

BOSHA ORTHOPEDIC NURSING SUMMIT 2018

JUNE 9, 2018 • MARRIOTT COURTYARD ARLINGTON SOUTH • ARLINGTON, TEXAS

RESTORING THE JOINT

Joseph M. Berman, MD
The Joint Preservation Center
June 9, 2018



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Let's get started with:

PERHAPS A MISCONCEPTION

- Most Internists and Family Practitioners believe that Orthopedic Surgeons have limited options regarding treating:
 - articular cartilage injury
 - meniscus lesions and tearing
 - ligament instability and other problems of the knee



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AND THE BIGGEST MISCONCEPTION

- That surgeons do not have the ability to prevent progression of disease –
- In other words can we influence whether the knee progresses or not to Osteoarthritis
- Many colleagues believe that an injured knee will inevitably progress to Osteoarthritis and therefore a total knee arthroplasty



Not Necessarily!

THE JOINT PRESERVATION CENTER

IS PIONEERING NEW TREATMENT OPTIONS

We are just getting started!!



PROTECT THE JOINT

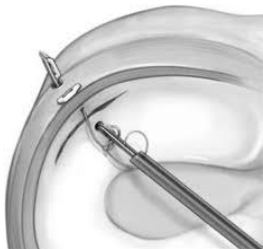
- If we can protect the joint – can we decrease the chance of future arthritis?
- The question then becomes how to repair or restore the joint following gross injury or repetitive microtrauma.
- Then we need to look at many different options



Some common knee pathologies

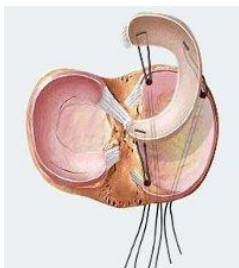
Meniscus Tears

- When they are torn we can sometimes repair them, not just remove it
- Saves the integrity of the joint and decreases the chance of arthritis



AND – IF THE MENISCUS IS REALLY GONE.....

- Meniscal transplant gives selected cases new meniscal tissue
- Transplant can decrease the predisposition to arthritis



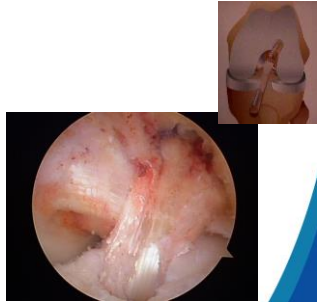
New Research

- NuSurface Artificial Meniscal Implant
- JPC was one of only 10 centers in the USA to be involved in the USA study
- Decrease stress on the joint to decrease relative rate of degeneration



AND – IF THE ACL IS TORN...

- Stabilization of the joint decreases the friction which decreases the predisposition to arthritis



OR – IF THERE IS A KNEE MALALIGNMENT

- Knee malalignment creates increased stresses – usually medially and can cause arthritis
- Osteotomy rebalances the knee and decreases the chance of arthritis



Medial Opening Wedge

SO THAT BRINGS US
TO WHY WE ARE HERE

ARTICULAR
CARTILAGE

Hunter 1743

• “From Hippocrates to the present age it is universally allowed that ulcerated cartilage is a troublesome thing and that once destroyed is not repaired.”

Even Hippocrates knew knee cartilage was a problem !!

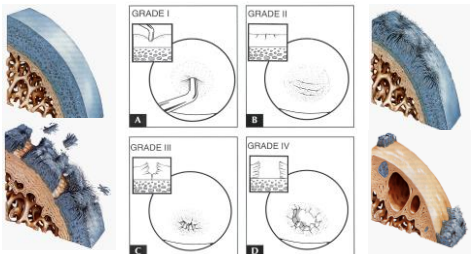


We are considering restoring - not just repairing - Articular Cartilage -

Are we just kidding ourselves
?!?!?!?



Cartilage Degeneration (CHONDROMALACIA) Outerbridge Classification System



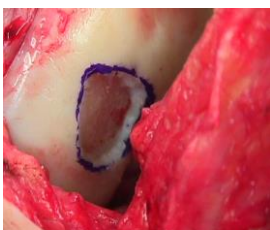
WHERE ARE WE? Hyaline Cartilage – options ??

- Hyaline Cartilage is the key to understanding and perhaps preventing OA
- Our ability to treat Hyaline Cartilage lesions are limited – BUT they are growing



FOCAL HYALINE CARTILAGE LESIONS

- Why treat them?
 - Because they cause pain, swelling, reduced function
 - Predispose to development of OA



INCIDENCE OF CARTILAGE INJURY

- Curl, et al., A Review of Cartilage Injuries: A Review of **31,516 Knee** Arthroscopies. Arthroscopy Journal, Aug. 1997.¹

- Grade III Lesions: 41%
- Grade IV lesions: 19.2%
- Grade IV, in patients < 40 years old: 5%

- Hjelle, et al., Articular Cartilage Defects in **1,000 Knee** Arthroscopies. Arthroscopy Journal, Sept. 2002.²

- Isolated Grade III or IV defects ≥ 1 cm² in patients < 40, 45 and 50 years old: 5.3%, 6.1%, 7.1% respectively



*Why is articular cartilage
so difficult to treat?*

No arterial supply

No inflammatory response to injury

**No macrophage invasion to phagocyte
the injured or necrotic tissue**

No intrinsic repair



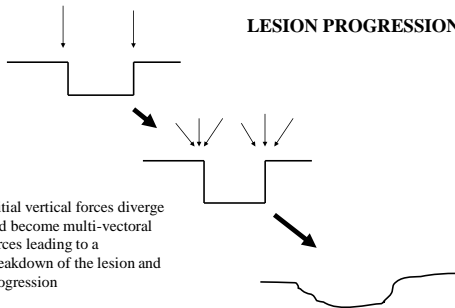
THE NATURAL HISTORY

- Once the articular cartilage is injured, there is a high probability it may progress to osteoarthritis.



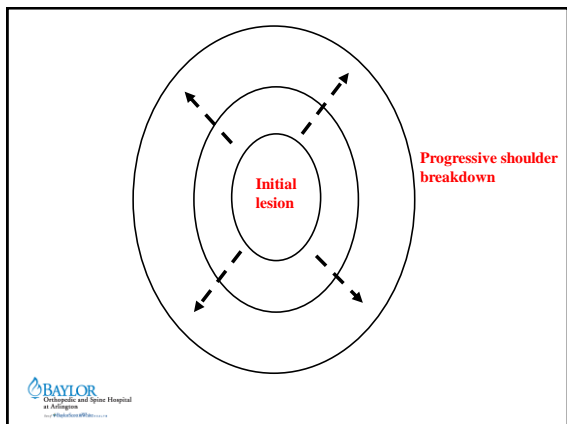
LESION PROGRESSION

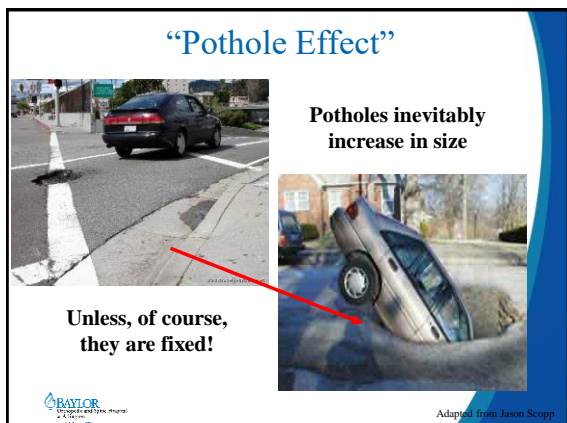
Initial vertical forces diverge and become multi-vectoral forces leading to a breakdown of the lesion and progression

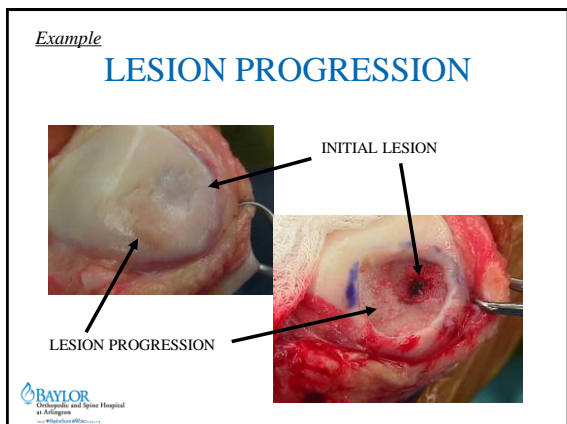


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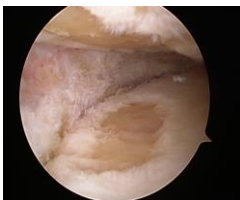






ADDRESS THE JOINT EARLY

- DON'T WAIT UNTIL THE JOINT IS BEYOND TODAY'S ABILITY TO REPAIR
 - ENCOURAGE EARLY INTERVENTION WHEN INDICATED
- GRADE IV DISEASE STILL HAS ONLY ONE ANSWER -- TKA

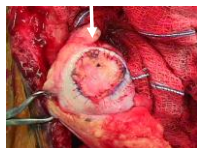
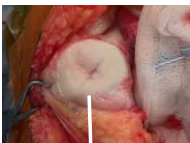


CONCEPT OF EARLY INTERVENTION

- RE-THINK OLD IDEAS OF WHEN TO INTERVENE
- LIMITED LESIONS CAN BE TREATED MORE EFFECTIVELY EARLIER
- EFFUSIONS AND PAIN ARE SIGNS OF DYSFUNCTION – TREAT THEM
- ARTHROSCOPY CAN BE USED AS A STAGING PROCEDURE AND DEFINE SECONDARY OPERATIVE OPTIONS

EXAMPLE OF EARLY INTERVENTION

- 15 Y/O female with history of multiple patella dislocations
- Treated with primary ACI and AMZ
- At one year, full activity, no pain, stable extensor mechanism, full ROM, normal strength ---"going to the prom in heels"



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CRITERIA TO CONSIDER

- HIGH/LOW DEMAND KNEE
- LOCATION OF LESION
- SIZE OF LESION
- AGE OF PATIENT
- ALIGNMENT OF KNEE
- STATUS OF “UNINVOLVED” PARTS OF THE JOINT



PATIENT SELECTION ITS RELATIVE

- AGE – 15 – 50 Y/O BUT;
 - CHRONOLOGIC VS PHYSIOLOGIC AGE
- WEIGHT
 - RELATIVE TO SIZE AND MUSCULATURE
- ACTIVITY LEVEL
 - REALISTIC EXPECTATIONS
 - HIGH ACTIVITY LEVELS ARE POSSIBLE AFTER CARTILAGE REPAIR IF CO-MORBIDITIES ADDRESSED



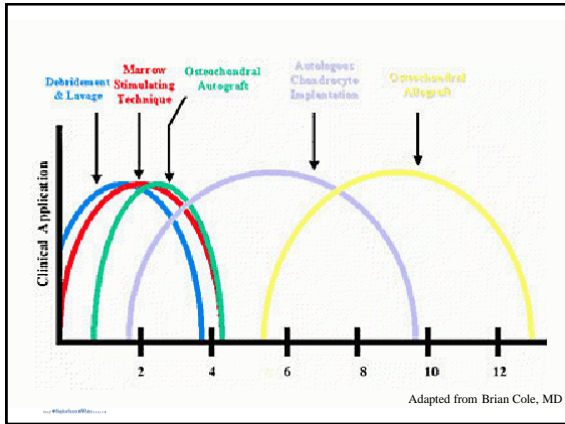
SURGICAL TREATMENT OPTIONS FOR HYALINE CARTILAGE LESIONS

- SIMPLE DEBRIDEMENT
- OSTEO-CHONDRAL GRAFTS
- BULK ALLOGRAFT
- MICROFRACTURE
- CARTILAGE RESTORATION



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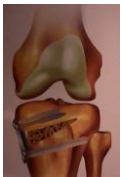


CO-MORBIDITIES

- MAL-ALIGNMENT
 - AXIAL
 - PATELLA-FEMORAL
- INSTABILITIES
- MENISCAL LOSS



CONCURRENT OPERATIONS



Realignment Osteotomy



ACL Reconstruction

Meniscus Transplant



Anterior-Medial Oblique Osteotomy



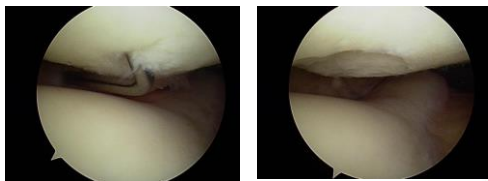
ABOUT HTO

- Varus angulation will increase failure rate of MFC lesions
- Physiologic varus is varus
- AND – Physiologic varus becomes pathologic varus when a lesion is found
- Correct varus to neutral – do not overcorrect



CHONDROPLASTY

- Simple debridement



OSTEO-CHONDRAL GRAFTS OATS

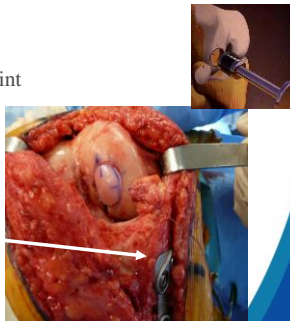
- Osteochondral Autologous Transfer System
- Move osteochondral plug from low contact area of joint to an area of high contact area



BULK ALLOGRAFT

- Fresh allograft
- Restoration of the joint with large lesion injuries

Note concurrent Osteotomy



MICROFRACTURE

- Microfracture – popularized because it is easy and cheap
- But – it has a limited durability of only 3-5 years



BUT....

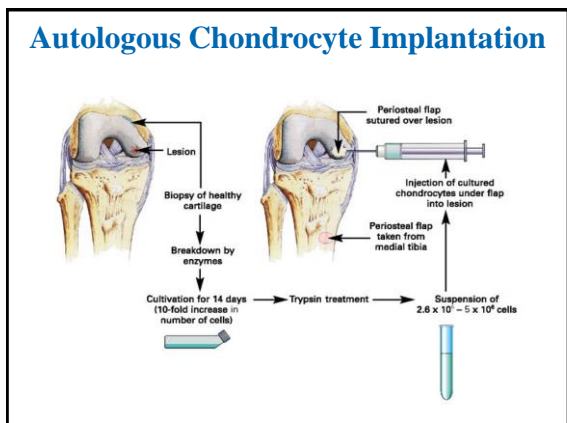
- All these procedures have a place in your armentarium – But, they all have one major short fall -----

THEY DON'T RESTORE ARTICULAR CARTILAGE BACK TO ARTICULAR CARTILAGE

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SOME HISTORY:

ORTHOPAEDIC RESEARCH SOCIETY MEETING ATLANTA 1984

CHONDROCYTE TRANSPLANTATION- AN EXPERIMENTAL MODEL IN THE RABBIT.
L. PETERSON ET.AL.

The slide features a white background with a blue curved border on the right side. It contains text about the history of chondrocyte transplantation, specifically mentioning a 1984 meeting in Atlanta. The Baylor Orthopedic and Spine Hospital logo is at the bottom left.

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**SINCE 1985 WORK ON HUMAN
CHONDROCYTE CULTURE
TECHNIQUE HAS BEEN GOING AT
THE UNIVERSITY OF GOTHENBURG.**

*Basic concepts from a post-
doctoral thesis from Dr. Lars
Peterson, MD, PhD*



**ANNUAL MEETING OF SWEDISH
MEDICAL SOCIETY 1986**

**ARTICULAR RESURFACING
WITH CULTURED
CHONDROCYTES.
L.PETERSON ET.AL.**



**IN 1987 THE ETHICAL COMMITTEE
AT THE MEDICAL FACULTY OF THE
UNIVERSITY OF GOTHENBURG
APPROVED THE USE OF
AUTOLOGOUS CHONDROCYTE
TRANSPLANTATION IN THE HUMAN
KNEE**



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USA HISTORY

- Brought to the USA in 1993 and FDA approved in 1995
- Original work by Tom Minas, MD at Brigham and Woman's in Boston
- Original indications of a single lesion have changed and expanded
- First ACI implants in the Dallas Fort Worth area about 1998 – Berman



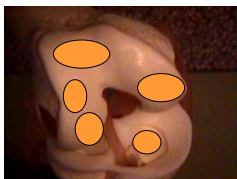
Enter MACI

- **Next Generation** in Cartilage Retoration
- Licensed by FDA as of December 2016
- Instead of vials of cells sent to the surgeon, a Porcine I/III graft saturated with 500,000 chondrocytes per cm sq. is sent
- Markedly simplified the implant procedure



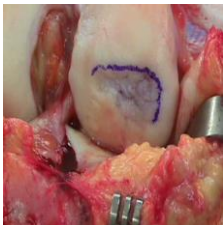
ADVANTAGES OF MACI

- ANY SIZE LESION
- ANY LOCATION
- MULTIPLE LESIONS
- TROCHLEAR AND PATELLA LESIONS ARE APPLICABLE
- BEST POTENTIAL LONG TERM RESULTS
- HEALS WITH HYALINE-LIKE CARTILAGE



DISADVANTAGES OF MACI

- TWO OPERATIONS
- TECHNIQUE INTENSIVE
- PROLONGED REHABILITATION
- EXPENSIVE

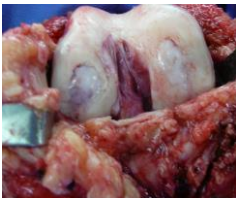


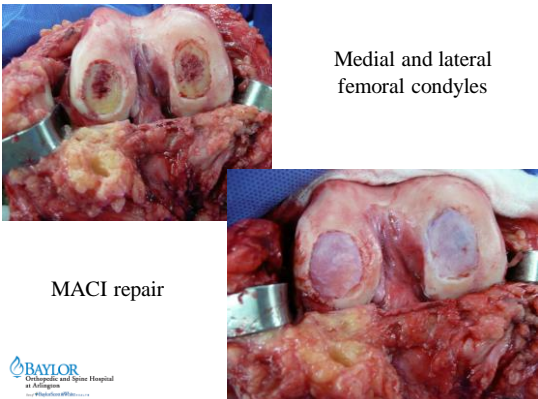
INDICATIONS

- CLASSIC INDICATIONS
 - ISOLATED FEMORAL CONDYLE
 - TROCHLEAR
- EXPANDED INDICATIONS
 - PATELLAR
 - MULTIPLE LESIONS
 - BI-POLAR LESIONS
 - TIBIAL

EXAMPLE OF INDICATIONS


- 51 year old female
- Options are biologic repair vs total knee







Medial and lateral femoral condyles

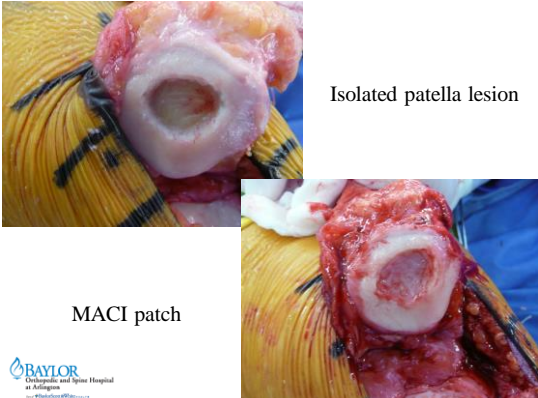
MACI repair



EXPANDED INDICATIONS INCLUDE THE PATELLA


- PATELLA LESIONS WITH FAILED CHONDROPLASTY
- BECAUSE OF LOCATION, SIZE, CONTOUR AND COMPRESSION FORCES – MACI IS A CONSERVATIVE APPROACH
- SHOULD HAVE CONCURRENT ELEVATION OSTEOTOMY





Isolated patella lesion

MACI patch



SALVAGE VS. PRIMARY OPTION

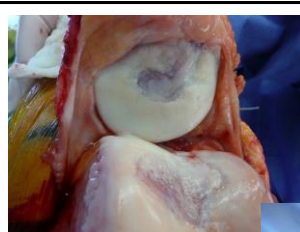
- MACI HAS BEEN THOUGHT TO BE A SALVAGE OPERATION AFTER PRIMARY PROCEDURES HAVE FAILED
- SUCCESS OF THE OPERATION HAS CHANGED INDICATIONS FROM SALVAGE TO FIRST STAGE OPTION



WHAT IS YOUR OPTION

- 19 year old male
- Three lesions – patella, trochlea, lateral femoral condyle
- Biologic option is best option for this age with multiple lesions
- MACI is the most conservative option for this problem



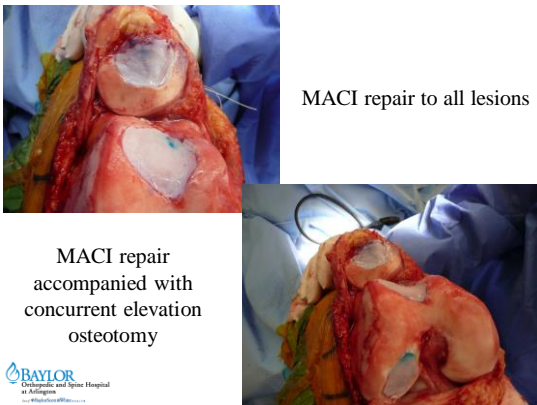


Patella and trochlea




Lateral femoral condyle





MACI repair to all lesions


MACI repair accompanied with concurrent elevation osteotomy



ACI IN ADOLESCENT ATHLETES


- 20 Adolescent patients
- 47 months postop follow-up
- 96% returned to impact sports
- 60% at the same or higher level than preinjury
- Surgery within 12 months since acute injury → 100% return to preinjury sport
- Surgery of chronic injury → 42% return

Mithoefer et al. to be published



Ancillary (Necessary) Personnel

- Your Nurse/Assistant
 - Everyone needs a “Christy”
 - Very detail oriented procedures with long rehabilitations and long relationships between doctor and patient
 - Interfaces with Patients, understands the operating room, understands the procedure
- A good physical therapist
 - Knows the protocols for the various locations.
 - Knows when to speed up and when to slow down
 - A poor therapist will definitely ruin an otherwise good procedure



REHABILITATION

- VERY IMPORTANT
- DOCTOR AND THERAPIST NEED TO WORK TOGETHER
- CPM
- PAIN CONTROL WITH SELECT NERVE BLOCKS AND INTRA-INCISIONAL INJECTION – NOTHING IN JOINT
- MUCH CAN BE DONE AS OUTPATIENT SURGERY – HEP IMMEDIATELY



REHABILITATION

- BEGIN PARTIAL WEIGHT BEARING – 30% OF BODY WEIGHT - WITHIN 7 DAYS
 - WITH CONDYLAR LESIONS – INCREASE BY 30% EVERY 10-14 DAYS
 - WITH PATELLA LESIONS – INCREASE BY 30% EVERY 7-10 DAYS
- ROM – DEPENDS ON LOCATION OF LESION – BUT PROM EARLY
 - AVOID INCREASED FRICTION
- CONCURRENT OPERATIONS NEED TO BE WELL STABILIZED TO ALLOW EARLY PROM



All factors considered

OUTCOMES

- FOR CONDYLAR LESIONS – 90%
- TROCHLEA LESIONS – 85-90%
- MULTIPLE LESIONS – 70%
- PATELLA LESIONS – 65% -- BUT – INCREASED TO 85% WITH CONCURRENT ELEVATION OSTEOTOMY



New Possible Option

- Cartiheal –
- Calcium Carbonate dowls
- Use Sea Coral as source
- Chemotaxic – encourages articular cartilage and bone restoration
- New FDA study – JPC will be one of 15 sites in the USA and one of only 30 world wide
- Can be used for OA





Cartiheal



CONCLUSION

- Treatment of articular cartilage lesions still challenges our knowledge and skill
- Earlier treatment of any lesion seems to yield the best results
- MACI has been shown to be a viable option in the treatment of lesions in any location of the knee regardless of size or containment



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SUMMARY

- MACI can be used for salvage procedures to many lesions of the knee
- However, in certain lesions, MACI may be the first and most conservative procedure such as the patella +/- trochlea
- Hyaline-Like Cartilage produced by MACI seems to have long term durability without deterioration of results after two years



NEXT.....

- Future cartilage restoration techniques will be easier allowing more surgeons to take advantage of the opportunity for their patients
- Articular Cartilage bio-engineering and its repair, I believe, will be the hot topic and emphasis for the next decade



THE JOINT PRESERVATION CENTER



THANK YOU
