ARTHROFIBROSIS: AN EVIDENCE-BASED APPROACH TO TREATMENT

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- No conflict of interest present in today's presentation.
- The views expressed in these slides and the today's discussion are mine and do not represent GLATA or Purdue University.
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OBJECTIVES

- Discuss and define arthrofibrosis using the most recent published criteria for staging.
- Outline peri-operative strategies for management and prevention of arthrofibrosis.
- Synthesize the literature to demonstrate outcomes of current management techniques.
- Discuss the most appropriate surgical and rehabilitative treatment techniques as guided by published evidence.

INTRODUCTION - HISTORY

- ACL surgery in the 1970's
  - Goal was to give chronic ACL deficient knee stability
  - Patients with acute injuries were almost always given a trial of rehabilitation and bracing
  - Most procedures were extra-articular
  - These are the procedures we used for all other joints then
  - Patients were casted in 30º flexion for 6 weeks for protection
  - Knee stiffness was desired because extra-articular procedures would loosen over time
  - Knee extension greater than 0º was discouraged

INTRODUCTION - HISTORY

- Intraarticular grafts were added to augment the extra-articular procedures beginning in the late 1970's
- Rehab was not altered to account for intraarticular surgery
- Goal was still to make the knee stable by leaving it "slightly" stiff
- But the added intraarticular procedures caused many more stiff knees and patients with disabling arthrofibrosis

HISTORY

- Surgeons started doing ACL reconstruction for acute injuries in early 1980's
  - Mostly for athletes in "high risk sports"
  - Thinking was to do surgery as quickly as possible after the injury
  - Common for a patient to have surgery the same day or within a few days of injury
  - Post-op treatment
    - 6 weeks of casting with knee in 30º of flexion
    - Wanted bone plugs to heal before ROM exercises were introduced
    - Rate of arthrofibrosis was higher with acute surgery

ARTHROFIBROSIS

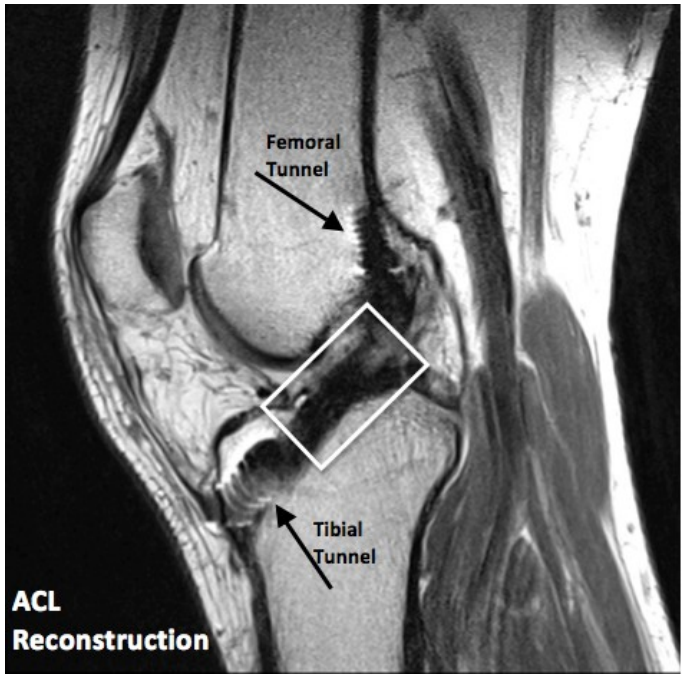
- The intraarticular graft in the notch may cause knee extension problems
- Totally different from our former extra-articular ACL procedures
- The normal ACL is a perfect fit in the notch perfectly with the knee in full extension – to include hyperextension
- The intraarticular ACL procedures are adding a graft that may be larger than the notch or may be placed improperly causing limitation in extension

ARTHROFIBROSIS

- Limited extension post-op allows scar to form in the notch where the ACL graft needs to fit
- Arthrofibrosis is a disabling complication that causes
  - Loss of ROM
  - Loss of strength
  - Pain
  - Stiffness
  - Inability to return to previous levels of activity

ARTHROFIBROSIS

Normal ACL



Normal ACL Reconstruction

Arthrofibrosis

ARTHROFIBROSIS

- Can happen after any intra articular knee surgery
- Arthrofibrosis is any symptomatic loss of knee extension or flexion compared to the normal, contralateral knee

CLASSIFICATION

	Extension	Flexion	Other Features
Type 1	≤ 10° loss	Normal	Passively straightens w/ overpressure
Type 2	>10° loss	Normal	Unable to fully extend w/ overpressure
Type 3	>10° loss	≥25° loss	↓ med/lat movement of patella
Type 4	>10° loss	≥30° loss	Patella infera on x-ray

PREVENTION

- Prevention of arthrofibrosis is always preferred
  - Careful patient selection
  - Appropriate timing of surgery
  - Precise graft placement
  - Well-defined perioperative rehabilitation with emphasis on symmetric knee extension

PREVENTION

- *Pre-operative*
  - Full, symmetric ROM (including hyperextension)
  - Minimal or no knee swelling
  - Good quad control
  - Normal gait
  - Mental preparation including education about pre- and postoperative expectations
  - Appropriate timing of surgery for patients and family

PREVENTION

- *Post-operative*
  - Full, symmetric ROM (including hyperextension)
  - Minimal or no knee swelling
  - Good quad control
  - Normal gait

TREATMENT

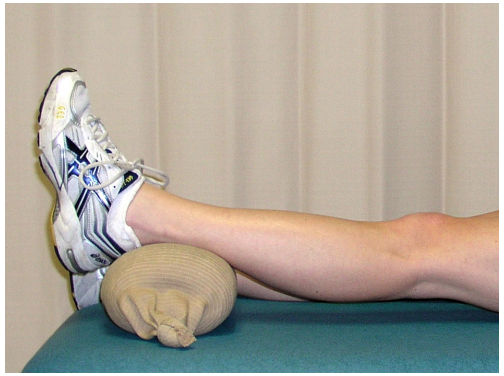
- Best when done as an interdisciplinary team throughout the entire process
- Treatment should include:
  - Rehabilitation
  - Medication management
  - Counseling

TREATMENT - PREOPERATIVE

- Focus on knee extension until maximized
  - Serial casting?
  - Extension device

TREATMENT - PREOPERATIVE

- Focus on knee extension until maximized
  - Therex options
    - Towel stretch or Ideal stretch
    - Sitting extension habit - Heel prop
    - Standing extension habit



TREATMENT - PREOPERATIVE

- Next, active quadriceps control needs to be restored
  - Therex options
    - Leg Pendulum Swings
    - Step-ups
    - Terminal Knee Extension (TKE)
    - LAQ

TREATMENT - PREOPERATIVE

- When extension is maximized and patient has an AHL, can begin knee flexion exercises
  - Therex options
    - Heel slide
    - Wall slide

*Cannot push flexion if there is a loss of extension

TREATMENT - PREOPERATIVE

- Strength is not a big concern and should not be addressed while patient is working on ROM
- If ROM is maximized, single leg strengthening exercises can be use as long as ROM is not impacted
- Therex options
  - Leg press
  - Stepdown
  - Low-impact conditioning (stationary bike, elliptical, stair climber)

SURGERY

- For those who continue to demonstrate ROM deficits, surgery is indicated
  - Ongoing counseling and mental preparation
  - Patients still going through grief cycle should delay
  - Want to ensure appropriate postoperative recovery support
- Surgery techniques will vary by surgeon
  - Excise hypertrophied cyclopes lesion and extrasynovial scar tissue
  - Notchplasty and graft debridement
  - Fibrotic fat pad scar removed
  - Scar resection in the medial and lateral gutters of knee
  - Knee manipulation

TREATMENT - POSTOPERATIVE

- Priorities:
  - Swelling control
    - Compression hose
    - Cryo-cuff
    - Bed rest
  - Extension ROM
    - Extension device
    - Towel stretch or Ideal stretch
  - Leg Control
    - Quad set
    - Straight leg raise

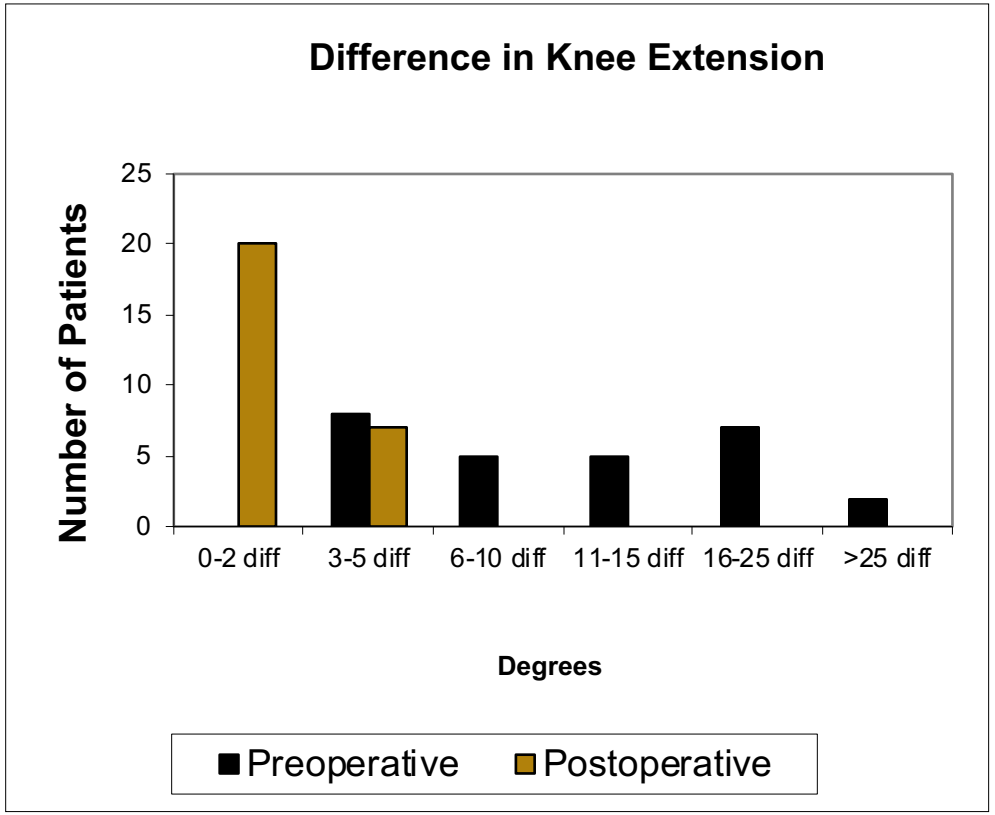
TREATMENT - POSTOPERATIVE

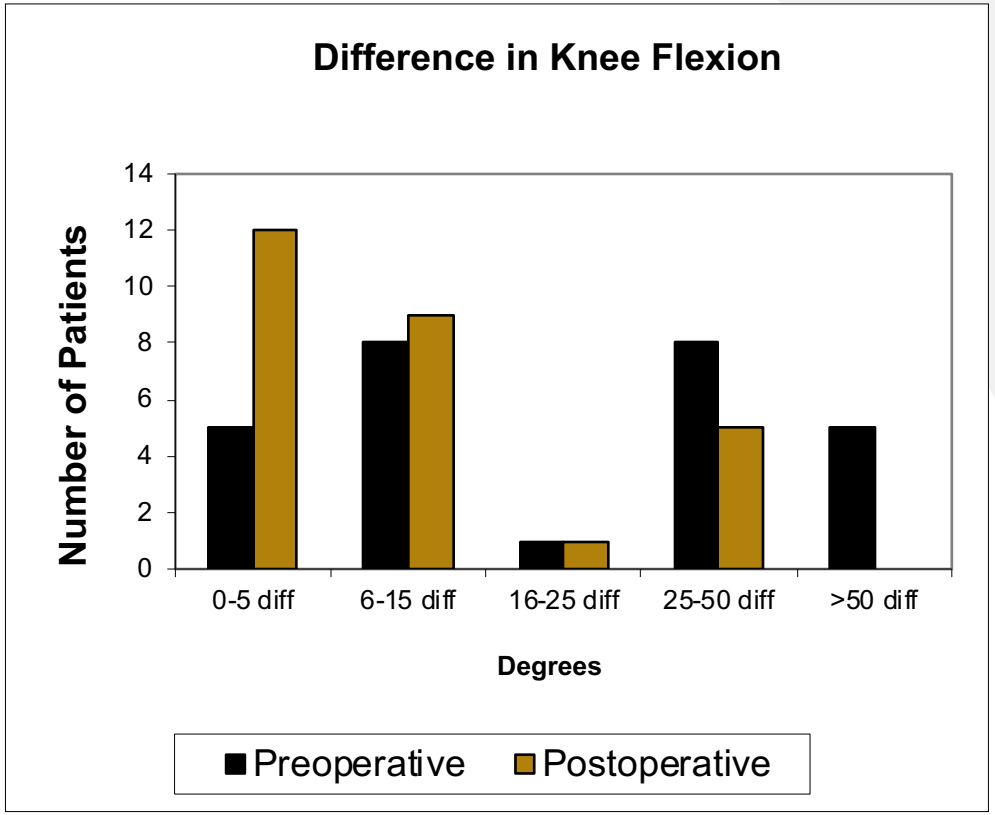
- Progressions
  - ROM (extension) → Full PROM
  - Swelling control → Min to none
  - Quad control → AHL (full AROM)
  - ROM (flexion) → maximize
  - Single leg strengthening → symmetric, but don't lose ROM
  - Low impact conditioning → control swelling, and don't lose ROM

RESULTS

		Preoperative Differences		Postoperative Differences		IKDC	
Classification	Number of patients	Extension	Flexion	Extension	Flexion	Preoperative	Postoperative
Type I	7	7.0	4.0	1.4	1.4	57	78
Type II	5	10.6	23.0	2.0	8.6	55	68
Type III	13	16.4	40.6	1.9	16.8	47	68
Type IV	2	9.0	37.0	3.5	35.0	42	62
All patients	27	12.3	27.4	1.6	11.9	50	69

RESULTS


Difference in Knee Extension
Number of Patients
25
20
15
10
5
0
0-2 diff
3-5 diff
6-10 diff
11-15 diff
16-25 diff
>25 diff
Degrees
Preoperative
Postoperative


Difference in Knee Flexion
Number of Patients
14
12
10
8
6
4
2
0
0-5 diff
6-15 diff
16-25 diff
25-50 diff
>50 diff
Degrees
Preoperative
Postoperative

IKDC COMPARISON

Normal IKDC Scores	Men	Women
Age 18-24	95.5	93.4
Age 25-34	94.6	92.5
Age 35-50	93.1	90.7
Age 51-65	88.4	84.7

Anderson, AJSM, 2006

Postop IKDC Scores – Common Surgeries	
Autologous Chondrocyte Implantation (ACI)[1]	75.8
Autologous Chondrocyte Implantation (ACI) with Meniscus Transplantation[1]	61.0
ACL (PT BTB)[2,4]	87.6 – 95.4
ACL (Quad tendon)[3] *12% arthrofibrosis	90.0
ACL (Allograft)[4]	85.0
ACL (Hamstring)[5]	93.5

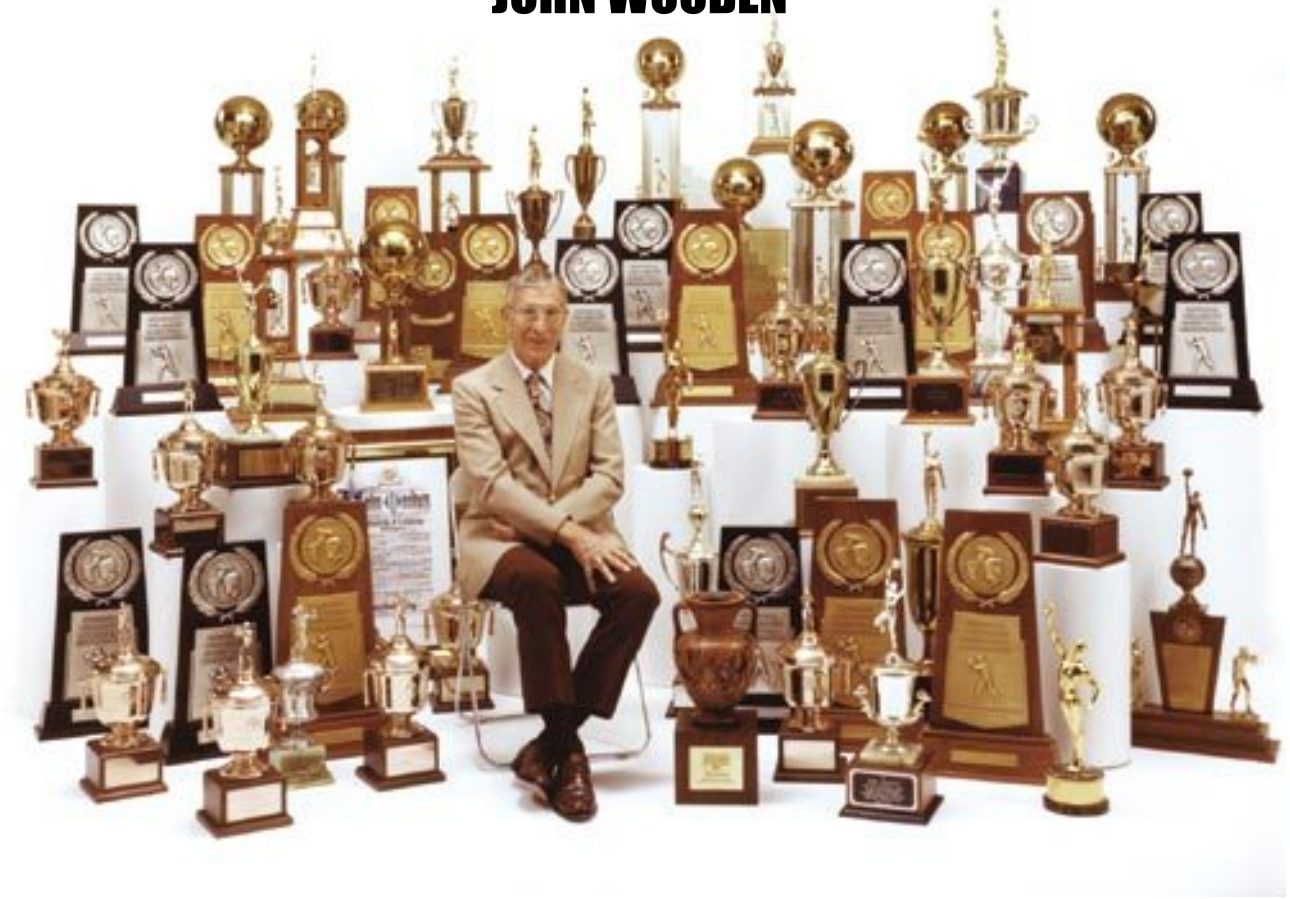
[1]Yoon, Arch Orthop Trauma Surg, 2019
[2]Colombet, Orthop J Sports Med, 2018
[3]Barie, BMC Musculoskelet Disord, 2018
[4]Kane, Knee Surg Sports Traumatol Arthrosc, 2016
[5]Shahpari, Arch Bone Jt Surg, 2018

SUMMARY

- Arthrofibrosis includes a vast amount of pathology and is a permanent condition to manage
- The most effective method of treating this is to prevent the condition
- Focus should be on symmetric knee ROM and leg control
- This should be treated by a team of individuals and not just one person

DON’T EVER MISTAKE ACTIVITY FOR ACHIEVEMENT!

- JOHN WOODEN



QUESTIONS?

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