CHADS score: interactive case presentation

(CHA$_2$DS$_2$-VASC)

T. Szili-Torok, MD, PhD
"Classically, the formal oral presentation is given in 7 minutes or less. Although it follows the same format as a written report, it is not simply regurgitation. A great presentation requires style as much as substance; your delivery must be succinct and smooth. No time should be wasted on superfluous information; one can read about such matters later in your admit note. Ideally, your presentation should be formulated so that your audience can anticipate your assessment and plan; that is, each piece of information should clue the listener into your thinking process and your most likely diagnosis."
How often do you deal in your medical practice with patients with atrial fibrillation and an implanted cardiac rhythm device (pacemaker or ICD)?

1, almost never

2, sporadically (few times a year)

3, regularly (on a monthly basis)

4, frequently although it is not my subspeciality

5, I am an cardiac electrophysiologist
Case presentation - Past Medical History

Mr. B. - 76-year-old man, with atrial fibrillation and an ICD

Appendectomy (time: unknown)
Hypertension
History of significant alcohol intake

-1999  Palpitations
2001  Stroke
2002 sept  Acute MI (inferior) - EF 23%
2002 oct  Recurrent chest pain - coronary angiogram
2002 nov  Acute cardiac failure - paroxysmal atrial fibrillation
2003 sept  Syncope - considered as orthostatic reaction
2003 oct  Ventricular tachycardia
Echocardiogram
What would be the core elements of your strategic treatment plan?
1, Optimization of medical therapy
2, Cardiac resynchronization
3, Implantable cardiac defibrillator
4, All of the above mentioned treatment modalities
Past Medical History

2005-2006  Optimization of medical therapy
2006 may  BiV ICD impl.
2006 jul   Right ventricular electrode dislocation
            re-operation, pocket hematoma
2006 aug   Pocket and lead revision due to major
            pocket bleeding, pneumothorax
Follow up - 2008

ECG

Echocardiogramm
Case presentation- Current Medical History

- No any symptoms (he feels great as compared to recent years, he is in NYHA functional class I)
- He carries a BiV- ICD and arrives for a regular technical checkup for the outpatient clinic, 2012 February
- This time only technical control is scheduled
- The ICD-PM technician reveals that the device is in ERI mode - elective replacement indication
Which perioperative anticoagulation strategy would you use

1, Stop anticoagulation because of previous major bleeding

2, Unfractionated heparine bridging: provides flexibility for fast interruption - increases safety - decreases bleeding

3, LMWH bridging: provides possibility of 1 day hospital stay - proven to be safe

4, Continue oral anticoagulation and adjust INR < 2

5, Continue anticoagulation and keep INR above 2
On his long journey from Troy, Ulysses had to navigate the Strait of Messina. On the Italian side was the rock monster Scylla, on the Sicilian side was the whirlpool Charybdis. To navigate between these obstacles in this perilous passage, it was essential that Ulysses would steer a steady course, lest he, his ship, and all his sailors either be sucked to a watery grave by coming too close to the whirlpool Charybdis or be devoured by the monster Scylla.

James Gillray 1793

Henry Fuseli, 1794/6
Scylla and Charybdis

- 106 PubMed hits

Thromboembolic events  Bleeding

Efficacy  Safety

Ablation for atrial fibrillation  Device implantation
**CHA$_2$DS$_2$-VASc Score for Atrial Fibrillation Stroke Risk**

Calculates stroke risk for patients with atrial fibrillation

- **Age?**
  - < 65 years old +0
  - 65-74 years old +1
  - ≥ 75 years old +2

- **Congestive Heart Failure History?**
  - Yes +1

- **Hypertension History?**
  - Yes +1

- **Stroke/TIA/Thromboembolism History?**
  - Yes +2

- **Vascular Disease History? (previous MI, peripheral arterial disease or aortic plaque)**
  - Yes +1

- **Diabetes Mellitus?**
  - Yes +1

- **Female?**
  - Yes +1

**Score**
## HAS-BLED Score for Major Bleeding Risk

Estimates risk of major bleeding for patients on anticoagulation to help determine risk-benefit in atrial fibrillation care.

<table>
<thead>
<tr>
<th>Factor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension History? (uncontrolled, &gt;160 mmHg systolic)</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Renal Disease? (Dialysis, transplant, Cr &gt;2.6 mg/dL or &gt;200 µmol/L)</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Liver Disease? (Cirrhosis, Bilirubin &gt;2x Normal, AST/ALT/AP &gt;3x Normal)</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Stroke History?</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Prior Major Bleeding or Predisposition to Bleeding?</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Labile INR? (Unstable/high INRs, Age ≥65?)</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Medication Usage Predisposing to Bleeding? (Antiplatelet agents, NSAIDs)</td>
<td>Yes+1</td>
</tr>
<tr>
<td>Alcohol Usage History?</td>
<td>Yes+1</td>
</tr>
</tbody>
</table>
Please calculate the $\text{CHA}_2\text{DS}_2\text{VASC}$ score of this patient in order to assess his stroke risk.
Case presentation- Past Medical History

Appendectomy (time: unknown)

Hypertension

History of significant alcohol intake

-1999 Palpitations

2001 Stroke

2002 sept Acute MI (inferior) - EF 23%

2002 oct Recurrent chest pain- coronary angiogram

2002 nov Acute cardiac failure- paroxysmal atrial fibrillation

2003 sept Syncope - considered as orthostatic reaction

2003 oct Ventricular tachycardia
What is the $\text{CHA}_2\text{DS}_2\text{VASC}$ score of this patient?

1, 1
2, 3
3, 5
4, 7
5, 9
Please calculate the HAS-BLAD score of this patient in order to assess his bleeding risk.
Case presentation- Past Medical History

Appendectomy (time: unknown)

Hypertension

History of significant alcohol intake

-1999  Palpitations

2001  Stroke

2002 sept  Acute MI (inferior) - EF 23%

2002 oct  Recurrent chest pain- coronary angiogram

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Past Medical History

2005-2006  Optimization of medical therapy
2006 may  BiV ICD impl.
2006 jul  Right ventricular electrode dislocation
            re-operation, pocket hematoma
2006 aug  Pocket and lead revision, pneumothorax
What is the HAS-BLAD score of this patient?

1, 0
2, 2
3, 4
4, 6
5, 8
Physical and Laboratory examination at admission

Severe obesity (BMI: 33.38)
NYHA I functional class
Heart-Lung-Abdomen: no abnormalities
Labs: No any abnormality- INR: 1.2
Treatment plan:
Elective BiV ICD device change
Day admission
Based on his CHA$_2$DS$_2$-VASC score: **LMWH** bridging therapy
Antithrombotics (aspirine) continuation
Early restart of oral anticoagulation

Box change: no complication, no significant bleeding was observed although the medical report says: multiple sources of pin-point bleedings

Readmission in 5 days due to painful hematoma
1 day later- bleeding continues: INR 3.6, heparine still on board
Patient develops fever 38.9 degrees
What would you do in the current situation?

1. Conservative treatment - Long course antibiotics

2. Full system removal

3. Pocket revision
ECG- post-re-implantation of CRT
Was it a medical DEFECT or was it an unavoidable complication?

1. Defect
2. Unavoidable complication

(your judgement of us....)
Annually around 300,000 pts receive ICD/PM/CRT (US+ Eur)

Approximately 45% is having OAC and/or antiplatelet therapy

What is the risk for perioperative thromboembolism?
What is the risk of postoperative bleeding?

What is the best perioperative strategy?
### Table 1. Risk stratification for perioperative arterial or venous thromboembolism according to the American College of Chest Physicians, Eighth Edition.

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Prosthetic heart valve</th>
<th>Atrial fibrillation</th>
<th>Venous thromboembolism</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Prosthetic mitral valve, Starr–Edwards, Bjork Shiley AVR, stroke or TIA within 6 months</td>
<td>CHADS(_2) score: 5 or 6, recent stroke or TIA within 3 months, mitral stenosis</td>
<td>Recent event within 3 months, thrombophilia deemed high risk (e.g., APLA)</td>
</tr>
<tr>
<td>Moderate</td>
<td>St Jude bileaflet AVR and AF, prior stroke, or TIA or CHADS(_2) ≥1</td>
<td>CHADS(_2) score of 3 or 4</td>
<td>Recent event 3–12 months, low-risk thrombophilia (e.g., factor V Leiden), recurrent VTE active malignancy</td>
</tr>
<tr>
<td>Low</td>
<td>St Jude bileaflet AVR alone</td>
<td>CHADS(_2) score 0–2</td>
<td>Single episode of VTE &gt;12 months prior</td>
</tr>
</tbody>
</table>

*LMWH or UHF bridging*

*Ramirez et al., Exp Rev, 2011*
What is the risk for perioperative thromboembolism?
Risk of thromboembolism with short-term interruption of warfarin therapy

- Prospective observational cohort study
- 101 sites in the US
- Enrollment between 2000 and 2002
- 1293 episodes of warfarin therapy interruption
- Outcome: thromboembolic event or clinically significant bleeding within 30 days

Garcia et al, Arch Intern Med, 2008
Duration and frequency of interruption of warfarin therapy

Garcia et al, Arch Intern Med, 2008
Risk of thromboembolism with short-term interruption of warfarin therapy

Garcia et al, Arch Intern Med, 2008
What is the risk for post-operative bleeding complications?
Evaluation of pocket hematoma after PM/ICD impl

Enrollment between 1990-2002 (retrospective)
Predictors were determined prospectively
3164 Implantations
Operator experience was evaluated too (graded as <50, between 50 and 100 and >100)

Wiegand et al, Chest 2004
Pocket hematoma after PM and ICD surgery

Patient characteristics
- age > 74 years
- female gender
- coronary artery disease
- reduced LV function
- artificial aortic or mitral valve
- (history of) atrial fibrillation

Anticoagulation
- aspirin only
- ticlopidine / clopidogrel only
- combination of both
- phenprocoumon
- high-dose heparin

Implantation
- generator or lead revision
- submuscular pocket
- puncture of subclavian vein

Implanter experience
- low (n < 50)
- medium (n = 50–100)
- high (n > 100)

Wiegand et al, Chest 2004
Pocket hematoma prompting re-operation

Patient characteristics
- age > 74 years
- female gender
- coronary artery disease
- reduced LV function
- artificial aortic or mitral valve
  (history of) atrial fibrillation

Anticoagulation
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Implanter experience
- low (n < 50)
- medium (n = 50-100)
- high (n > 100)

adjusted hazard ratio for pocket hematoma prompting reoperation

Wiegand et al, Chest 2004
Postoperative use of heparine increases morbidity of device implantation

Retrospective
Case controlled
38 patients with MV and 76 Afib
114 age and sex matched controls

Marquie et al, Europace 2006
Postoperative use of heparine increases morbidity of device implantation

* Marquie et al, Europace 2006
Postoperative use of re-initiation of heparine after device implantation

49 pts
Randomized
3 arms study:
6 hours
24 hours
no OAC

Michaud et al, JACC 2000
Bleeding risk and antiplatelet therapy?
Dual antiplatelet and heparine increases bleeding risk

Primary endpoint: significant bleeding defined as need for pocket exploration and/or blood transfusion

Tompkins, JACC, 2010
Dual antiplatelet and heparine increases bleeding risk

Primary endpoint: significant bleeding defined as need for pocket exploration and/or blood transfusion

Tompkins, JACC, 2010
Dual antiplatelet and heparine increases bleeding risk

**Primary endpoint:** significant bleeding defined as need for pocket exploration and/or blood transfusion

_Tompkins, JACC, 2010_
Dual antiplatelet and heparine increases bleeding risk

Primary endpoint: significant bleeding defined as need for pocket exploration and/or blood transfusion

Tompkins, JACC, 2010
Controversial results with DA therapy

<table>
<thead>
<tr>
<th>Complications</th>
<th>Control [n (%)]</th>
<th>DA-Therapy [n (%)]</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hematoma</td>
<td>3 (0.9)</td>
<td>1 (0.9)</td>
<td>0.581</td>
</tr>
<tr>
<td>Pneumothorax</td>
<td>2 (0.6)</td>
<td>0</td>
<td>0.986</td>
</tr>
<tr>
<td>Hemothorax</td>
<td>0</td>
<td>0</td>
<td>–</td>
</tr>
<tr>
<td>Lead perforation</td>
<td>2 (0.6)</td>
<td>0</td>
<td>0.986</td>
</tr>
<tr>
<td>Lead dislodgement</td>
<td>1 (0.3)</td>
<td>1 (0.9)</td>
<td>0.986</td>
</tr>
<tr>
<td>Infection</td>
<td>2 (0.6)</td>
<td>0</td>
<td>0.986</td>
</tr>
</tbody>
</table>

109 patients

Dreger et al, PACE, 2010
Specific CRT results
Does CRT differ from other device implantations

There is no fundamentally important difference
CRT and therapeutic INR
Differences in major pocket hematoma and hospital stay

Ghanabri et al, PACE 2010
What is the best perioperative anticoagulation strategy?
Risk stratification before device implantation

- Risk of arterial or venous thrombosis
  - Intermediate to high risk: Proceed on coumadin INR: 2–3 or DAT
  - Low risk: Discontinue coumadin or clopidogrel 5 days prior, continue ASA
    - Restart clopidogrel, coumadin postoperative day 0
    - No heparin products postoperation

Ramirez et al., Exp Rev, 2011
Peri-operative anticoagulation and device implantation

Incidence of complications

Risk factors for complications

Cheng et al, Europace 2009
### Trombo-embolische complicatie risico

<table>
<thead>
<tr>
<th>LAAG</th>
<th>HOOG</th>
</tr>
</thead>
</table>
| - AF met CHADS₂ score ≤2 of CHA₂DS₂-VASc score ≤2  
- Mechanische Aortaklep*  
St Jude Medical Bileaflet ≥ 3 mnd na OK  
- CMP: LVEF < 30 %  
- LV aneurysma met LVEF > 30%  
- Veneuze trombo-embolie ≥ 6 mnd  
- Hypertensie  
- Diabetes Mellitus  
- Leeftijd 65-74 jaar | - AF met CHADS₂ score ≥2 of CHA₂DS₂-VASc score ≥2  
- Alle mechanische kleppen, behalve mechanische Aortaklep* (St Jude Medical, Bileaflet ≥ 3 mnd na OK)  
- Bio-klepprothese met AF of slechte LV functie  
- Intracardiale trombus in situ (of in VG) met slechte LV functie  
- Veneuze trombo-embolie recidiverend / recent < 3 mnd  
- Longembolie < 12 mnd  
- CVA/TIA in voorgeschiedenis  
- Ernstige trombofilie of stollingsziekten  
- Leeftijd ≥ 75 jaar |

### Bloedings risico

- Geen van de onderstaande risicofactoren

| LAAG | VERHOOD | B
|------|---------|---|
| A | Gebruik Acetylsalicyl, Carbasalaat, Clopidogrel, Prasugrel, Dipyridamol, Acenocoumarol, Fenprocoumon  
- Nierinsufficiëntie, eGFR < 60 ml/min  
- Leverinsufficiëntie  
- Trombocyten < 50 of bekende bloedingsneiging  
- Recente ICD/PM implantatie  
- (Pocket) bloeding in VG  
- Planning lead extractie, bijplaatsen lead, complexe wissel, pocket revisie  
- HASBLED ≥ 3 | C | D
**Protocol A:**

*Trombo-embolic complication risk*  
*LOW*

*Bleeding risk*  
*LOW*

· *Stop OAC, no heparine bridging*

<table>
<thead>
<tr>
<th>dag -5</th>
<th>stop fenprocoumon</th>
</tr>
</thead>
<tbody>
<tr>
<td>dag -3</td>
<td>stop acenocoumarol</td>
</tr>
<tr>
<td>dag -1/0</td>
<td>opname, INR &lt; 2.0, interventie</td>
</tr>
<tr>
<td>dag + 1</td>
<td>geen OAC</td>
</tr>
<tr>
<td>dag +2</td>
<td>geen OAC</td>
</tr>
<tr>
<td>dag +3</td>
<td>herstart OAC met normale dosering, geen oplaaddosis</td>
</tr>
</tbody>
</table>
**Erasmus MC protocol**

**Protocol D:**
Trombo-embolic complicatiion risk  **HIGH**  
Bleeding risk  **HIGH**  
OAC continuation

**SENIOR Electrophysiologist with an experience more than 100 implantations**

<table>
<thead>
<tr>
<th>dag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>dag-5/-3</td>
<td>fenprocoumon of acenocoumarol niet onderbreken, dosering halveren</td>
</tr>
<tr>
<td>dag -2</td>
<td>controle INR</td>
</tr>
<tr>
<td>dag-1/0</td>
<td>opname, streefwaarde INR ≤ 2.3</td>
</tr>
<tr>
<td>dag 0</td>
<td>controle INR &lt;2.3 = Implantatie, OAC continueren</td>
</tr>
<tr>
<td>dag + 1</td>
<td>OAC continueren normale dosering met normale dosering, geen oplaaddosis</td>
</tr>
<tr>
<td>dag +++</td>
<td>controle INR</td>
</tr>
</tbody>
</table>
Conclusions

1. Complex decision - fine-tuned clinical protocol is necessary
2. Experienced operator is mandatory
3. No evidence yet is available for new anticoagulation agents
4. OAC (warfarin or coumadin continuation seems to be the best strategy)
5. Small mistake can change the fortune of the patient