

# Coagulopatie e Artropatie

Brescia, 24 Novembre 2017

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Director of Ortho-Trauma Unit



**FONDAZIONE IRCCS CA ' GRANDA**  
**OSPEDALE MAGGIORE POLICLINICO**

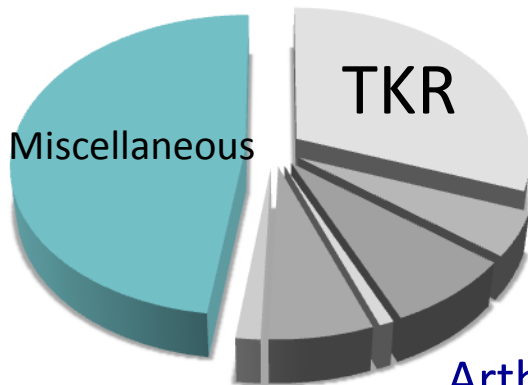
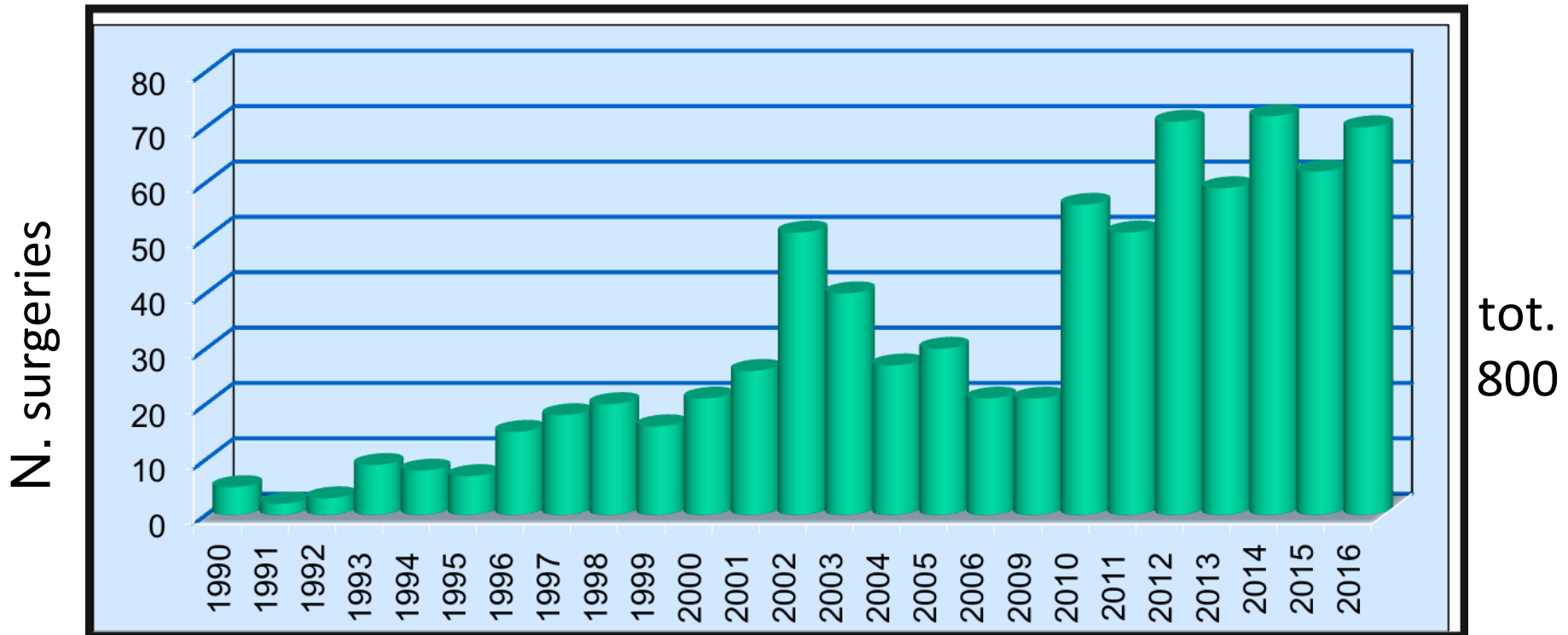




**haemostasis-surgery**

The challenges posed by undertaking EOS in PWH complicated by inhibitor

# Our experience in PWH



Arthroscopic procedures

- ❖ Haemophilia A/B
- ❖ Rare disease
- ❖ PWH INH

*“...the harmful effects of blood within a joint are well known.”*

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Houghton GR, Duthie RB.  
Clin Orthop 1979



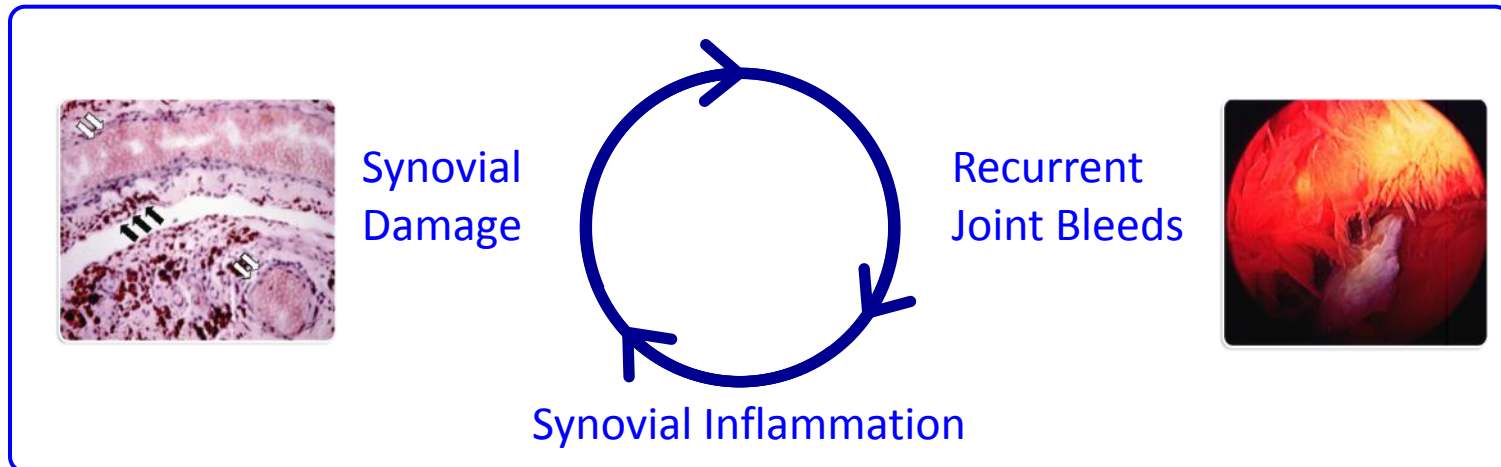
# Haemarthrosis (bleeding into the joints):

## A cycle of damage

Haemarthrosis often occurs in one or several joints and may progress to a destructive, disabling arthropathy<sup>1</sup>

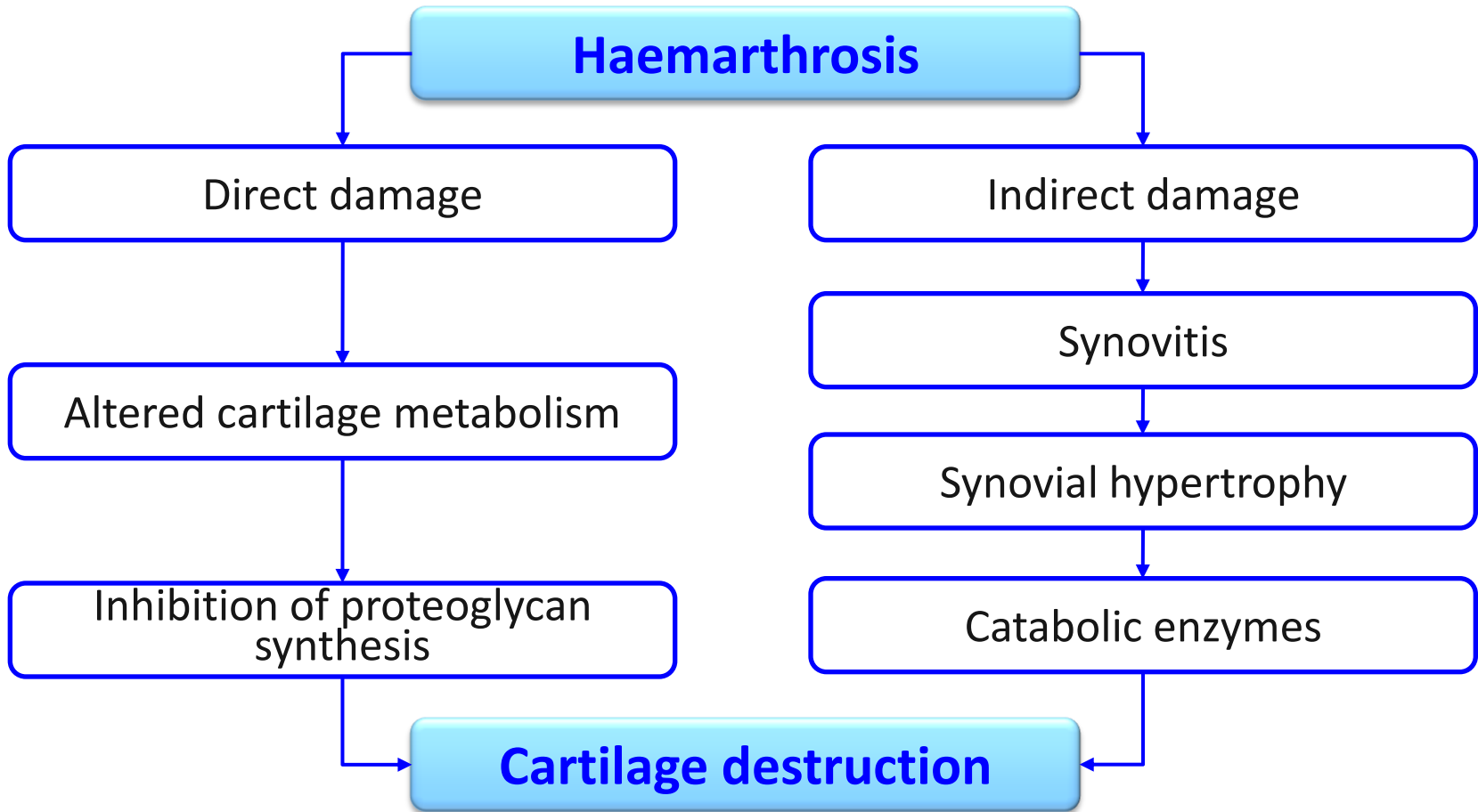
Just one bleeding episode can trigger a cycle of chronic synovitis, inflammatory arthritis, and progressive arthropathy<sup>2</sup>

Exposure of human cartilage to whole blood in concentrations up to 50%\* for 4 days<sup>+</sup> induced long-lasting damaging effects *in vitro*<sup>3</sup>

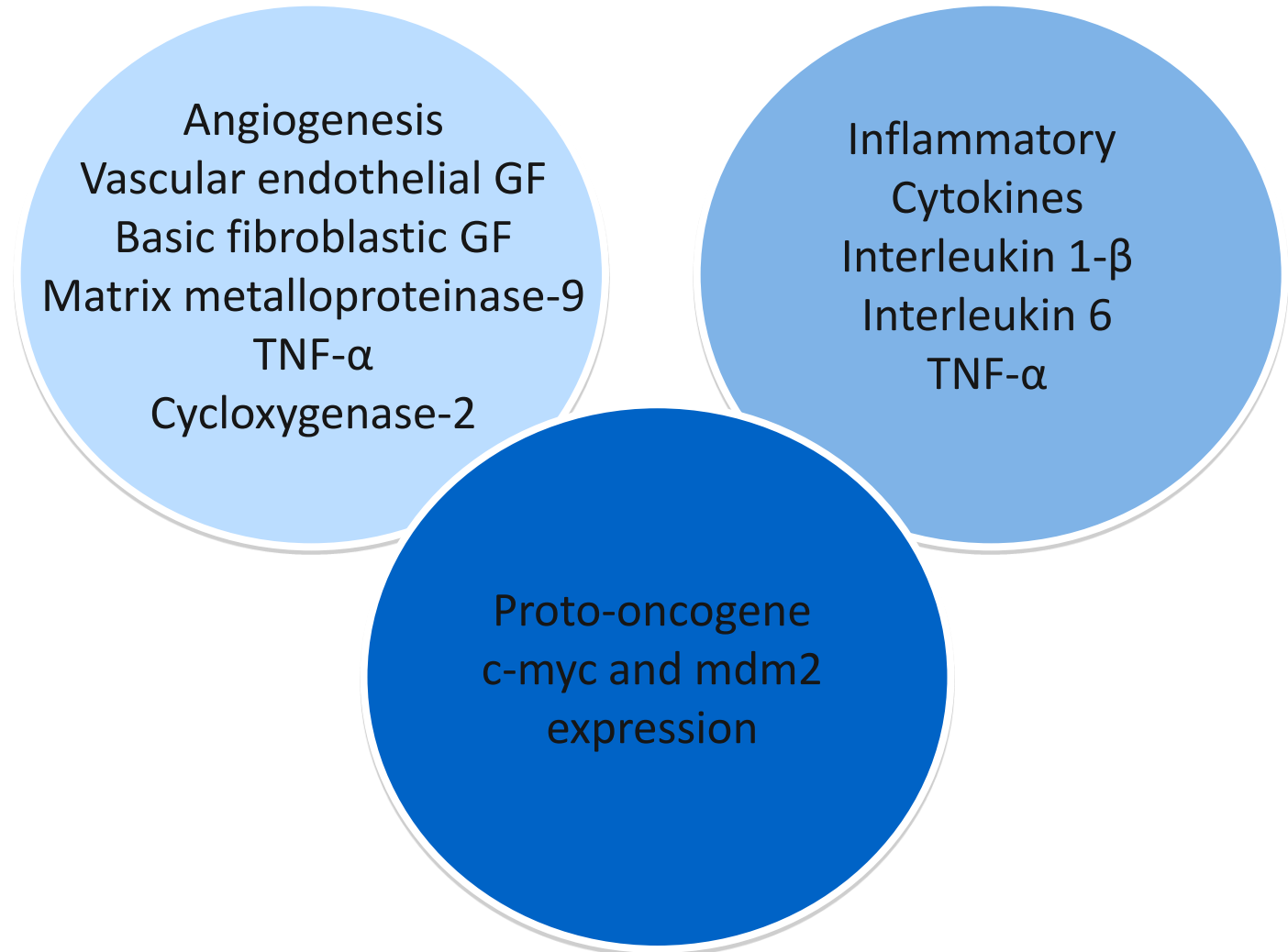


Adapted from Luck *et al. J Am Acad Orthop Surg* 2004; 12: 234-45

# Pathogenesis of haemophilic arthropathy appears to be multifactorial:

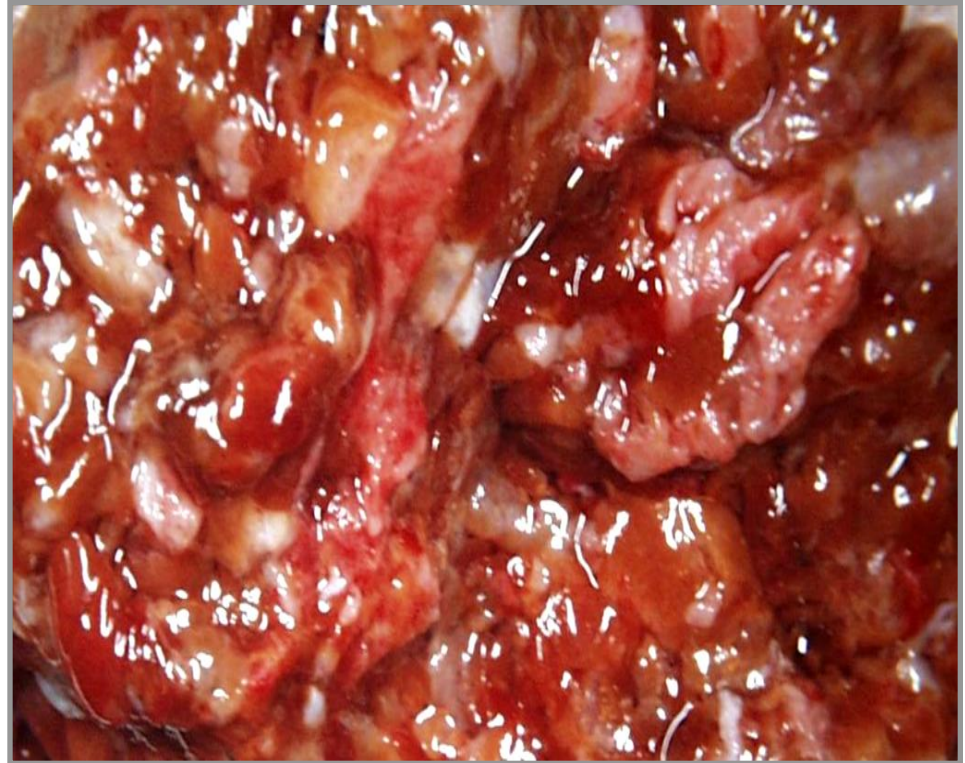


# Infiltration and propagation of hemophilic synovitis



# Haemophilic synovitis

- Hypertrophic
- Hypervascularized
- Inflamed



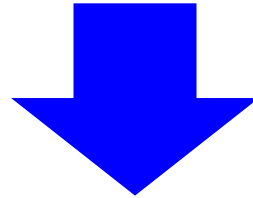


**BLOOD-INDUCED CARTILAGE DAMAGE  
IN HEMOPHILIA**



**GORIS ROSENDAAL**

Only a transient (4 days) exposure of cartilage to blood is needed to induce long-lasting changes to cartilage matrix turnover, resembling degenerative cartilage damage.



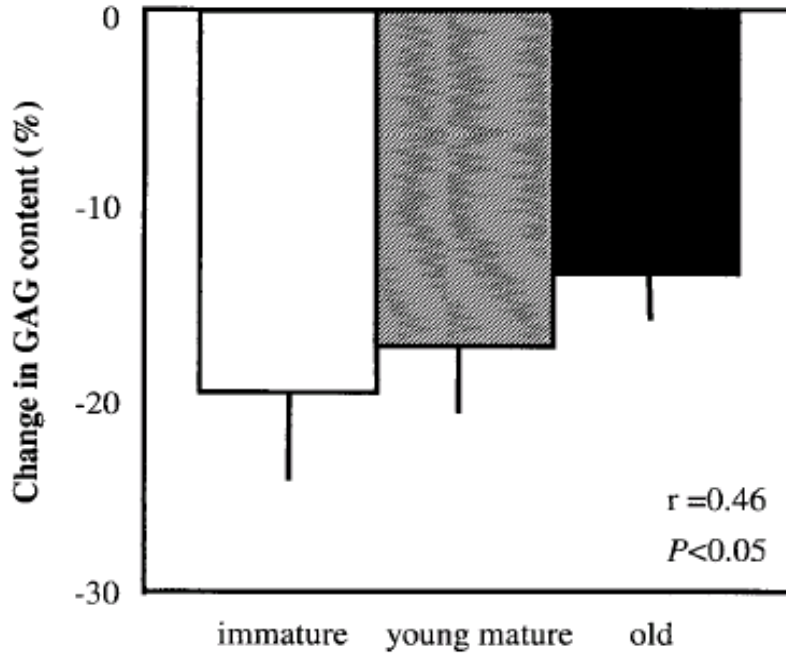
Adverse effects of blood on cartilage proteoglycan turn-over:

release increased

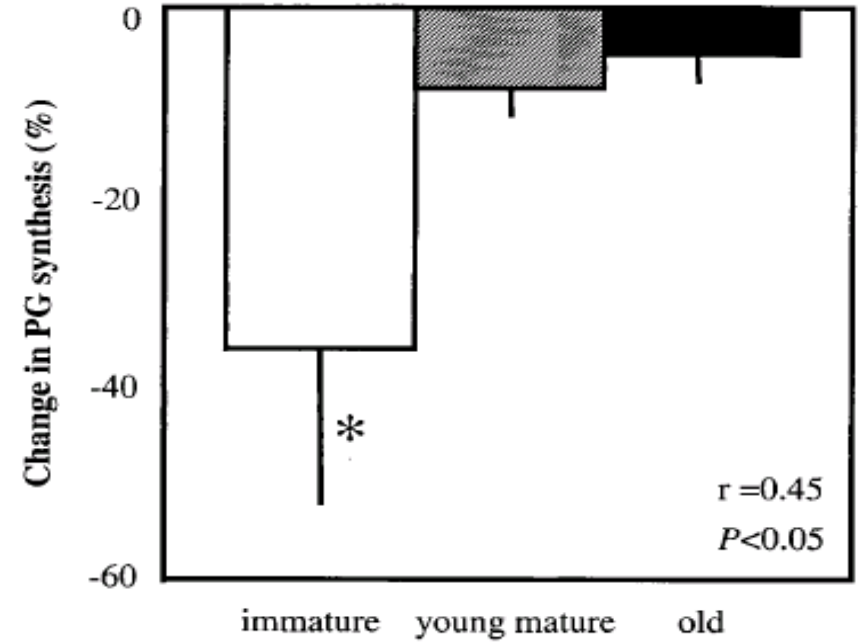
synthesis diminished

content decreased as a consequent

Percentage change in total glycosaminoglycan content of cartilage from blood-injected knees compared with controls.



**Up to 19%**



**36%**



“Immature articular cartilage is more susceptible to blood induced damage than mature articular cartilage”

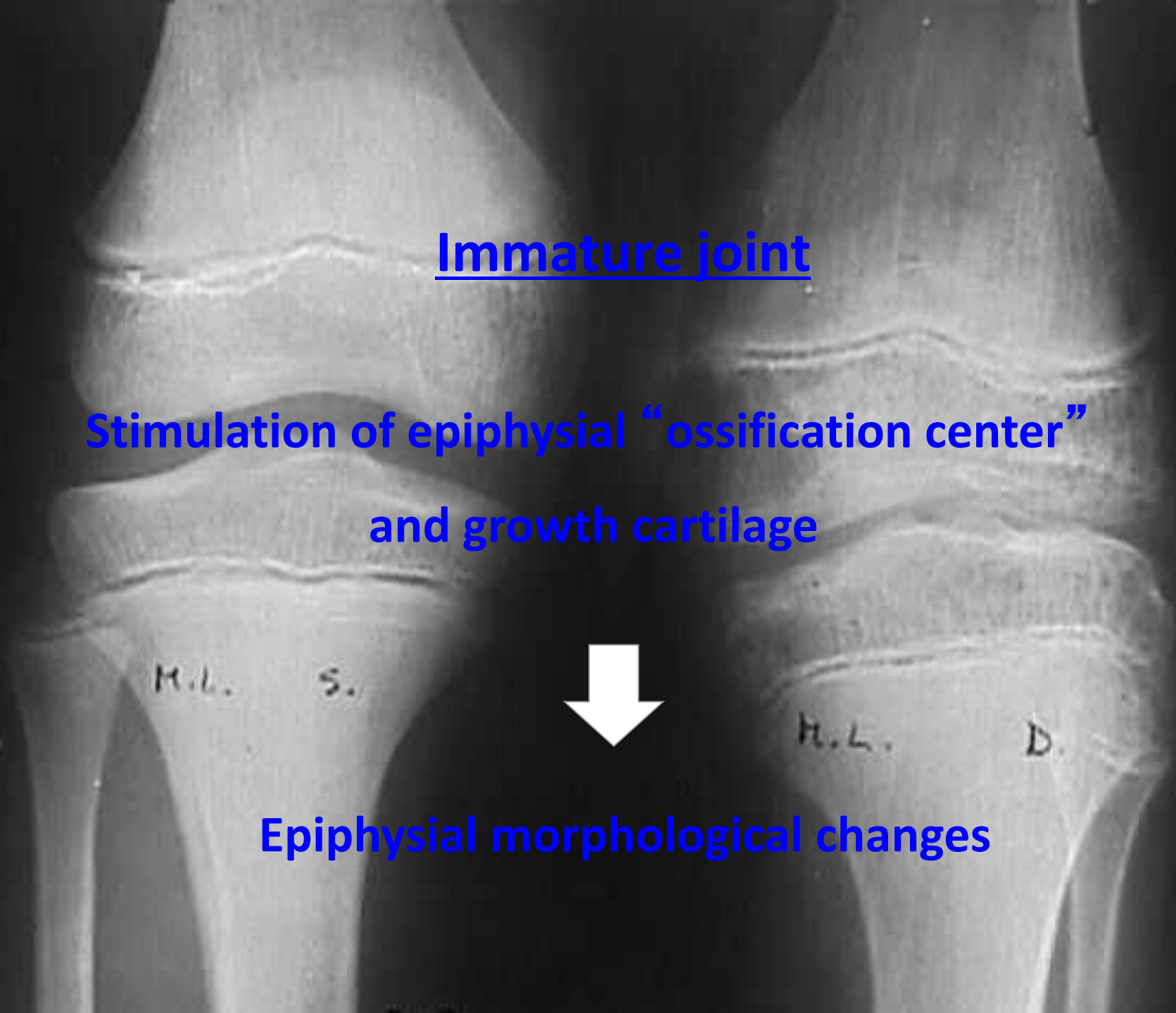
Roosendaal G:J Rheum,2003

Immature joint

Stimulation of epiphysial “ossification center”  
and growth cartilage



Epiphysial morphological changes



## PWH today...

- **Adults**  
(arthropathy)
- **Kids on prophylaxis**  
(Micro – bleeds) ??
- **Inhibitor pts**



# Adult

- **Management of daily life**
- **Physical activity**
- **Monitoring of target joint:**

Rx-RMN-TAC

- **Periodic cycles of FKT**
- **Pre – rehabilitation**
- **Post - surgical**



# Kids

- **Sport education**
- **Monitoring target joints:**
  - Baropodometry
  - Ultrasound
  - Gait analysis





# European Study on the Orthopaedic Status of patients with haemophilia and inhibitors

“The burden of orthopaedic complications and the impact on quality of life are more severe in patients with haemophilia who have developed an inhibitor compared with those patients without inhibitors.”

**Pts with INH with a history of orthopaedic procedures or surgery:**

**14-35 years: 34%**

**36-65 years: 66%**

# TEAM

**Phisyoterapist**

**Ortho-surgeon**



**Anesthesiologist**

**Hemathologist**

# Factor influencing surgeries in PWH

- ✓ Factor replacement (or by-passing agents) availability
- ✓ Hemophilia center: number of pts
- ✓ Team learning curve:

Surgeon  
attitude

Hematologist  
attitude



# MDA :What the physiotherapist has to know about...

- ✓ Stiffness
- ✓ Axial deviation
- ✓ Deformity



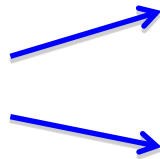
- ✓ Soft tissue release
- ✓ Bone cut
- ✓ Synovectomy

Increase bleed expectation...

# What the hematologist has to know about...

## Surgery

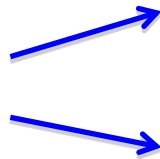
**Total knee replacement**



Primary implant

Revision

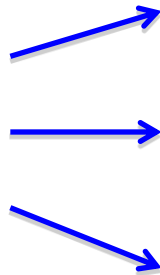
**Arthroscopy:**



Synovectomy

Debridment

**Different Bleeding expectation:**



< 500 cc

500 - 800 cc

800 - 1200 cc

**Knee**



**Ankle**



# What the surgeon has to know

- ✓ Severity of coagulation factor deficiency
  - on demand or prophylaxis mild hemophilia?
- ✓ Comcominant liver disease
  - HBV+/HCV+
  - Liver dysfunction
  - Cirrhosis
  - Thrombocytopenia
- ✓ Concomitant HIV infection
  - CD4
  - CD8
  - HIV viremia

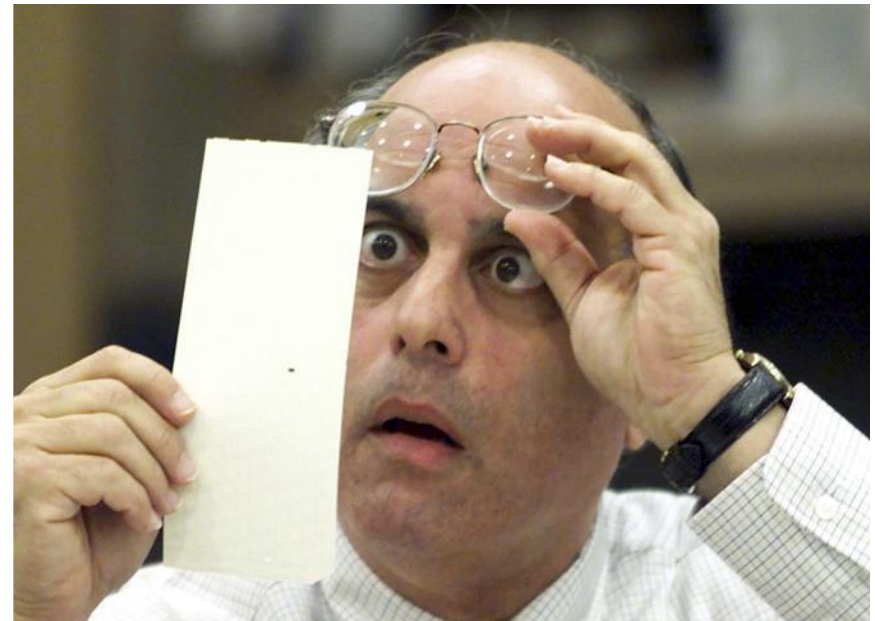


# Joint bleed

## The role of hematologist

### Diagnosis

- Clinical examination
- Pain swelling no function
- Ultrasounds

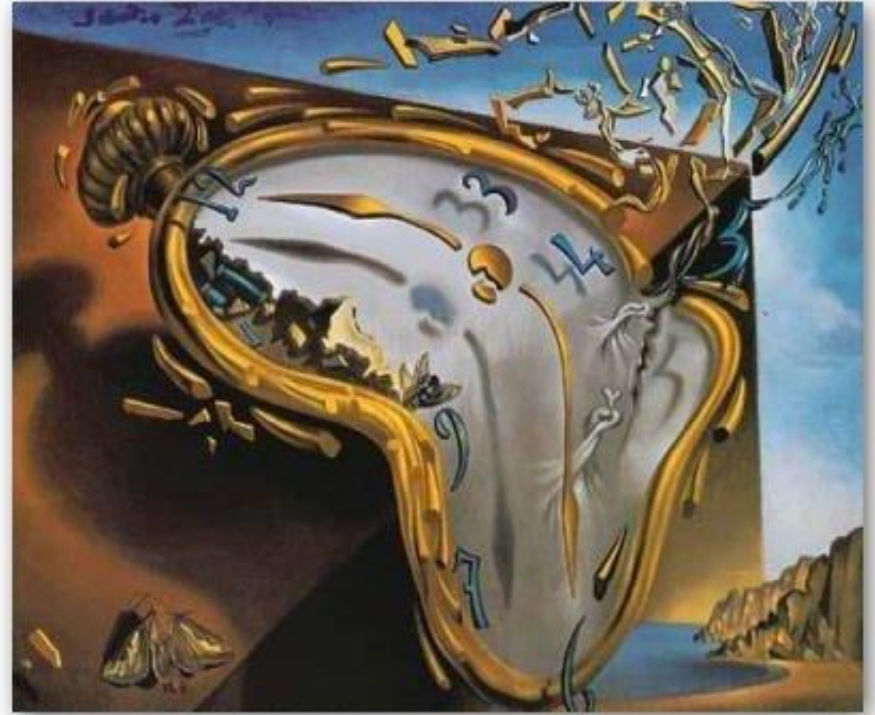


# Prevention of orthopaedic damage through haemostatic control

- ✧ In patients with haemophilia, suboptimal bleeding control can lead to severe loss of function of the joint (joint deformity, loss of motion, muscle atrophy) within the first two decades of life;
- ✧ Prompt and effective *on-demand treatment* of bleeds should be considered the first line of defence:
  - To regain haemostasis
  - To reduce long-term consequences of joint bleeds



“It is generally agreed that the early treatment of bleeding in haemophilia as allowed by self-administration at home, results in a high success rate.”



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Santagostino E. et al. BJH 1999

# Primary prophylaxis

*“...Prophylaxis with recombinant factor VIII can prevent joint damage...”*

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Manco-Johnson M. NEJM 2007;  
357 (6): 535-44.



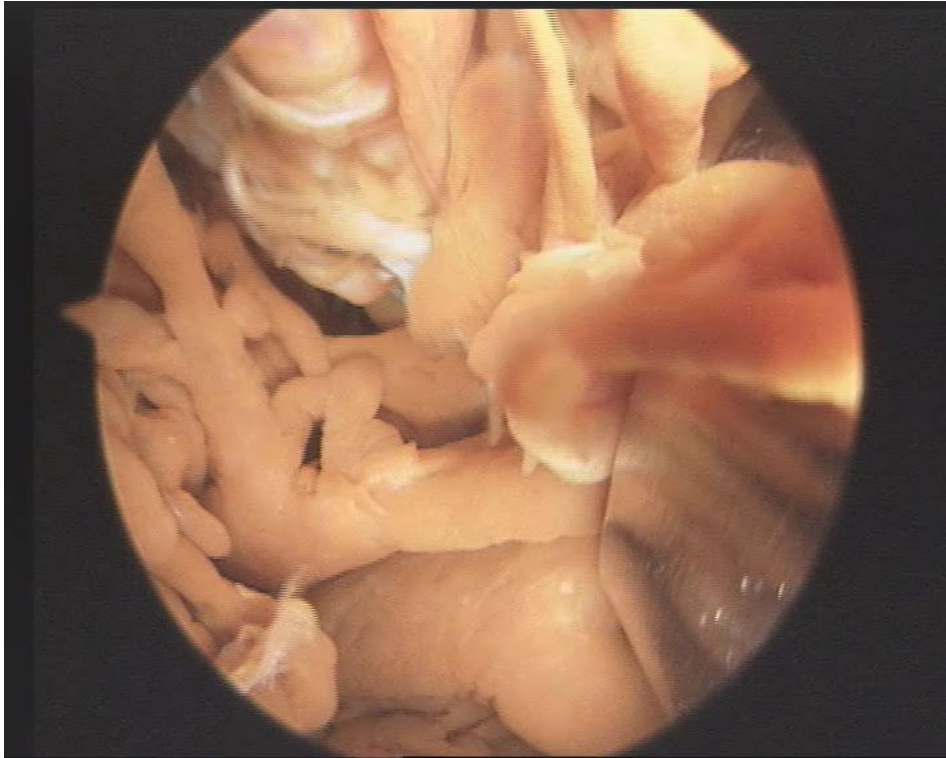
# Joint bleed

## Treatment

- Early factor replacement
- Ice
- Rest
- Early mobilization



## The role of surgeon



All acute hemarthrosis  
should be aspirated ?

*A tense painful joint showing no response after 24 h of treatment*

*Pain not controlled by analgesia*

*Neurovascular or skin compromise*

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Gilbert M. Mt Sinai J Med 1977



## Prevention: sport

### Not only...

*Sports can improve strength, endurance, and cardiopulmonary fitness while providing companionship, a sense of achievement and heightened self-esteem, providing a healthier lifestyle with long-term benefits.*



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*Wind WM et al., 2004*

## Prevention: sport

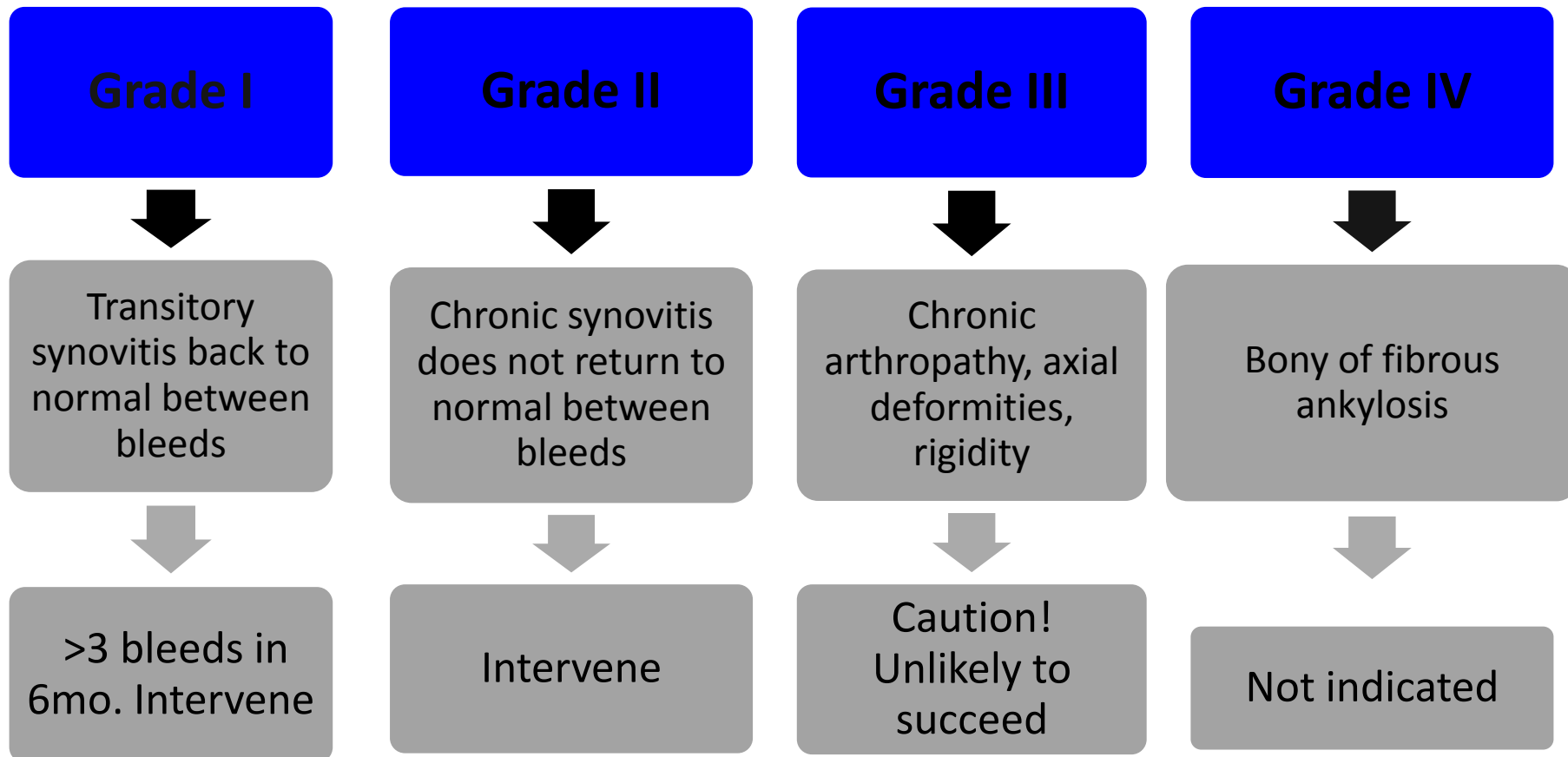
Increasing muscle strength by resistance training might increase the stability of the joint, thereby decreasing the frequency and severity of bleeding episodes and the associated pain.



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Tiktinsky R. et al., 2002

# Treatment of synovitis





# Treatment options

1. **Prophylaxis - upgrade treatment**

2. **Arthrocentesis**

**Synoviorthesis :**

-Chemical synovectomy

3. -Radio synovectomy

**Synovectomy:**

-Arthroscopic

4. -Open

5. **Angiographic embolization**

6. **TKR**





**Arthroscopic treatment of hemophilic arthropathy: comments..**

# Home message

## Synovectomy



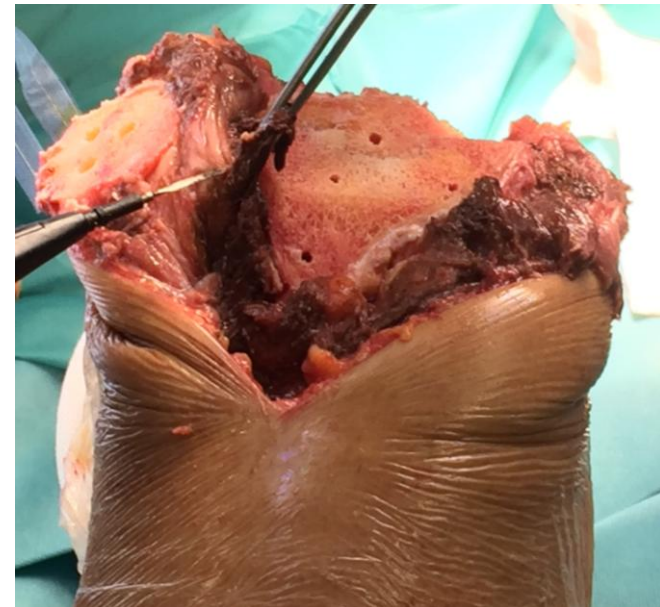
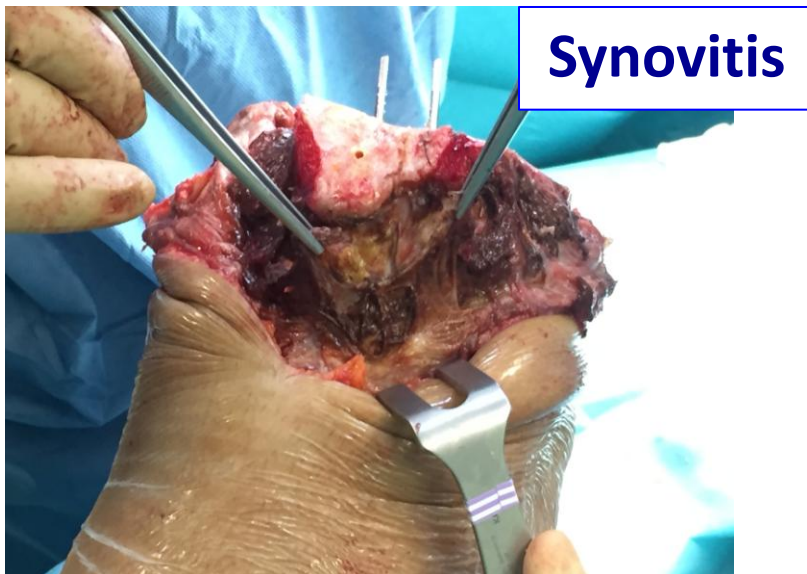
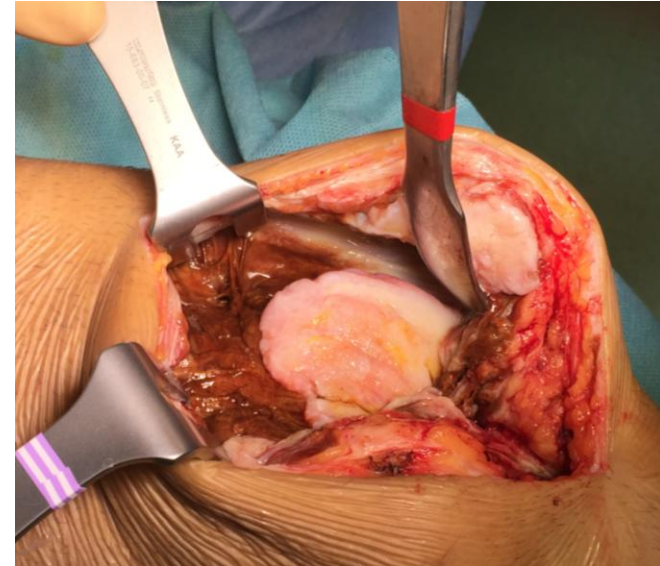
↓ bleeding tendency

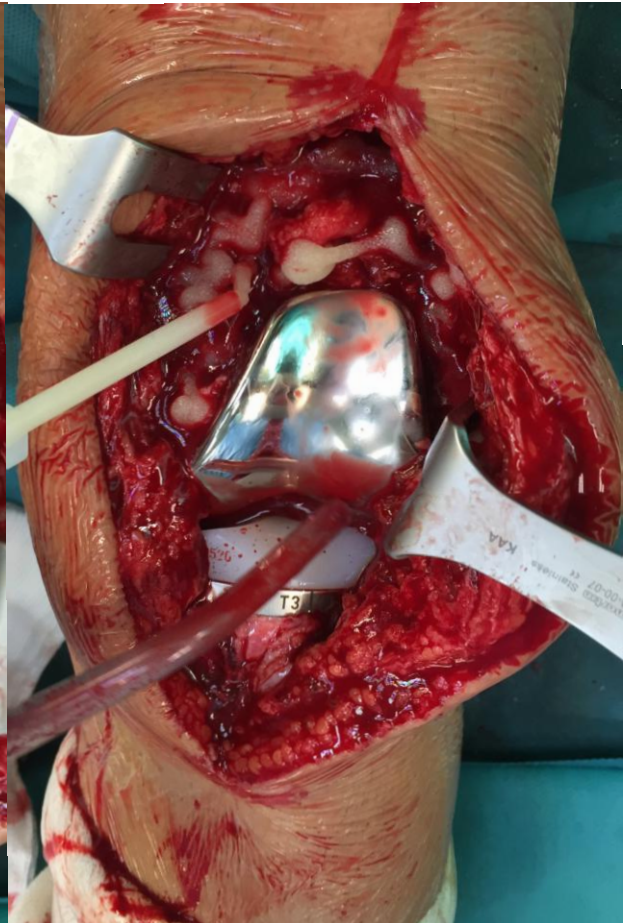
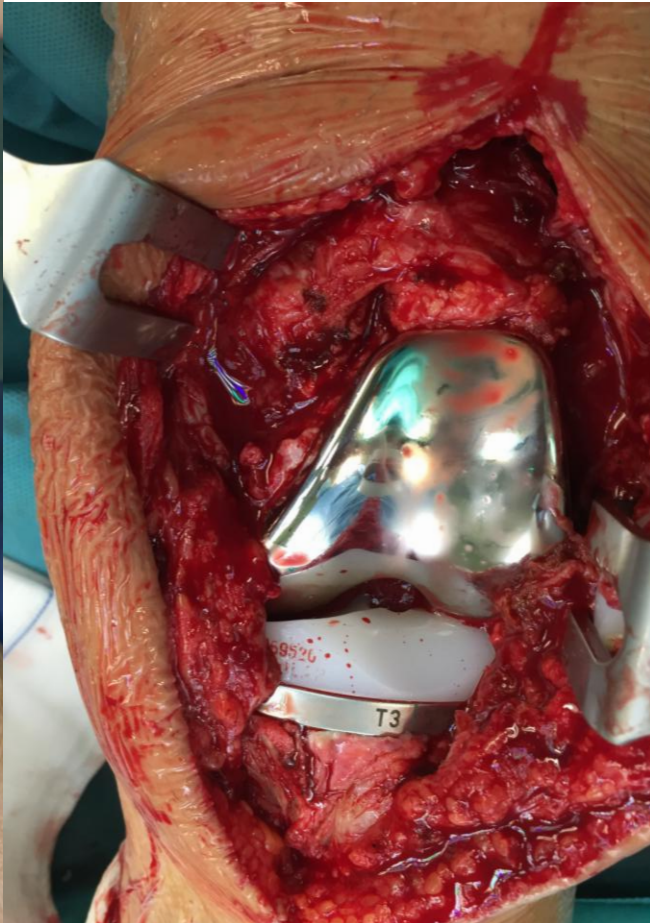
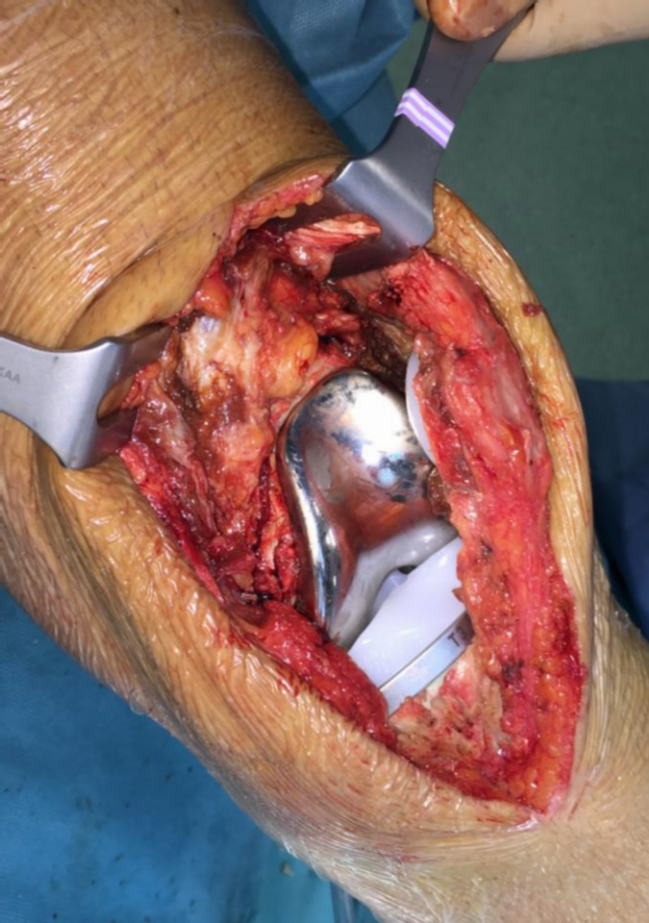
progressive deterioration of the  
radiographic appearance

# Chronic synovitis in advanced stage of arthropathy

## TKR

- Higher expected bleeding
- Post-op swelling
- Drain management
- Fibrin seal

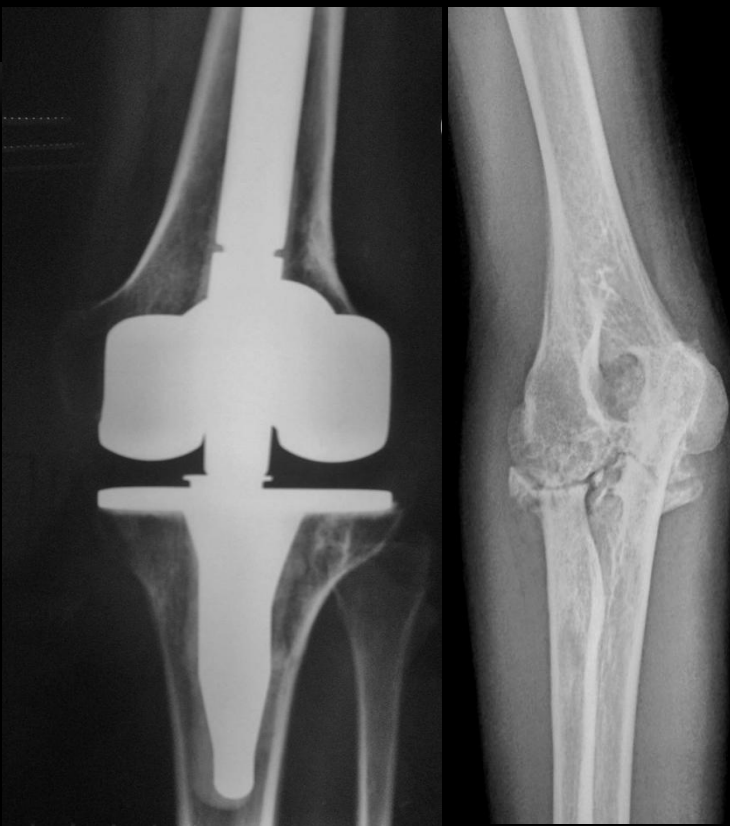




**After synovectomy**

**Target joints**

**Neglected joints**



# Eligibility criteria

Multiple joint involvement

Axial deviation

Restricted R.O.M.

Poor bone  
"stock"

**Pain**



# Correlation between x-ray and clinical exam

Advanced deformity and joint stiffness



Advanced stage of arthropathy





# No correlation between x-ray and clinical exam

good function-no pain

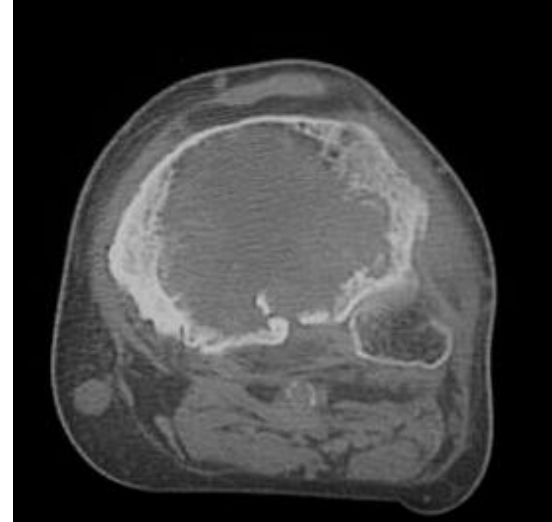


advanced stage of arthropathy



# Pre-op planning

Standard x - ray	yes
Axial loading x - ray	yes
MRI/CT scan	sometimes
Pettersson score	yes
Knee rating scale	
HSS	yes
IKDC	
Other	



Antibiotic  
prophylaxis

Teicoplanin:

800 mg 2h before surgery,  
400mg x 2 for 24h

Cephalosporin 3°gen:

2g 30min before surgery and till drain removal

## Surgery time

Haemostatic agents

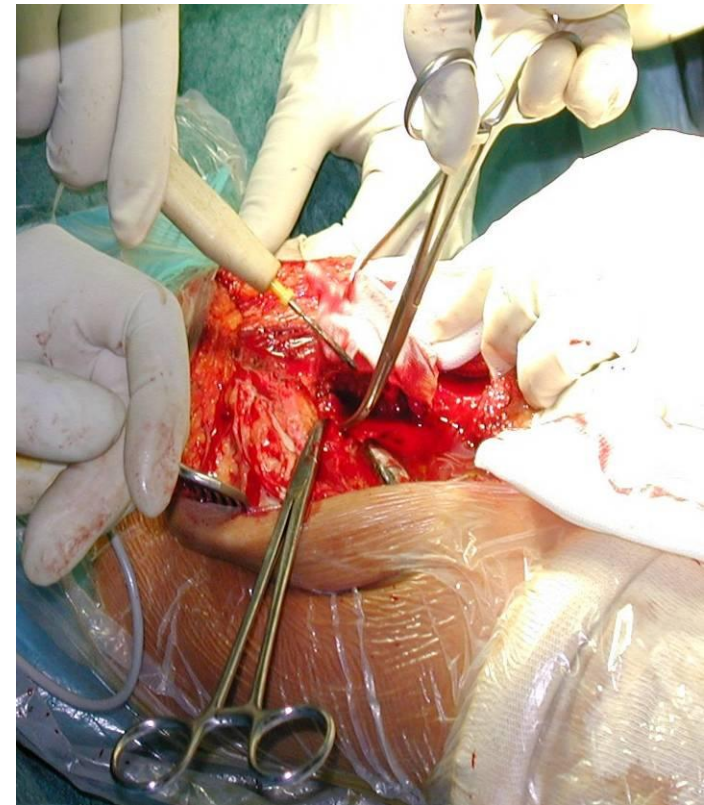
yes

Intra and early post-op  
autologous blood  
transfusion device

yes

Preoperative autologous  
blood donation

no



# Surgery time

Cemented or cementless implants

Cemented

CR or PS

PS

Tourniquet

Not always

Wedge + modular stems

Yes

Drain

Always



## Post-op

NSAIDs

No

Crural analgesia

No

Antithromboembolic prophylaxis

No

Early Rehab

No

Guideline

No

Pts and bleeding related

Yes

## Factors influencing the long-term outcome of primary total knee replacement in haemophiliacs: a review of 116 procedures at a single institution

Luigi P. Solimeno,<sup>1</sup> Maria E. Mancuso,<sup>2</sup>  
Gianluigi Pasta,<sup>3</sup> Elena Santagostino,<sup>2</sup>  
Samantha Perfetto<sup>1</sup> and  
Pier Mannuccio Mannucci<sup>2</sup>

- **22 years: 1993 – 2007**
- **116 primary TKR / 92 pts (INH and no INH)**
- **different types of implants (considering bone stock, axial deviation and instability)**
  - **cemented or cementless,**
  - **cruciate-retaining**
  - **posterior-stabilized**
  - **constrained**
- **Lost follow—up: none**

*TKR, in the past...*

## Conclusions: TKR

Risk of complications was related to:

- ✓ Presence of inhibitors
- ✓ Continuous infusion
- ✓ Cementless implant
- ✓ Different primary surgeons



***TKR, in the past...***

# Currently...TKR

- 6 years: 2010-2016
- 101 Primary procedures / 132 pts
- Unilateral: (84%)
- Bilateral: (16%)

## Particular cases:

- 1 case: TKR in femur fracture
- 1 case: TKR + massive bone graft





## Currently...Results TKR

- 87% excellent/good
- 9% fair
- pts expectation ??
- ROM – activity level > pain
- 4% poor



# X - ray: HA evolution monitoring Surgery timing

Arthroscopy

Arthroscopy/TAR

TAR/fusion



# Haemophilic arthropathy (HA) of the ankle

- Recurrent haemorrhage begins at an early age of 2–5 yo
- Repeated intraarticular bleedings progressively cause irreversible damage to the ankle joint, leading to HA



- Rodriguez-Merchan EC. The haemophilic ankle. *Haemophilia* 2006; 12: 337–44
- Panotopoulos J, Hanslik-Schnabel B, Wanivenhaus A, Trieb K. Outcome of surgical concepts in haemophilic arthropathy of the hindfoot. *Haemophilia* 2005; 11: 468–71
- Lafeber FP, Miossec P, Valentino LA. Physiopathology of haemophilic arthropathy *Haemophilia* 2008; 14(Suppl. 4): 3–9

# Haemophilic arthropathy (HA) of the ankle

The radiographical changes by *Pettersson* and *Gilbert*

- Subchondral irregularity
- Cartilage space narrowing
- Significant anterior and posterior osteophyte
- Total collapse of the body of the talus
- Spontaneous ankylosis of the ankle joint



# HA: Clinical evaluation

- High level of chronic pain
- Repeated bleedings
- Functional impairment
- Joint stiffness
- Loss of joint stability
- Axial deviation

Moderate

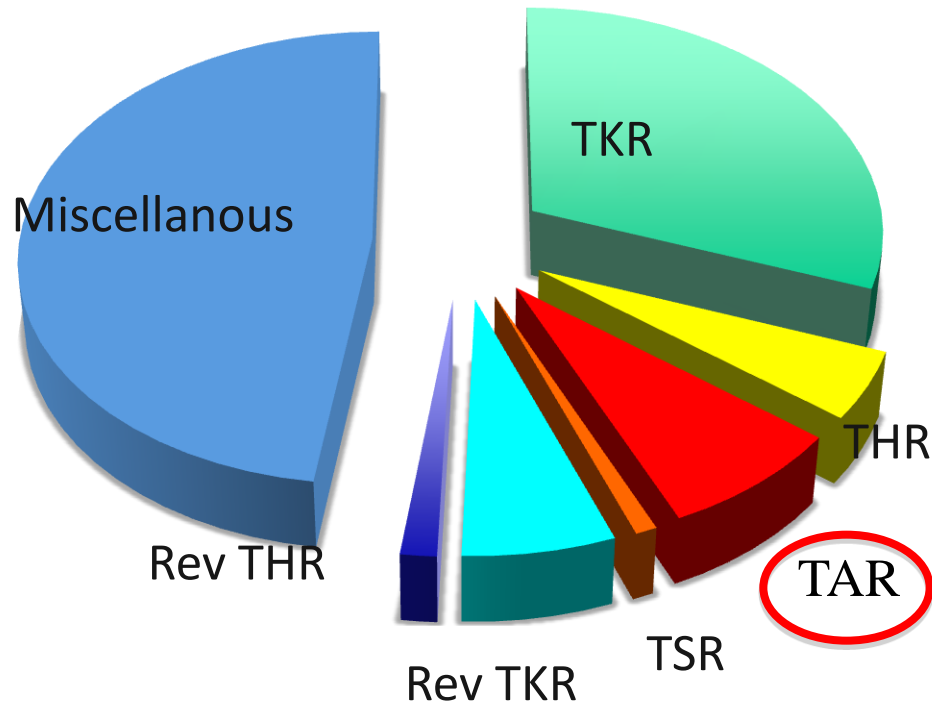


Severe



# Our experience:

Total ankle replacement (2009 – 2016)



330 Surgeries

TAR 8 %

# Our experience about TAR (2009–2016) Clinical presentation

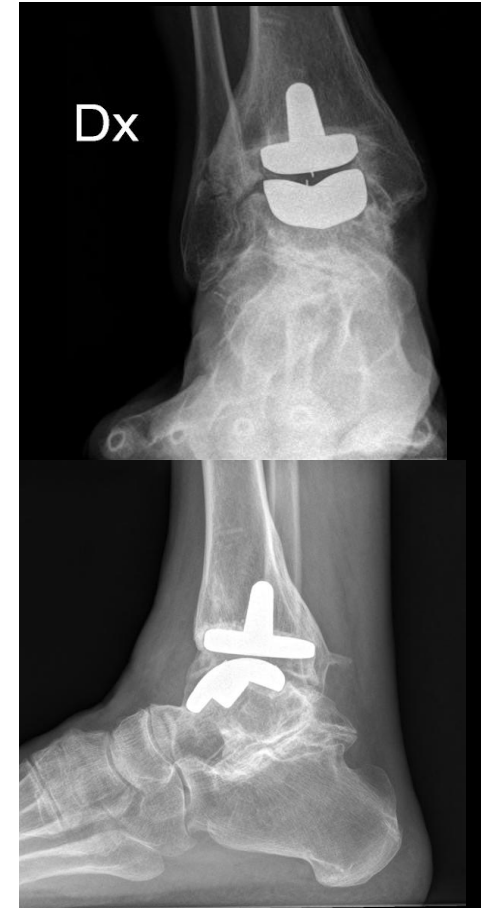
- 33 pts / 37 TAR end-stage ankle AO
- median age: 35 (24-54)
- Same surgeon



# Our experience about TAR (2009–2016)

## hospitalization and follow-up

- Time surgery (mean): 2 h 15'
- Period of hospitalization (mean): 6 days
- Factor consumption (mean): 34.667 U.I.
- Duration follow-up (median) 3 years





# Our experience about TAR (2009–2016)

## Intra-op complications:

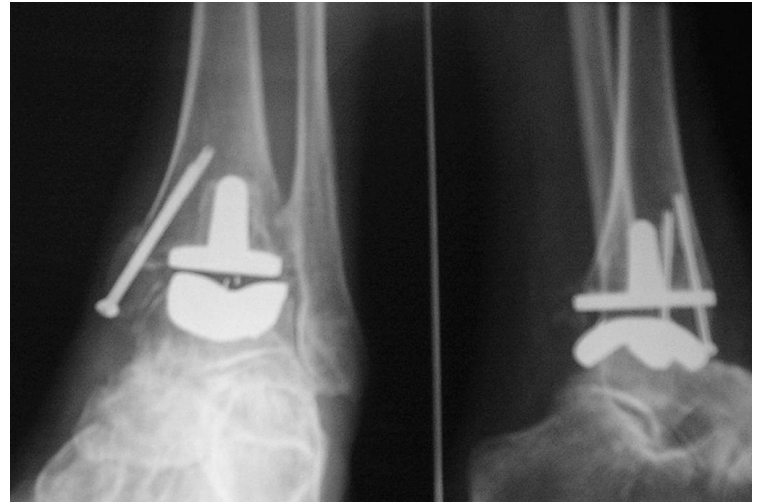
3 pts: lateral malleolar fracture

## Post-op complications:

10 cases delayed wound healing

▪ 2 early infections                      open debridement

1 aseptic loosening



Intra and post-op complications = 10 %

# Our experience about TAR (2009–2016)

## Results:

- ✓ Pain level from 8 (7-10) pre-op to 1 (0-4) post-op
- ✓ Functional improvement ( ROM )
- ✓ POIS

- ✓ Excellent/good: 30
- ✓ Fair: 4
- ✓ Poor: 3

➤ Mid-term results are encouraging

➤ Long-term outcomes necessary in the future!



**COMPLICATIONS**

**Arthroscopic  
procedures**

**Total joint  
replecement**

**Orthopedic**

**Perioperative  
Bleeding**

# Complications: arthroscopic procedures

- Prolonged post-op bleeding
- Haematoma
- Blood transfusion needed
- Delayed rehab



# Complications: bleeding after arthroscopic procedures

## Hematological management

- Tranexamic acid
- Increase rFVIIa dosage
- Decrease administration interval
- Shift to APCC
- Add APCC

## Orthopaedic treatment

- Ice
- Elevation
- Bendage
- Splint
- Delay rehab
- Drain management
- Arthrocentesis
- Post-op embolization

Prevention: *embolization*

# Complications in Total Joint Replacement

Early

## Knee

- ✓ Post-op bleeding
- ✓ Haematoma
- ✓ Early infection:
  - superficial
  - deep

## Ankle

- ✓ Fracture
- ✓ Wound healing

Late

## Knee/Ankle

- ✓ Aseptic loosening
- ✓ Septic loosening



*Sir John Charnley*

*“Hematoma  
means  
death of  
surgeon”*

Life style related ??

Thank you for your attention