PREVALENCE OF STIFFNESS IN TKA

Kim et al  JBJS 86A, July 2004
- 1000 knees
- 1.3% prevalence of stiffness
  - flexion contracture ≥ 15º
  - flexion < 75º

GOALS OF TKA

#1 • relieve pain
#2 • improve function
#3 • maximize ROM

GOAL #3 MAXIMIZE ROM

May be the most poorly understood part of knee replacement

ROM CRITERIA FOR ADL’s

Level walking 65º
Ascending stairs 85º
Descending stairs 90º
Rising from chair 100º

Greater in short people!
THE STIFF TKA

What causes it?
How do you prevent it?
How do you treat it once it occurs?

STIFF TKA

Preoperative Factors
Intraoperative Factors
Postoperative Factors
Treatment Methods

PREOPERATIVE FACTORS IN MAXIMIZING ROM

- Realistic Expectations (surgeon and patient)
  - Ritter CORR 143
    - postop motion correlates with preop motion
  - Parsley et al CORR 275
    - patients with limited motion preop improve
    - patients with > 105° lose motion in a PCR knee
    - no difference in degenerative and inflammatory patients pre- and post-op ROM

PREOP FACTORS – Red Flags

GOAL OF TALK

Preoperative Factors
Intraoperative Factors
Postoperative Factors
Treatment Methods
**INTRAOPERATIVE FACTORS IN MAXIMIZING ROM**
- Factors directly under a surgeon's control
  - approach
  - ligament balancing
  - bone resection
  - prosthetic design
  - closure

**INTRAOPERATIVE FACTORS - APPROACH**
- Mid vastus vs. median parapatellar
  - no significant difference
  - Keating JAP Vol 14 #1
- Limit anterior dissection
  - ? association with heterotopic ossification
  - keep debris out of suprapatella pouch

**INTRAOPERATIVE FACTORS – LIGAMENTOUS BALANCING**
- May be most important intraoperative factor
  #1) must do a complete concave release to catch up with convex side or risk tightness on one side during the flexion arc

**INTRAOPERATIVE FACTORS – LIGAMENTOUS BALANCING**
- May be most important intraoperative factor
  #2) must create a rectangular flexion gap or risk a “nutcracker” effect as the knee bends

**INTRAOPERATIVE FACTORS – BONE RESECTION**
- Do not increase patellofemoral joint height
  - ↑ patella thickness
  - reverse notch
- Leads to excessively tight extensor mechanism
INTRAOPERATIVE FACTORS – 
BONE RESECTION

- Do not increase patellofemoral joint height
  - ↑ patella thickness
  - reverse notch
- Leads to excessively tight extensor mechanism

Oversized femoral component (i.e.) under-resected posterior femur
  - leads to overstuffed flexion gap and subsequent loss of ROM

Undersized femoral component (i.e.) over-resected posterior femur
  - leads to early tray/posterior femur impingement

Posterior osteophyte retention
  - leads to early tibial tray impingement and subsequent loss of ROM

Inadequate proximal tibial resection
- modular tibial tray metal 3-5 mm. thick
  - poly thicker than the F/E gap
  - thin poly
  - up to 10 mm. acceptable with regard to bone strength

- Femoral component extension
- Reverse tibial slope
  - limits flexion
- Excessive tibial slope
- Femoral component flexion
  - can lead to a flexion contracture
INTRAOPERATIVE FACTORS – BONE RESECTION

Inadequate distal femoral resection
– lower joint line leads to flexion contracture

INTRAOPERATIVE FACTORS – PROSTHETIC DESIGN

PCS vs. PCR

Hirsch  CORR 309

PCS significantly greater ROM than PCR

Review of Literature

Emerson - CORR 368

– 50 patients in each group
– extension vs. flexion closure

112° 117°
– same surgeon and prosthesis

Masri - CORR 331

– 0 significant difference
– multiple surgeons and prostheses

INTRAOPERATIVE FACTORS – MAINTENANCE OF POSTERIOR OFFSET

INTRAOPERATIVE FACTORS - CLOSURE

Range of Motion After Total Knee Arthroplasty
The Effect of Implant Design and Weight-Bearing Conditions

Journal of Arthroplasty, #13, 1998

• Fluoroscopic study
• PCS greater ROM than PCR
• Paradoxical roll forward of PCR knees
INTRAOPERATIVE FACTORS

✦ Drop and dangle

GOAL OF TALK

Preoperative Factors
Intraoperative Factors
Postoperative Factors
Treatment Methods

POSTOPERATIVE FACTORS IN MAXIMIZING ROM

✦ Formal physical therapy
✦ CPM
✦ Overuse syndrome
✦ Follow-up schedule

POSTOPERATIVE FACTORS - PT

✦ Home physical therapy
  – advantage – patient convenience
  – disadvantage – variable quality
✦ Office physical therapy
  – advantage – quality control
equipment access
  – disadvantage – patient inconvenience

POSTOPERATIVE FACTORS – OVERUSE SYNDROME

✦ Usually Type AAA males
✦ Eager to return to work or play
✦ Physical therapy to excess
✦ Treatment – immobilization
  NSAID's

POSTOPERATIVE FACTORS – Follow-up Schedule

✦ Identify the patient with predisposition to stiffness
✦ Sometimes only evident postop
✦ Manipulate at 4-6 weeks
✦ See all within 2 weeks of surgery
  problem patient routine patient
  – more intense P.T.
  – ↑ frequency of office visits
  flu at 5-6 wks postop
GOAL OF TALK
- Preoperative Factors
- Intraoperative Factors
- Postoperative Factors
- Treatment Methods

TREATMENT METHODS
- Manipulation
- Arthroscopic debridement
- Open debridement +/- revision of components

TREATMENT METHODS - MANIPULATION
- "Timing is everything"
- Fibroblasts mature at 6-8 weeks
- Proper follow-up schedule is essential to time manipulation before six weeks

COMPILATION
- Fatal PE after manipulation
  Stecker JBJS, Jan. '96
TREATMENT METHODS - MANIPULATION

Keys to avoidance
- Early identification of problem patient
- Early manipulation first 4-6 weeks "just do it"
- Proper technique "A stiff knee is infinitely better than a patella tendon rupture or femoral fracture"

TREATMENT METHODS - MANIPULATION

Flexion Contracture
- Effective if done early and was correctable at time of surgery
- Most minor flexion contractures stretch out in time

McPherson, JAP Vol 9, #5

TREATMENT METHODS - MANIPULATION

Ways to hasten flexion contracture resolution
1. Gait training heel-toe
2. Shoe lift on opposite foot
   - Patient must then stretch posterior capsule to get to the floor

TREATMENT OPTIONS - MANIPULATION

Passive manipulation
- No data
- Useful in late cases of recalcitrant flexion contractures or failed manipulations

Surgical Treatment of Flexion Contractures
Fehring et al., AAHKS, 2006

- 14 patients > 15° flexion contracture
- 10/14 complete resolution
- 1 patient 5° FC
- Significant improvement
  - Extension p <0.0001
  - Flexion p = 0.002
  - Total arc of motion p <0.0001

Predictive Risk Factors for Stiff Knees in TKA
Ghandi, et al, JAP, 2006

1200 Knees
3.7% < 90°

Risk Factors
- Preop flexion
- Intraop flexion
- Patella baja pre- or post-op
### TREATMENT METHODS - ARTHROSCOPIC DEBRIDEMENT

**Arthroscopic release of PCL for stiffness**
- Williams [CORR 331]
  - 10 cases
  - average pre-op ROM 0-73
  - average post-op ROM 0-112

**Arthroscopic treatment for arthrofibrosis**
- Bocell [CORR 271]
  - 7 cases - 2 successes
- Sprague [CORR 166]
  - 1 case - not successful

**Babis et al., JBJS 83A, 2001**
- only 7 patients
- debridement and exchange to thinner poly
- very poor results
- mean ROM arc 58° (40°-70°)

### TREATMENT METHODS – DEBRIDEMENT AND POLY EXCHANGE

**18 Knees**
- aggressive PT postop 3-5 times/week
- functional bracing
- mean ↑ in ROM 31°
- only 2/3 had G/E Knee Society Scores

### TREATMENT METHODS – REVISION TKA

**Nicholls and Dorr**
- 12 patients 13 knees
- 9 revised for flexion contracture
- 3 revised for ↓ ROM
- 11 of 12 satisfied, yet ROM improved in only 3 patients

**Christensen et al.**
- 11 knees
- preop average ROM 39°
- postop average ROM 83°
- all patients satisfied

### THE STIFF TKA

What causes it?
How do you prevent it?
How do you treat it once it occurs?
KEYS TO SUCCESS - AVOIDANCE

... in the end ...

Italian Society of Muscles, Ligaments and Tendons

Thank you

Thank you