


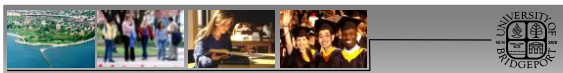
# Knee Orthopaedic Tests

## Orthopedics and Neurology DX 612

James J. Lehman, DC, MBA, DABCO  
University of Bridgeport College of Chiropractic





# Sports and Knee Injuries

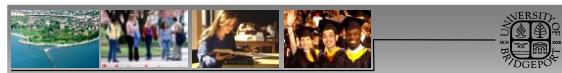



# Knee Injury


## Strain, Sprain, Internal Derangement



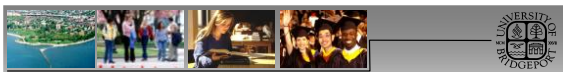
- Please differentiate an internal derangement from an external knee injury.



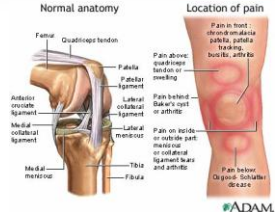
# Internal Derangement of Knee (IDK)



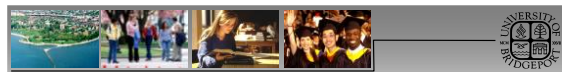
- Some physicians refer to IDK as "I don't know."




# Accurate Diagnosis Improves Treatment Outcomes



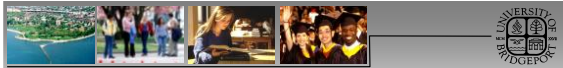
- Know your anatomy
- Understand pain locations
- Master your special tests



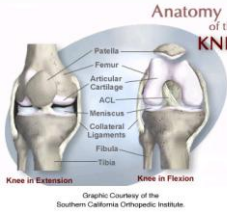
# Orthopedic Evaluation



- History
- Observation
- Palpation
- Range of motion
- Special tests



## Anatomy of the Knee

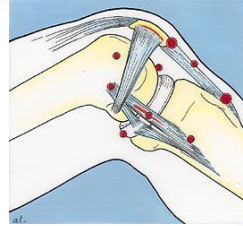


- What types of injuries to the knee should we expect to treat with manipulation?

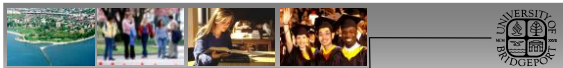


## Knee Pain

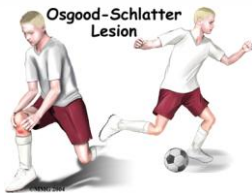
Can you name the point of pain with palpation?



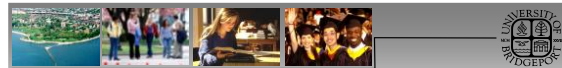
- Osgood Schlatter's Disease?
- Jumper's knee?
- PFA?
- Collateral ligament sprain?
- Meniscal tear?



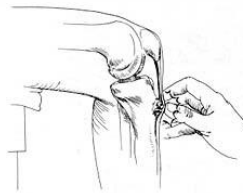
## Osgood-Schlatter Lesion



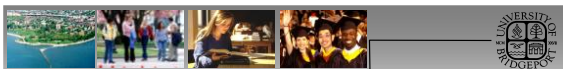
- Occurs between ages 10-15 with increased stress
- Genetic relationship (30% per family)
- Athletes 20% higher than non-athletes



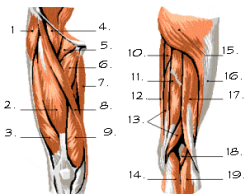
## Osgood Schlatter's Lesion



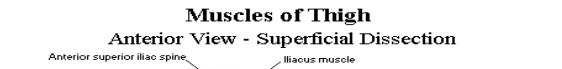
- Anterior tubercle of tibia inflammation with young athletes who run and jump
- Fracture may occur with an acute injury



## Muscles of the Thigh and Knee

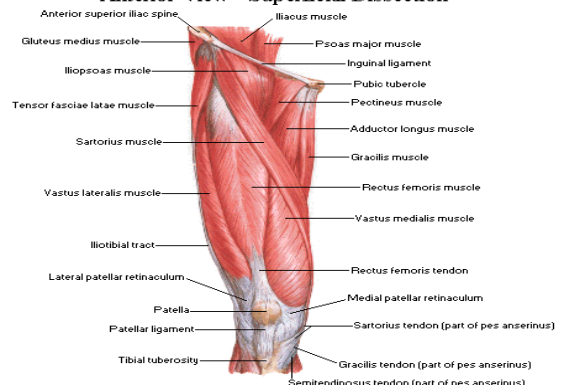


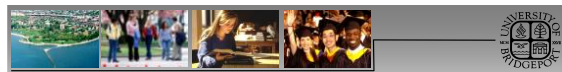
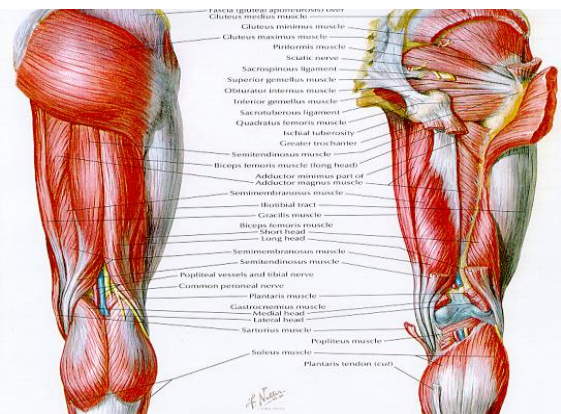
- Please name the muscles of the thigh and knee.



## Muscles of Thigh

### Anterior View - Superficial Dissection



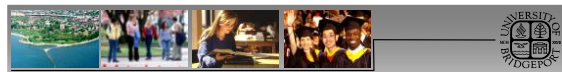
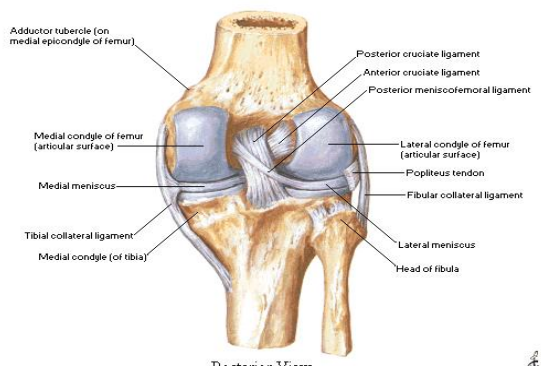


## Radiograph of the Knee



- Please identify ten anatomical structures of the knee.

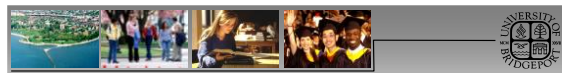
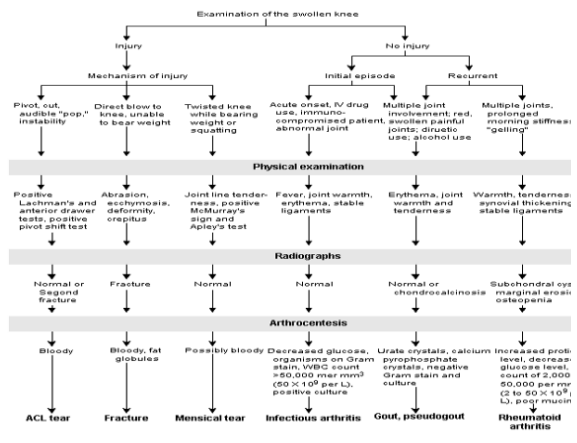
## Knee - Cruciate and Collateral Ligaments Right Knee in Extension



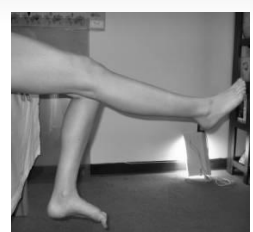
## Evaluation of the Knee



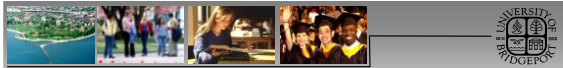
- What type of injuries should we consider with our differential diagnosis of the knee?



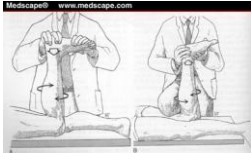
## Knee ROM



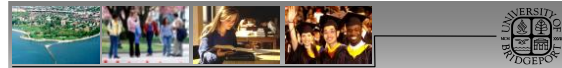
- Flexion = 135-147 degrees
- Range = ? degrees
- Extension = -2 to 2 degrees
- Range = ? degrees



## Meniscus and Ligament Instability



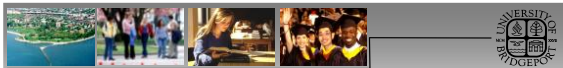
- Apley's compression tests meniscus
- Apley's distraction tests nonspecific ligaments



## Meniscal Injury McMurray's Test



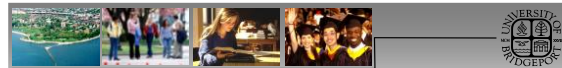
- Flex and extend with internal and external rotation.
- Stresses distorted meniscus
- Palpable or audible click is positive



## Meniscal Injury Retreating McMurray



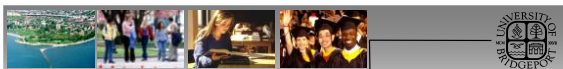
- Palpate medial meniscus with knee and hip flexed 90 degrees plus lateral and medial rotation



## Meniscal Injury Retreating McMurray



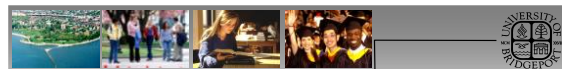
- Meniscal tear blocks medial rotation



## Meniscal Injury Bounce Home Test



- Passive flexion of hip and knee
- Cup heel and request dropping of knee
- Femur rotation on tibia & extension blocked

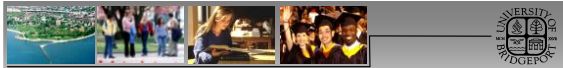


## Meniscal Injury Bounce Home Test



- Blockage or rubbery end feel with full extension are positive signs of meniscal injury





## Meniscal Injury Steinman's Tenderness Test



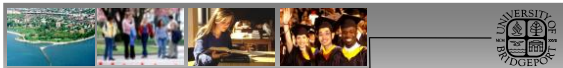
- Supine
- Hip and knee flexion to 90 degrees
- Palpate medial and lateral joint lines with index and thumb w/ flexion and extension



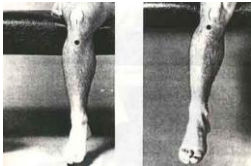
## Meniscal Injury Steinman's Tenderness Test



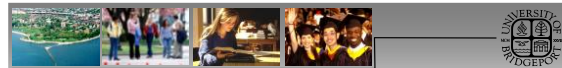
- Pain moving anteriorly or posteriorly with flexion and extension indicates meniscal injury.



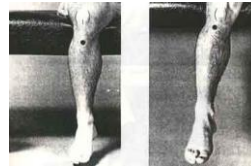
## Meniscal Injury Modified Helfet's Test



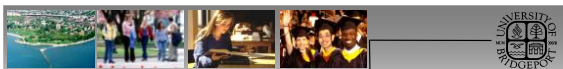
- Seated with foot on floor
- Note location of tibial tuberosity
- Extend leg and note location of tibial tuberosity



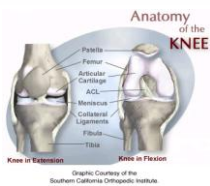
## Meniscal Injury Modified Helfet's Test



- Expect lateral movement of tibial tuberosity with extension of knee
- Blocked movement indicates meniscal injury

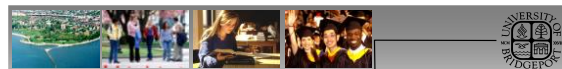


## Thessaly's Test



- New test for the early detection of meniscal injury.

■ <http://www.ejbsj.org/cgi/content/abstract/87/5/955>

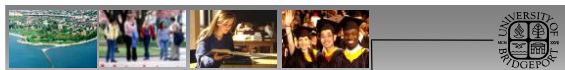


## Thessaly Test for Meniscus Tear

Five degree of knee flexion

Unaffected knee first

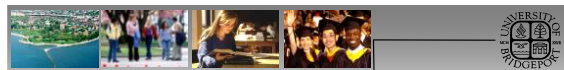




### Thessaly Test for Meniscal Tear

External rotation assisted

Internal rotation

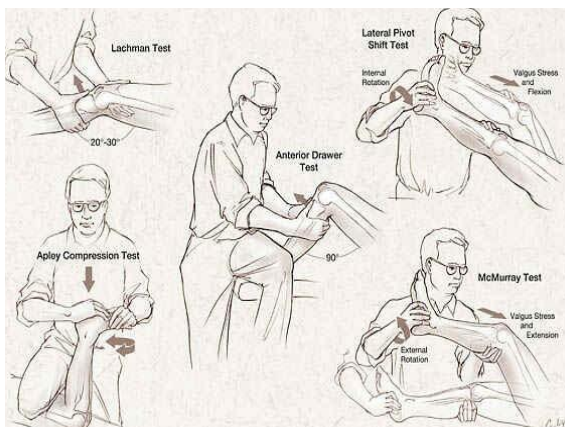


### Thessaly Test for Meniscal Tear

Positive findings

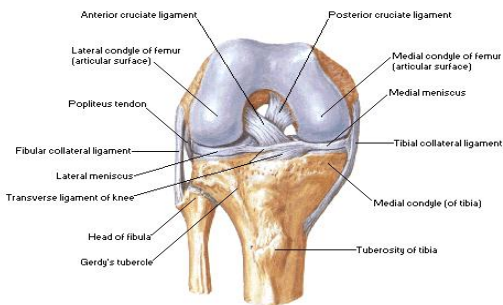
Repeat process at 20 degrees

- Pain medial or lateral
- Clicking or locking
- Most accurate at 20 degrees of knee flexion



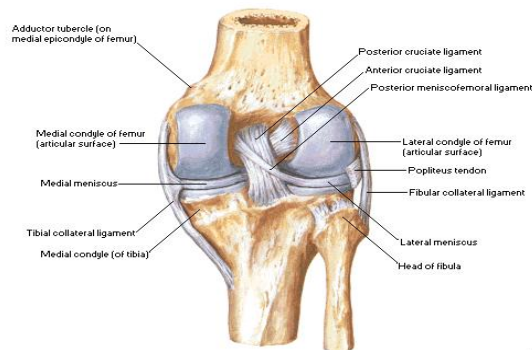
Test	Diagnosis		
	Injury of Medial Meniscus	Injury of Lateral Meniscus	Combined Injury of Anterior Cruciate Ligament and Meniscus
McMurray test			
Sensitivity	48%	65%	45%
Specificity	94%	80%	79%
False positive	4.2%	12.4%	23%
False negative	17.6%	3.2%	2.7%
Accuracy	78%	84%	74%
Apley test			
Sensitivity	41%	41%	20%
Specificity	93%	80%	84%
False positive	4.0%	13%	38%
False negative	20%	5.4%	4%
Accuracy	75%	82%	59%
Joint line tenderness			
Sensitivity	71%	78%	65%
Specificity	87%	90%	80%
False positive	8.8%	9.3%	19%
False negative	10%	2%	1.7%
Accuracy	83%	89%	80%
Thessaly test at 5° of flexion			
Sensitivity	66%	81%	65%
Specificity	96%	91%	83%
False positive	2.9%	8%	17.4%
False negative	11.4%	1.7%	1.7%
Accuracy	86%	90%	82%
Thessaly test at 20° of flexion			
Sensitivity	89%	92%	80%
Specificity	97%	96%	91%
False positive	2.2%	3.7%	9%
False negative	3.6%	0.73%	1%
Accuracy	94%	96%	90%

### Right Knee in Flexion



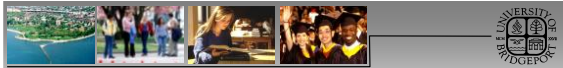
Anterior View

### Right Knee in Extension



Posterior View

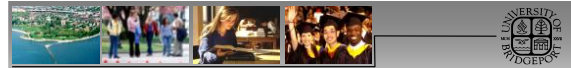




## Muscle Strain & Ligamentous Sprain Instability



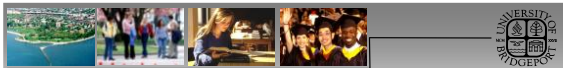
- Please describe and grade a strain/sprain injury.



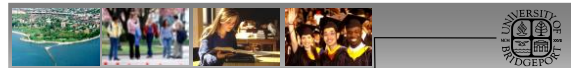
## Grading Strain & Sprain Injuries



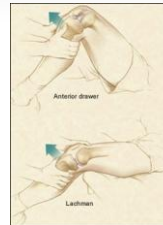
- Grade 1: Microscopic tears
- Grade 2: Partial tears
- Grade 3: Complete tear with rupture



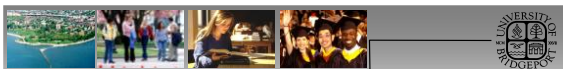
## Ligament Instability Anterior and Posterior Drawer Signs



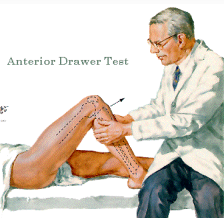
## Anterior Drawer Sign and Lachman's Anterior Cruciate & Posterior Oblique



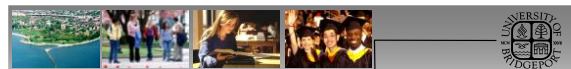
- Anterior translation of more than 5 mm indicates injury



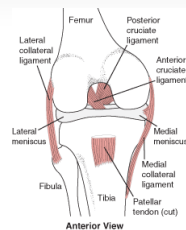
## Anterior Drawer Sign



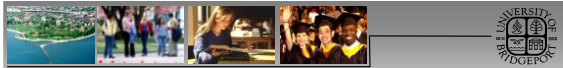
- Anterior cruciate
- Medial collateral ligament
- ITB
- Capsules & ligaments
- Arcuate-politeus complex



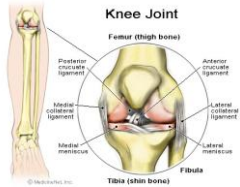
## Knee Ligaments



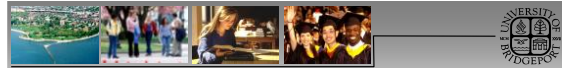
- Which are the most commonly injured ligaments in the knee?



## Ligament Injuries



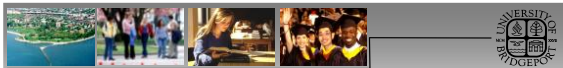
- Medial collateral and anterior cruciate ligaments are the most commonly injured.



## Ligament Injuries



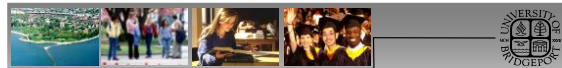
- What is the most common force or mechanism of injury to the knee?



## Ligament Injuries



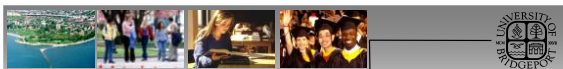
- Inward and medial force
- External rotation with some flexion



## Ligament Instability Lachman's Test



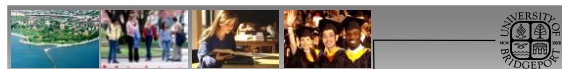
- Anterior and posterior cruciate ligament sprains
- Most reliable test for anterior cruciate ligament rupture



## Ligament Instability



- How would you grade a ruptured ligament?

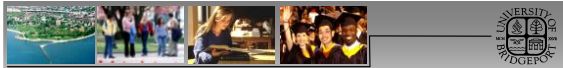


## Ligament Instability Slocum's Test



- Anterior cruciate
- Posteriorlateral capsule
- Fibular collateral ligament
- ITB





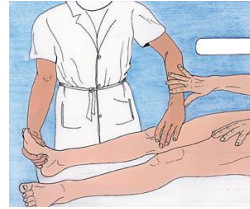
## Patellofemoral Dysfunction Patella Grinding Test



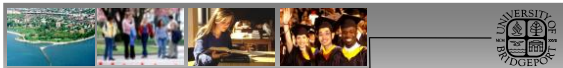
- Chondromalacia patellae
- Patellofemoral arthralgia
- Chondral fracture



## Patellofemoral Dysfunction Patella Apprehension Test



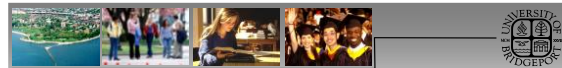
- Pain and apprehension are present
- Positive test indicates lateral patellar dislocation



## Patellofemoral Dysfunction Dreyer's Test



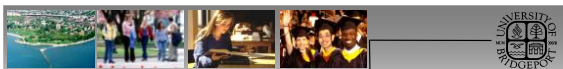
- Patient cannot raise his leg while in a supine position



## Patellofemoral Dysfunction Dreyer's Test



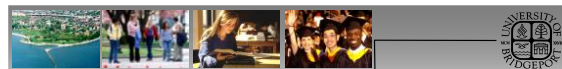
- Stabilize quadriceps tendon and patient able to raise leg indicates traumatic fracture



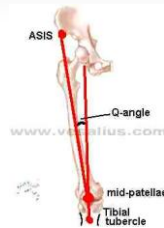
## Patellofemoral Dysfunction Clarke's Patellar Scrape Test



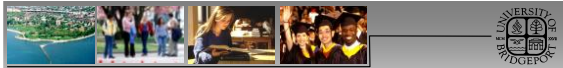
- Pain and crepitation may indicate patellofemoral arthralgia or chondromalacia patellae




## Quadriceps Angle "Q Angle"




- Adults typically 15 degrees
- Increases or decreases in the q-angles are associated in cadaver models with increased peak patellofemoral contact pressures (Huberti & Hayes, 1984).



## Quadriceps Angle "Q Angle"



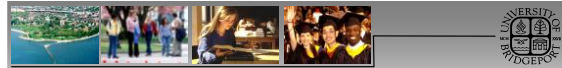
Normal



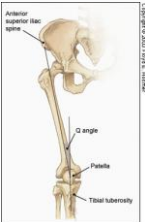
Abnormal

Q Angle

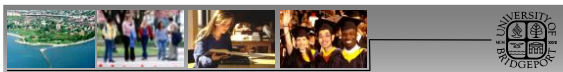
- Insall, Falvo, & Wise (1976) implicated increased q-angle, along with patella alta, in a prospective study of patellofemoral pain.



## Increased Q Angle

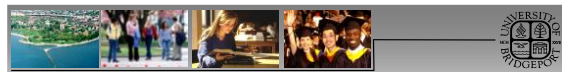


- Femoral anteversion
- External tibial torsion
- Laterally displaced tibial tubercle
- Genu valgus



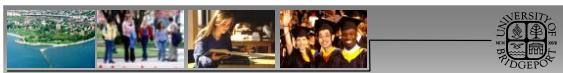
## Patellofemoral Arthralgia

- Magnetic resonance imaging determination of tibial tubercle lateralization and patellar tilt correlates positively with the clinical diagnosis of anterior knee pain, suggesting that patellofemoral pain is caused by subtle malalignment.
- LEVEL OF EVIDENCE: Level III, development of diagnostic criteria on basis of nonconsecutive patients.
  - Arthroscopy. 2007 Mar;23(3):333-4; author reply 334.



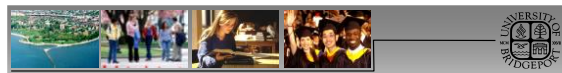
## Inflammation

- A basic way in which the body reacts to infection, irritation or other injury, the key feature being redness, warmth, swelling and pain.
- Inflammation is now recognized as a type of nonspecific immune response.
- MedicineNet.com




## Vascular Supply to Tendons

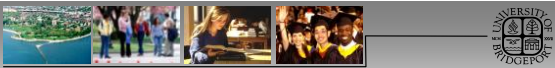
- Tendons have limited blood supply
- Each tendon receives its vascular supply from segmental vessels
- Wheelless' Textbook of Orthopaedics



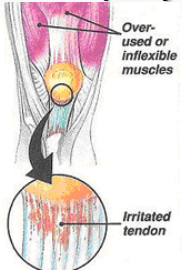
## Patellar Tendonitis "Jumper's Knee"



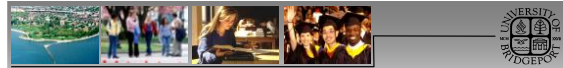
- Patellar tendonitis is an important cause of anterior knee pain.
- Patellar tendonitis and anterior knee pain. Am. J Knee Surg. 1999 Spring;12(2):99-106. PMID: 10323501 [PubMed - indexed for MEDLINE]



## Tendonitis, Tendinitis, Tendinosis, Tendonopathy or Tendinopathy?



- Non-inflammatory degenerative changes
- Remodeling process
- Nodular development



## Treatment of Tendonopathy



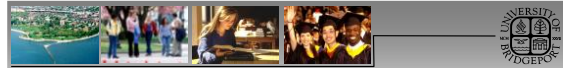
- Eccentric stretching
- NSAIDS contraindicated
- Prolotherapy (15% dextrose and lidocaine)



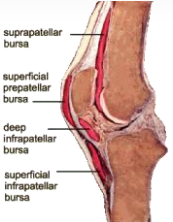
## Signs of Inflammation



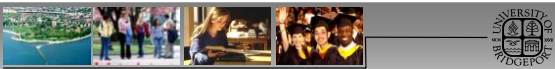
- Are you able to name the four signs of inflammation in Latin?




## Bursae of the Knee



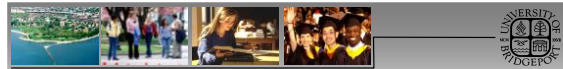
- Trauma, such as kneeling or contusion
- Dolor, rubor, tumor, calor are the four classical signs of inflammation.



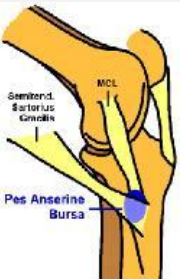
## Palpation of the pes anserine bursa "Goose's Foot"



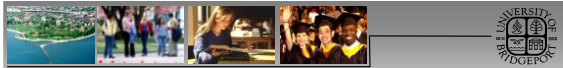
- Insertion of the conjoined tendons into the anteromedial proximal tibia.
- Pes anserine bursitis is rare.



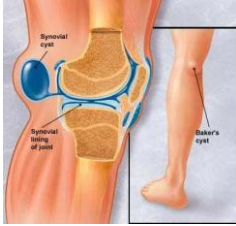
## Pes Anserinus



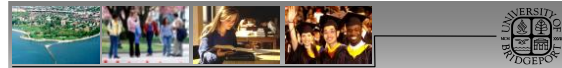
- From anterior to posterior, pes anserinus is made up of the tendons of the sartorius, gracilis, and semitendinosus muscles.
- Conjoined tendon lies superficial to the tibial insertion of the medial collateral ligament



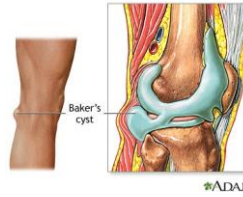
## Baker's Cyst Popliteal Cyst



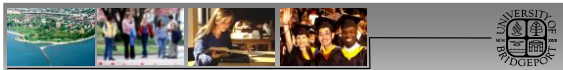
- There may be a painless or painful swelling behind the knee
- The cyst may feel like a water-filled balloon
- Occasionally, the cyst may rupture, causing pain, swelling, and bruising on the back of the knee and calf



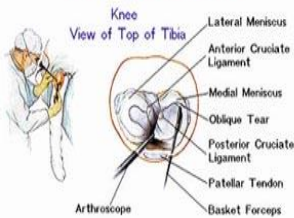
## Causes of Popliteal Cyst



- An accumulation of synovial fluid
- Meniscal tears in children
- DJD in adults



### Arthroscopy: Knee I



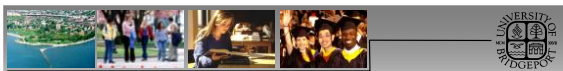
### Arthroscopy: Knee II



## One Final Question...



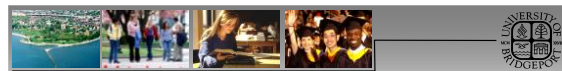
- Who is Brian Daubach?



## Remember...



- It is an honor and a privilege to treat another human being.



## One Final Thought...



- Diagnosis is the key to successful treatment!