

AVN- important topics

- Etiology/pathogenesis
 - Demographics
 - Classification
- Treatment options

Osteonecrosis Occurs In The 'At Risk' Patient

Associated Condition

Steroids*	CTQ	Gout	Radiation
Alcohol Abuse*		Coagulopathies	
Smoking		Metabolic Disease	
Lipid Disturbances		Major Trauma	

Coagulopathies

- Lupus anticoagulant
- Protein C or S deficiency
 - Factor V leiden
 - Lipoprotein A
 - Homocysteine
- Anticardiolipin antibody
 - Antithrombin III

The Face of Osteonecrosis



21 years old



15 years after THR

Average Age 38
25% <25 years old

All Treatments Are Not Equal

**Success Rate
Morbidity
Potential Complication
Impact on Subsequent THR**

All Osteonecrosis is Not Equal

Important Variables

**Stage
Size
Age
Underlying Disease**

Natural History of No Treatment

(Observation, Protected Wt. Bearing)

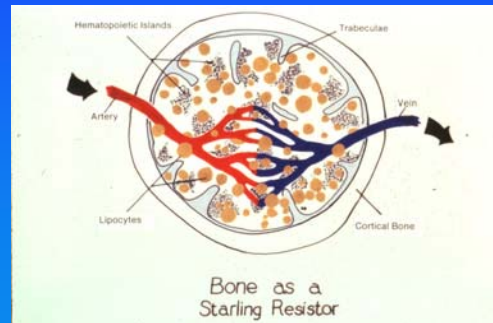
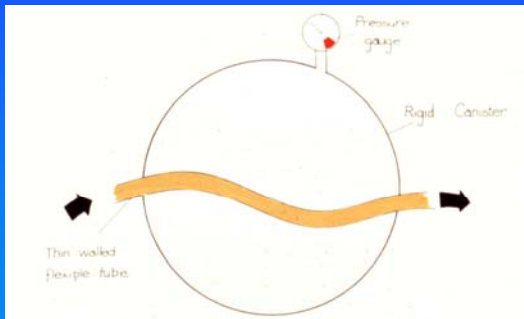
21 studies 819 22.7% Success
[0-32]

Usually 2-4 year F/U

Mont et al. 1995

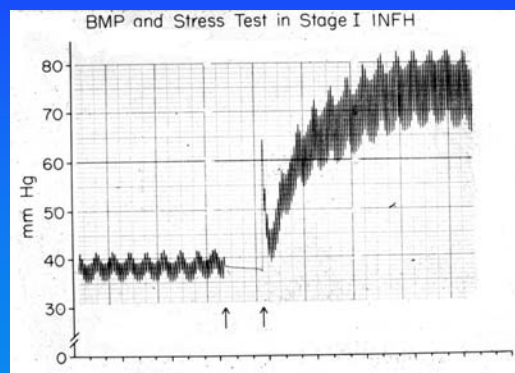
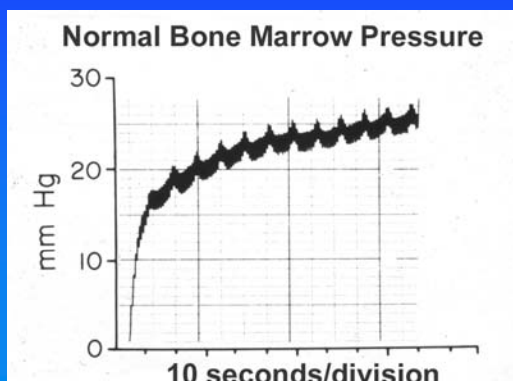
Exact Pathogenetic Pathway Unknown

Bone Functions as Starling Resistor



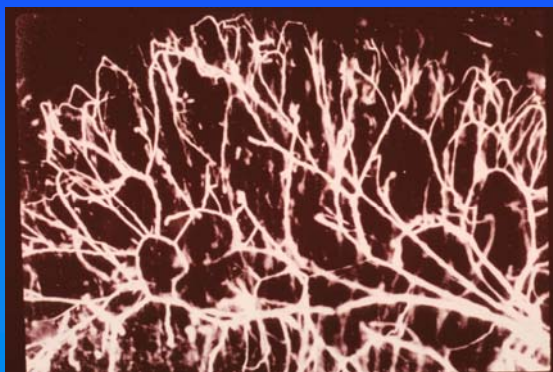
CTQ

Increase BMP Hallmark of Osteonecrosis



Pathogenesis of Osteonecrosis

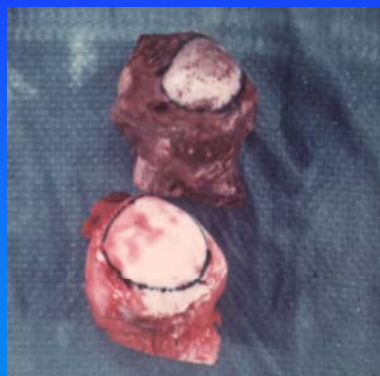
Coagulation Defect May Be Final Common Path



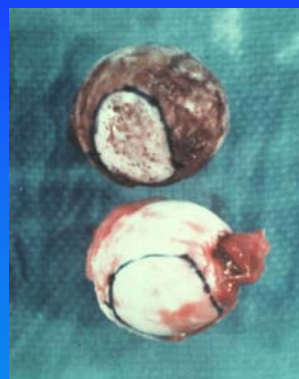
AVN occurs in the convex ends of long bones

CTQ

Biomechanics of Collapse in Osteonecrosis



AP View



Top View

OA & ON - Same area of collapse/wear

Osteonecrosis Several Staging Systems

Ficat
Steinberg
ARCO
Marcus/Enneking

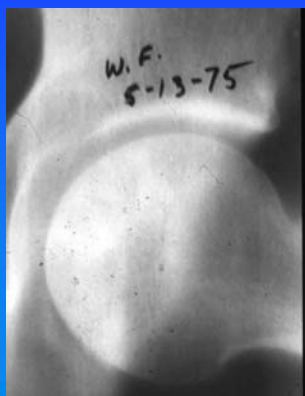
Pre-collapse vs.
Post collapse

I & II Precollapse in ALL

CTQ

Stage III Osteonecrosis

The watershed between
cure and palliation



Stage II "Intact"

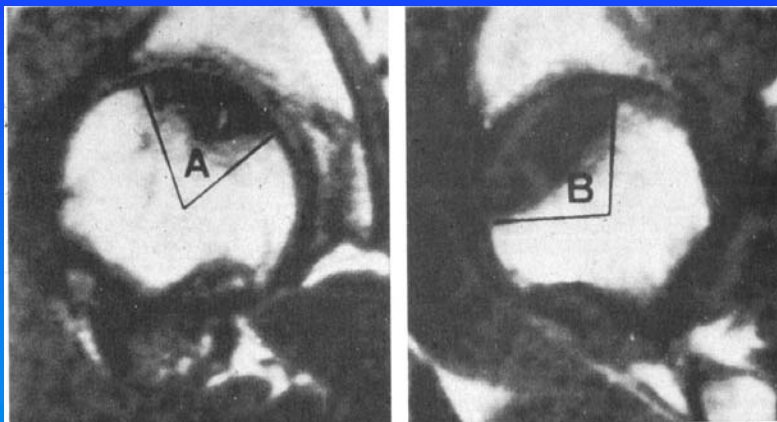


Stage III "it's broke"

CTQ

Osteonecrosis Staging

Kerboul angle: $>200^\circ$ = large



A + B = Kerboul Angle

Osteonecrosis Staging

Size of Lesion

A: small <15%

B: medium 15 to 30%

C: large >30%

The Goal of Treatment in Osteonecrosis

Preserve the Femoral Head

Core Decompression

Osteotomy

Free Fibular Graft

Bone Graft

Femoral Head Resurfacing

Core Decompression

Simple, low cost
Low morbidity
Controversial

Core Decompression

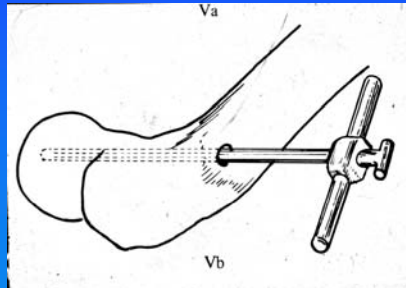
- Moderately effective for precollapse disease (70%)
- Recommended for asymptomatic AVN of the hip **CTQ**

Core Decompression

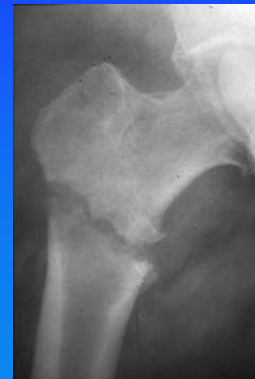
Avoid The Pit Falls



Biplane Image



Entry @ Lat. Flare



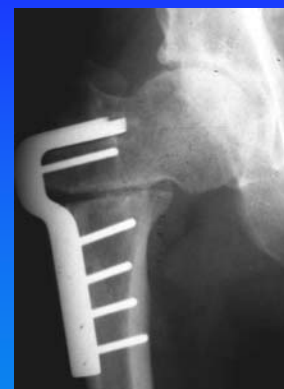
Crutches 6 wks.

CTQ

Osteotomy for Osteonecrosis



Deforms the Femur



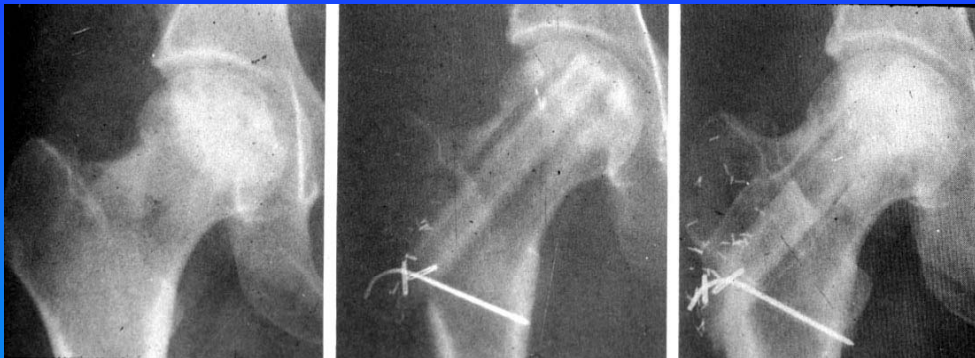
Sig. Morbidity

Suitable for some small Stage III
-sugioka, or varus types

Indication for Osteotomy

- Smaller lesion (kerboul <200)
- Preserved region of cartilage than can be rotated into a weight bearing position

Free Vascular Fibular for Osteonecrosis



Donor morbidity (25%) **CTQ**
Better in stage III than core

Free Vascular Fibular for Osteonecrosis

103 Hips

Stage II 89%

Stage III 77%

Stage IV 55%

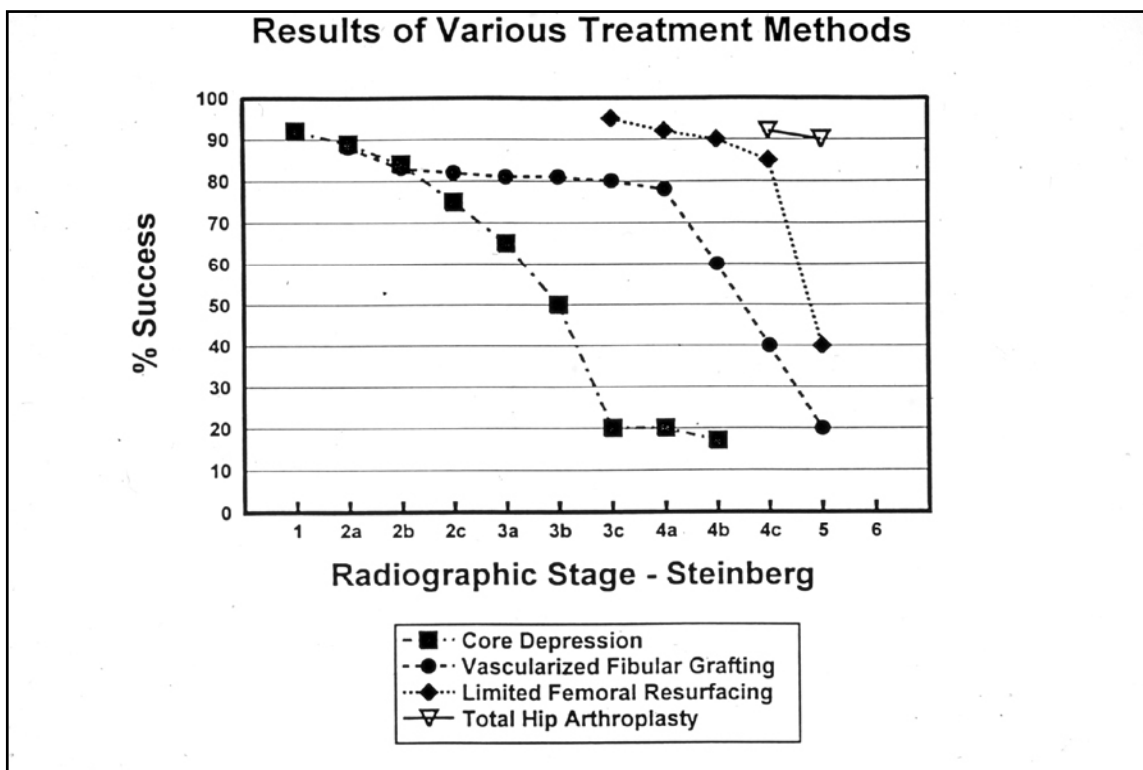
Stage V 65%

5 Year Survival

Urbaniak 1996 JBJS

INCIDENCE

- HIPS>KNEES>SHOULDERS>ANKLES
- Check hips for asymptomatic lesions if other joint presents first (multifocal AVN)



Transient Osteoporosis of the Hip

CTQ

- Seen in younger men
- Extensive edema seen on T2 MRI
- No “double line” sign
- Not associated with AVN risk factors
- Resolves with protected weight bearing
- May progress to AVN



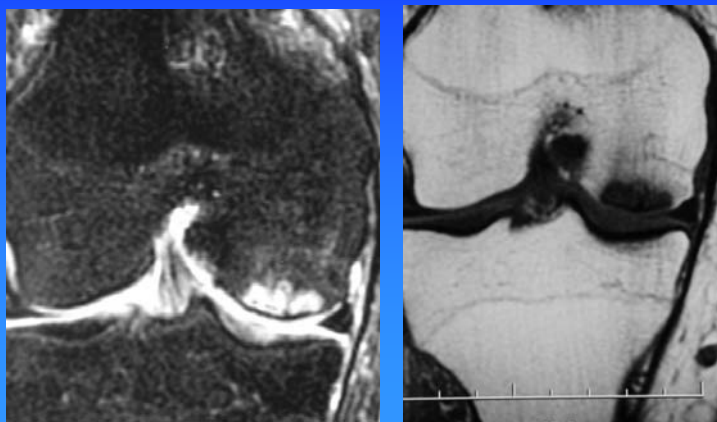
Take home points

- AVN occurs in the at risk patient
- Average age is 34
- Core decompression for stage II
- Don't forget to check the hips
- Core hip even if asymptomatic
- Temporizing procedures for stage III and under 40
- THR over 40

Management of Osteonecrosis of The Knee

SPONK is Not Osteonecrosis

CTQ



MRI of SPONK

SPONK

Differentiate from ON

Medial femoral condyle **CTQ**

Mostly women >60 **CTQ**

? Microfracture **CTQ**

Possible benign course **CTQ**

Ecker & Lotke
J. Am Acad Orthop Surg 1994

Treatment of SPONK

79 Patients

Group I - Bone scans, x-ray-negative

Group II - Small lesions <1/3 width of
condyle

Group III - Large lesions >50%

diameter of condyle

I & II - Conservative

III - Rapid progression

Ecker & Lotke
J. Am Acad Orthop Surg
1994

SPONK vs AVN of the Knee

SPONK

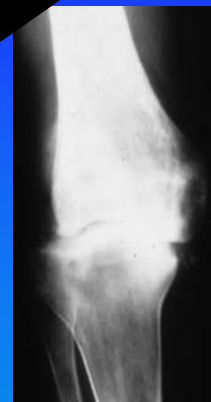
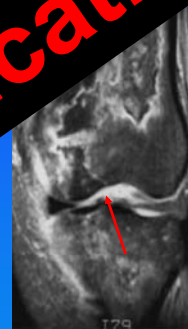
- age > 65
- one condyle
- unilateral
- only knee
- no risk factors

AVN

- age < 45
- multiple condyles
- bilateral
- other joints
- risk factors
(steroids, alcohol)

Staging ON Knee

Same Criteria as



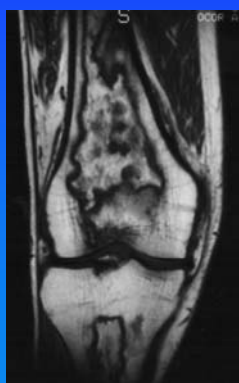
Different Implications

Stage II
X-ray pos
No Collapse

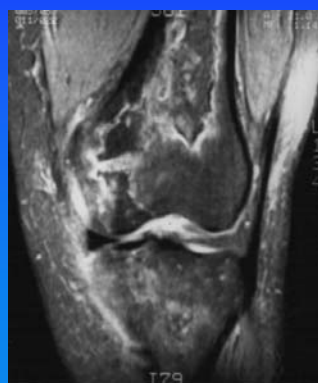
Stage III
Early Collapse

Stage IV
Arthritis

All ON Knee Not the same



Metaphyseal
Rarely collapse



Epiphyseal

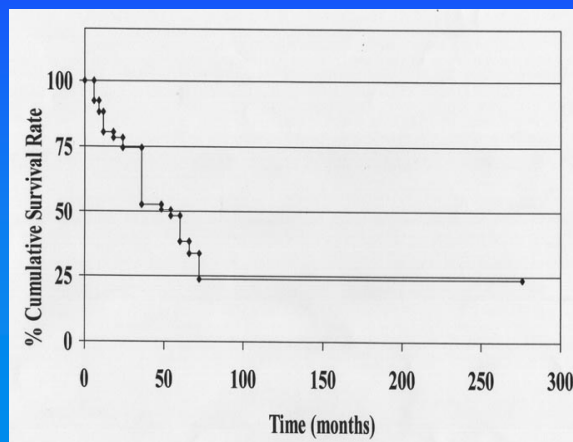
CTQ

Treatment Options

- Non-Operative
- Core Decompression
- Arthroscopic Debridement
- OATS/Mosaicplasty
- Uni-TKR
- TKR

Treatment of Atraumatic ON Knee

41 Treated initially non-operative
8 (20%) clinical success @ 8 y. follow

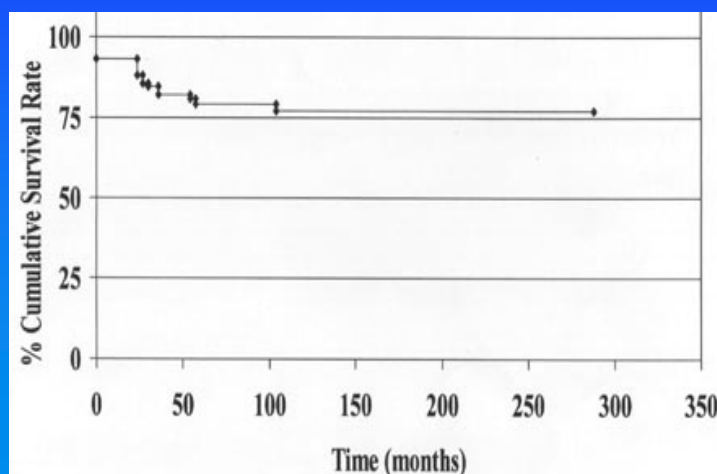


CTQ

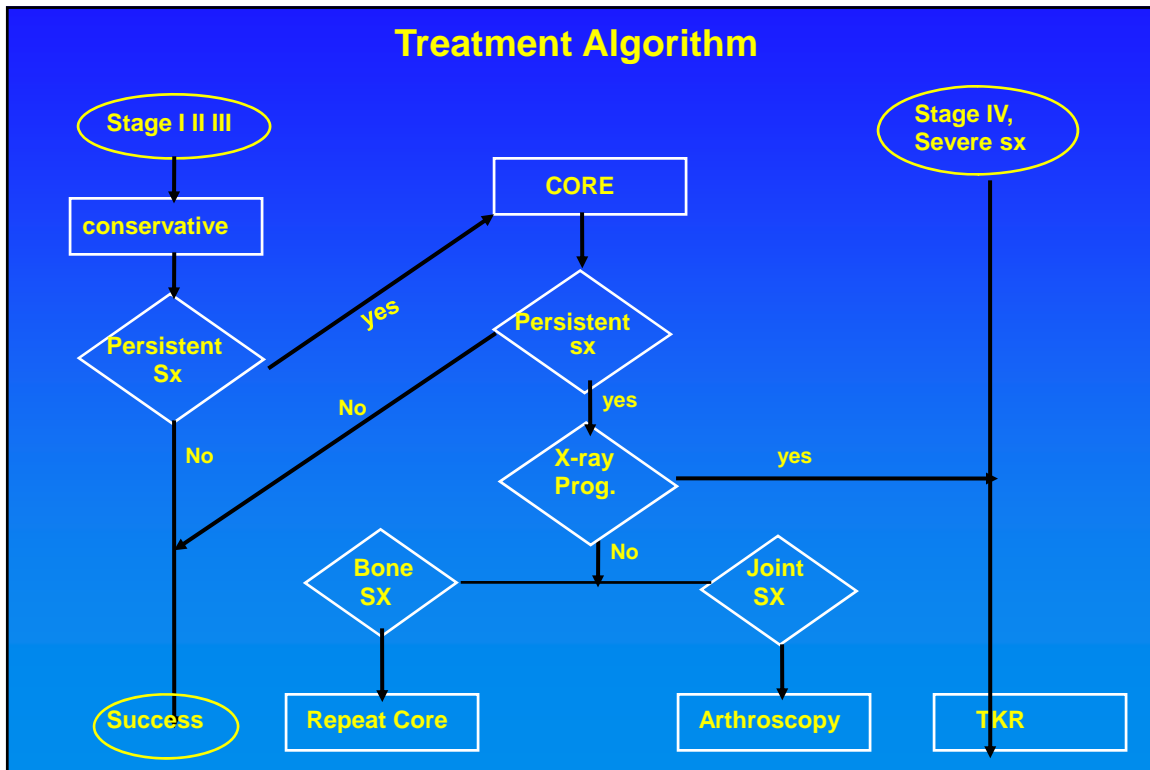
Mont et al
JBJS 2000

Treatment of Atraumatic ON Knee

91 Knees core decompression
79% Good or excellent @ 7 year follow



Mont et al
JBJS 2000



Treatment of Atraumatic ON Knee

TKR

- Never do Uni (Uni is good for SPONK) CTQ
- Always use cement CTQ
- When bone terrible use stems CTQ