic complications (stroke/TIA) (%) | 1 (0.3) | 1 (0.3) | 2 (0.3) | 1.00 |
| TIA (%) | 1 (0.3) | 1 (0.3) | 2 (0.3) | |
| Stroke | 0 | 0 | 0 | |
| Bleeding and thromboembolic complications (%) | 22 (6.8) | 27 (8.4) | 49 (7.6) | 0.457 |
| Other complications | 3 (0.9) | 2 (0.6) | 5 (0.8) | 1.00 |

**In our multicenter experience, uninterrupted rivaroxaban appears to be a feasible and safe alternative to uninterrupted warfarin therapy in patients undergoing AF ablation. Future larger and randomized trials are needed to confirm our findings.**

# NOACs

- **AF ablasyonu öncesinde/sonrasında coumadine iyi bir alternatif!**
  - Kanama riski ve emboli riski coumadine benzer
  - Daha kolay kullanım
    - Kısa yarım ömürleri nedeniyle ablasyondan sadece 1 gün önce kesilebilirler
    - Etkileri hızlı başladığı için ablasyondan hemen sonra başlanabilirler
  - En az 2-3 ay devam edilir. Bu süreden sonra tedavinin devamı için CHA2DS2-VASc skoruna göre karar verilmelidir

**Table 1** Approaches to Periprocedural Anticoagulation for Catheter Ablation of Paroxysmal AF

| Option | Day | | | | | | | | | | | Pros | Cons |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #1 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure | Full-dose L increases bleeding after procedure<br>Inconvenient/expensive for patient |
| | W* | | | | | W | W | W | W | W | W | | |
| | | | | | | H(L) | L | L | L | L | L | | |
| #2 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure<br>Reduces access site bleeding | Inconvenient/expensive for patient |
| | W* | | | | | W | W | W | W | W | W | | |
| | | | | | | H(L) | ½L | ½L | ½L | ½L | ½L | | |
| #3 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Avoids fluctuations in coags<br>Simple/convenient for patients<br>Safe at experienced centers | Could worsen outcome of any bleeding/tamponade<br>Deviates from standard surgical practices<br>Difficult to predict whether INR too high on day of procedure |
| | W | W | W | W | W | W | W | W | W | W | W | | |
| #4 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Avoids fluctuations<br>Simple/convenient for patients | Increases bleeding/complications (7) |
| | D | D | D | D | D | D† | D | D | D | D | D | | |
| #5 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure | Could increase post-procedure bleeding complications |
| | D* | D* | D* | | | H | D | D | D | D | D | | |
| #6 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure | May not provide enough post-procedure anticoagulation |
| | D* | D* | D* | | | H | ½D | ½D | ½D | D | D | | |
| #7 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Potential antidote available | |
| | R* | R* | R* | | | H | R | R | R | R | R | | |

*Prescribed only for patients with $CHADS_2$ score >0. †Hold morning dose before procedure. Give dose 3 h after hemostasis is achieved post-procedure.

AF = atrial fibrillation; Coags = coagulation parameters; D = dabigatran; H = unfractionated heparin; INR = international normalized ratio; L = low-molecular-weight heparin; R = rivaroxaban; W = warfarin.

**Table 2** Approaches to Periprocedural Anticoagulation for Catheter Ablation of Persistent AF

| Option | Day | | | | | | | | | | | Pros | Cons |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | | |
| #1 | W | | | | | W | W | W | W | W | W | Normalizes coags for procedure | Full-dose L increases bleeding after procedure<br>Inconvenient/expensive for patient |
| | | | L | L | L | H(L) | L | L | L | L | L | | |
| #2 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure<br>Reduces access site bleeding | Inconvenient/expensive for patient |
| | W | | | | | W | W | W | W | W | W | | |
| | | | L | L | L | H(L) | ½L | ½L | ½L | ½L | ½L | | |
| #3 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Avoids fluctuations in coags<br>Simple/convenient for patients<br>Evidence-based | Could worsen outcome of any bleeding/tamponade<br>Deviates from standard surgical practices<br>Difficult to predict whether INR too high on day of procedure |
| | W | W | W | W | W | W | W | W | W | W | W | | |
| #4 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Avoids fluctuations<br>Simple/convenient for patients | Increases bleeding/complications (7) |
| | D | D | D | D | D | D† | D | D | D | D | D | | |
| #5 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure | Could increase post-procedure bleeding complications |
| | D* | D* | D* | | | H | D | D | D | D | D | | |
| #6 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Normalizes coags for procedure | May not provide enough post-procedure anticoagulation |
| | D* | D* | D* | | | H | ½D | ½D | ½D | D | D | | |
| #7 | −5 | −4 | −3 | −2 | −1 | 0 | 1 | 2 | 3 | 4 | 5 | Potential antidote available | |
| | R | R | R | R | R | R | R | R | R | R | R | | |

*Prescribed only for patients with $CHADS_2$ score >0. †Hold morning dose before procedure. Give dose 3 h after hemostasis is achieved post-procedure.
Abbreviations as in Table 1.

# Antikoagülasyon – Ablasyon sonrası

- **LMWH**
  - Ablasyondan 3-4 saat sonra veya sheath ler çekildikten sonra başlanır ve INR ≥2 olana kadar devam edilir
- **Coumadine**
  - Aynı akşam veya ertesi sabah başlanır
  - En az 3 ay devam edilir (HRS/EHRA/ECAS: 2 ay )
  - Uzun dönem oral antikoagülasyon CHA2DS2-VASc skoruna göre yapılmalıdır

**Venice Chart International Consensus Document on Atrial Fibrillation Ablation: 2011 Update**

# The Risk of Thromboembolism and Need for Oral Anticoagulation After Successful Atrial Fibrillation Ablation

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**Objectives** The aim of this multicenter study was to evaluate the safety of discontinuing oral anticoagulation therapy (OAT) after apparently successful pulmonary vein isolation.

**Background** Atrial fibrillation (AF) is associated with an increased risk of thromboembolic events (TE) and often requires OAT. Pulmonary vein isolation is considered an effective treatment for AF.

**Methods** We studied 3,355 patients, of whom 2,692 (79% male, mean age 57 ± 11 years) discontinued OAT 3 to 6 months after ablation (Off-OAT group) and 663 (70% male, mean age 59 ± 11 years) remained on OAT after this period (On-OAT group). $CHADS_2$ (congestive heart failure, hypertension, age [75 years and older], diabetes mellitus, and a history of stroke or transient ischemic attack) risk scores of 1 and ≥2 were recorded in 723 (27%) and 347 (13%) Off-OAT group patients and in 261 (39%) and 247 (37%) On-OAT group patients, respectively.

**Results** During follow-up (mean 28 ± 13 months vs. 24 ± 15 months), 2 (0.07%) Off-OAT group patients and 3 (0.45%) On-OAT group patients had an ischemic stroke ($p = 0.06$). No other thromboembolic events occurred. No Off-OAT group patient with a $CHADS_2$ risk score of ≥2 had an ischemic stroke. A major hemorrhage was observed in 1 (0.04%) Off-OAT group patient and 13 (2%) On-OAT group patients ($p < 0.0001$).

**Conclusions** In this nonrandomized study, the risk–benefit ratio favored the suspension of OAT after successful AF ablation even in patients at moderate-high risk of TE. This conclusion needs to be confirmed by future large randomized trials. (J Am Coll Cardiol 2010;55:735–43) 

**Table 4** Incidence of Thromboembolic Events and Major Hemorrhage According to $CHADS_2$ Score in Off- and On-OAT Groups

| | $CHADS_2 = 0$ | | $CHADS_2 = 1$ | | $CHADS_2 \geq 2$ | |
|---|---|---|---|---|---|---|
| | Off-OAT | On-OAT | Off-OAT | On-OAT | Off-OAT | On-OAT |
| Patients, n | 1,622 | 155 | 723 | 261 | 347 | 247 |
| TE, n (%) | 1 (0.06) | 0 | 1 (0.14) | 1 (0.38) | 0 | 2 (0.81) |
| Major hemorrhage, n (%) | 0 | 1 (0.64) | 1 (0.14) | 2 (0.8) | 0 | 10 (4) |

OAT = oral anticoagulation; TE = thromboembolic events.

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QUARTERLY FOCUS ISSUE: HEART RHYTHM DISORDERS

Editorial Comment

# Do Not Stop the Warfarin Until . . .*

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In short, although this is clearly the largest follow-up of post-atrial fibrillation ablation patients and late stroke, it is really only hypothesis generating. These data cry out for a prospective, randomized clinical trial that includes standardized methods of follow-up to assess and characterize recurrence of atrial fibrillation and to determine the incidence/prevalence of stroke.

Therefore, our conclusion: do not stop the warfarin until we have prospective, randomized clinical trials that can help guide us in providing anticoagulation therapy for our patients.