Sport activity in patients with an ICD

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EuroPRevent 2011
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Potential related conflicts of interest

Unconditional Research Grants via the University of Leuven from Medtronic, Biotronik, St. Jude Medical, and Boston Scientific

Coordinating Clinical Investigator Biotronik-sponsored EuroEco trial

EuroPRevent 2011
Geneva, 14 April 2011
Can all participate?

Lady X

She too?
Recommendations

Leaves room for individualized assessment and informed choice!
Current recommendations

Summary

• Sports allowed with ICD: \(^1-^5\)
  – *competitive* sports with *low* dynamic or static cardiovascular demand
    • golf, billiard, bowling, …
  – *leisure-time* sports with *low to moderate* cardiovascular demand

• Underlying heart disease or channelopathy
  – specific restrictions: cf. ESC and AHA recommendations\(^1-^5\)

• “ICD is no substitute for disease-specific recommendations”
  – I.e.: an ICD is no means to allow reentry into the arena

The real world

• 55% of (614 American) electrophysiologists allow competitive sports participation¹
  – their recommendation being based on the underlying cardiovascular disease rather than the presence of ICD

General Consideration  /1A
Preventing lead or ICD damage

A. No sports with bodily impact
   - lead fracture\(^1,3\)
   - device malfunction\(^2,4\)
   - skin perforation
     • sometimes late\(^5\)

• Padding appropriate?
  soccer, basketball, baseball,…

B. Avoid extreme ipsilateral arm movements
   – first \textbf{6w} after implant: in all
   – later: volleyball, basketball, tennis, climbing, ... golf, ...
General Consideration /2

Preventing danger due to loss of consciousness

• Due to arrhythmia and/or ICD intervention

• For patient and others
  – swimming, diving, motorsports, climbing, …

• Serious injuries are rare but do occur¹
  – HRS questionnaire
  – 40% report patients with sport-related shocks
  – ≤8% lead or system damage, minor injury
  – ≤1% report serious injury

1. Lampert et al, J Cardiovasc Electrophysiol 2006
Effectiveness of ICD during peak exercise = ?

- Blind belief in ICD is unfounded:
  - very effective but not foolproof
    - in general
    - unproven reliability during intense exercise
  - probably sub-optimal
    - given the metabolic, autonomic and potentially ischemic changes during exercise, hydration status, vasodilation, …
      i.e. more than only catecholamines!
- 9 cases of witnessed SD in athletes
  - only 1 survived despite prompt CPR and AED (X = 3.1 min)

1. Drezner & Rogers, Heart Rhythm 2006
Exercise increases risk for arrhythmias

- Athletes have higher sudden death risk
  - Relative risk 2.8, p<0.001, similar among different types of sports

1. Corrado et al, JACC 2003
ICD increases assurance for non-competitive physical activities

- Contributing to physical and psychological well-being
  - ICD patients benefit physically from cardiac rehabilitation ($\text{VO}_2^{\text{max}}$)
  - Anxiety (for physical activity) is prevalent in ICD recipients$^{2,3}$

- Leisure-time recreational activities allowed$^4$ from
  - 6 w after implant
  - 6 w after appropriate intervention

Inappropriate Shocks

- ≥10%/year (16-44%) \(^1\text{-}^5\)

**Causes**

- Mainly due to supraventricular arrhythmias

- Extrinsic events
  - diaphragmatic, set screw, lead defect, electromagnetic interference

- Intrinsic events (without real tachyarrhythmia) \(^6\text{-}^{10}\)
  - mainly T-wave oversensing

Inappropriate shocks (and shocks in general)

- painful
- psychological problems: from anxiety to aversion!
- potentially life-threatening (by triggering malignant arrhythmias)

1. Heidbuchel, Cardiol Clin 2007

shock on T-wave (35J > ULV/DFT)  ⇒  sustained VT
Prevent inappropriate shocks!!

• Anticipate
  – maximal sinus rate? (exercise test, Holter, EP study)
  – atrial arrhythmias? (underlying heart disease)

• Bradycardic agents!
  – beta-blockers to prevent sinus tachycardia (explain why)
  – often beta-blockers and/or verapamil and/or digitalis for AT/AF

• Sometimes preventive ablation
  – e.g. atrial flutter

• (Some) restriction in exercise level
Dual Chamber ICD?

- No significant difference in inappropriate ICD therapy DDD vs. VVI\(^1-2,4\)

- Increased risk for short-term and long-term lead complications\(^3\)
  - especially in young athletes

- Therefore
  - conservative stance: weigh benefit / risks in every patient
    i.e. prefer VVI-ICD whenever possible

1. Deisenhofer et al, J Cardiovasc Electrophysiol 2001
2. Sinha et al, J Cardiovasc Electrophysiol 2004
3. Connolly et al, NEJM 2000
Data on ICD in athletes are needed

Safety of Sports for Patients with ICD: A Multicenter, Investigator-initiated, Registry

– **US initiated** (Jan 2008)
  – Rachel Lampert, MD, Yale University
  – David Cannom, MD, Los Angeles Cardiology Associates
  – Brian Olshansky, MD, University of Iowa
  – Christine Lawless, MD, University of Ohio
  – Elizabeth Saarel, MD, University of Utah

– **European extension** (Jul 2008)
  • European Coordinator:
    – Hein Heidbuchel, MD PhD, University of Leuven
  • Endorsed by:
    – EACPR Section on Sports Cardiology
    – EHRA Scientific Initiative Committee
Registry on ICD in Sports
Research Plan

• Study Population
  – 400 ICD patients, 10-60y, at any time after ICD implantation
  – who, with or without the approval of their primary physicians, have made the decision to participate
    1. in activities more vigorous than bowling or walking (ie, > IA) at any level of competition, or
    2. potentially dangerous sports (skiing, mountaineering, rock climbing, …)
    3. in intense recreational sports, “autocompetitive” (>Ia) (EU extension)

• Centralised 6-monthly follow-up for 4 years
  – Yale University
  – University of Leuven
  – regional investigators
Registry on ICD in Sports
Hypothesis and Aims

• Primary Hypothesis:
  – The incidence of serious adverse events occurring during sports will be <1% over 4 years:
    1) tachyarrhythmic death (due to failure to convert VT/VF or post-shock pulseless electrical activity, PEA) or externally resuscitated arrest, or
    2) significant injury due to syncopal arrhythmia or shock.

• Exploratory Aims:
  – Determine the incidence of minor adverse events during sports:
    • multiple shocks, minor injuries, damage to lead/system
  – Determine whether risk is greater during sports vs. other situations
  – Determine whether risk is greater in specific populations:
    • competitive vs. recreational
    • underlying cardiovascular disorder
Registry on ICD in Sports
Enrollment as of 15 March 2011

- total "competitive": n = 368 (US 321; Europe 47)
- total "recreational": n = 106 (Europe)

- Belgium 35
- France 12
- Germany 5
- Israel 3
- Norway 6
- Poland 1
- Spain 17
- Switzerland 2
- The Netherlands 71
- UK 1

- 28% ≤20y; 36% women; EF 60%
Recruiting (15)
Leuven, BE (Heidbuchel)
Antwerp, BE (Huybrechts)
Aalst, BE (Geelen)
Arlon, BE (Mairesse)
Madrid, ES (Lozano)
Barcelona, ES (Mont)
Toulouse, FR (Boveda)
Rennes, FR (Carré)
Leipzig, GE (Wetzel)
Rotterdam, NL (Jordaens)
Oslo, NO (Anfinsen)
Lotz, PL (Chudzik)
Southampton, UK (Morgan)
Tel Aviv, Israel (Viskin)
Bern, CH (Wilhelm)

Screening (4)
Prague, CZ (Kautzner)
München, DE (Hoffman)
Zürich, CH (Duru)
Nijmegen, NL (Smeets)

In preparation (3)
Copenhagen, DK (Rasmussen)
Saint-Denis, FR (Piot)
Stockholm, SE (Rosenqvist)

If you want to join: hein.heidbuchel@uzleuven.be or other country investigator!!
Ethical & philosophical considerations

• “Informed decision by athletes”
  – what is the personal freedom for choice by athlete / advising physician?
  – has society the moral right (or duty) to protect individuals?

• Science as a tool to defy nature?
  – Just relying on our technology to protect…?
  – Athletes, or gladiators …?

Pieter Bruegel the Elder, c.1558
Conclusions
Defibrillators in Athletes

• A solution for safe continuation
  – of mild / moderate sports activity
  – even competitive in some (if low cardiovascular demand)

And she?
Interested in Sports Cardiology?

You are cordially invited to attend the Section meeting of the ESC/EACPR Section on Sports Cardiology:

Friday 15 April 2011, 12:30 – 14:00 PM, 
Room 14, 2nd floor

Or become an EACPR member (free) and denote your interest in Sports Cardiology.

Or visit our Web site: 
www.sportscardiology.eu
Thank you!