

## DVT prophylaxis in Total Joint Replacement



### Learning objectives

- Clotting and bleeding risk
- Overall statistics
- Endpoints used in DVT studies
- AAOS vs. CHEST guidelines
- Uncontroversial measures of prophylaxis
- Use of risk profiling

## What is the Magnitude of the Problem?

- Baseline rate of DVT in THR
  - DVT: 40 TO 60%
  - Asymptomatic PE: 10 TO 15%
  - Fatal PE: 1-3%

## Virkow's triad 1856

- Hypercoagulability
- Venous stasis
- Endothelial injury

## Uncontroversial Measures

- Epidural/spinal anesthesia
- Intermittant pneumatic compression
- Rapid return to ambulation/ weight bearing
- Short operating time

## Epidural Anesthesia

- Stimulates Fibrinolytic system
- Sympathectomy increases venous flow
- Mild hypotension reduces blood loss
- 40 to 50% reduction in overall DVT rate compared to general anesthesia

Lieberman, JBJS 1994

## Intermittent Pneumatic Compression

- Increases venous flow
- May stimulate fibrinolysis
- Very safe
- Compliance is an issue

Warwick, JBJS 1996  
Hooker, JBJS 1999  
Woolson, JBJS 1996

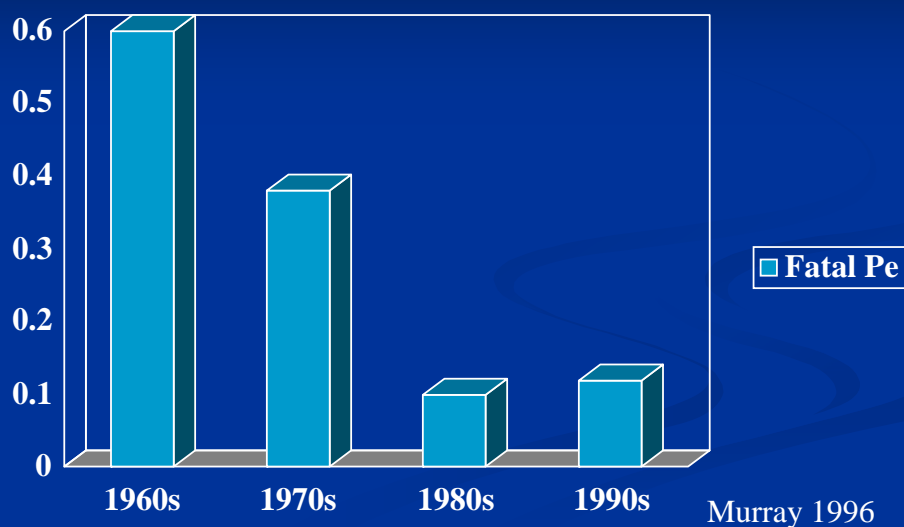
## Chemoprophylaxis

- When to initiate therapy
- How to balance efficacy vs. bleeding complications
- How long to maintain therapy
- Which patients (if any) to use chemoprophylaxis in

# Clots Form On the Table!

Sculco et al: 86% in 24 hours  
Sharrock et al: insertion of femoral component

## Real Rate of Fatal PE



## Real DVT/ PE risk in THR

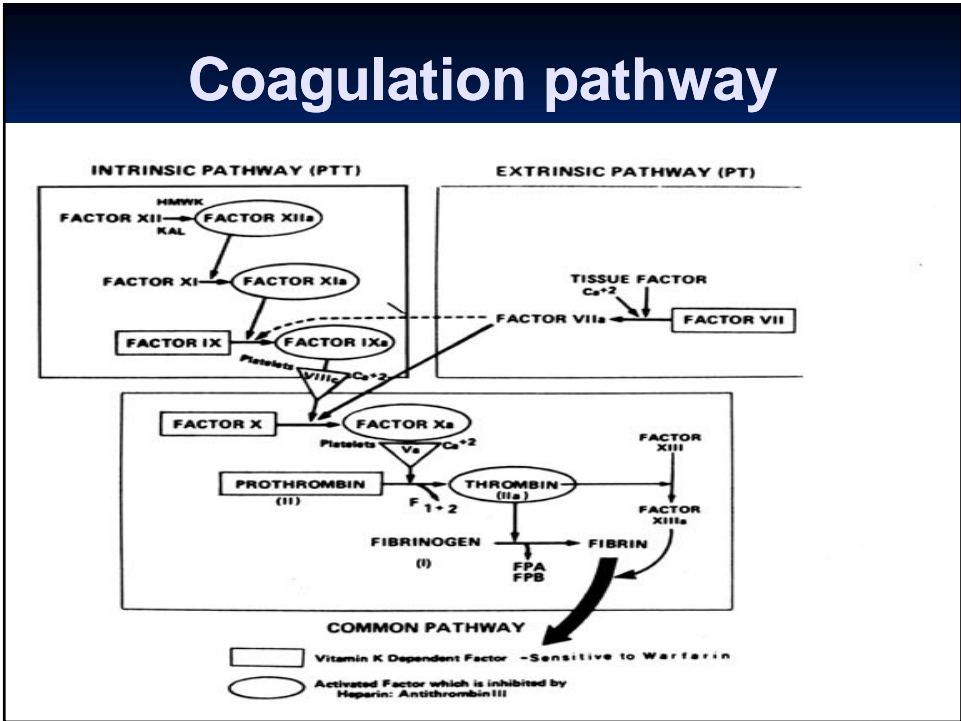
- Death from fatal PE: 0.1%
- Overall death rate 0.3 to 0.4 %
- Estimated max potential treatment improvement 0.05%

## Discussion of endpoints

- Endpoints to prevent
  - Post phlebitic syndrome
  - Symptomatic DVT
  - PE
  - DEATH
- Endpoints we study
  - Asymptomatic DVT (proximal and distal)
- THESE ARE NOT THE SAME

# Assumptions of DVT studies

- Distal DVT- Proximal DVT- PE- death
- Proximal DVT- post phlebitic syndrome



## Warfarin

- Pros
  - Oral
  - Inexpensive
  - Effective compared to placebo in reducing DVT
  - Low operative site bleeding
- Cons:
  - Requires monitoring
  - Occasional severe systemic bleeding complications.

## Warfarin

- Affects Vit K dependent factors : II, VII, IX, and X
- Prevents gamma carboxylation (activation) of factor X and Prothrombin (factor II)

Warfarin is commonly used to prevent deep venous thrombosis after total hip arthroplasty. What is its mechanism of action?

- 1-Forms complexes with antithrombin III
- 2-Inactivates active thrombin and active factor Xa
- 3-Prevents conversion of fibrinogen to fibrin
- 4-Prevents gamma carboxylation in factor X and prothrombin
- 5-Prevents thromboxane A2 formation, interfering with platelet aggregation

Preferred Response: 4

## Aspirin

- Pros:
  - Excellent protection against arterial thrombosis
  - No monitoring
  - Good safety profile
- Cons:
  - Little evidence of efficacy in reduction of DVT

## Low Molecular Weight Heparin

- Enoxaparin (Lovenox)
- Deltaparin (Fragmin)
- Pentasaccharide (Arixtra)

## Advantages

- Less protein binding
- Less platelet inhibition
- Longer half life
- More direct factor Xa inhibition

## LMWH vs. Coumadin

DVT	6-21%	15-26%
Prox DVT	2-5%	2-5%
Bleeding	4-12%	2-4%

Fitzgerald, JBJS 2001  
Hull 2000  
Colwell, JBJS 1994

## LMWH vs. Coumadin

- No difference in symptomatic DVT, PE, or Death
- Clinically significant bleeding rate 2x to 4x coumadin

Which of the following postoperative modalities to prevent deep venous thrombosis is

associated with the highest risk of hematoma?

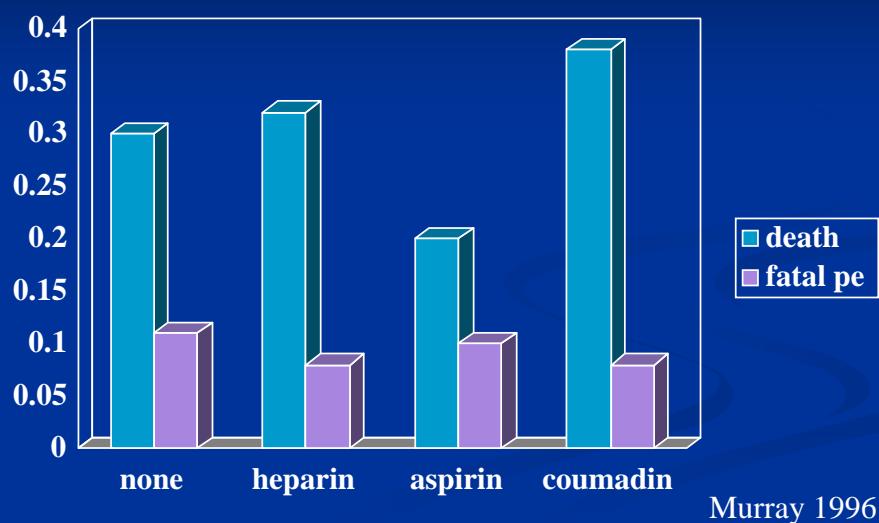
- 1-Aspirin
- 2-Dipyridamole
- 3-Compression device
- 4-Clopidogrel bisulfate
- 5-Low-molecular-weight heparin

Preferred Response: 5

## LMWH and Epidural

- 43 Patients with acute epidural hematoma
  - 28 patients acutely decompressed
  - 16 patients permanently paralyzed
- Must wait at least 12 hours after and 2 hours before dosing to instrument the neuraxis

## Does Chemoprophylaxis reduce morbidity/mortality?



## Post Phlebotic Syndrome after proximal DVT

- 35 to 70% at 3 years post op
- 50 to 100% at 10 years post op
- Up to 8% of patients will develop skin ulceration

## Additional risk factors for DVT

- Cancer
- History of DVT/ PE
- Oral contraceptives
- Smoking
- Venous insufficiency
- Etc

## Stratification of risk

- Low risk
  - ICD +Aspirin
- Moderate risk
  - LMWH +ICD
- High Risk
  - LMWH or Coumadin
  - Consider filter

## CHEST vs. AAOS guidelines

- CHEST considered only high quality studies. Looked primarily at EFFICACY
  - Preferred double blind, randomized trials with venographic endpoint
- AAOS considered lower quality studies. Weighted SAFETY and EFFICACY

## CHEST Guidelines 2004/7

- THR
  - LMWH, or Coumadin (Adjusted dose)
  - NO aspirin alone, or mechanical alone
- TKR
  - LMWH, or Coumadin (Adjusted dose)
  - Intermittant compression as alternative (1b)
  - NO aspirin alone
- Duration at least 10 days, recommend 28 to 35 days (new for 2007)

## Academy Guidelines/ THR, TKR

- Standard PE risk, standard bleeding risk
  - Aspirin 325mg BID X 6 weeks
  - LMWH X 7-12 days
  - Arixtra X 7-12 days
  - Warfarin INR  $\leq 2$ , 2-6 weeks
- Considered bleeding and clinically significant endpoints

## Academy Guidelines/ THR, TKR

- Patients with elevated PE risk and standard bleeding risk
  - LMWH X 7-12 days
  - Arixtra X 7-12 days
  - Warfarin INR  $\leq 2$ , 2-6 weeks
  - Aspirin is off the menu!

## Academy Guidelines/ THR, TKR

- Patients with standard PE risk and elevated bleeding risk
  - Aspirin 325mg BID X 6 weeks
  - Warfarin INR  $\leq$  2, 2-6 weeks
  - NO LMWH or Pentasaccharides!

What modality recommended in the AAOS Guideline on the Prevention of Symptomatic Pulmonary Embolism is recommended across all risk (low to high risk of either bleeding or pulmonary embolism) groups undergoing total hip or total knee arthroplasty?

- 1-Mechanical prophylaxis
- 2-Vena cava filter
- 3-Spinal anesthesia
- 4-Low-molecular-weight heparin
- 5-Synthetic pentasaccharides