Anil Bhave, PT
Director Gait Laboratory
Clinical Director Orthopedic Rehabilitation
Rubin Institute of Advanced Orthopedics
Sinai Hospital, Baltimore, Maryland

Arthrofibrosis
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Arthrofibrosis

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Challenging problem

FOR THOSE SEEKING A CHALLENGE

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Rehabilitation needs to be

• Better
• Faster
• Cheaper
Up to what time you can expect improvement?
Cross-linking

- Aggressive passive motion adds trauma, increases inflammation – results in more collagen production, cross-linking, and disorganized orientation of fibers
- Cross-linking of collagen – fibers adhere to one another
- Limits pliability and extensibility of tissues
- Scar tissue extensibility enhanced by tension applied to area

Scanning electron microscopy x30 shows dense hypertrophy of collagen fibrils with extensive cross-linking

Morrey (2000)
Prevention strategy

Discuss Primary TKA study

• Review of 600 patients after Primary TKA performed
• Similar Pain management, inpatient PT program etc
• 150 patients came to RIAO therapy and 441 went to outside facilities
Multimodal approach

- NMES within 1 week
- JAS and CKD fitting in 1 month
- Extension assist orthosis in 6 to 8 weeks
- Astym therapy within 4 to 6 weeks
Results

• Significant reduction in re-admission and MUA rate in RIAO therapy group
• Greater optimal ROM in RIAO therapy group
• No re-manipulations in RIAO therapy group
• Improved satisfaction in RIAO therapy group
Captured Patella Syndrome
International Consensus Definition and Classification of Knee Joint Fibrosis
Kalson NS\textsuperscript{1,2,*}, Argenson JN\textsuperscript{3}, Bellemans J\textsuperscript{4}, Bhave A\textsuperscript{5}, Furnes O\textsuperscript{6}, Gollwitzer G\textsuperscript{7}, Haddad FS\textsuperscript{8}, Hofmann S\textsuperscript{9}, Krenn V\textsuperscript{10}, Lewis P\textsuperscript{11}, Mann C\textsuperscript{12}, Mont M\textsuperscript{5}, Morgan-Jones R\textsuperscript{13}, Oussedik S\textsuperscript{8}, Williams F\textsuperscript{14}, Toms A\textsuperscript{15}, Mann DA\textsuperscript{1}, Borthwick LA\textsuperscript{1}, Deehan DJ\textsuperscript{1,2,*}
1Fibrosis Research Group, Institute of Cellular Medicine, Newcastle University, Newcastle upon Tyne, NE2 4HH, UK.
2Musculoskeletal Unit, Freeman Hospital, Newcastle Hospitals, NHS Trust, High Heaton, Newcastle upon Tyne, NE7 7DN, UK.
3Institute for Locomotion, Department of Orthopedic Surgery, Sainte-Marguerite Hospital, Aix-Marseille University, Marseille, France
4ZOL Hospitals Genk, Belgium
5Rubin Institute of Advanced Orthopedics, Center for Joint Preservation & Replacement, Sinai Hospital, Baltimore, Maryland, USA.
6Norwegian Arthroplasty Register, Dept. of Orthopedic Surgery, Haukeland University hospital, Bergen, Norway and Department of Clinical Medicine, University of Bergen, Bergen, Norway
7ATOS Klinik München, Effnerstr. 38, 81925 Munich, Germany and Klinik für Orthopädie und Sportorthopädie, Klinikum rechts der Isar der Technischen Universität München, Ismaninger Str. 22, 81675 Munich, Germany
8Director, Institute of Sport, Exercise & Health, University College London Hospitals, 235 Euston Road, London NW1 2BU
9Associate Professor Orthopedic Surgery, Head Knee Training Centre, LKH Stolzalpe Hospital, & Teaching Hospital Univ. Clinic Graz, Austria.
10MVZ-Zentrum für Histologie, Zytologie und Molekulare Diagnostik, Trier, Germany
11Australian Orthopaedic Association National Joint Replacement Registry, South Australian Health and Medical Research Institute, Adelaide, South Australia, Australia.
12Norfolk and Norwich University NHS Trust, Norwich, UK.
13University Hospital Llandough, Cardiff
14Dept of Twin Research and Genetic Epidemiology, King’s College London, St Thomas’ Hospital, London SE1 7EH
15Exeter Knee Reconstruction Unit, Princess Elizabeth Orthopaedic Centre, Royal Devon & Exeter Hospital, Exeter, UK.
Arthrofibrosis

• Post-surgical knee joint fibrosis was defined as a restricted range of motion (ROM), in flexion and/or extension, that is not attributable to osseous or prosthetic block to motion from mal-aligned or mal-positioned or incorrectly sized components, metal hardware, ligament reconstruction, infection, chronic regional pain syndrome (CRPS) or other specific causes, but is due to soft tissue fibrosis that was not present pre-operatively.

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ROM reduction

• Movement restriction was graded as mild, moderate or severe according to the flexion range (90 to 100°, 70° to 89°, <70°) or extension deficit (5 to 10°, 11 to 20°, >20°).
• **Consensus Statements – Definition and Classification**

• Post-surgical knee joint fibrosis is defined as restricted ROM, in flexion or extension, that is not attributable to osseous or prosthetic block to motion from mal-positioned or incorrectly sized components, metal hardware, ligament reconstruction, infection, CRPS or other specific causes, and is due to soft tissue fibrosis that was not present pre-operatively

• Joint fibrosis may be spontaneous (primary) or following an insult such as surgery or trauma (secondary)

• Spontaneous knee joint fibrosis, in the absence of trauma or surgery, is extremely rare. Post-trauma or post-surgery knee fibrosis is much more clinically important

• This classification can be further sub-categorised into post-arthroplasty joint fibrosis, post-ligament reconstruction fibrosis etc., according to the algorithm in Figure 2

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Consensus Statements – Pathoanatomy

- The anatomical location of fibrosis can be demonstrated during open or arthroscopic surgery. Current imaging modalities (e.g. USS, MRI) are not yet validated for visualising fibrosis.
- The location of the scar tissue may be as follows:
  - Infrapatellar (Hoffa) fibrosis
  - Medial or lateral parapatellar fibrosis or scarring (gutter)
  - Suprapatellar pouch fibrosis, scarring or obliteration
  - Patella tendon shortening
  - Posterior fibrosis
  - Quadriceps muscle fibrosis/scarring (vastus intermedius)
  - Intrasubstance fibrosis of the knee joint capsule,
  - Diffuse fibrosis or scarring involving a combination of the above
- Local fibroses such as discrete bands of adhesions that do not cause restricted range of motion are not sufficient for a diagnosis of Knee Joint Fibrosis
Consensus Statements – Prevention and Management

- Early fibrosis, <3 to 6 months post-operatively, may respond to treatment with physiotherapy and rehabilitation therapy and manipulation under anaesthesia (MUA), whereas established, mature, ‘late’ fibrosis is relatively resistant to physical therapy and MUA
- Some evidence exists that successful post-operative pain control can reduce the incidence of post-surgical knee fibrosis \(^{41}\), although further research into prevention of post-surgical knee joint fibrosis is required
- Further research is required to develop an evidence-based management algorithm to prevent post-surgical joint fibrosis
- We propose an algorithm for management of diagnosed post-surgical knee Joint Fibrosis (Figure 4)
Post-surgery Stiff knee Investigation Algorithm

History
Pain control after surgery inadequate?
Rehabilitation followed?

Clinical examination
Measure ROM

Investigations
1. Imaging
   Plain XRs – heterotopic ossification, patella infera
   CT scan – component malrotation
2. Serology
   Inflammatory markers
3. Aspiration
   To rule out infection
Additional Optional Tests
1. Histology
   Biopsy to demonstrate scar tissue
2. MRI – scar tissue

**NOTE THAT NOT ALL INVESTIGATIONS ARE MANDATED, CLINICAL JUDGEMENT IS REQUIRED AND THE DIAGNOSIS MAY BE MADE CLINICALLY WITH SUPPORT OF PLAIN RADIOGRAPHS**

Exclude
Chronic Regional Pain Syndrome
Infection, wound issues
Problems with implant (mal-positioning, cement, ectopic bone formation (rare), loosening, mal-alignment)

Diagnosis of Post-surgery knee fibrosis may be made
Post-surgery Knee Joint Fibrosis Management and Treatment Algorithm

<3-6 Months Post-op Early Fibrosis

Cases may respond to non-operative measures*
Physiotherapy, stretching, movement exercise, relaxation techniques
Static progressive splints

ROM improved

ROM not improved

MUA

Surgical Procedure
First line – arthroscopic
Second line – open debridement to restore ROM, may require revision of TKR

>6 Months Post-op Mature Fibrosis

Trial of non-operative measures*
Physiotherapy, stretching, movement exercise, relaxation techniques
Static progressive splints

ROM not improved

ROM improved

*Important to work up patient to exclude causes of stiff TKR whilst non-operative treatments are employed

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A Novel, Nonoperative Treatment Demonstrates Success for Stiff Total Knee Arthroplasty after Failure of Conventional Therapy

Morad Chughtai, MD¹  Michael A. Mont, MD¹  Chris Cherian, BS¹  Jeffrey Jai Cherian, DO²
Randa D. K. Elmallah, MD¹  Qais Naziri, MD³  Steven F. Harwin, MD⁴  Anil Bhave, PT¹

¹ Center for Joint Preservation and Replacement, Rubin Institute for Advanced Orthopedics, Baltimore, Maryland
² Department of Orthopedics, Philadelphia College of Osteopathic Medicine, Philadelphia, Pennsylvania
³ Department of Orthopaedics, SUNY Downstate Medical Center, Brooklyn, New York
⁴ Department of Orthopaedic Surgery, Beth Israel Medical Center, New York

Address for correspondence Michael A. Mont, MD, Center for Joint Preservation and Replacement, Rubin Institute for Advanced Orthopedics, 2401 West Belvedere Ave, Baltimore, MD 21215 (e-mail: mmont@lifebridgehealth.org; rhondamont@aol.com).

Avoided 13 Repeat MUA and 11 possible revision TKA
Cost $2400
Painful stiff TKA

Functional training to improve knee flexion in gait

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Return to function

Final Result:

Symmetric gait
0 - 90 deg ROM
Pain free stair ascent/descent
Return to work full time

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Case 1,
71 yr. old female patient
Primary TKA
H/O

- Symptomatic OA Knee for 4 yrs
- 1 previous arthroscopy 3 years prior to TKA
- No major medical problems
- Height = 5, 5
- Weight = 153 lbs
Routine post op Rx

- 3 days inpatient
- 11 days inpatient Rehab
- Outpatient PT 3 Times a week
- Difficult PT due to pain and stiffness
At 6 month mark

- Patient dissatisfied ROM = -25 to 75
- Arthroscopic lysis of knee with MUA
- Followed by PT
- Initial improvement in ROM with back to
- 20 to 75 ROM within 3-4 weeks

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3 opinions

• Must perform complete revision as soon as possible.
• Wait 6 more months and perform revision, continued PT may or may not help.
• Aspiration, Joint injection (steroid) followed by PT, Extension assist bracing, ASTYM

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ASTYM Rx for healthy scar

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Custom Knee Device (CKD,)

SPS
TTER (Total time at end range)

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CKD +ASTYM+ Bracing+PT

- CKD for extension 2 to 3 hours per day
- CKD for flexion 30 min 3 times daily
- **Extension assist pneumatic bracing**
- ASTYM treatment with PT 2 times a week for 6 weeks
- PT only for additional 2 times a week for 4 weeks

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Extension Lag

Pneumatic Brace for better and safer ambulation
With quad strengthening

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Novel knee brace

- Swivel thigh cuff
- Pneumatic bladder
- Pneumatic bladder
Extension assist

Polycentric Knee hinge
Return to function

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Happy Patient

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Return to Function

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Role of Manipulation under anesthesia and after care
WHY DO IT?

• Conservative therapies have failed
• Team agrees that this would be best option
• Patient agrees also

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When to do it

• Between 6 and 12 weeks recommended
• Our Center between 8 and 10 weeks
• Rarely after 12 with great care
Procedure

• Gentle to progressively more forceful knee flexion under anesthetic

• Multiple reps like milking a cow
Care

• Be gentle
• Stabilize well
• Listen
• Initially when you start move patella then the knee
Start MUA
Complications

- Patellar or Quad tendon ruptures
- Massive swelling
- Supracondylar fracture
- May develop KFC
After care

- JAS fitting/ should be in place pre MUA
- Daily PT for 1 week then 2/3 times
- ASTYM with in 1 week of MUA
- Edema management
- Some patients get CPM for all night
- Flexion goals should be achieved in 1 month

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Thank you

abhaved@lifebridgehealth.org
anilbhave@yahoo.com

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