

# STIFFNESS AFTER TKA PRE, PER AND POST OPERATIVE CAUSING FACTORS

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# INTRODUCTION

**Stiffness is one of the most common complications following TKR, causing frustration to both the surgeon and the patient.**

# DEFINITION

- Definition has changed over the time
  - 1990: Nicholls et al described stiffness as flexion  $< 45^\circ$  and flexion contracture of  $20^\circ$
  - 2002: Christensen et al described stiffness as flexion  $< 75^\circ$
  - 2006: Yercan et al described stiffness as flexion  $< 95^\circ$  and flexion contracture of  $10^\circ$

**Surgeons and patients have greater expectations for their knee replacements  $>20$  years ago.**

# FUNCTIONAL LIMITATION

Walking with a flexed knee gait requires constant quadriceps activation, leading to an increased energy consumption and greater fatigue.

Without sufficient flexion, activities of daily living such as stair climbing, rising from a chair, and tying one's own shoelaces can be challenging.

Although the traditional teaching is that a stiff knee should not be painful, patients who are fighting a nonfunctional range of motion will have pain during these activities.

# PRE OP FACTORS

- Preoperative range of motion is the best predictor of postoperative range of motion.
- The treatment of stiffness after TKR must begin with the management of patient expectations.
- Most patients will gain approximately 10° to 15° from TKR, however, some hyperflexible patients will lose motion
- A history of prior surgery, particularly a HTO and the diagnosis of posttraumatic osteoarthritis has also been associated with stiffness post-TKR.
- Therefore, these patients should be aware that there is a greater incidence of postoperative stiffness when compared to a virgin osteoarthritic knee.

Table 1

## Average Change in Postoperative Knee ROM<sup>a</sup>

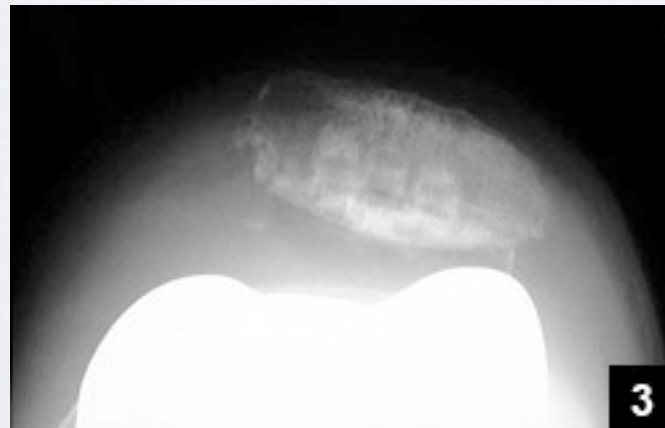
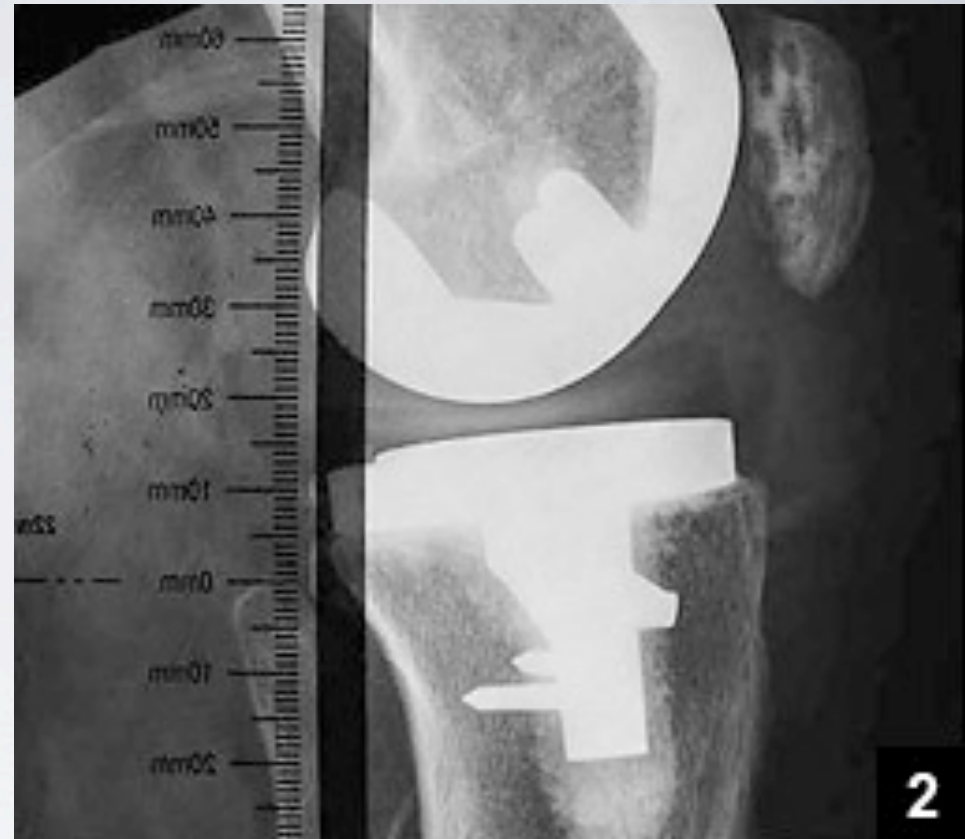
| Preoperative Flexion | Δ ROM From TKR |
|----------------------|----------------|
| <80°                 | +27°           |
| 81°-102°             | +12°           |
| 103°-115°            | +3°            |
| 116°-122°            | -3.3°          |
| >123°                | -10.8°         |

Abbreviations: ROM, range of motion; TKR, total knee replacement.  
<sup>a</sup>Using a cruciate-retaining knee replacement, stratified by preoperative knee flexion.

# INTRA OPERATIVE FACTORS

- Meticulous surgical technique is critical for the realization of good motion.
- The implants must be positioned properly with regard to the coronal and sagittal planes.
- The goal of tibial resection is to produce a cut bony surface perpendicular to the mechanical axis, with a few degrees of posterior slope. The aim of femoral resection is to recreate neutral mechanical limb alignment with 3° to 6° valgus, and 0° to 4° of flexion.

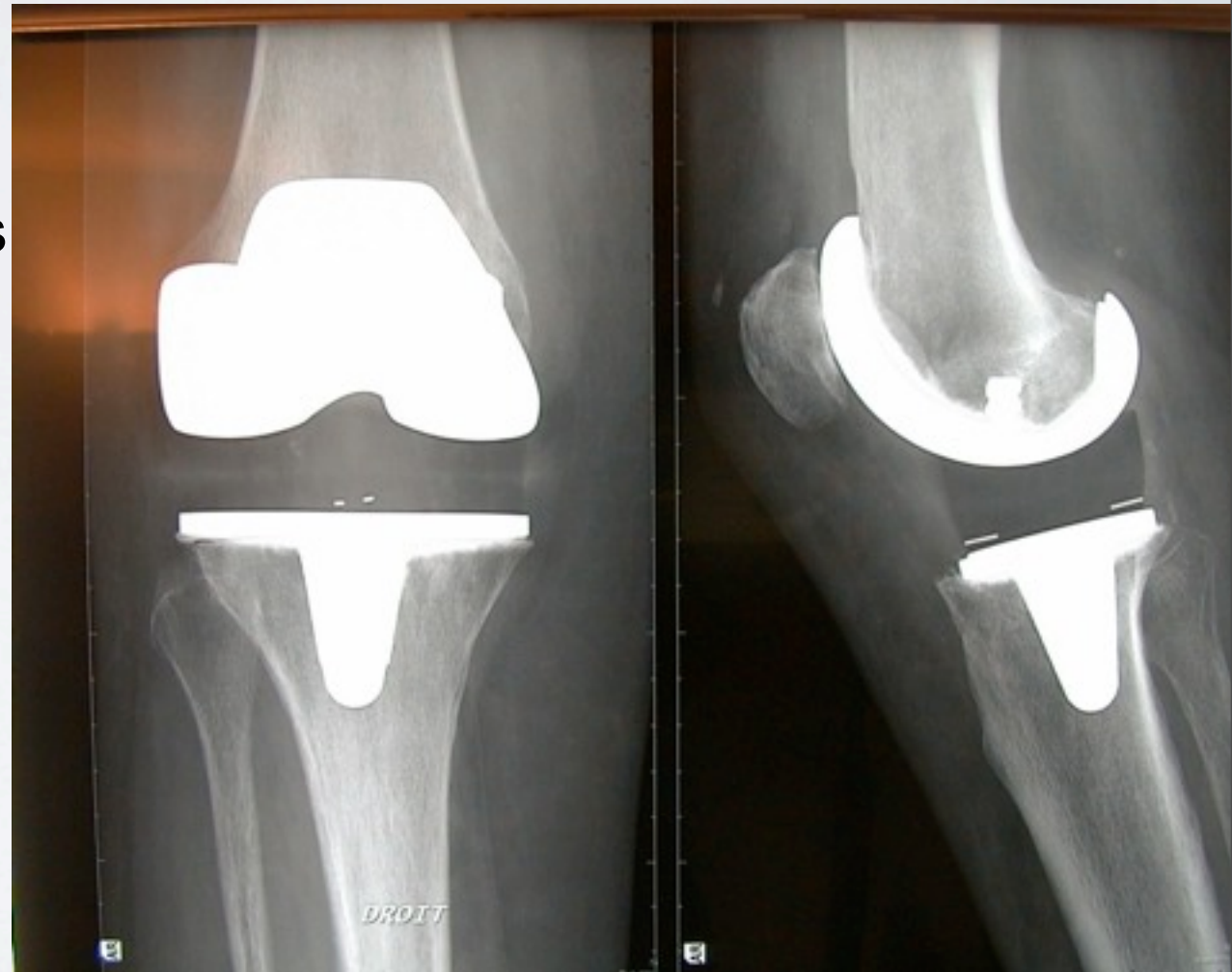
# INTRA OPERATIVE FACTORS



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Soft tissue balancing also has a great effect on postoperative motion. If the collateral ligaments are not well balanced, the kinematics of the knee will suffer.

A varus knee left with medial collateral ligament tightness will not bend as well as a well-balanced knee.





# INTRA OPERATIVE FACTORS

- Balancing the flexion and extension gaps is another important step in achieving a knee that can bend.
- Flexion and extension gaps should be equal to allow for the smooth transition from extension into flexion. These factors can be controlled independently by the amount of bone resected from the distal and posterior femur.
- Therefore, determining both the level of the distal femoral resection and the size of the femoral component are crucial. For a cruciate retaining knee, the tension in the posterior cruciate ligament (PCL) may also affect the balance of the flexion/extension gaps

# INTRA OPERATIVE FACTORS

- Rotational malalignment will also affect motion by creating potential conflict with the soft tissues, femoral and tibial implants, and patellar and femoral implants.
- The femoral component must be aligned with the epicondylar axis to create a symmetric flexion space
- the tibial component must be aligned with the middle one-third of the tibial tubercle to allow for good patellofemoral tracking.

# INTRA OPERATIVE FACTORS

- **Implant Considerations**

The size of the femoral component may affect the flexion gap.

Therefore, an array of sizes to match the native anatomy of the femur are essential

Most modern systems have 6 to 8 sizes that allow for incremental sizing and reproduction of the posterior offset.

Some implants are designed for “high-flexion.” This refers to the ability to allow a greater ROM prior to impingement as compared to the standard implant.

However, clinical studies and meta-analyses comparing high-flexion with standard implants have not demonstrated any difference in ROM.

1. McCalden RW, MacDonald SJ, Bourne RB, Marr JT. A randomized controlled trial comparing “high-flex” vs “standard” posterior cruciate substituting polyethylene tibial inserts in total knee arthroplasty. *J Arthroplasty*. 2009; 24(6 Suppl):33-38.
2. Malik A, Salas A, Ben Ari J, Ma Y, González Della Valle A. Range of motion and function are similar in patients undergoing TKA with posterior stabilised and high-flexion inserts. *Int Orthop*. In press.
3. Gandhi R, Tso P, Davey JR, Mahomed NN. High-flexion implants in primary total knee arthroplasty: a meta-analysis. *Knee*. 2009; 16(1):14-17.

# POST OPERATIVE FACTORS

- The effectiveness of postoperative analgesia will have an effect on motion after TKR.
- Many surgeons and anesthesiologists have adopted, regional nerve blocks, and local infiltration of anesthetics to achieve more effective pain control.
- The more complete the control of postoperative pain, the greater the patient's ability to participate in physical therapy.
- it is an important aspect that must be understood as part of the counseling process; the surgeon and patient will enter into a cooperative agreement to obtain the best possible result.

# POST OPERATIVE FACTORS

Complex regional pain syndrome should be considered when the pain is out of proportion to the physical findings and/or no objective data exist to explain the lack of motion postoperatively.

The knee may appear slightly erythematous and will be hyperalgesic to the touch. If complex regional pain syndrome is suspected, a diagnostic/therapeutic sympathetic block may aid in pain control.

# POST OPERATIVE FACTORS

- Occult infection is another consideration when dealing with stiffness post-TKR.
- A low-grade infection may cause underlying inflammation and pain that will limit the patient's ability to participate in therapy.
- Systemic laboratory indicators and a joint aspiration are helpful to rule out this potential cause.

# ARTHROFIBROSIS

Despite a surgeon's best efforts and surgical prowess, some patients will continue to develop frustrating stiffness post-TKR.

Scar tissue formation that has yet to be identified.

These patients will, no matter what, continue to develop arthrofibrosis as part of their healing process, despite flawless technical execution of their TKR.

# CONCLUSION

- Stiffness is one of the most frequent complications of TKR.
- It is multifactorial with some elements out of the surgeon's control
- Prevention is paramount, with careful patient selection, preoperative counseling, and meticulous surgical technique.
- In approximately 80% of cases of stiffness, treatment will successfully address the problem.