

Knee Exam



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GOAL

- ▶ Learn a standardized history and physical examination of patients with knee injuries



KNEE INJURY

- ▷ Components of the assessment include
 - ▷ Focused history
 - ▷ Attentive physical examination
 - ▷ Thoughtfully ordered tests/studies

FOCUSED HISTORY



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FOCUSED HISTORY QUESTIONS

▷ Onset of Pain

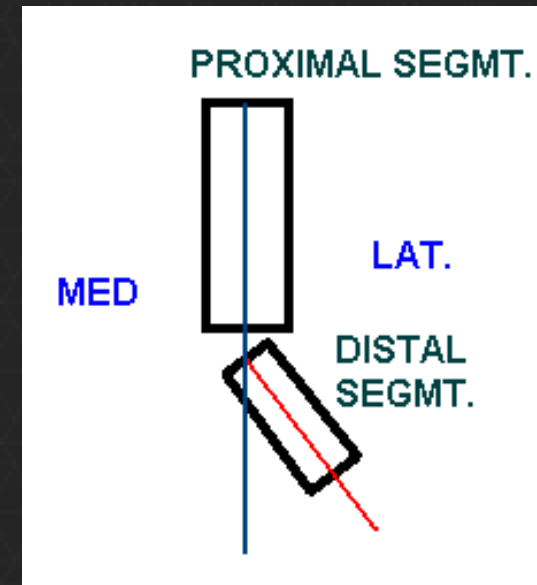
- ▷ Date of injury or when symptoms started

▷ Location of pain*

- ▷ *Anterior*
- ▷ *Medial*
- ▷ *Lateral*
- ▷ *Posterior*

FOCUSED HISTORY QUESTIONS₂

- ▷ **Mechanism of Injury** -helps predict injured structure
 - ▷ **Contact or noncontact injury?***
 - ▷ If contact, what part of the knee was contacted?
 - ▷ Anterior blow?
 - ▷ Valgus force?
 - ▷ Varus force?
 - ▷ **Was foot of affected knee planted on the ground?*****



Valgus alignment = distal segment deviates lateral with respect to proximal segment.

Patellas Touch

<http://moon.ouhsc.edu/dthomps/namics/varus.gif>



FOCUSED HISTORY QUESTIONS₃

▷ Associated Events/Mechanics

▷ Pop heard or felt?

▷ Swelling after injury (immediate vs delayed)

▷ Catching / Locking

▷ Buckling / Instability (“giving way”)

INSTABILITY - EXAMPLE

Patellar dislocation



http://www.carletonsportsmed.com/Libraria_medicus/PF_patella_dislocation.JPG



FOCUSED HISTORY QUESTIONS₄

▷ Degree of Immediate Dysfunction





FOCUSED HISTORY QUESTIONS₅

- ▷ **Aggravating Factors**
 - ▷ Activities, changing positions, stairs, kneeling
- ▷ **Relieving Factors/treatments tried**
 - ▷ Ice, medications, crutches
- ▷ **History of previous knee injury or surgery**

HISTORICAL CLUES TO KNEE INJURY DIAGNOSES

Noncontact injury with “pop”	ACL tear
Contact injury with “pop”	MCL or LCL tear, meniscus tear, fracture
Acute swelling	ACL tear, PCL tear, fracture, knee dislocation, patellar dislocation
Lateral blow to the knee	MCL tear
Medial blow to the knee	LCL tear
Knee “gave out” or “buckled”	ACL tear, patellar dislocation
Fall onto a flexed knee	PCL tear

PHYSICAL EXAM



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PHYSICAL EXAM - GENERAL

- ▷ Develop a standard routine
- ▷ Alleviate the patient's fears

GENERAL STEPS

Inspection

Palpation

Range of motion

Strength testing

Special tests





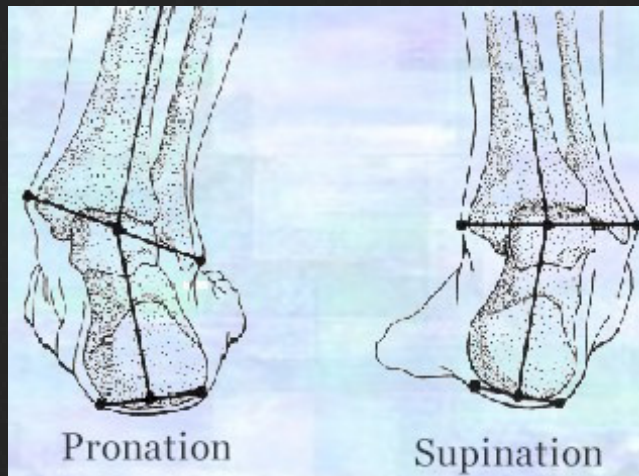
PHYSICAL EXAM - EXPOSURE

- ▶ Adequate exposure - groin to toes bilaterally
- ▶ Examine in supine position
- ▶ Compare knees



OBSERVE – STATIC ALIGNMENT

- ▷ Patient stands facing examiner with feet shoulder width apart
 - ▷ Ankles, subtalar joints – pronation, supination
 - ▷ Feet – pes planus, pes cavus



(<http://www.steenwyk.com/pronsup.htm>)



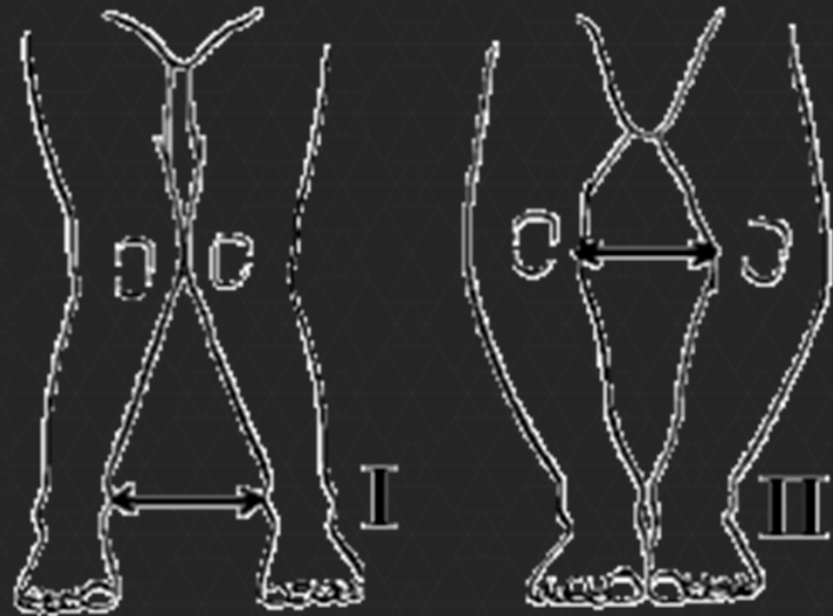
Pes planus

Pes cavus

(http://www.arc.org.uk/about_arth/booklets/6012/images/6012_1.gif)

OBSERVE – STATIC ALIGNMENT

- ▶ Patient then brings medial aspects of knees and ankles in contact
- ▶ Knees – genu valgum (I), genu varum (II)



Genu valgum

Genu varum

(<http://www.orthoseek.com/articles/img/bowl1.gif>)



OBSERVE – DYNAMIC ALIGNMENT

- ▶ Pronation/Supination may be enhanced with ambulation
- ▶ Antalgic gait indicates significant problem (anti = against, algic = pain)



INSPECT KNEE

- ▷ Evidence of local trauma
 - ▷ Abrasions
 - ▷ Contusions
 - ▷ Lacerations
- ▷ Patella position
- ▷ Muscle atrophy
- ▷ Warmth
- ▷ Erythema
- ▷ Effusion



INSPECT KNEE-RELATED MUSCLES

- ▶ Quadriceps atrophy
 - ▶ Long-standing problem
- ▶ Vastus medialis atrophy
 - ▶ After surgery



<http://www.neuro.wustl.edu/neuromuscular/pics/people/patients/Hands/ibmquadratrm.jpg>

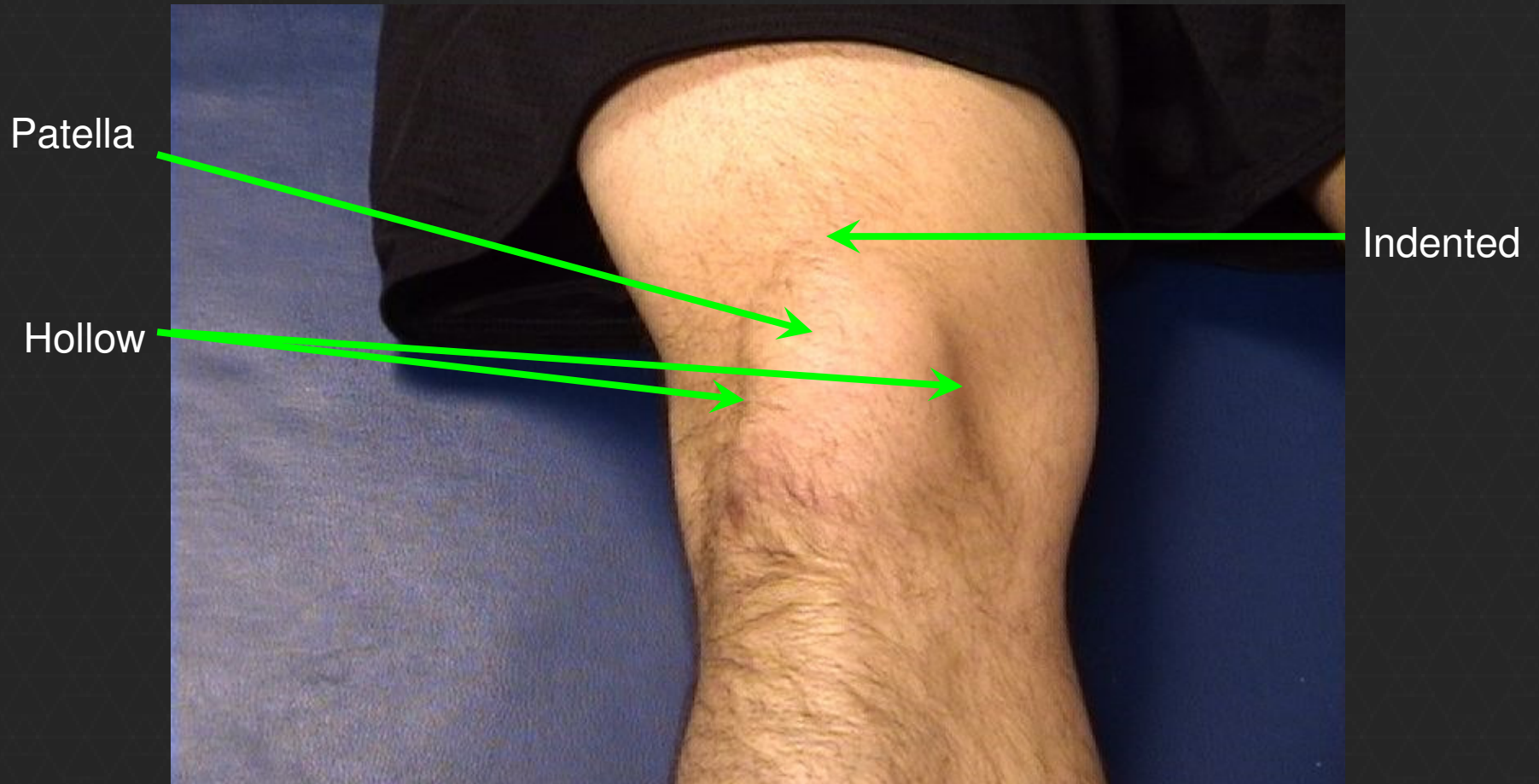


KNEE – ANTERIOR, EXTENDED





ANATOMY - ANTERIOR, EXTENDED*





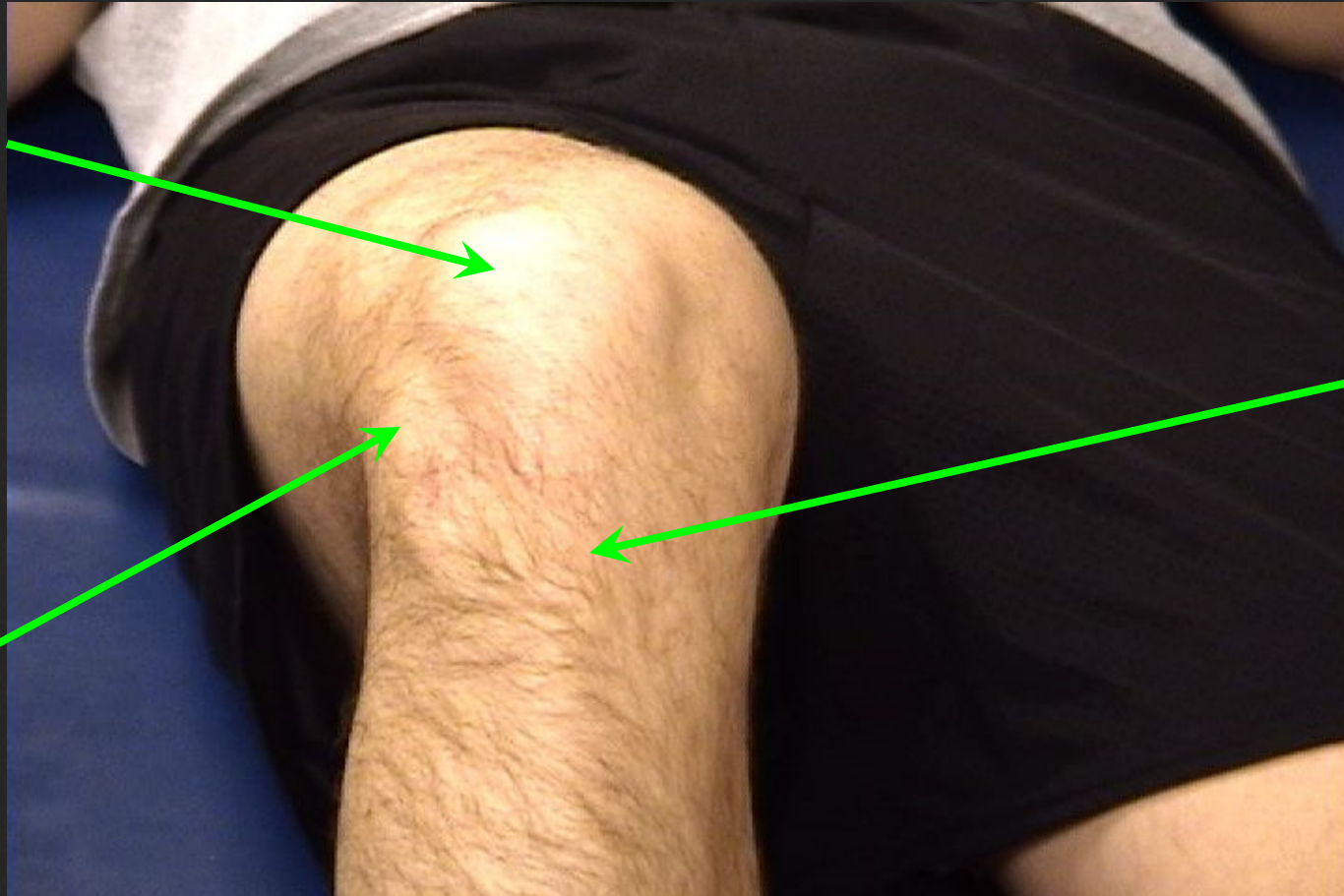
KNEE – ANTERIOR, FLEXED





ANATOMY - ANTERIOR, FLEXED

Patella



Tibial
Tuberosity

Head
Of
Fibula



PALPATION – ANTERIOR

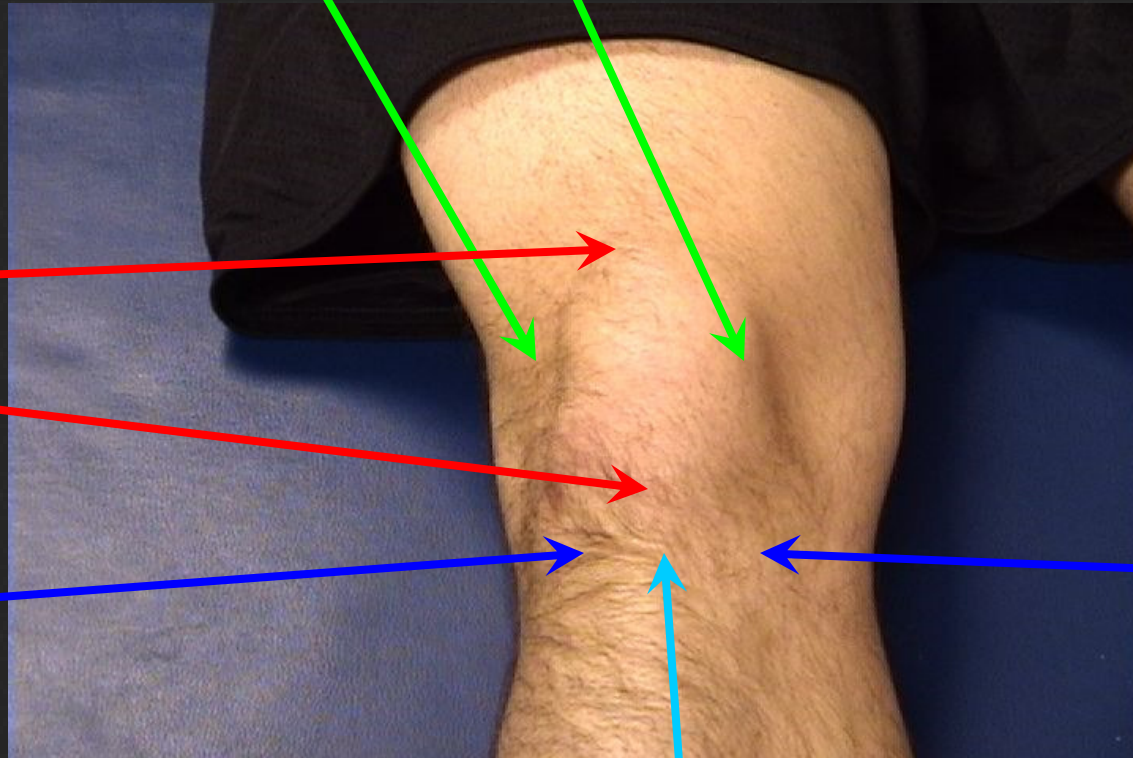
**Patella:
Lateral and Medial Patellar Facets**

**Superior
And
Inferior
Patellar Facets**

Lateral Fat Pad

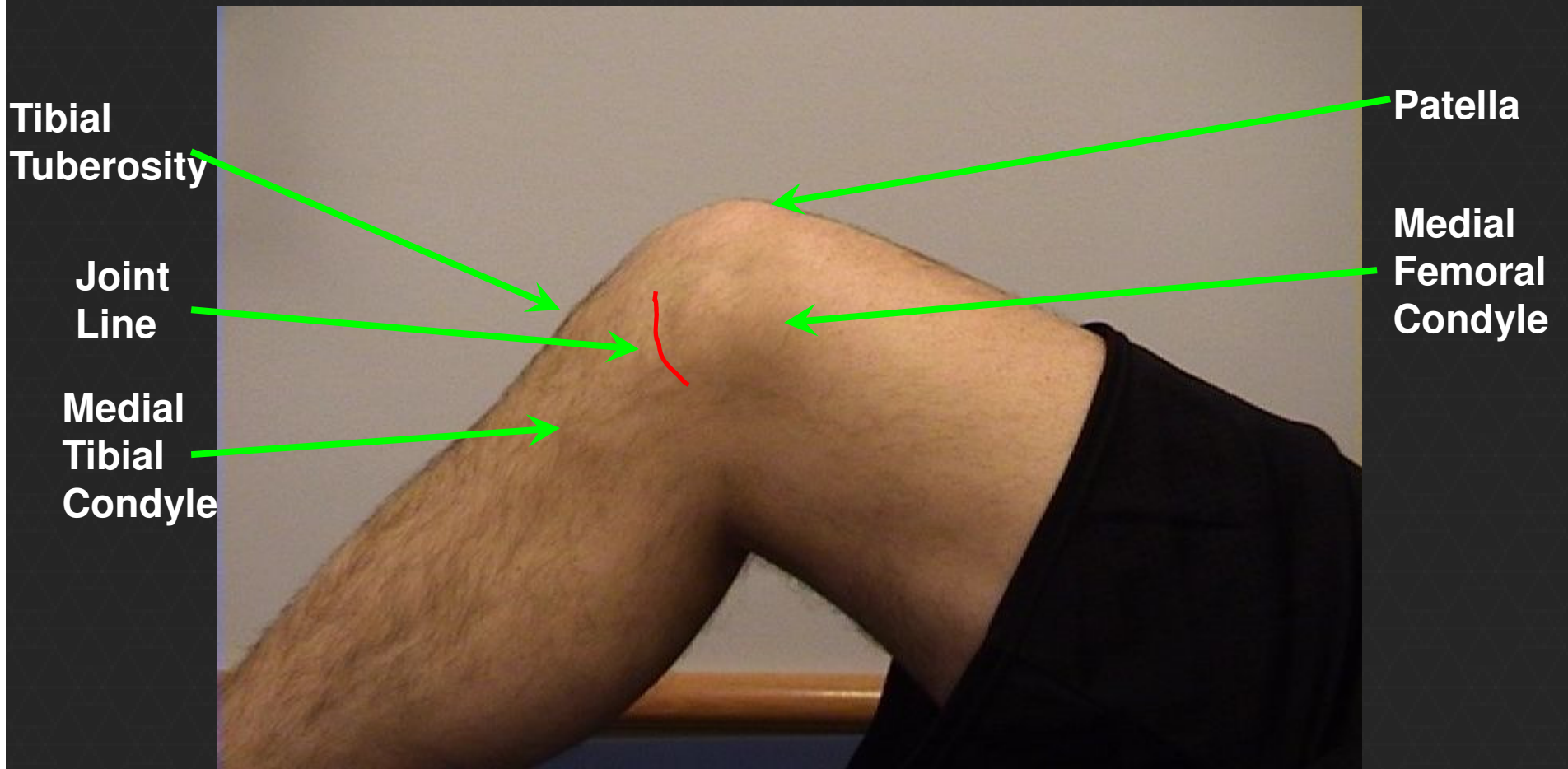
**Medial Fat
Pat**

Patellar Tendon**



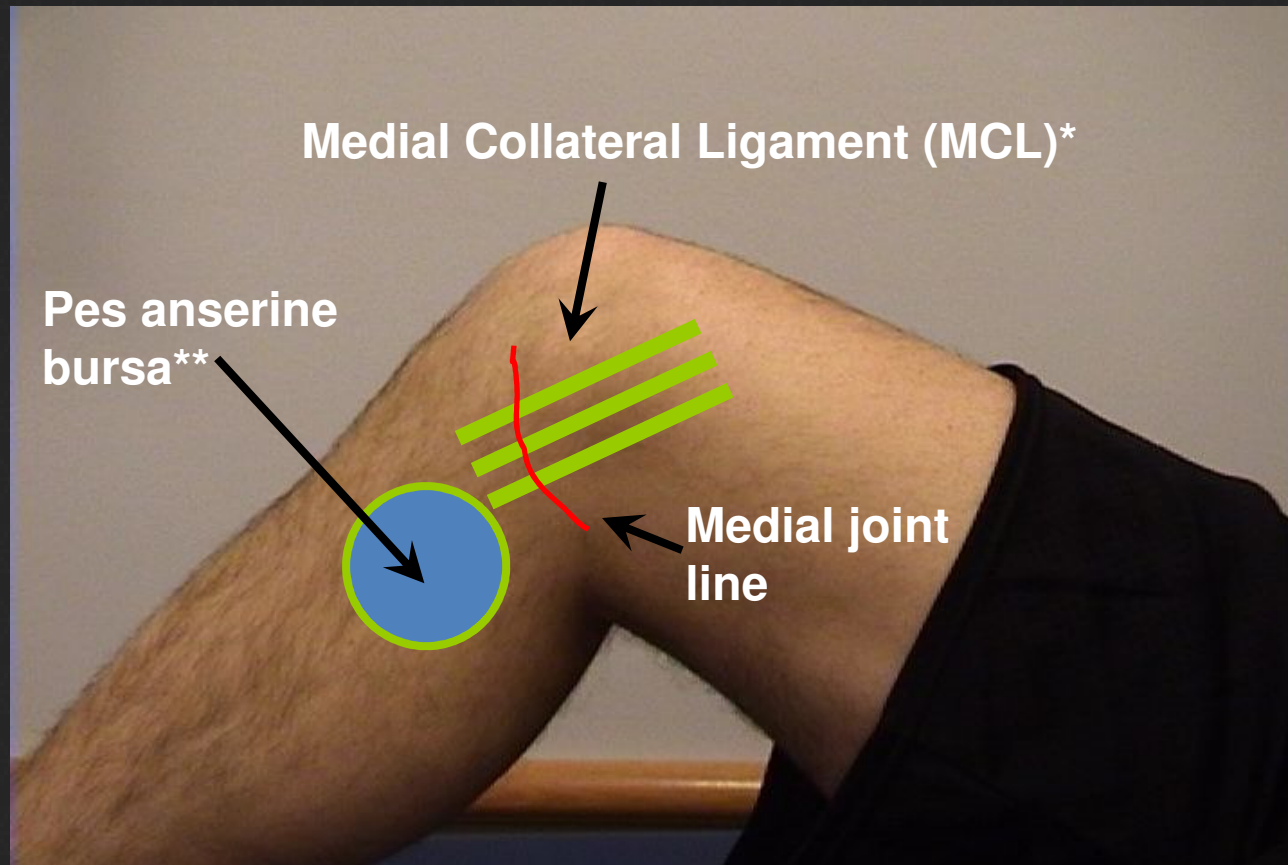


ANATOMY - MEDIAL



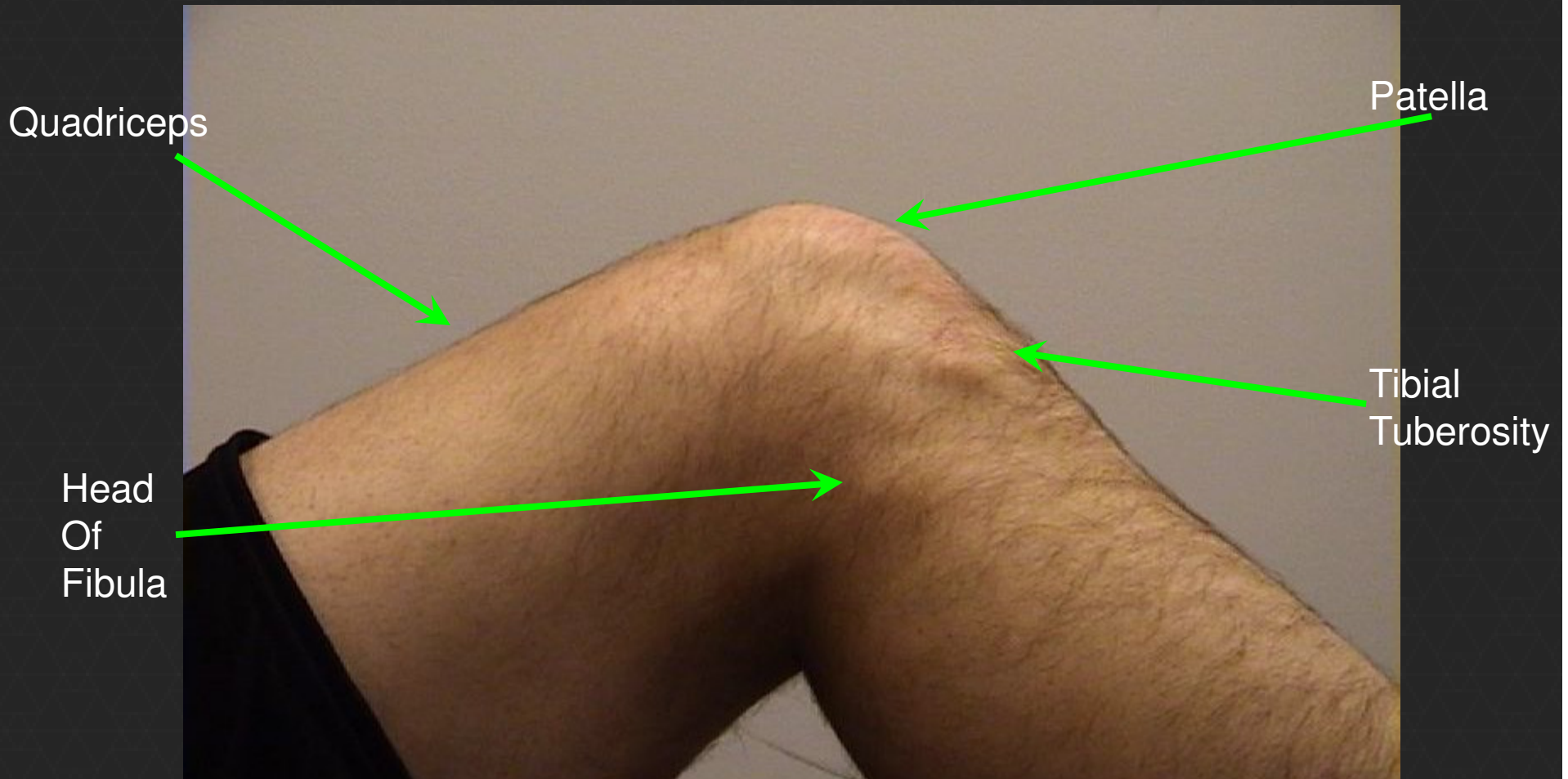


PALPATION - MEDIAL



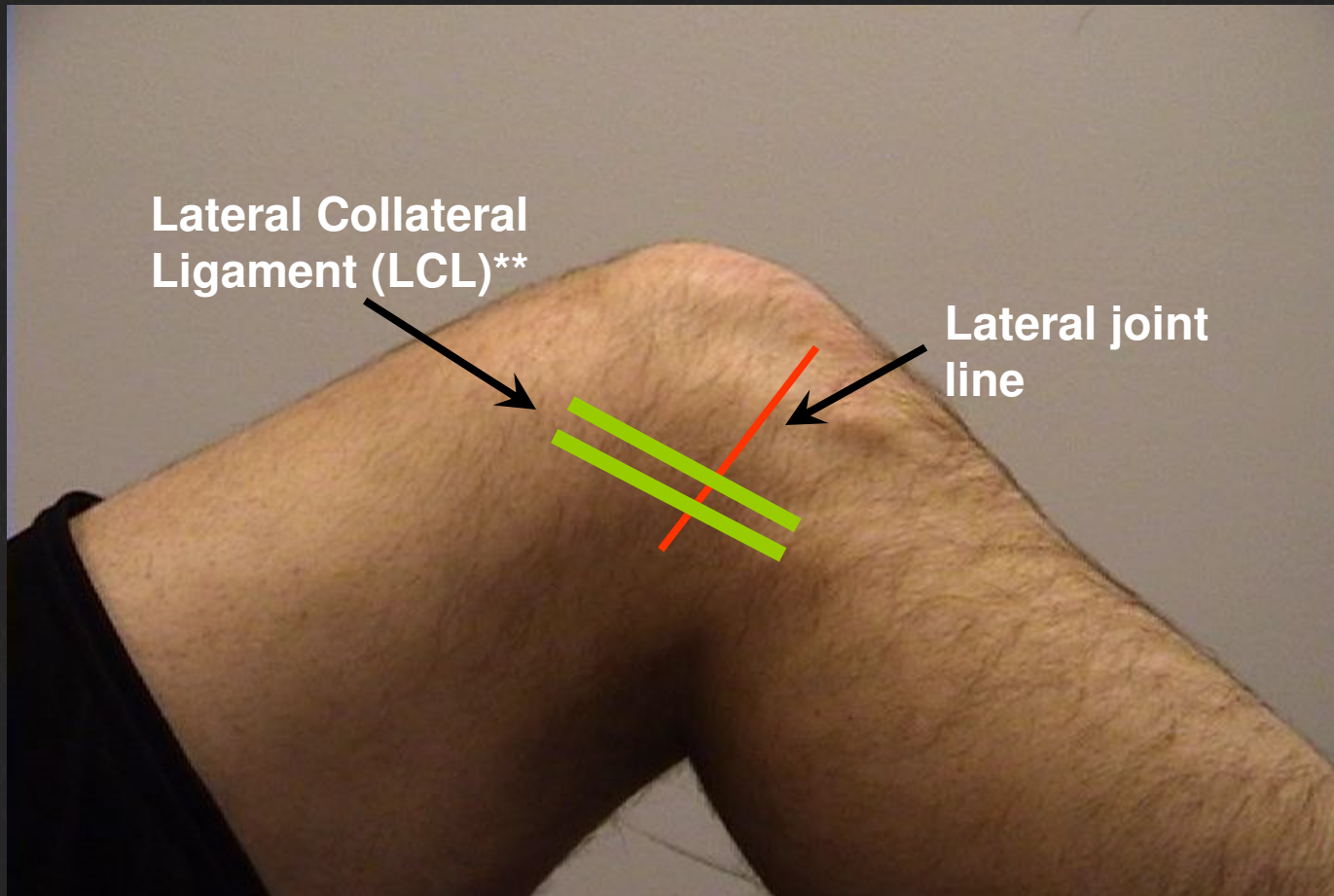


SURFACE ANATOMY – LATERAL





PALPATION – LATERAL*

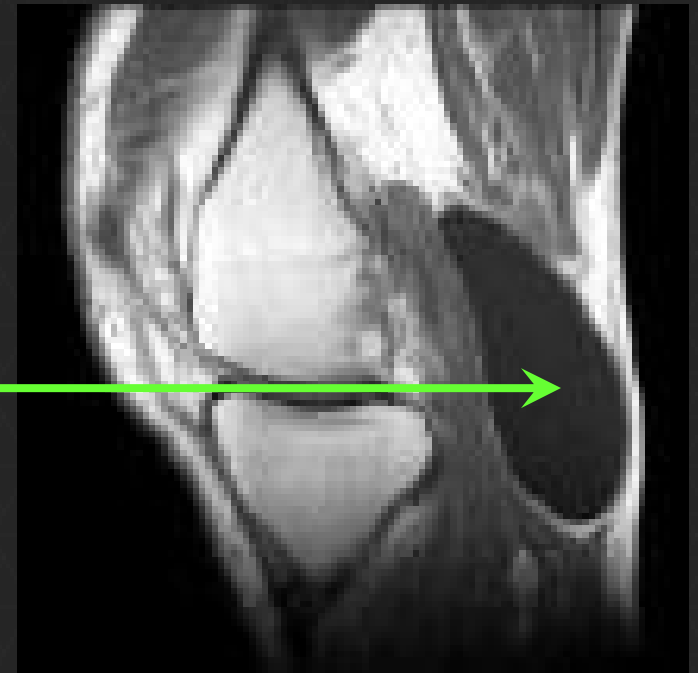




PALPATION - POSTERIOR

- ▷ Popliteal fossa

- ▷ Abnormal bulges
 - ▷ Popliteal artery aneurysm
 - ▷ Popliteal thrombophlebitis
 - ▷ Baker's cyst





RANGE OF MOTION TESTING

- ▶ Extension 0° \longrightarrow Flexion 135°
- ▶ Describe loss of degrees of extension
 - ▶ Example: “lacks 5 degrees of extension”
- ▶ Locking = patient unable to fully extend or flex knee due to a mechanical blockage in the knee (i.e., loose body, bucket-handle meniscus tear)

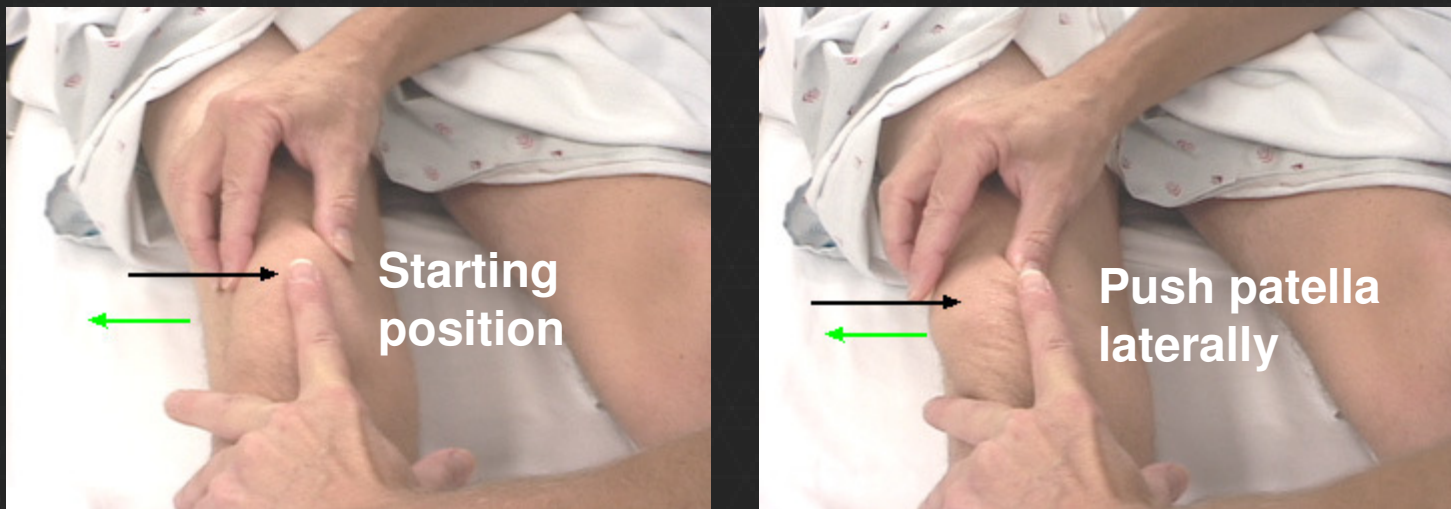


STRENGTH TESTING

- ▶ Test knee extensors (quadriceps) and knee flexors (hamstrings)
 - ▶ Can test both with patient in seated position, knees bent over edge of table
 - ▶ Ask patient to extend/straighten knee against your resistance
 - ▶ Then ask patient to flex/bend knee against your resistance
- ▶ Compare to unaffected knee

SPECIAL TESTS – ANTERIOR KNEE PAIN

▷ Patellar apprehension test*

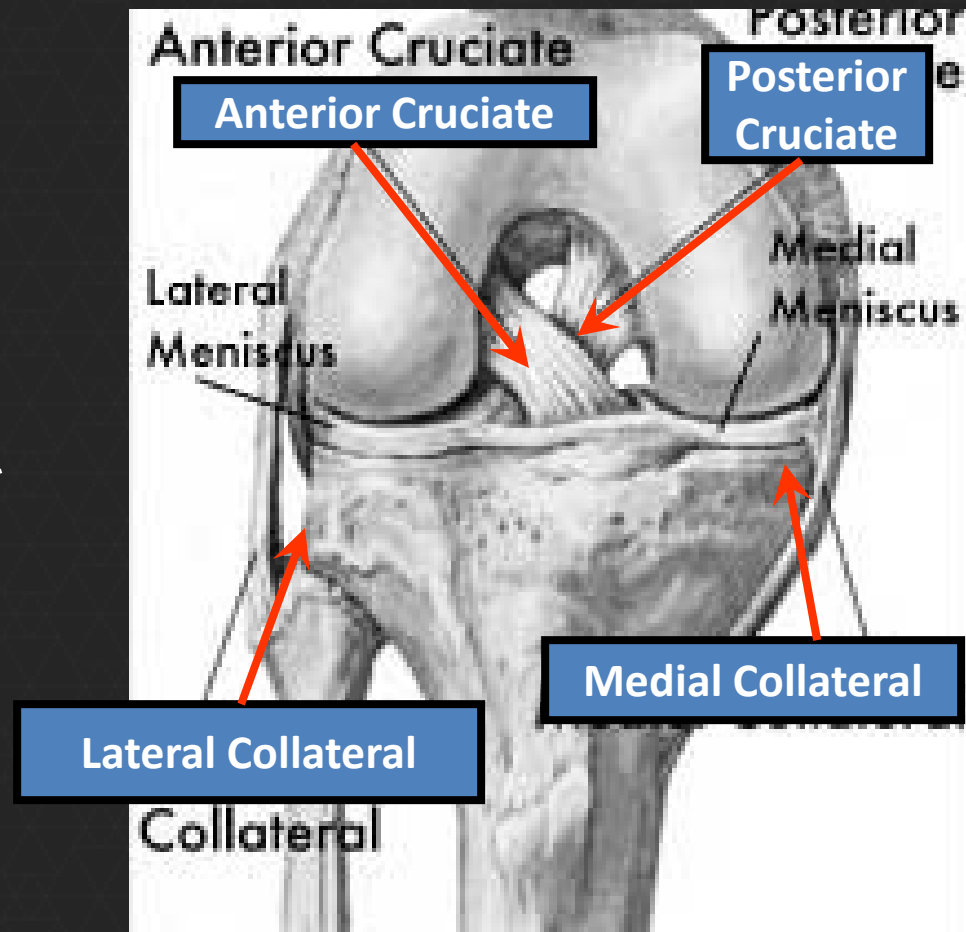


(http://www.sportsdoc.umn.edu/Clinical_Folder/Knee_Folder/Knee_Exam/lateral%20patellar%20ap%20prehension.htm)

▷ Patellofemoral grind test**

SPECIAL TESTS - LIGAMENTS


- ▶ Assess stability of 4 knee ligaments via applied stresses*





STRESS TESTING OF LIGAMENTS

- ▷ Use a standard exam routine
 - ▷ Direct, gentle pressure
 - ▷ No sudden forces

- ▷ Abnormal test
 1. Excessive motion = laxity
What is NORMAL motion?*
 2. Soft/mushy end point**



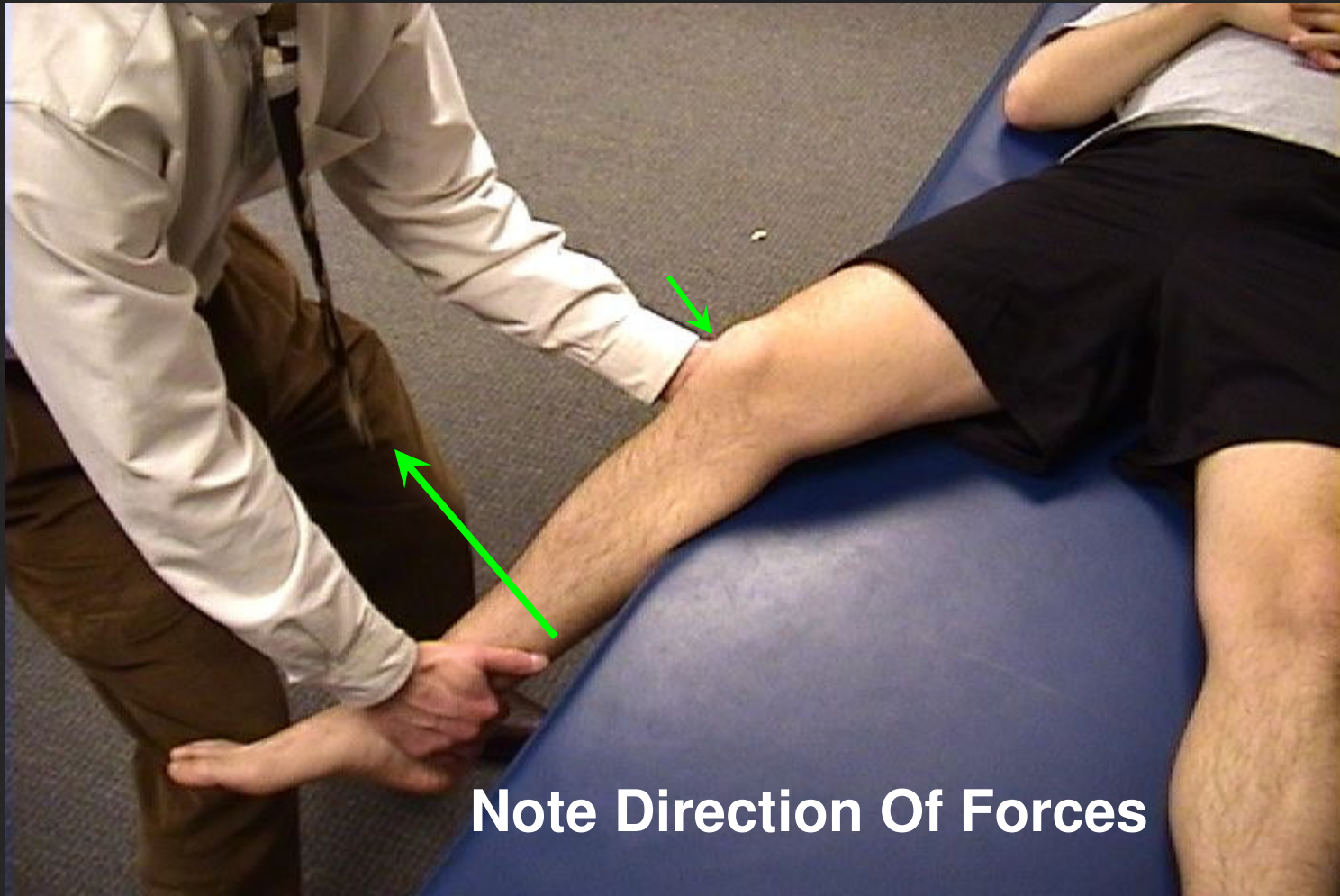
COLLATERAL LIGAMENT ASSESSMENT



**Patient and Examiner
Position***



VALGUS STRESS TEST FOR MCL*



Note Direction Of Forces

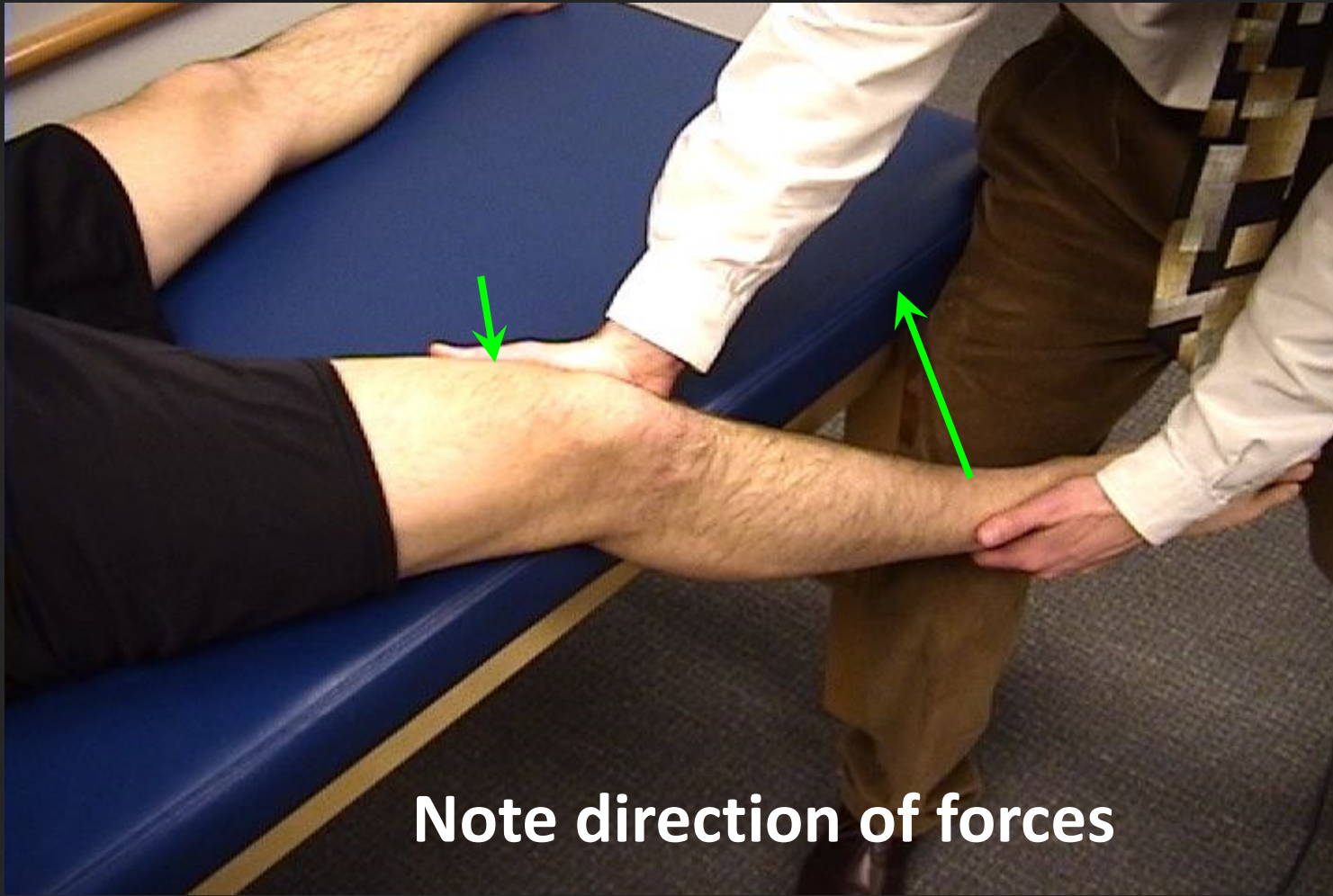


VALGUS STRESS TEST





VARUS STRESS TEST FOR LCL*



Note direction of forces



VARUS STRESS TEST





LACHMAN TEST*

- ▷ Patient Position
- ▷ Physician hand placement





LACHMAN TEST₂

- ▷ View from lateral aspect*



Note direction of forces



LACHMAN TEST





ANTERIOR DRAWER TEST FOR ACL

- ▷ Physician Position & Movements*
- ▷ Patient Position





POSTERIOR DRAWER TESTING- PCL*



Note direction of forces



ASSESS MENISCUS – KNEE FLEXION

- ▶ Most sensitive test is full flexion*
 - ▶ Examiner passively flexes the knee or has patient perform a full two-legged squat to test for meniscal injury
- ▶ Joint line tenderness**
 - ▶ Flexion of the knee enhances palpation of the anterior half of each meniscus



TESTS THAT WE DO NOT RECOMMEND ROUTINELY

- ▶ Pivot-Shift* - for ACL tear
- ▶ Posterolateral corner injury

REVIEW OF EVIDENCE – ACL*

Table 3. Comparison of 3 Clinical Examination Techniques for Diagnosing Anterior Cruciate Ligament Tears*

Study (Reference)	Lachman Test		Anterior Drawer Test		Pivot Test	
	Sensitivity	Specificity	Sensitivity	Specificity	Sensitivity	Specificity
Boeree and Ackroyd (14)	0.63	0.90	0.56	0.92	0.31	0.97
Hardaker et al. (40)	0.74	NA	0.18	NA	0.29	NA
Donaldson et al. (41)	0.99	NA	0.35	NA	0.70	NA
Jonsson et al. (42)	0.87	NA	0.33	NA		
Liu et al. (43)	0.95	NA	0.61	NA		
Braunstein (59)	0.91	1.0				
Torg et al. (71)	0.95	NA	0.61	NA	0.71	NA
Katz and Fingerhuth (75)	0.89	NA	0.41	0.95	0.78	0.98
Noyes et al. (76)		NA	0.56	NA	0.89	NA
Lee et al. (79)	0.89	NA	0.78	1.0		
Hughston et al. (81)			0.58	0.23		
Summary statistic (95% CI)	0.87 (0.76–0.98)	0.93 (0.89–0.96)	0.48 (0.38–0.59)	0.87 (0.83–0.91)	0.61 (0.40–0.82)	0.97 (0.93–0.99)

(Jackson JL, et al | 578 | 7 October 2003 | Annals of Internal Medicine | Volume 139 • Number 7

- ▷ Lachman Test Sens 87% Spec 93%
- ▷ Anterior Drawer Sens 48% Spec 87%
- ▷ Pivot Shift Test Sens 61% Spec 97%

REVIEW OF EVIDENCE - MENISCUS

Table 4. Comparison of 2 Common Physical Examination Tests for Meniscal Pathology*

Study (Reference)	Joint Line Tenderness		McMurray Test	
	Sensitivity	Specificity	Sensitivity	Specificity
Anderson and Lipscomb (38)	NA	NA	0.58	0.95
Noble and Erat (39)	0.67	0.13	0.63	0.58
Fowler and Lubliner (63)	0.85	0.29	0.29	0.95
Barry et al. (83)	0.76	0.43	0.56	1.0
Summary statistic (95% CI)	0.76 (0.65–0.87)	0.29 (0.10–0.46)	0.52 (0.35–0.68)	0.97 (0.87–0.99)

* NA = not assessed.

(Jackson JL, *et al.*)

www.annals.org

7 October 2003 | Annals of Internal Medicine | Volume 139 • Number 7 | 579

- ▶ Joint Line Tenderness Sens 76% Spec 29%
- ▶ McMurray Test Sens 52% Spec 97%



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Ebell MH. A Tool for Evaluating Patients with Knee Injury. *Family Practice Management*. March 2005:67-70.

Jackson JL, O' Malley PG, Kroenke K. Evaluation of Acute Knee Pain in Primary Care. *Ann Intern Med*. 2003;139:575-588.

Malanga GA, Andrus S, Nadler SF, McLean J. Physical Examination of the Knee: A Review of the Original Test Description and Scientific Validity of Common Orthopedic Tests. *Arch Phys Med Rehabil* 2003;84:592-603.

Solomon DH, Simel DL, Bates DW, Katz JN. Does this patient have a torn meniscus or ligament of the knee? Value of the Physical Examination. *JAMA* 2001;286:1610-1620.

Thank you!



TOPIC 1