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Why do some knee replacements get stiff?

This article explains to patients the complexity in achieving full range of motion after a knee replacement. All surgeons want happy patients with full range of motion. Some surgeons are better at delivering those results than others. Why? Is it surgeon skill? Is it the patient?

Stiffness vs. Unstable

Stiffness and instability are two separate sides of the same spectrum. There is a bell-shaped distribution curve that describes the number of patients likely to be stiff, perfectly balanced, or unstable. Most arthritic knees are stiffer with less range of motion than a normal non-arthritic knee. This stiffness might be a flexion contracture (not getting the knee fully straight) or limited flexion (not being able to bend the knee all the way back). The distribution curve for arthritic knees is therefore shifted to the left compared to the normal knee distribution curve. (*Fig.1*)

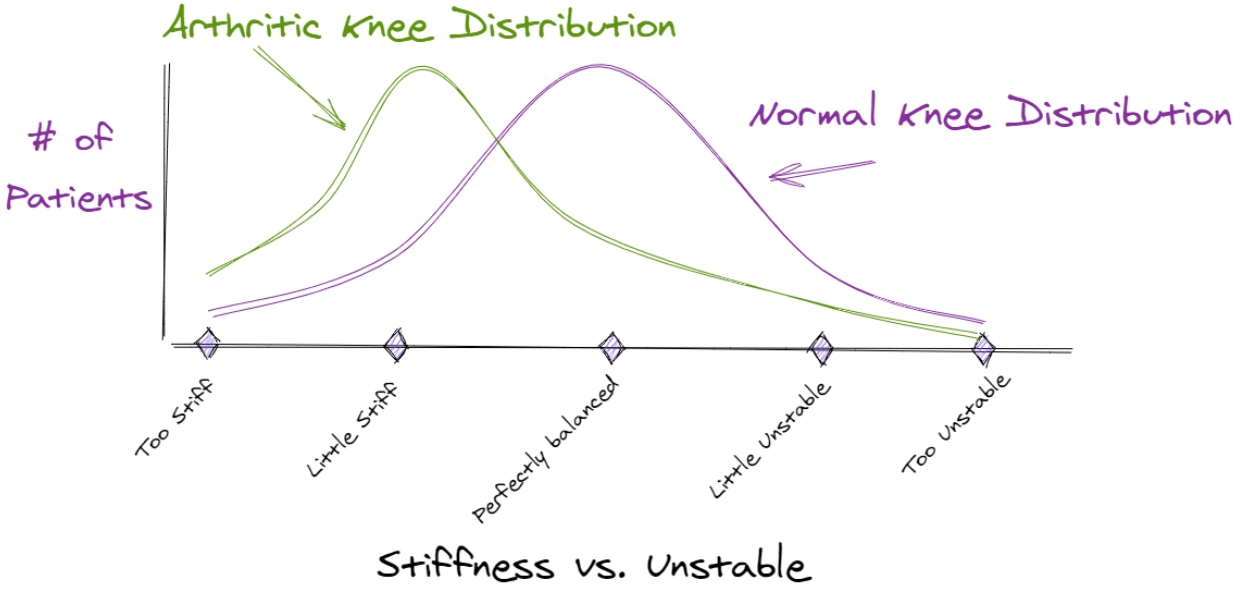


Fig. 1 - Distribution of Stiff vs. Unstable Knees - Normal vs. Arthritic

Amount of bone resection during surgery affects stiffness

During surgery, any surgeon can remove more bone, release more soft tissue, and/or use thinner implants to give the knee replacement more motion, but this “putting the knee in loose” technique increases the risk of instability (*Fig. 2*). Putting the knee in loose effectively shifts the distribution curve to the right and can correct for the patient’s pre-operative stiffness. The more pre-operative stiffness a patient has, the more bone the surgeon will likely remove during surgery.

Any surgeon can remove less bone, release less soft tissue, and/or use thicker implants to give the knee replacement more stability, but this “putting the knee in tight” technique increases the risk of stiffness (i.e. less motion). Putting the knee in tight effectively shifts the distribution curve to the left to hopefully fix any pre-op instability issues.

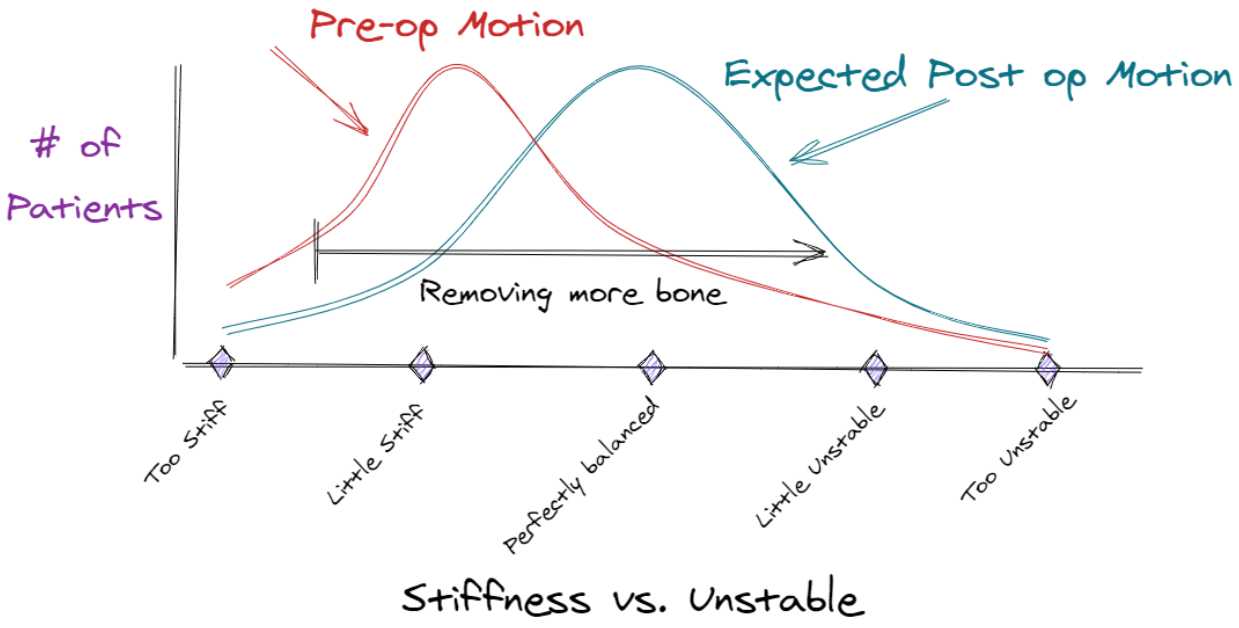


Fig. 2 - Putting the Knee in Loose

Scar Tissue affects Stiffness

Some patients will have significant swelling and make considerable scar tissue in the first couple of months after their knee replacement surgery. The more scar tissue that a patient makes, the stiffer their knee will become. (*Fig. 3*) Scar tissue effectively shifts the curve back to the left. The more post-operative scar tissue the surgeon expects the patient to make, the more bone the surgeon will likely remove during surgery.

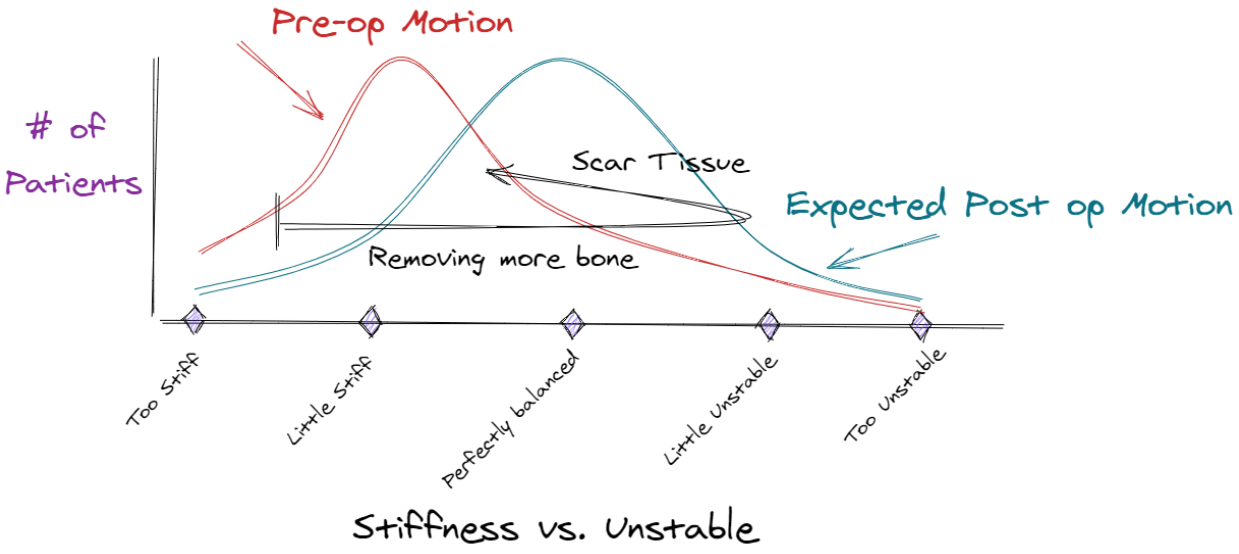


Fig. 3 - Scar Tissue increases Stiffness

Physical Therapy affects Stiffness

All surgeons expect their patients to have some post-operative swelling and some scar tissue formation. The patients perform physical therapy to combat the effects of the scar tissue formation (*Fig.4*). If a patient makes more scar tissue than expected and struggles to regain their range of motion, then the patient will likely do more physical therapy and/or consider a manipulation (the patient receives anesthesia, and then the surgeon gently flexes the knee to the maximum amount).

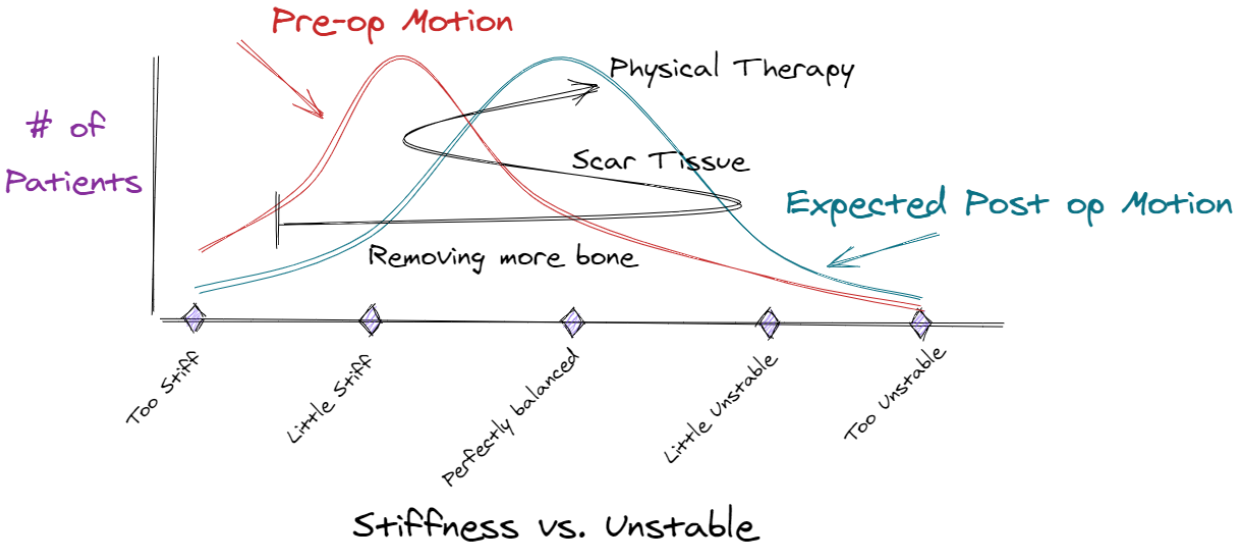


Fig. 4 - Physical Therapy decreases Stiffness

Swelling and Range of Motion

In general, most surgeons make their knee replacements feel “balanced” on the operating table with the expectation that the way the knee feels on the operating table will closely represent the way the knee will feels when the patient is fully recovered. Surgeons expect patients’ knee replacements to be swollen, stiff, and lose some of their initial motion during the first few weeks after surgery and then to regain their full range of motion in a few months as their swelling diminishes.(*Fig.5*) In an unpublished study that I did involving 300 of my knee replacements, the patients who had greater than 2 cm of swelling on post op day #2 ended up with 12 degrees less flexion than the patients who had less than 2 cm of swelling. Excessive swelling can have a deleterious effect on knee range of motion.

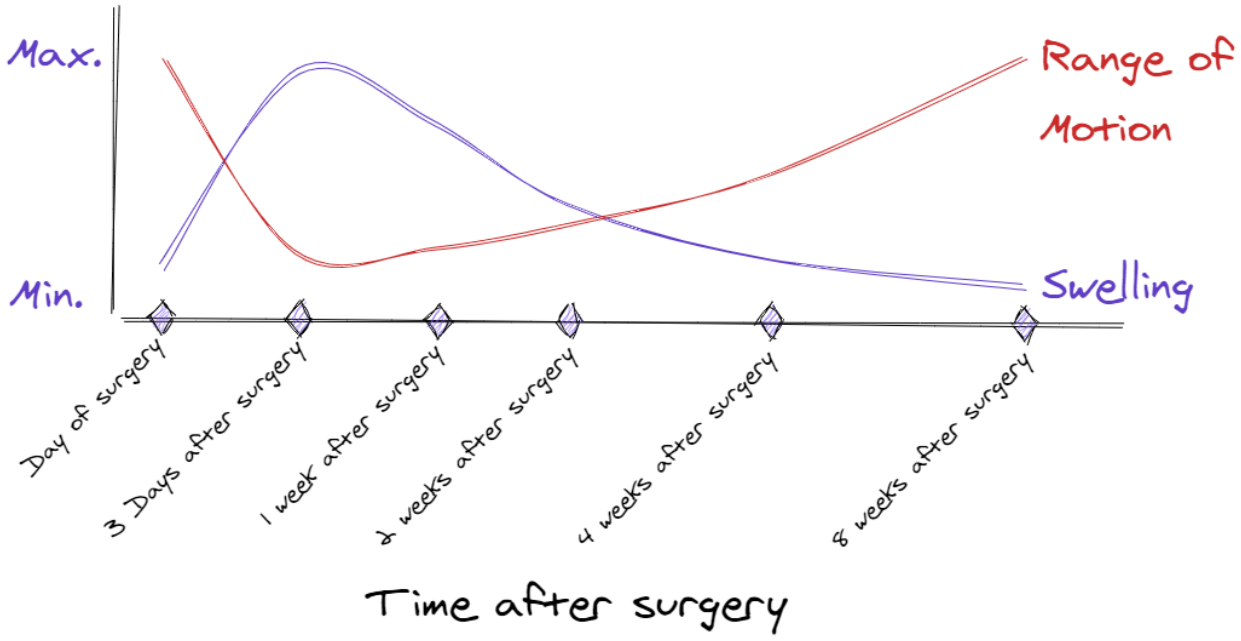


Fig. 5 - Swelling vs. Range of Motion

Considerations for how to perform knee replacement

How loose or tight to initially make a knee replacement is constantly debated among surgeons and depends on many factors:

- How stiff is the patient before surgery?
- How much scar tissue does the surgeon expect the patient to make?
- How hard will the patient work at physical therapy?
- What is a perfectly balanced knee replacement supposed to feel like in the operating room?
- Which complication is the surgeon more interested in avoiding; instability or stiffness?

It is important to realize that any surgeon could make all of their knee replacement patients easily obtain normal range of motion by removing extra bone, but then a number of these patients would have problems with knee instability. Any surgeon could make all of their knee replacement patients have great stability by removing less bone, but then a number of these patients would have problems with their knee range of motion. Therefore, most patients should expect to initially be stiff for a few months after surgery and

approach an ideal balance between stability and range of motion when their knee is healed and the swelling has left (i.e. 3-6 months).

A patient should not get discouraged if they have to work a little harder at achieving their range of motion. Likewise, a patient should not be overly excited if they easily obtain early range of motion.

How Surgeons assess Stability during Surgery

This stability of the knee replacement (how tight or loose) in the operating room is a subjective feel. Many surgeons make provisional bone cuts and insert spacer blocks that represent the thickness of the knee replacement. The surgeon applies a side to side force to the knee and observes how much the knee opens up on one side or the other. If the knee does not open up like the surgeon wants, then the surgeon either removes more bone, releases more soft tissue, or both.

Surgical navigation (and robotics) can also provide some objective data to intra-operative stability. The navigation arrays are drilled into the femur and tibia. The surfaces of the knee joint is registered. The surgeon can then measure the flexion and extension gaps while the surgeon applies a force from side to side.

Risk Factors for Stiffness

There are some patient factors that increase the risk of post-operative stiffness.

- Limited pre-op motion
- Previous knee surgeries
- Previous history of stiffness after other joint surgeries.
- Ankylosing Spondylitis
- Patella Baja
- Likely diabetes
- Likely obesity

There are some surgical risk factors that increase the risk of post-operative knee stiffness.

- Improper balancing between the flexion and extension gaps
- Oversizing the components
- Joint line elevation
- Inadequate bone resection
- Posterior Stabilized (PS) implants typically achieve more flexion than Cruciate Retaining (CR) implants, but also have more instability issues.

How do you limit post operative Stiffness?

Patients should follow their surgeon's instructions. For me, that means patients concentrate on range of motion above all else. When patients walk too much or stand too long, they tend to increase their bone stress pain, increase their swelling, and lose range of motion. This over-activity can set a patient back. For that reason, I encourage patients to walk frequently but for very short distances like from one room to the other. Patients should avoid walking outside for exercise for the first 2 months. Patients should also:

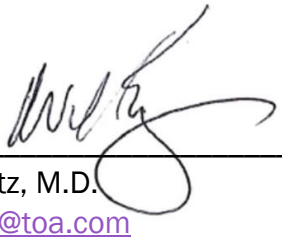
- Elevate their leg.
- Ice their leg every few hours.
- Take anti-inflammatory meds as tolerates.
- Do hourly heel slides.
- Put a pillow under their ankle and elevate their knee so there is nothing but air under the knee.
- Steroids in some situations.

Helpful Videos

- Dr. Kurtz's personal website has an extensive list of educational videos or you can select one of the titles below that relate to knee replacements.
  - https://www.nashvillejointreplacement.com/post-op-knee-education
- Activities
  - https://vimeo.com/429039164
  - https://vimeo.com/430232587
- Swelling and stiffness
  - https://vimeo.com/430749899
- How to optimize your knee recovery
  - https://vimeo.com/429031163
- Watch Dr. Kurtz perform a knee replacement
  - https://vimeo.com/441881538

Thank you for reading this material. Our team is here to help you with your recovery. If you have questions, we will provide you with the answers. Maintaining a positive attitude and staying engaged in your recovery are the best ways to ensure a great outcome.

Best wishes for a speedy recovery,



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