

Chondral Lesions of the Knee Joint

Knee Update 2013 Congress
Dusseldorf, Germany

April 5, 2013

K. Donald Shelbourne, MD

Questions to Consider

- How are chondral lesions found?
- Are chondral lesions symptomatic?
- What is the ideal rehabilitation for chondral lesions with or without surgery?

How are chondral lesions found?

- ⊙ Radiographs do not usually show chondral lesions (unless OCD is present)
- ⊙ Arthroscopy – for meniscus tear, ligament reconstruction, PF realignments
 - Incidental findings found and not the reason for the surgery
- ⊙ MRI
 - Used so frequently that surgery is many times based on MRI findings versus clinical symptoms

Are chondral lesions symptomatic?

- ⊙ In general – No
- ⊙ Chondral defects by themselves do not cause pain
- ⊙ In general, pain comes from
 - elevated chondral flaps (OCD)
 - loose chondral pieces
- ⊙ The defect may cause knee soreness or anterior knee pain with activities, but the defect itself doesn't cause the pain

Are chondral lesions symptomatic?

- Every patient with joint space narrowing on radiograph will have chondral lesions
- Yet, most will not have severe symptoms
 - Usually soreness with weight bearing (WB)
 - Anterior pain without localizing pain

What is the ideal rehab?

- WB vs. Non-WB
- How did non-WB become deemed “necessary” for healing?
 - Animal studies showing it takes 2 years for the new cartilage to adapt and mature
 - Not sure 6 weeks of non-WB makes a difference
 - In fact, I believe that appropriate WB can be beneficial for healing and maturation

What is the ideal rehab?

- Rehab lessons learned from following patients after treatment where chondral lesions were observed
- Several studies show that achieving full ROM is important to obtain optimal outcome

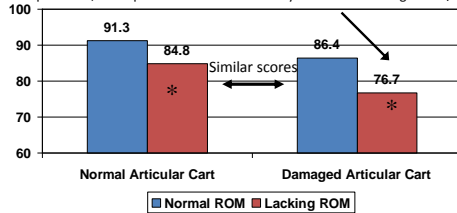
10-20 year results after ACL reconstruction

- Study* to look at the effect of ROM loss on results in the long-term
- Results were obtained for 1113 patients at a mean of 15.9 years after surgery

*Shelbourne KD, Gray T. AJSM 2009

Subjective Scores: ROM and Chondral Status

*Patients with ROM loss and articular cartilage damage – worse scores
* Keep in mind, these patients are around 30-35 years old at the long-term f/u



*Statistically significantly different

Deconditioned Knee Study*

- ACL data led us to evaluate how improving ROM might help patients with chronic knee pain and ROM loss
- 50 patients - mean age - 53.2 ± 9.9 years
- Underlying pathology – Osteoarthritis
- Rehabilitation program provided to improve ROM first and strength 2nd

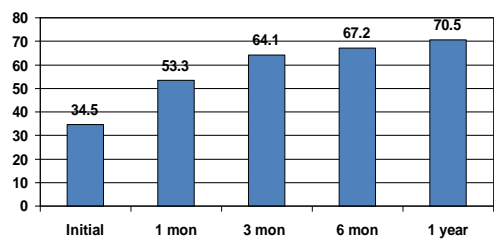
*Shelbourne et al. Am J Sport Phys Ther 2007

Range of Motion Deficits Compared to Opposite Normal Knee

	Initial Mean \pm SD (Range)	Final Mean \pm SD (Range)
Extension*	10° (5-34°)	3° (0-10°)
Flexion*	19° (1-70°)	9° (0-62°)

* $P < 0.001$

Results: IKDC Subjective Scores Through Time



ROM – Weight Bearing

- What does ROM have to do with WB?
- Believe that a non-WB restriction is the major factor causing ROM problems in the treatment of knee injuries
- Non-WB means people have to get around on crutches
- Hold leg in a bent-knee position
- Non-WB restrictions with articular cartilage restoration procedures last 6 weeks or more

ROM – Weight Bearing

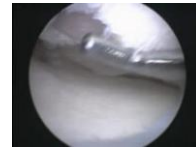
- ⊙ Would you want to live with that restriction?
- ⊙ An even better question is, how compliant do you think patients are with this restriction?
- ⊙ ACL patients taught us long ago that they were non-compliant with WB restrictions – had better results
- ⊙ I would propose that the patients who are non-compliant with WB restrictions with articular cartilage procedures have the best results
- ⊙ Why? Because WB provides good stimulation for healing

Lesions left alone - Results

- Different study* of 125 patients with [isolated](#) articular cartilage defect of Outerbridge grade 3 or 4 at time of ACL reconstruction
- Medial – 60 patients
- Lateral – 65 patients
- All patients had both menisci intact
- Mean age – 26 years old
- Mean defect size 1.7 cm² (0.5 cm² to 6.5 cm²)
- Compared to a control group with no lesions

*Shelbourne et al. JBJS Suppl 2, 2003

Chondral defect



Mean Subjective Scores: 101 pts at mean of 8 years post-op

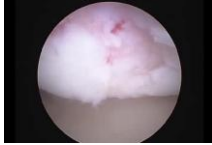
Compartment	DEF group	Cont Group
Medial (N=48)	94.0 ± 7.1	95.2 ± 6.7
Lateral (N=53)	92.8 ± 8.4	95.9 ± 6.5

Results show the natural history of leaving the lesions alone

Rehabilitation

- Rehabilitation included obtaining full ROM as soon as possible and there was no restriction on WB
- This rehabilitation is also used in patients who have a chondral lesion with a loose piece and are treated with microfracture

Grade IV Chondral Fx: Loose piece causing locked knee



Follow-up Arthroscopy: 10 months later



Rehabilitation

- Need to recognize knee asymmetry problems associated with chondral defects
- Exhaust all rehabilitation efforts to restore full ROM and improve strength before resorting to surgical intervention
- Articular cartilage surgery that involves rehabilitation restricting WB and ROM will undoubtedly make any knee ROM or strength deficit worse

Rehabilitation

- ⦿ So, how do you accomplish the goal of successful non-operative rehabilitation with physical therapy?
- ⦿ Need to be able to work closely with physical therapist or athletic trainer who understands or can learn what you want to accomplish
- ⦿ Ideally, this is done by having rehabilitation done in your office

Rehabilitation

- Advantage of rehab in your office
 - Rehab staff gets a complete understanding of the patient history
 - Can view x-rays and MRIs
 - If your practice has a high knee volume, they gain more expertise with treating knee problems

Rehabilitation

- ⦿ If you do not have rehab in your office
 - Have the PT or ATC come to office and observe you and your patients
 - Take time to teach them how to evaluate
 - Knee ROM
 - Effusion
 - Knee asymmetry
 - Teach them what you want them to do with your patients

Rehabilitation

- Having good rehab staff will
 - Make your non-operative rehabilitation more effective
 - You will find you will won't need to do as much surgery
 - More importantly, results will be more successful and patients will be happy

Rehabilitation

- If your patient does not have the desire to undergo rehab to improve ROM, then do not do surgery on that patient – he/she won't get better

Rehabilitation with articular cartilage procedures

- I am not against research and ideas for how to "grow" articular cartilage
- I just hate seeing patients treated surgically with the assumption that we "need" to do something or that patients will be better because we did "all that we could do"

Conclusion

- Chondral defects are common – BUT why penalize patients with over-treatment?
- Most chondral defects do not require surgical treatment
- When and which ones to treat are unknown
- Proper non-operative rehabilitation can be effective

Osteochondritis Dissecans

- OCD defined as a fragment of articular cartilage, together with avascular subchondral bone that becomes separated partly or completely from the joint surface (Aicrorth)
- Etiology remains unclear

OCD Treatment Options

- ⊙ Ideal technique remains controversial
- ⊙ Nonoperative – activity modification avoiding high impact activities, short-term immobilization and protected weight bearing
 - Goal is to prevent further loosening and/or chondral collapse
 - Generally only used in children with a nondisplaced piece
 - Need to be careful about immobilization because of the complications of atrophy, stiffness, and cartilage degeneration

OCD Treatment Options

- ⊙ Excision with stimulation
 - Abrasion
 - Drilling
 - Microfracture
- ⊙ Fixation
- ⊙ Restorative Techniques
 - ACI
 - Osteochondral Graft
 - Bone-Marrow Derived Cell Transplantation

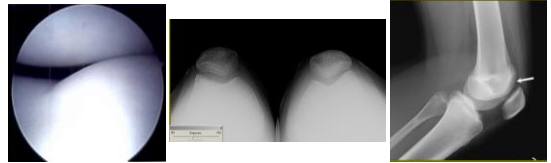
OCD Treatment Options

- To date, results are mixed
- There does not seem to be a clear advantage of one procedure over another, although use of restorative techniques is on the rise

My experience

- From 1983 to 2009, treated 102 patients with OCD
- Recently, obtained ≥ 2 yr follow-up on 33 patients who lived within 100 miles of our clinic

My Treatment Approach

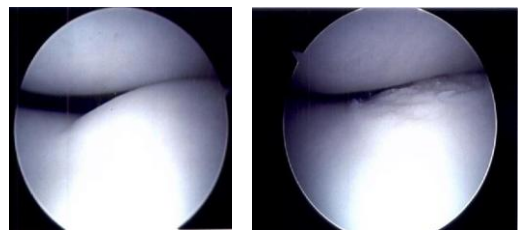


- Prior to separation of the piece, the chondral surface becomes elevated and symptomatic
- This is contrary to what you would think the appearance would be based on x-ray

My Treatment Approach

- For stable lesions, I simply debride the elevated portion with abrasion chondroplasty
- When the lesion is detached or unstable, this turns into an excision/loose body removal
 - With debridement/PICK arthroplasty of the lesion site

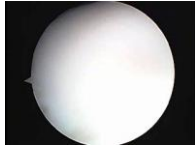
My Treatment Approach Example of Stable Lesion



Pre- debridement

Post- debridement

My Treatment Approach Example of an Unstable Lesion



Post-op Rehabilitation

- No immobilization
- No weight bearing restrictions
- Control swelling and prevent hemarthrosis
 - Cold/compression 24/7 for the first 2-3 days post-op
 - Elevation of knee above heart
 - Anti-embolism stockings
- Work on immediate return of full, symmetric ROM

Post-op Rehabilitation

- Low impact exercise (bike, elliptical) ~2 weeks post-op
- Progress into strengthening phase once ROM is symmetric to the opposite knee and swelling is well-controlled
 - Single leg press, single leg extensions, step downs
 - Progress to bilateral strengthening once quad strength is within 10% (side-to-side) on isokinetic testing

Patient population

- Mean age at time of surgery: 23.3 yrs (range 14-48)
- Mean objective follow-up: 7.7 yrs (range 2-15)
- Mean subjective follow-up: 10.5 yrs (range 2-23)

Lesion Characteristics

Location of the Lesion	n
Medial Femoral Condyle	17
Lateral Femoral Condyle	5
Patella	5
Trochea	6

- Size of lesion: Mean 2.7 cm² (range 0.5 – 8.0)

Results ROM

	1 mo	Latest Follow-up
Involved knee ROM	4-0-137	3-0-139
Non-Involved knee ROM	5-0-141	3-0-141

Results Strength

	Latest Follow-up
Single Leg Hop Test	99%
Cybex 180 deg/sec	94%

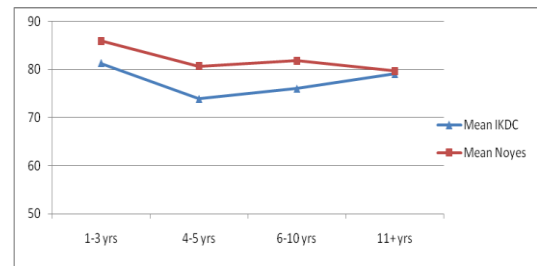
Subjective scores at Latest Follow-up

- Latest follow-up: 10.5 years (range 2-23)
- Modified Noyes: Mean 80.3 points (range 33 to 100)
- IKDC subjective score: Mean 79.9 (range 43 to 100)
- 19/33 (58%) had IKDC scores \geq published normal scores for their age and sex
– 24/33 (73%) were within 1 SD

Survey Scores Through Time

Years Post-op	IKDC		Modified Noyes	
	n	Mean \pm SD	n	Mean \pm SD
1-3	14	81.3 \pm 16.2	18	85.9 \pm 14.1
4-5	10	73.9 \pm 18.0	13	80.7 \pm 17.2
6-10	17	76.0 \pm 18.4	16	81.8 \pm 14.9
\geq 11	16	79.1 \pm 19.9	15	79.7 \pm 19.3
Most Recent	33	79.6 \pm 18.9	32	80.3 \pm 18.6

Survey Scores Through Time



Activity Level

- Pre-op mean: 7.7 (range 3-9)
- Post-op mean: 7.4 (range 3-10)

Results Radiographs at Latest Follow-up

- Mean 7.7 years post-op
- No joint space narrowing : 76% (25/33)
- No osteophyte formation: 67% (22/33)
- No sclerosis: 82% (27/33)

Results

Radiographs at Latest Follow-up

- Data were then analyzed in two groups: normal joint space group and joint space narrowing group

	Normal Joint Space (n = 25)	Joint Space Narrowing (n = 8)	P Value
Follow-up Time	7.3 yrs	8.8 yrs	.51
Age at Follow-up	29.2 yrs	37.9 yrs	.04*
Lesion Size (cm ²)	2.52	2.83	.72

*Statistically Significant Difference

Discussion

- The mean IKDC score reported in our study was 79.9 at a mean of 10.5 years post-op
- Comparable or higher than most studies of restorative procedures with shorter-term follow-up

Discussion

- ⦿ Typical rehabilitation program after restorative procedures involves restricted weight bearing for 4-12 weeks
 - Usually non-weight bearing for the first 4 weeks
- ⦿ Some programs do not restrict ROM, but others limit ROM or utilize braces
- ⦿ These postoperative rehabilitation programs impose significant limitations on a patient's lifestyle during recovery
- ⦿ We are also aware of the detrimental effects of prolonged weight bearing and/or ROM restrictions

Conclusions

- Results of this study show overall good results and a return to high level of function
- The results show 1/4 of patients develop degenerative changes
- One advantage of this treatment approach is that there is no restriction of weight bearing or a prolonged rehabilitation process

Conclusions

- Other procedures intended to restore the articular cartilage have yet to show superior results, yet employ rehabilitation restrictions that significantly impact the patient's lifestyle and could lead to permanent ROM deficits
- Is the additional cost and risk associated with these procedures justified?