Evaluation of Painful Total Knee Replacement

DR. (PROF.) ANIL ARORA
MS (Ortho) DNB (Ortho) Dip SIROT (USA)
FAPOA (Korea), FIGOF (Germany), FJOA (Japan)
Commonwealth Fellow Joint Replacement
(Royal National Orthopaedic Hospital, London, UK)
Senior Knee and Hip Replacement Surgeon
Associate Director
Department of Orthopaedics and Joint Replacement
Max Superspeciality Hospital, Patparganj, Delhi (India)
Email: anilarora@delhiorthojournal.com
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Pain

The pain shall be largely relieved in most of the cases by 3 months postoperatively.


Study involving more than 8000 patients reported that 19.8% had persistent pain one year after operation.
PAIN

Intrinsic factors

- Infection
- Instability
  - Mediolateral
  - Anteroposterior
- Malalignment of components
- Soft-tissue impingement
  - Component overhang
  - Popliteus impingement
  - Patellar clunk
  - Fabellar impingement
Intrinsic factors

- Stiffness/Arthrofibrosis
- Wear/Osteolysis
- Extensor mechanism problems
  - Patellar maltracking
  - Patella baja + alta
  - Unresurfaced patella
  - Undersized patellar button with lateral facet impingement
  - Oversized patellar button with overstuffing of patellofemoral joint
  - Extensor mechanism disruption
- Recurrent Haemarthrosis
PAIN

Neuroma

• Injury of the infrapatellar branch of the saphenous nerve

Complex Regional Pain Syndrome

• Uncommon cause

• Cutaneous Hypersensitivity & Discoloration

• Swelling and Stiffness

• Radiographs may show localized patchy osteoporosis.
PAIN

- Pes anserinus bursitis
- Stress / peri-prosthetic fracture
- Tendinopathy (patellar/quadricep)
- Heterotopic ossification
- Metal Hypersensitivity

Others

- Pigmented villonodular synovitis
- Rheumatoid arthritis
- Paget’s disease
- Foot and ankle pathology
PAIN - **Extrinsic factors**

- Hip pathology
- Neurological
- Vascular - DVT
- Psychological disorder
Associated Symptom

• Stiffness

• Instability

.........Intrinsic Cause
Unchanged Pain

......Extrinsic Cause !!
History: Pain - Characteristics

**Pain on weight bearing**
- Improves on sitting.
  = Mechanical

**Start-up pain**
- Initial weight bearing and improves after several steps.
  = Instability
- Continued start-up pain is suggestive of loosening of the tibial component.

**Chronic pain in full extension**
- Overstuffed extension space.
Pain Characteristics

**Pain with full flexion**
- Impingement between posterior femoral osteophyte and tibial component
- Overstuffing of the flexion space.

**Pain associated with stair climbing or descent**
- Dysfunction of the extensor mechanism.
- Patellar maltracking or subluxation

**Rest pain and continuous postoperative pain that never improved**
- Infection or CRPS.
# Pain - Characteristics

## Early post-operative pain

- **Infection (Acute)**
- **Indication (wrong)**
- **Inadequate balancing of the soft tissues**
- **Improper alignment of Prosthesis**
- **Impingement (Soft-tissue)**
Pain - Characteristics

**Delayed onset**

- **Loosening** of a component,
- **Wear** of the polyethylene,
- **Late Ligamentous** instability,
- **Late haematogenous** infection,
- **Stress fracture**.
Clinical Examination

• Signs of Infection

• CRPS: atrophic dusky skin, discoloration.

• Limb Alignment and Gait Pattern.

• Point Tenderness: Patellar, Ant/Post/Lat/Med.

• Knee Effusion (Recurrent Haemarthrosis)
 Persistent Flexion Contracture > 10°

ROM of <90° Flexion

Pain or functional disability

## Stiffness

### Lack of Extension
- Improper correction of FFD
- Inadequate resection of distal femur
- Posterior Femoral osteophytes
- Component malposition
- Overstuffing of the extensor space

### Lack of Flexion
- Tight PCL
- Patella baja
- Lack of tibial posterior slope
- Quadriceps contracture
- Suprapatellar heterotopic ossification
Instability - Characteristics

- Patients are symptomatic:
  - going up and down stairs /
  - start-up pain /
  - locking

- Medial-lateral instability

- Instability in the AP plane
Stability

Medio – Lateral
Antero-posterior

Permissible Laxity Approximately 4°
Instability

- **Early post-operative period**
  - Uncorrected pre-operative ligamentous imbalance
  - Improper intra-operative ligamentous balancing
  - Mismatch of the flexion-extension gap
  - Iatrogenic injury to the ligaments during surgery
  - Pre-existing neuromuscular pathology

- **Late instability**
  - Malalignment leading to progressive stretching of ligaments
  - Wear of polyethylene
  - Loosening of the component and collapse

Imaging

Plain Radiographs

Sequential radiograph over a period of time is key...
Joint Line
Femoral Component
Tibial Component
Loosening

- Serial radiographs
  - progressive increase in a radiolucent line
  - change in component position and subsidence
Aseptic / Mechanical Loosening

- Wear and Osteolysis
- Incomplete cementation
- Poor component alignment
- Inadequate ligamentous balancing
- Rheumatoid arthritis
- TKR with Neurological Disorders
TO SEE PATELLAR TRACKING
PATELLOFEMORAL PROBLEMS!
Patellar Dysfunction

- Tibial / Femoral component
  - Internal rotation
  - Medialization
  - Excessive Valgus

- Anterior placement of femoral Comp.

- Increased Combined thickness

- Asymmetric patellar resection

- Lateral positioning of the patellar component

- Raising the joint line (artificial patella baja)
Lateral patellar facet syndrome
Medial Impingement
Under resection of patella
Patellar fracture / Ischaemia
Patellar clunk & synovial hyperplasia

Entrapped
Suprapatellar
Nodule in
IC Notch

During Extension
it clunks out
Focus of Laboratory Tests is to distinguish between Septic and Aseptic Causes.
ESR
- Peak 5-7DAYS
- Pre-operative levels in 3 months.
- Can remain elevated for as long as one year.
- An ESR > 30 mm per hour has
  - Sensitivity 82%,
  - Specificity of 85% for infection
  - PP value of 58%
  - NP value of 95%.

CRP
- Early peak 2-3 days after surgery,
- Usually normal - 3 wks after operation.
- CRP value > 10 mg/l
  - 96% sensitivity
  - 92% specificity for infection
  - 74% PPV
  - 99% NPV
  - ESR+CRP----Sensitivity 0.95, NPV 0.97

IL-6
- Elevated (> 10 pg/mL)
- Peak - first 6 to 12 hours
- Baseline- 48 to 72 hours.
- A combination of CRP and IL-6 has excellent sensitivity
Aspiration

- No antibiotics for 2 weeks
- Multiple aspirations

Clinical data:
- Smear, Gram’s Stain
  - Leukocyte Count
    - Count >2500/ml
    - >60% PMNL
  - Culture
- Sensitivity: 65.4%
- Specificity: 96.1%

Reference:
Clin Orthop 345:8,1997
CT Scan

- To assess the rotation of Tibial and Femoral components

- Lytic Areas beneath the Implants
Scintigraphy

- Triple phase Technetium 99-m-HDT Scan
- Indium-111 leucocyte Scan
- Technetium Sulphur Colloid Bone Marrow Scan
Triple phase Technetium 99m Scan

- Sensitive but not very specific
- First two phase may be positive up to 1 year
- Third phase may persist positive indefinitely

- The characteristic findings with an infected TKR are **increased uptake in all three phases** of the scan.
- **The lack of increased uptake in the first two phases** is an important negative finding that would **mitigate against the diagnosis of infection**.
**Indium-111 Leucocyte Scan**

- 95% Sensitive
- **100% Negative PV**
- Positive Scan-Limited Value
- Negative Scan-Strong

  Predictor of absence of Infection

**Technetium Sulphur Colloid Bone Marrow Scan**

- Accumulates in RE system
- Hyperplastic Marrow - Positive Indium and SC Scan
- Infective Focus - **POSITIVE** Indium and **NEGATIVE** SC Scan
- **INCONGRUENT** Scan - 90% chance of Infection
- **CONGRUENT** Scan - Both Positive-Less likelihood of Infection
Clinical value of SPECT/CT for evaluation of patients with painful knees after total knee arthroplasty-a new dimension of diagnostics?

Michael T Hirschmann¹*, Praveen Konala², Farhad Iranpour², Anna Kerner³, Helmut Rasch³, Niklaus F Friederich¹

Abstract

Background: The purpose of our study was to evaluate the clinical value of hybrid SPECT/CT for the assessment of patients with painful total knee arthroplasty (TKA).

Methods: Twenty-three painful knees in patients following primary TKA were assessed using Tc-99m-HDP-SPECT/CT. Rotational, sagittal and coronal position of the TKA was assessed on 3D-CT reconstructions. The level of the SPECT-tracer uptake (0-10) and its anatomical distribution was mapped using a validated localization scheme. Univariate analysis (Wilcoxon-Mann-Whitney, Spearman`s-rho test, p < 0.05) was performed to identify any correlations between component position, tracer uptake and diagnosis.

Results: SPECT/CT imaging changed the suspected diagnosis and the proposed treatment in 19/23 (83%) knees. Progression of patellofemoral OA (n = 11), loosening of the tibial (n = 3) and loosening of the femoral component (n = 2) were identified as the leading causes of pain after TKA. Patients with externally rotated tibial trays showed higher tracer uptake in the medial patellar facet (p = 0.049) and in the femur (p = 0.051). Patients with knee pain due to patellofemoral OA showed significantly higher tracer uptake in the patella than others (p < 0.001).

Conclusions: SPECT/CT was very helpful in establishing the diagnosis and guiding subsequent management in patients with painful knees after TKA, particularly in patients with patellofemoral problems and malpositioned or loose TKA.
SPECT/CT

LOOSE TIBIAL COMPONENT

LOOSE FEMORAL COMPONENT
Magnetic Resonance Imaging

- Limited role due to artefact

Techniques to improve the quality of the image

- Increasing the imaging bandwidth
- Reducing time to echo (TE)
- Using fast spin echo train
- Avoiding chemical fat saturation
- Gradient echo imaging after joint replacement.
Arthroscopy aids diagnosis

- Proliferative synovitis
- Soft-tissue impingement
- Structural damage to components which is otherwise not visible on radiographs.
1 in 8 will still have pain !!!!
Thank you!