

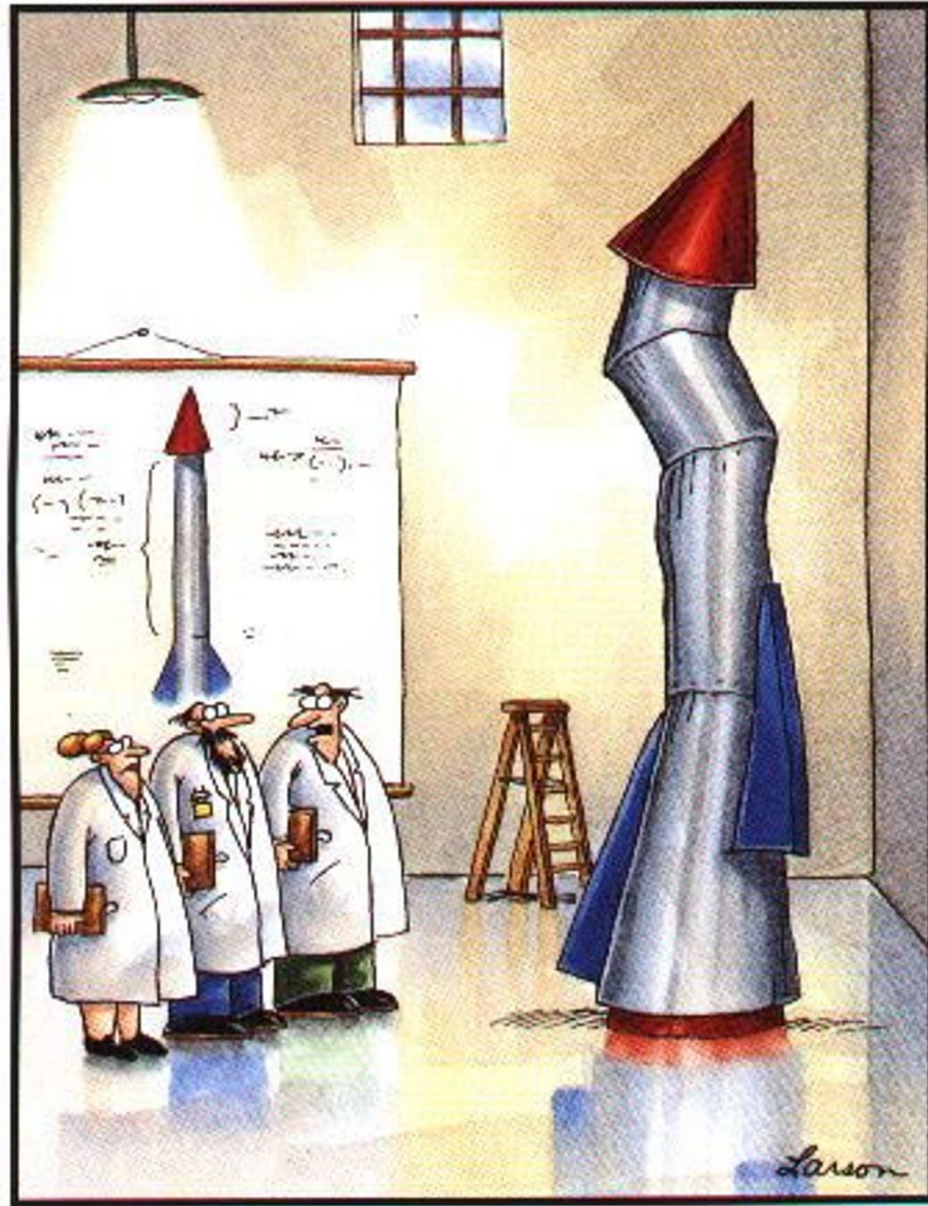


TEARS AND LIES MY RADIOLOGIST TOLD ME

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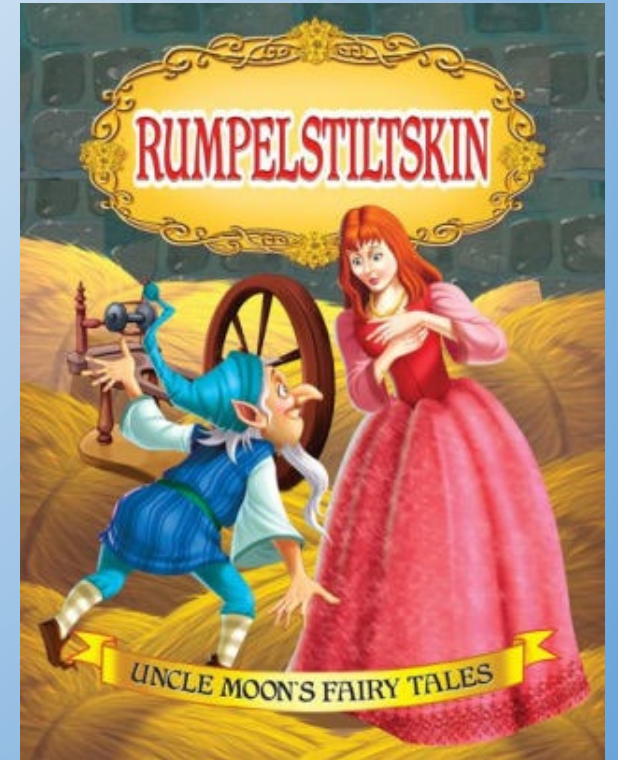


"It's time we face reality, my friends. ...
We're not exactly rocket scientists."



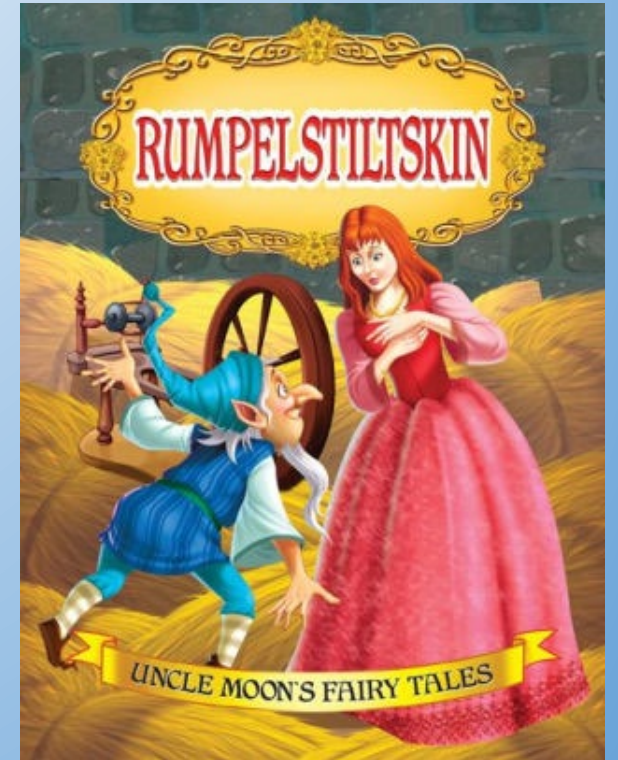
NAMING SOMETHING

- One moral of the German folk tale, *Rumpelstiltskin*, is that the act of naming something confers dominion over it.



NAMING SOMETHING

- “Rumpelstiltskin Principle” suggests that titles and names are tools of control.



RIDDLE ME THIS, BATMAN.....

• IS AN MRI OBJECTIVE?



Frank John Gorshin, Jr. 1966 Batman



IS AN MRI OBJECTIVE?

- **ATTORNEY:** “Dr. Bauer. The disc bulges on the MRI, that was obtained after my client was hurt.....”



IS AN MRI OBJECTIVE?

- **ATTORNEY: “Dr. Bauer. The disc bulges on the MRI, that was obtained after my client was hurt..... That’s objective evidence of injury, correct?”**



IS AN MRI OBJECTIVE?

- Q. All right. With respect to the failed prior conservative care, how does that establish that this motor vehicle accident caused a disc herniation?
- A: Well, the fact that he has pain that is not subsiding with conservative treatment establishes that it was related to the car accident on December 20, '19.
- Q. I'm not following your reasoning. Why does that mean that it was the car accident that caused a disc herniation?
- A. Why not? I have nothing else.
- Q: All right. Let me ask you about something else. You said the MRI. What is it about the MRI that proves the car accident caused the disc herniation?
- A. Well, I have a person who had no symptoms. He comes to me with symptoms, with findings, with positive MRI.
- Q. Well --
- A. That's enough, in my opinion. I don't know what else you're looking for, really.....



IS AN MRI OBJECTIVE?

- **X-rays, MRI,s, CAT scans do not show disease – they only show anatomy.**
- **Diagnoses and etiologies are two very different things**



THE ART OF MEDICINE.....



The art of medicine consists in amusing the patient while nature cures the disease.

(Voltaire)

izquotes.com



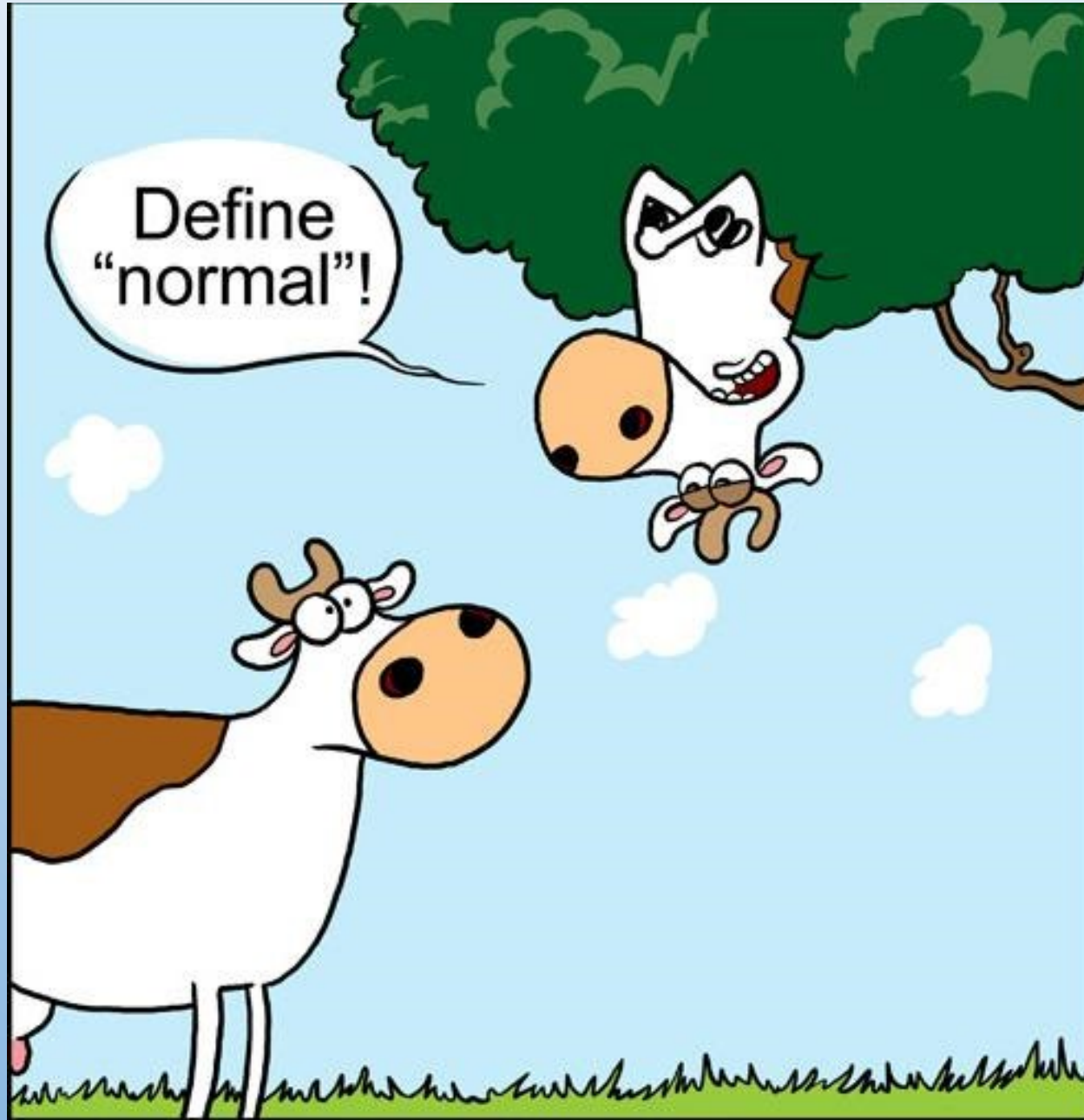
THE ART OF MEDICINE.....

....is determining what is clinically relevant.



What is **NORMAL?**





NORMAL

- **Typical; usual; according to the rule or standard**
- **Agreeing with regular and established type**
- **Functioning in a natural way; lacking observable abnormalities or deficiencies.**



NORMAL





MRI DARK SIDE

- **Unfettered general practitioner/phys. extender MRI utilization**
- **Unacceptable indication creep and disutility**





MRI DARK SIDE

- **Love affair with shiny machines**
- **Technology over clinical expertise**
- **Lack of understanding of the meaning of the results**





MRI DARK SIDE

- **Patients believe added value imaging**
 - **Pt's believe "imaging is the answer"**
 - **Pt's beliefs reflected knowledge gaps about appropriate treatment**
 - **How long it takes acute LBP to resolve**







tear¹

/ter/

verb

1. pull or rip (something) apart or to pieces with force.
"I **tore up** the letter"

Similar: rip up rip in two pull apart pull to pieces shred

2. **INFORMAL**
move very quickly in a reckless or excited manner.
"she **tore** along the footpath on her bike"

Similar: sprint race run dart rush dash hasten hurry scurry ▼

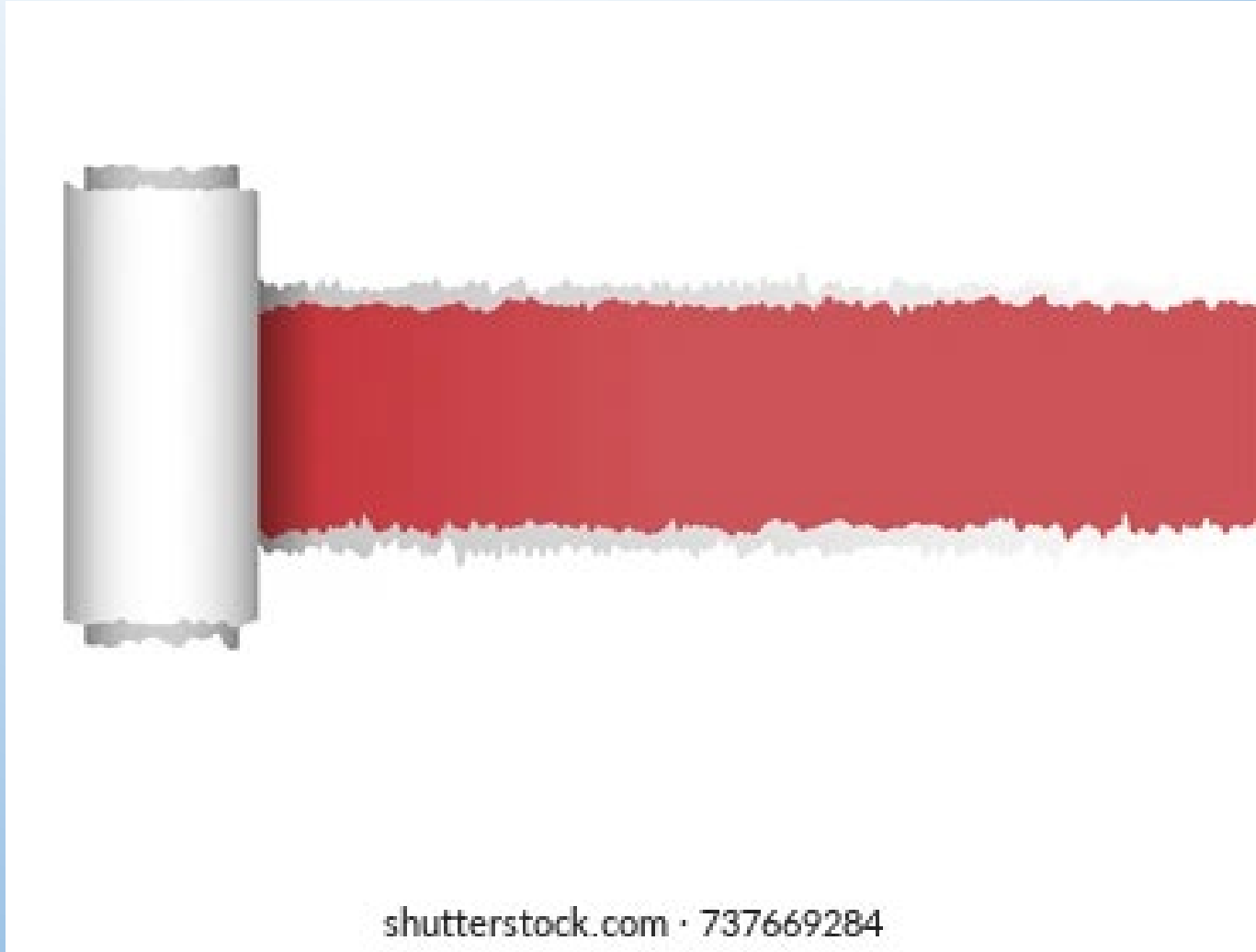
noun

1. a hole or split in something caused by it having been pulled apart forcefully.
"there was a tear in her dress"

Similar: rip hole split rent cut slash slit ladder run snag

2. **INFORMAL • US**
a brief spell of erratic or unrestrained behavior; a binge or spree.
"one of my drinking buddies came for the weekend and we **went on a tear**"

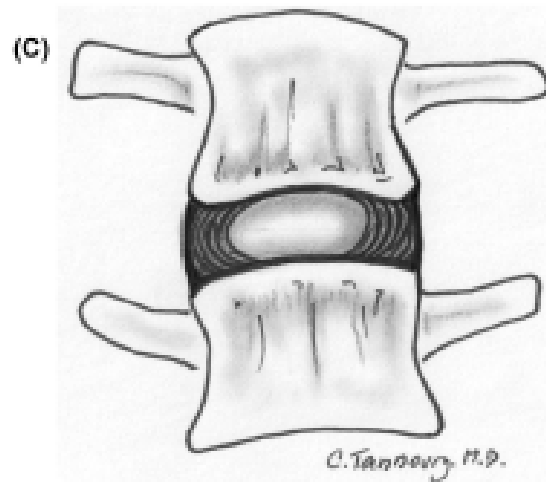
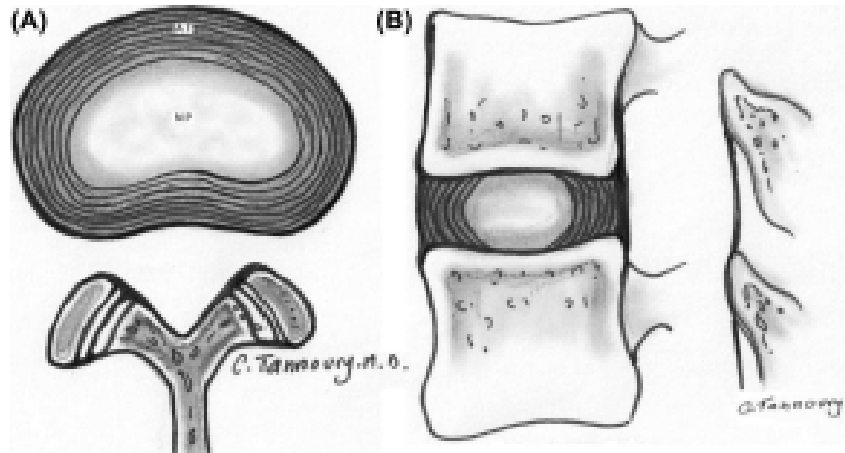




FISSURES



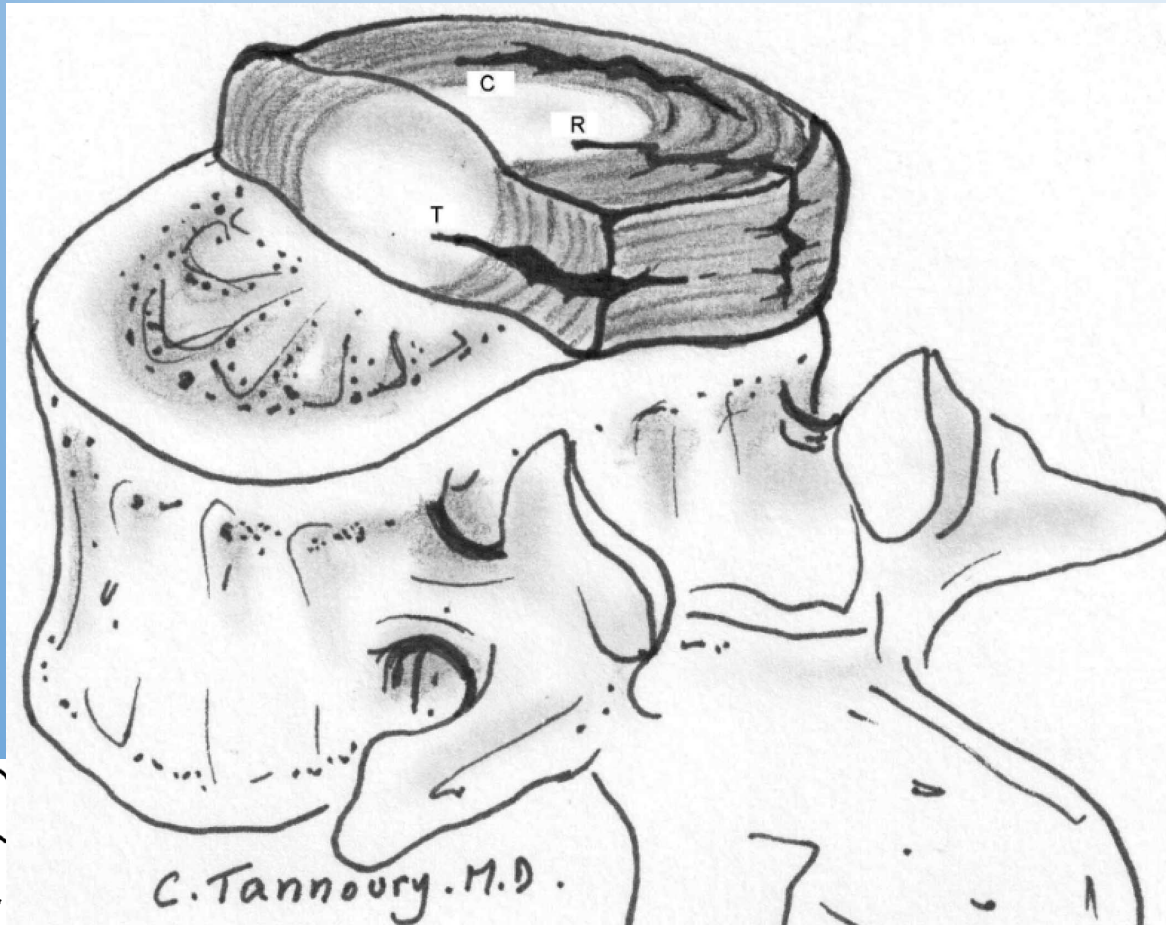
ANATOMY



- Normal disc, composed of central nucleus pulposus and peripheral annulus fibrosus
- Wholly within the boundaries of the disc space

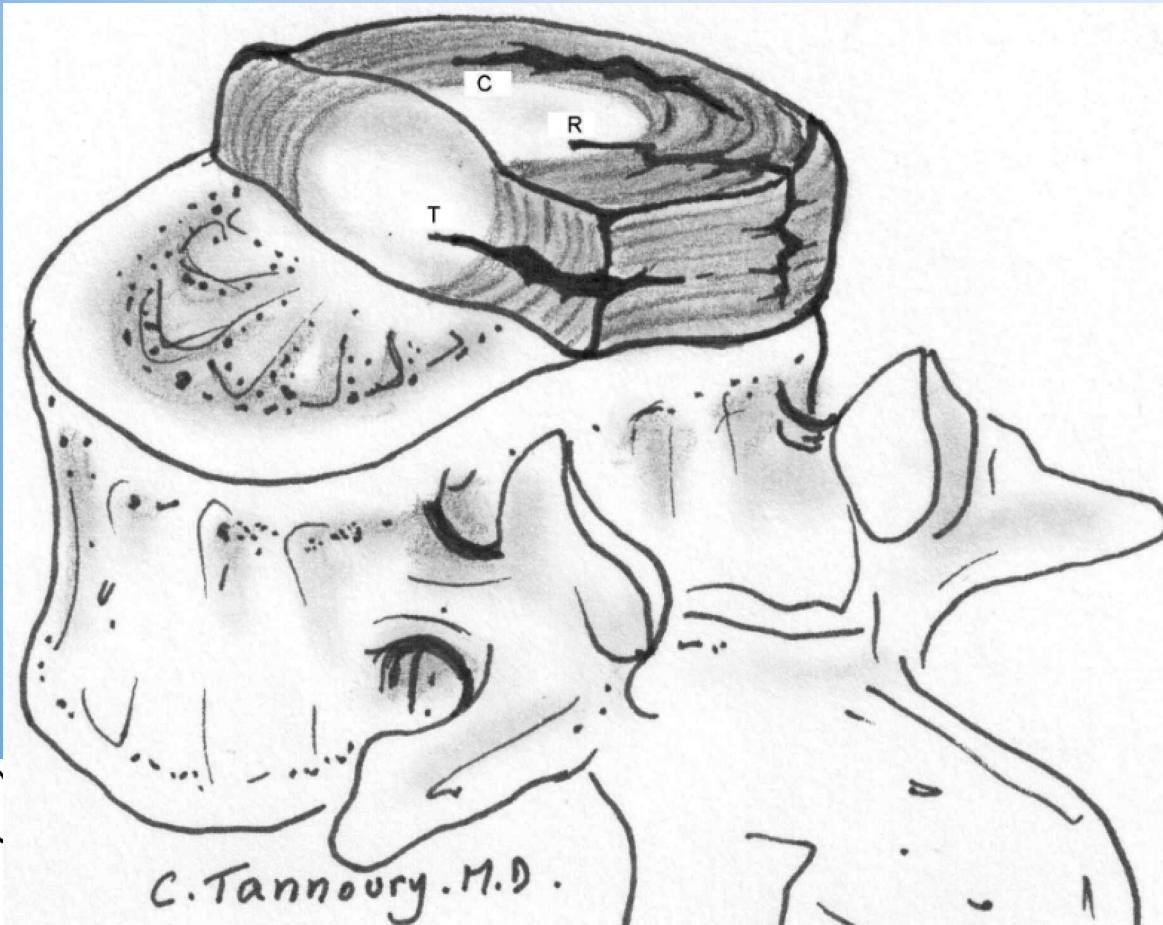


FISSURES



- Radial (R), transverse (T), concentric (C) separations of fibers of the annulus

FISSURES



- Separations between annular fibers/separations of annular fibers from attachments to the vertebral bone





ANNULAR TEARS

- **Although the word tear is commonly used to describe the gamut of these lesions, it does not necessarily indicate a traumatic cause**





ANNULAR TEARS

- **The word fissure should be used, as words like "tear" can make us feel damaged and in need of repair**



FISSURES

- **Annular fissures nearly all degenerated discs**
 - **radial, concentric, and transverse types**
- **If disc dehydrated on MRI scan**
 - **At least 1 or more small fissures in the annulus**





ANNULAR TEARS

- **Annular fissures are degenerative in nature and are neither caused by nor accelerated by trauma**
- **Annular tears are not a sign of injury and are not created by a fall.**



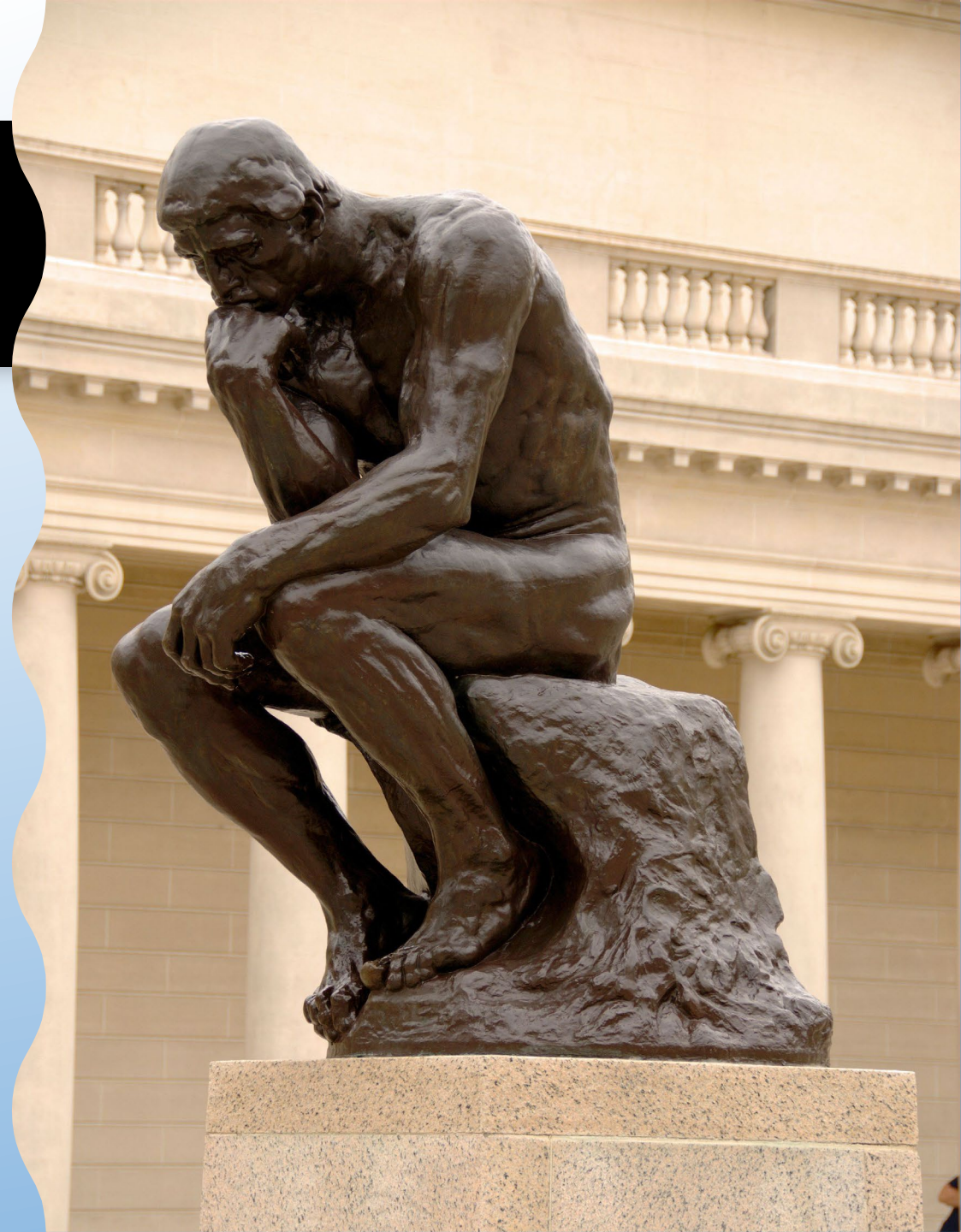
BULGES AND FISSURES

- **Anulus fibrosus is most affected disc component in degenerative process.**
- **Annular fissures one of earliest manifestations degenerative disc disease.**
- **Frequently found asymptomatic population.**





**SO, WHEN
IS A TEAR
NOT A
TEAR?**





**SO, WHEN
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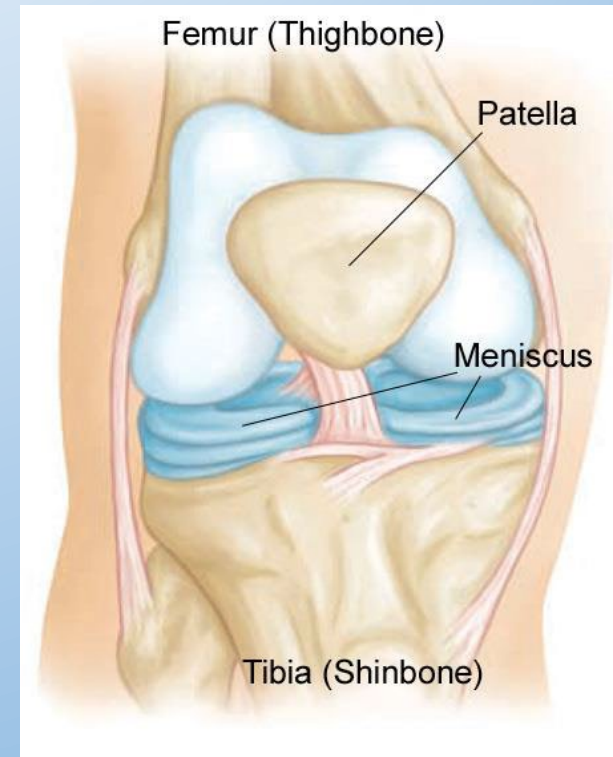






KNEES

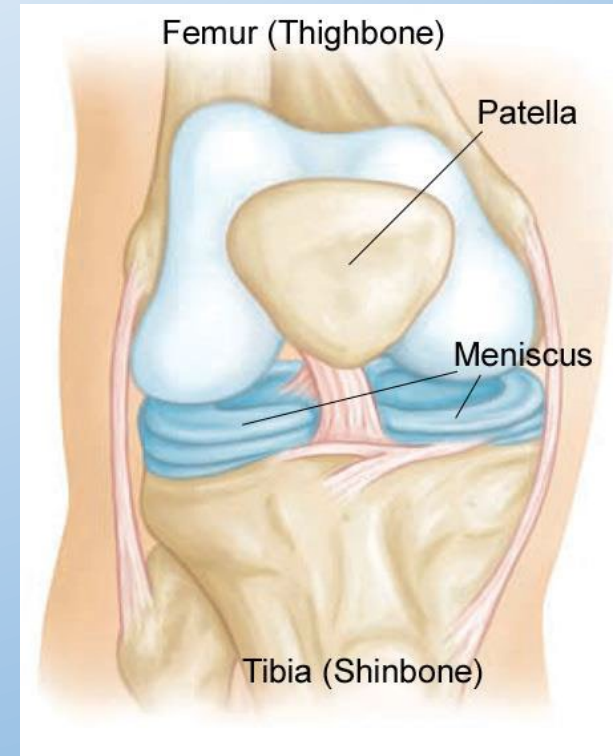
- **Menisci function in proprioception, load sharing, shock absorption, reduction in joint contact stresses**





KNEES

- **Menisci function in passive stabilization, increase congruity/contact area, limit extremes of flexion/extension**





KNEES

- **Medial and lateral menisci transmit 50% - 70% of the load when the knee is in extension**
- **Increases to 85% with 90° of knee flexion**
- **Menisci key role in enhancing joint stability**





KNEE DEGENERATION

- **Decreased cellularity, menisci from patients 40+ more vulnerable to degeneration.**
- **Nearly all knees asymptomatic adults abnormalities in at least one knee structure on MRI**
- **Insidious onset of symptoms w/o traumatic history.**
- **>40 years old, degenerative tears most common.**
- **Represent part of the pathology of degenerative arthritis.**





MENISCUS TEARS

- **Finding of meniscus tear on MRI does not necessarily mean that any injury has occurred**
- **Meniscus tears can occur in the absence of any memorable injury**





MENISCUS TEARS

- People with meniscus tears do not always have pain, and a person with knee pain and meniscus tear on MRI does not necessarily have pain as a result of the tear





MENISCUS TEARS

- **Prevalence of bone and soft tissue abnormalities in asymptomatic knees**
- **Osteophytes and meniscal abnormalities were the most prevalent abnormalities asymptomatic population - 61.4%**





MENISCUS TEAR MRI

- **Relationship between radiographic knee OA w/presence relevant meniscal tear**
 - **MRI in symptomatic patients over age 60.**





MENISCUS TEAR MRI

- **Increased K-L grade – higher proportion of meniscal tear**
- **Extremely high concordance of MRI findings w/ OA & meniscal sx**





MENISCAL TEAR?

- **Canary in the coal mine**
- **“Something that gives an early warning of danger or failure”**





MENISCUS TEAR MRI

- **Degenerative meniscal tears associated with incipient OA**
- **Meniscal tear signals the first symptom of the disease.**
- **Menisci and articular cartilage share components and properties exposed to similar stresses**





MENISCUS TEAR MRI

- **Meniscal damage at baseline was more common in patients when tibiofemoral OA developed; odds ratio of 5.7**
- **Significantly more OA observed in contralateral knees vs control**
- **Meniscal damage is predictive for the development of radiographic OA.**





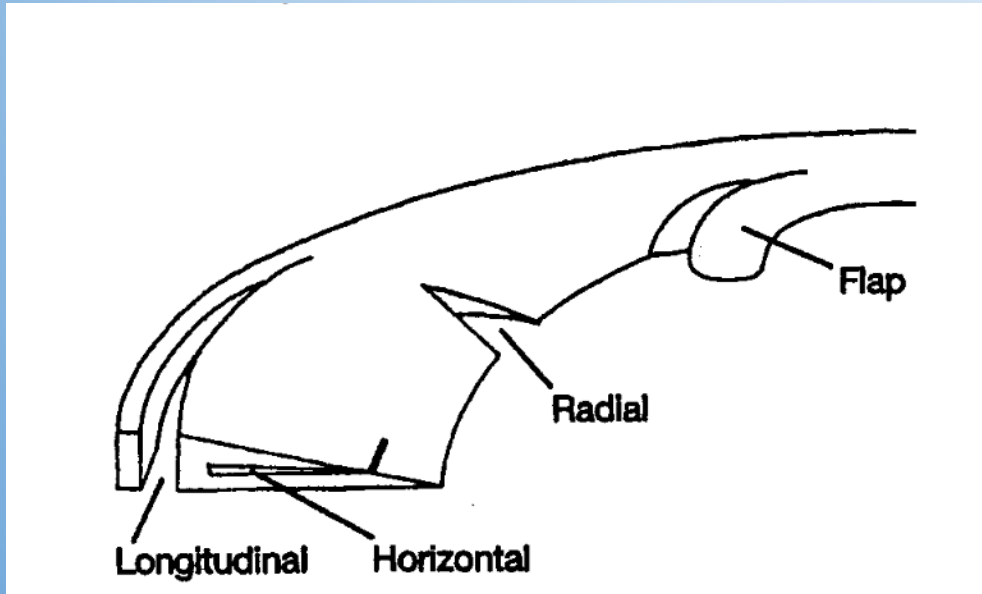
MENISCUS TEAR MRI

- **Osteoarthritic knees with a meniscal tear not more painful than those without a tear, and the meniscal tears do not affect functional status.**
- **Pain with nonobstructive meniscal tears not triggered by the meniscus**
- **Early stages of osteoarthritis**
- **Knee pain and meniscal integrity not directly related**





TYPES OF TEAR



- **Longitudinal tear:** vertical tear longitudinal direction in the periphery of the meniscus.
- **Horizontal tear:** horizontal cleavage
- **Radial tear -** vertical tear starting in the free (central) margin
- **Flap tear -** oblique vertical cleavage parrot beak
- **Degenerative meniscus-tear or multiple tears** in a degeneratively changed meniscal tissue





MENISCUS INTRAMENISCAL SIGNAL INTENSITY

- **Linear intrameniscal signal intensity is NOT a tear**
- **Middle-aged w/o OA, intrameniscal signal highly unlikely to resolve and is risk factor for degenerative meniscal tear.**





MENISCUS EXTRUSION

- **Meniscal extrusion is common**
- **Often a sign of degraded/torn meniscus and OA**





MENISCUS EXTRUSION

- **Initial joint space narrowing on X-ray 2° to meniscal extrusion not thinning of articular cartilage.**
- **Meniscal subluxation highly associated knee OA sx**



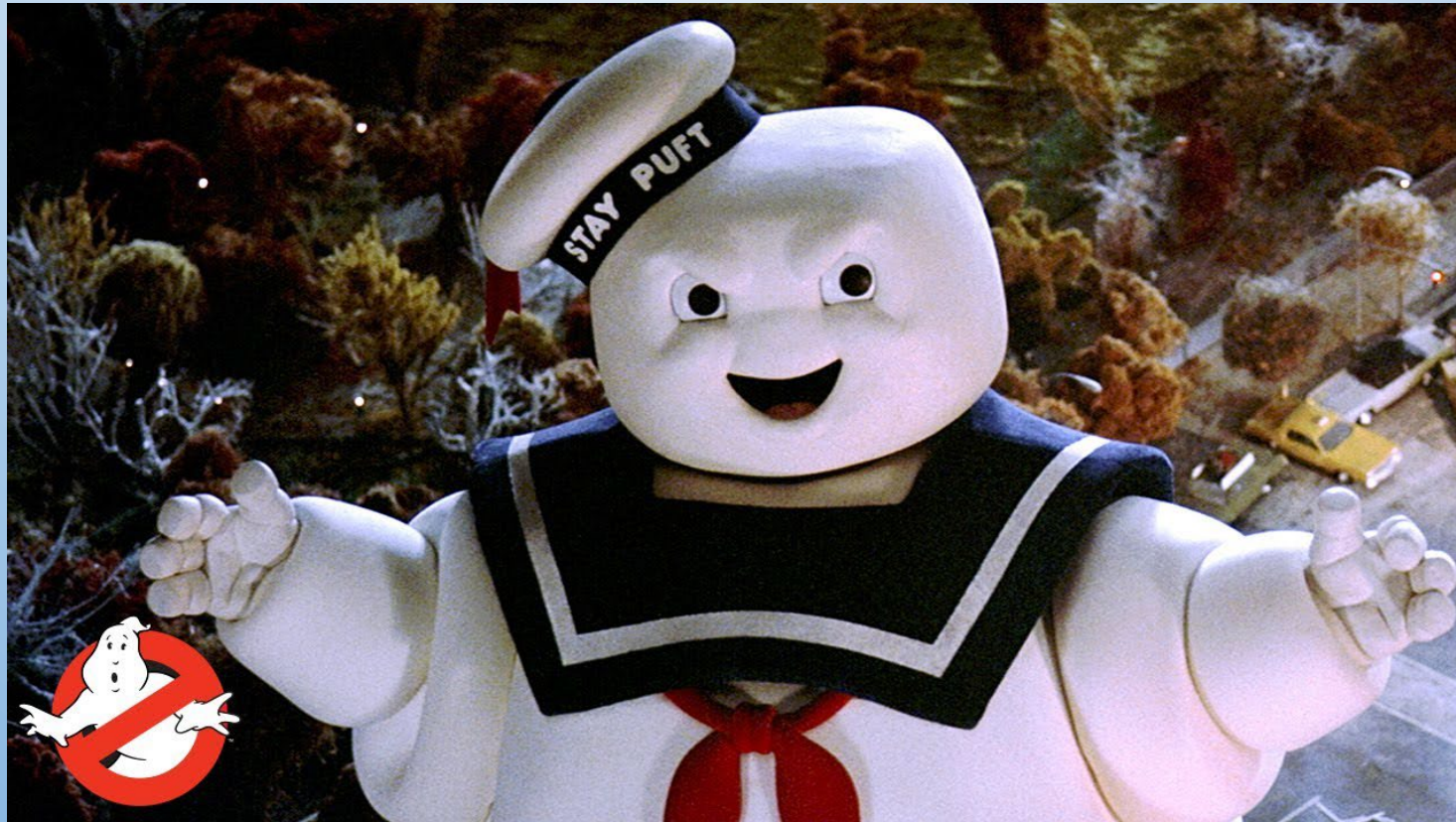


MENISCUS EXTRUSION

- **340 subjects 45-55 years, mean BMI 26.7**
- **Kellgren-Lawrence grade 0 in both knees**
- **High degree of meniscal body extrusion on MRI strongly associated with development radiographic knee OA.**



OBESITY/OA/KNEE PAIN





OBESITY/OA/KNEE PAIN

- **Obesity accounts for a substantial proportion of severe disabling knee pain.**
- **Higher BMI predicts knee pain and long-term studies independently of radiographic knee osteoarthritis.**







ARTHROSCOPY DEGENERATIVE TEAR

- Randomized controlled trial 140 adults, 35-60 years
- MRI verified degenerative meniscal tear
- 96% without definite radiographic knee OA.
- Inconclusive with respect to potential differences in progression XR OA features after surgical or non-surgical treatment for degenerative meniscal tear





ARTHROSCOPY DEGENERATIVE TEAR

- **Worse outcomes 1 and 2 years after APM:**
 - **Complex meniscal tears**
 - **larger extrusion**
 - **cartilage injuries**
 - **larger meniscal excision**





ARTHROSCOPY DEGENERATIVE TEAR

- **146 adults, mean 52 years (35-65 yrs), degenerative medial meniscus tear verified by MRI scan and scope**
- **Consistent, inc. risk for progression of radiographic knee OA in the APM group as compared with the placebo.**





ARTHROSCOPY DEGENERATIVE TEAR

- **Consistent, slightly greater risk for progression of radiographic knee osteoarthritis in the APM group as compared with the placebo.**
- **No benefit in patient-relevant outcomes, at 5 years after surgery**






ARTHROSCOPY DEGENERATIVE TEAR

- **APM provides little/no clinical benefit in pain or function in degenerative tears**
- **Not improved success compared placebo**
- **More serious/total adverse events**





COMMON ORTHOPEDIC PROCEDURES

- Ten of the most common elective orthopaedic procedures—arthroscopic anterior cruciate ligament reconstruction, arthroscopic meniscal repair of the knee, **arthroscopic partial meniscectomy of the knee**, arthroscopic rotator cuff repair, arthroscopic subacromial decompression, carpal tunnel decompression, lumbar spine decompression, lumbar spine fusion, total hip replacement, and total knee replacement
- 



FRACTURE?





BONE MARROW “FRACTURE”!!!!

- **Subchondral marrow edema common in patients with degenerative joint disease.**
- **BME lesions identified in 56% of knees**
 - **4x more likely in painless knees.**





BONE MARROW “FRACTURE”!!!!

- Findings on histologic/microscopic examination BME not demonstrate fracture
- Meniscal pathology substantially increased risk BME



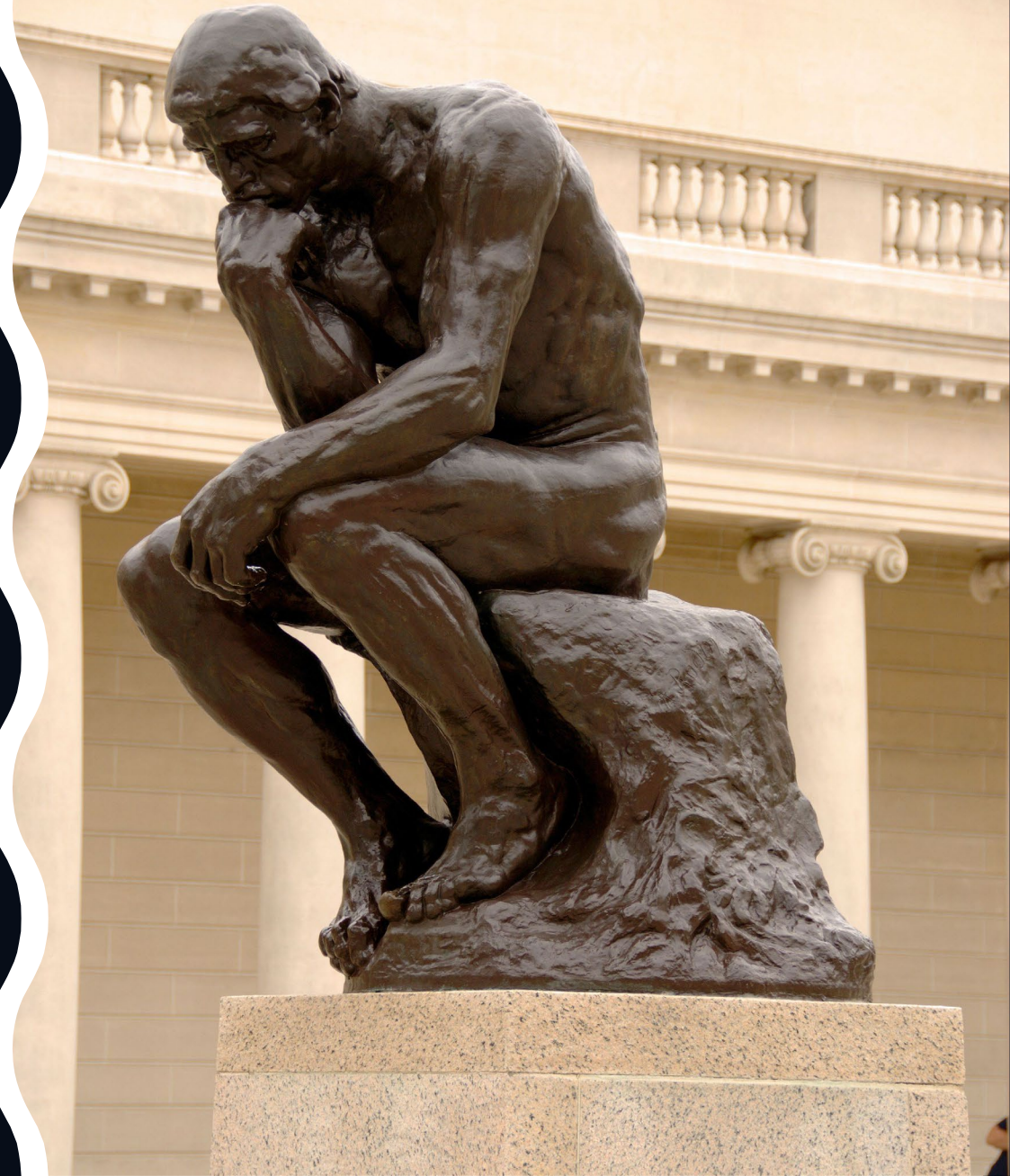


INJURY?

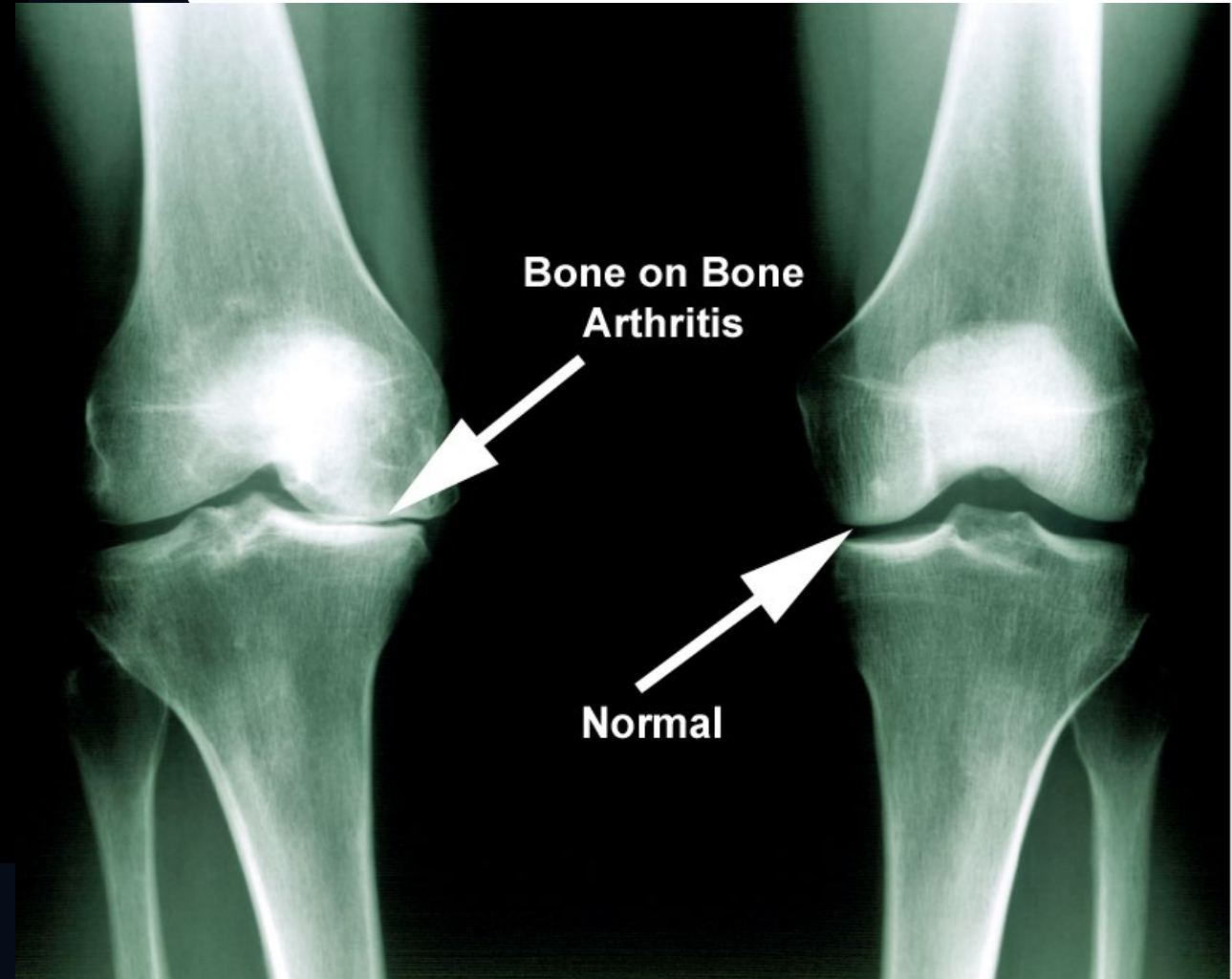
- **Newly sxs from OA often misinterpreted as injury.**
- **Approximately 1 in 5 patients misperceived new symptoms as representing a new disease, often as a type of injury**



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NOT A
TEAR?**



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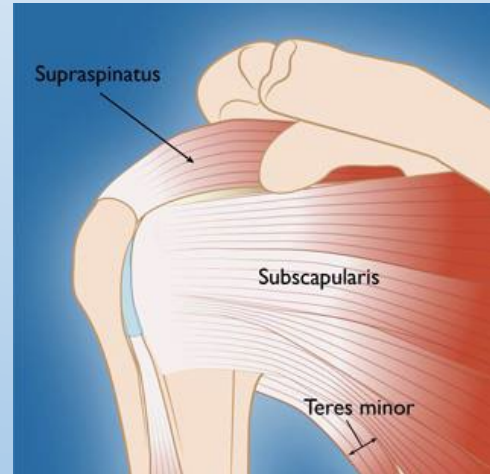
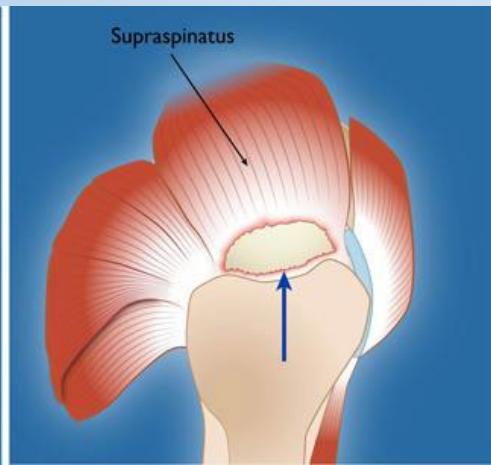
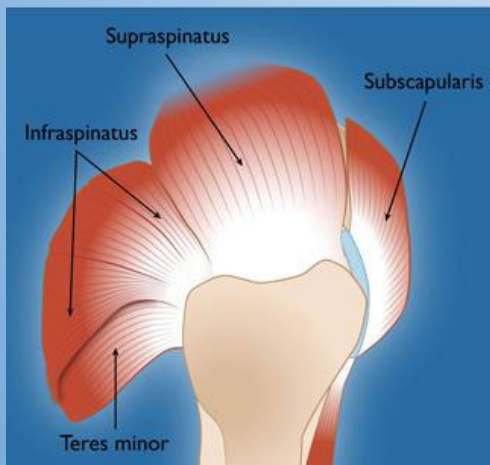
SHOULDER INJURY

- **Shoulder disorders and complaints important and costly health problem.**
- **Shoulder pain results in millions of working days being lost per year**





SHOULDER INJURY



Rotator Cuff Anatomy





ACUTE ROTATOR CUFF TEAR

- **Acute tear: fall on outstretched arm or lift something too heavy with a jerking motion**





ACUTE ROTATOR CUFF TEAR

- **Acute tear: Traumatic rotator cuff tears are more likely to occur in relatively young (age 54.7), largely male patients who suffer a fall or trauma to an abducted, externally rotated arm**
- **Tears are typically large/involve the subscapularis.**





ACUTE ROTATOR CUFF TEAR

- **Acute, traumatic, full thickness rotator cuff tears, with immediate weakness and pain account for only 8% of those who present with symptomatic rotator cuff tears.**





TRAUMATIC ROTATOR CUFF TEAR

- Traumatic rotator cuff tears more commonly occur in conjunction with shoulder dislocation





CHRONIC ROTATOR CUFF TEAR

- Rotator cuff imaging findings are the result of age-related degenerative changes
- Substantial portion of the asymptomatic population has evidence of rotator cuff pathology





CHRONIC ROTATOR CUFF TEAR

- RCT in general population most commonly associated with:
 - elderly patients
 - Males
 - dominant arm
 - engaged in heavy labor
 - history of trauma





CHRONIC ROTATOR CUFF TEAR

- RCT in general population most commonly associated with:
 - positive for impingement sign
 - showed lesser active forward elevation
 - weaker muscle strength in abduction and external rotation.



ETIOLOGY?



CHRONIC ROTATOR CUFF TEAR

- **MR-evident tendon abnormalities frequently seen asymptomatic:**
 - **46% tendons normal MR**
 - **18% tendinopathy**
 - **22% partial tears**
 - **14% complete tears.**





CHRONIC ROTATOR CUFF TEAR

- **Abnormalities progress w/age**
- **Tendinopathy changes more common younger**
- **Partial + complete tears more evident 60+ years old.**





CHRONIC ROTATOR CUFF TEAR - MRI

- **Subacromial spurs and humeral head cysts were increasingly common in subjects with increasingly severe MR-evident tendon abnormalities -- asymptomatic**





CHRONIC ROTATOR CUFF TEAR - MRI

- **Bone changes useful markers of tendon disease**
- **Mild to moderate degree of AC joint osteoarthrosis all age + degrees tendon abnormality.**





CHRONIC ROTATOR CUFF TEAR - MRI

- **Small amounts of fluid in joint/tendon sheath are common in asymptomatic volunteers; normal.**
- **Large glenohumeral joint effusions associated with advanced MR-evident rotator cuff tendon changes**





CHRONIC ROTATOR CUFF TEAR - USG

- **Ultrasound complete rupture supraspinatus tendon 56 -83 yrs.**
- **MRI confirmed complete rupture 90%.**
- **All pts no functional deficits**





CHRONIC ROTATOR CUFF TEAR - USG

- **Strength significantly lower in pts group complete tendon tear.**
- **Higher prevalence older individuals RCT no pain or decrease ADL**





CHRONIC ROTATOR CUFF TEAR - CADAVER

- Unselected cadaveric population both *sx/asx*
- Population in cadaveric studies older than general population
- Total number of cadaveric studies was 30





CHRONIC ROTATOR CUFF TEAR - CADAVER

- Total prevalence of rotator cuff tears in the full cadaveric data group was 30.3%
- Partial thickness tears 18.5%
- Full-thickness tears 11.8%.





CHRONIC ROTATOR CUFF TEAR - MRI

- Rotator cuff abnormalities common w/ age
- 9.7% patients <20 years
- 62% >80 years
- High rate of abnormalities sx/asx





CHRONIC ROTATOR CUFF TEAR - MRI

- Degeneration of rotator cuff considered common aspect of normal human aging





CHRONIC ROTATOR CUFF TEAR - MRI

- **Partial-thickness RC tears & degenerative changes in AC joint considered age-related changes**





CHRONIC ROTATOR CUFF TEAR - MRI

- Plain radiographs may show AC joint arthritis
 - Unless specifically tender on palpation in this region, this is a clinically insignificant radiographic finding





AC JOINT ARTHRITIS

- **>30, 68% shoulders arthritic changes**
- **<30, 93% shoulders arthritic changes**

- **Many patients may be clinically asymptomatic.**





AC JOINT ARTHRITIS

- **Compare symptomatic the asymptomatic patients**
- **Large population of asymptomatic patients had significant arthritis**





AC JOINT ARTHRITIS

- **Large population of asymptomatic patients had significant arthritis**
 - **Normal in 18%**
 - **Mild in 66%**
 - **Moderate in 12%**
 - **Severe in 4%**





AC JOINT ARTHRITIS

- **Statistically higher grade of AC arthritis in the symptomatic group**
- **MRI reactive bone edema more reliable predictor symptomatic AC**



A black and white photograph of a religious procession, likely the Feast of the Virgin of Luján. In the foreground, a woman in a white, ornate gown and a tall, lace-trimmed crown (the Virgin of Luján) is walking. To her right, another woman in a white dress is walking. The background is filled with a large crowd of people, some holding flags and banners. The scene is set outdoors on a paved area. The text "WHY IS THIS IMPORTANT?" is overlaid in large, bold, black capital letters across the center of the image.

**WHY IS THIS
IMPORTANT?**



SHOULDER PAIN COMPLAINTS?

- **Very common in industry**
- **Female workers performing repetitive tasks**
- **Especially when the job perceived as more physical**

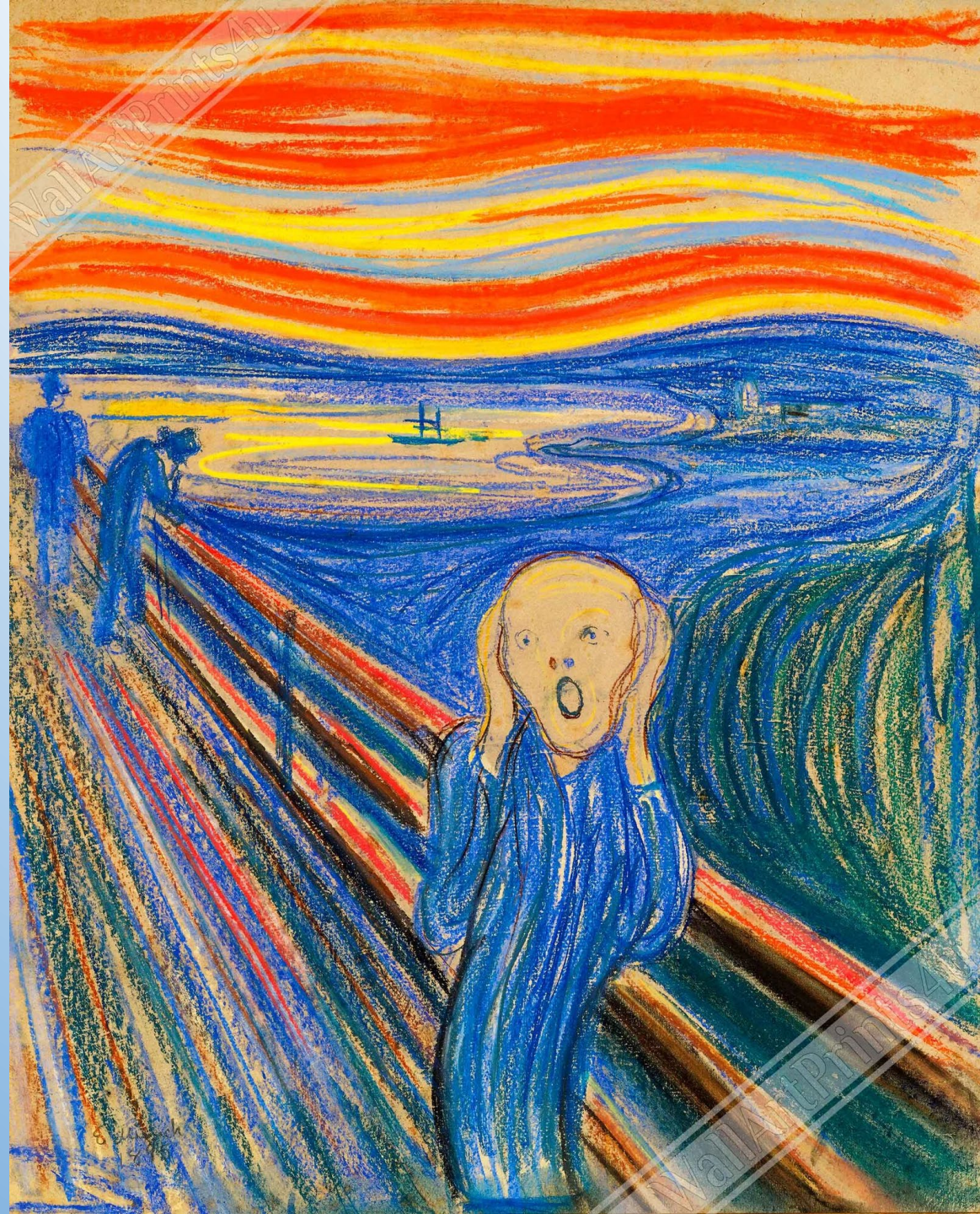




SHOULDER PAIN COMPLAINTS?

- **No difference in radiographic abnormalities between these populations.**
- **Symptoms could not be correlated with shoulder imaging anomalies**





WallArtPrints4U

WallArtPrints4U





ORDER MRI???

- **No discriminatory power at all**
- **Irrelevant findings potential to frighten patients**
- **Initiate cascades of unnecessary testing or intervention.**



A close-up photograph of a person's hand resting on their own shoulder. The hand is positioned on the right side of the frame, with fingers slightly curled. The person is wearing a red garment. The background is a soft, out-of-focus light blue. A large white circle is overlaid on the left side of the image, containing text.

OVERUSE

- **Common assertion in industry**



OVERUSE?

- Evaluation of both shoulders of patients with old unilateral arm amputation
- Rotator cuff degeneration rate was not significant higher in the healthy side
 - Functional overload





OVERUSE?

- **Rotator cuff of the amputee side, minor functional stresses**
 - **Healthy in just 28% of cases**
 - **Healthy 52% of non-amputee side**



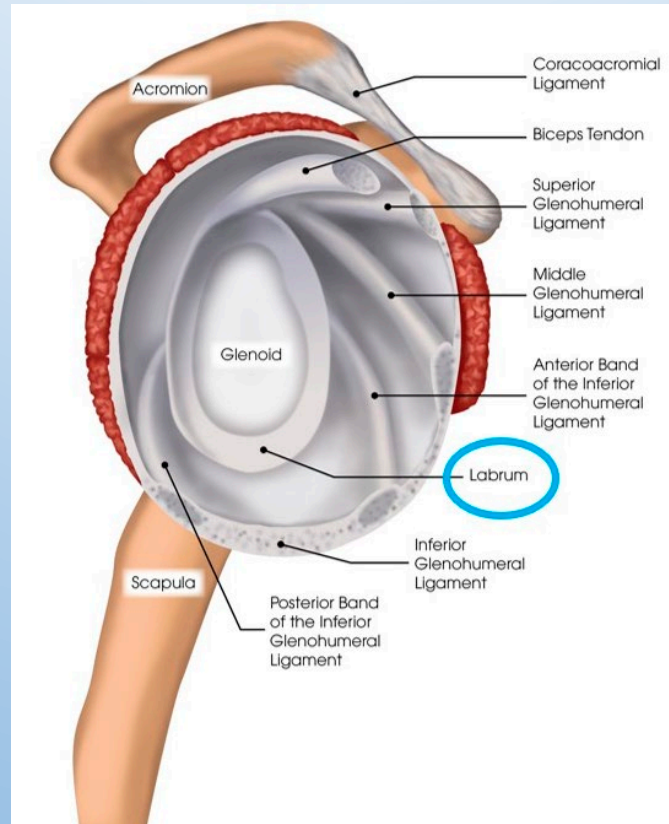


OVERUSE?

- **Rotator cuff tendon status could be worsened by disuse**

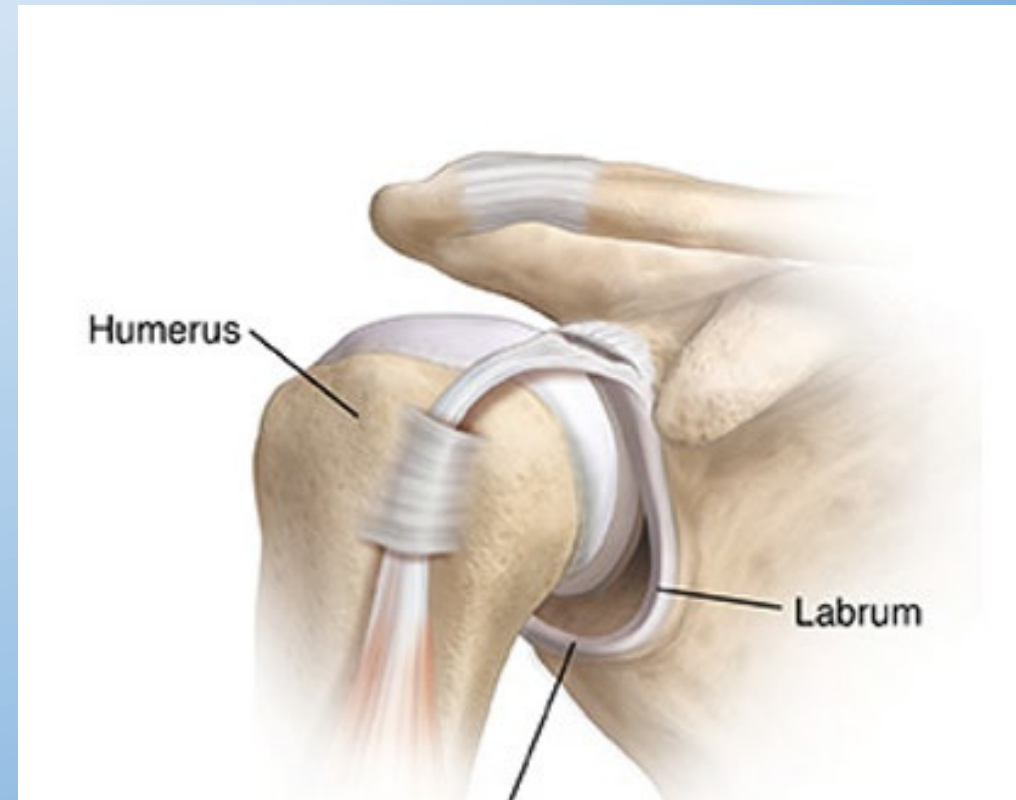


LABRUM OF THE SHOULDER



LABRUM OF THE SHOULDER

- A rim of fibrous tissue that helps keep the humeral head located very flat glenoid





LABRUM OF THE SHOULDER

- Labrum can be torn by sudden movements of the humeral head against the glenoid forcing separation of the labrum from the underlying bone





LABRUM OF THE SHOULDER

- Traumatic events MAY result in a SLAP lesion
 - Falling on an outstretched arm
 - Bracing oneself during a motor vehicle accident





LABRUM OF THE SHOULDER

- **Compression of the superior joint surfaces superimposed with subluxation of the humeral head.**
- **Forceful traction injury can also tear the labrum.**





LABRUM OF THE SHOULDER

- Traumatic events MAY result in a labral tear
 - Shoulder dislocations
 - Rapid movement of the arm while in an abduction, flexion and externally rotated position



LABRUM OF THE SHOULDER

- Labrum is cartilaginous tissue
- Will degrade/degenerate over time

COCKPIT[®] USA





LABRUM OF THE SHOULDER

- **Cadaveric studies: detachment of the labrum from the glenoid occurs more frequently with aging.**
- **Histologically, increasingly extensive degenerative changes were noted in labra with increasing age**





LABRUM OF THE SHOULDER

- Labrum sparsely vascularized with no particular pattern of distribution.
- Vascularity decreased with increasing age of the individual.





LABRUM OF THE SHOULDER

- **Cadaveric shoulders; mean age 57 years**
- **Significant qualitative + quantitative increase lesions all regions with age.**
- **12: 00 anterosuperior position region most likely**
 - **Highest stress distribution on the glenoid.**





LABRUM OF THE SHOULDER

- Superior labral tears high frequency MRI 45- to 60-year-old asymptomatic shoulders
- 55-72% abnormal findings





LABRUM OF THE SHOULDER

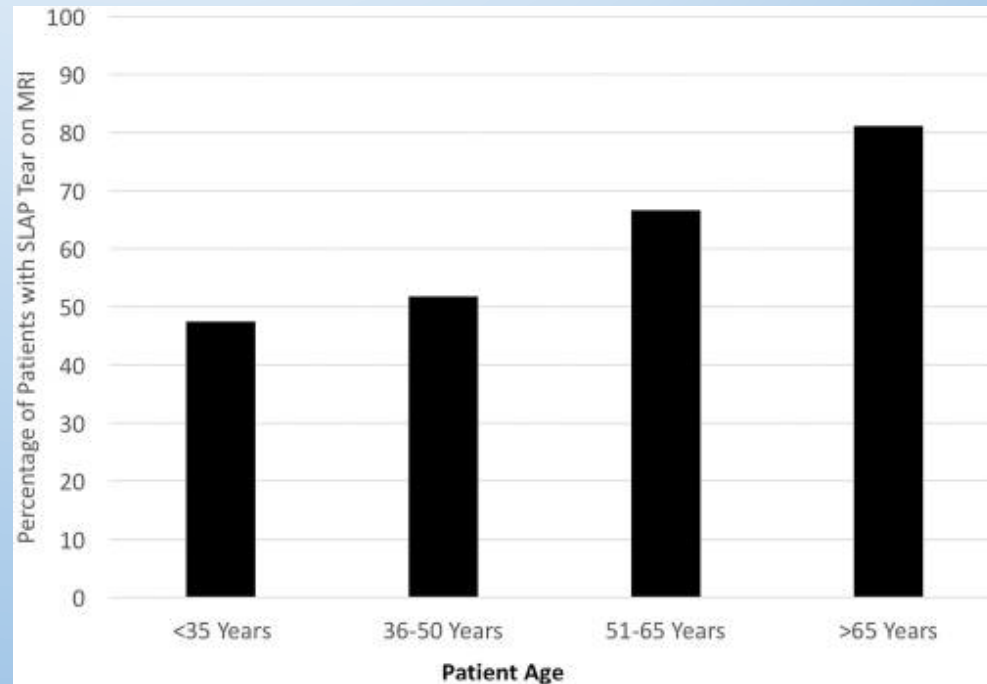
- **281 MRI significant difference in the proportion of SLAP tears found on the MRIs for each age group**
 - **51 - 65 years 66.7%**
 - **65+ years 81.2%**



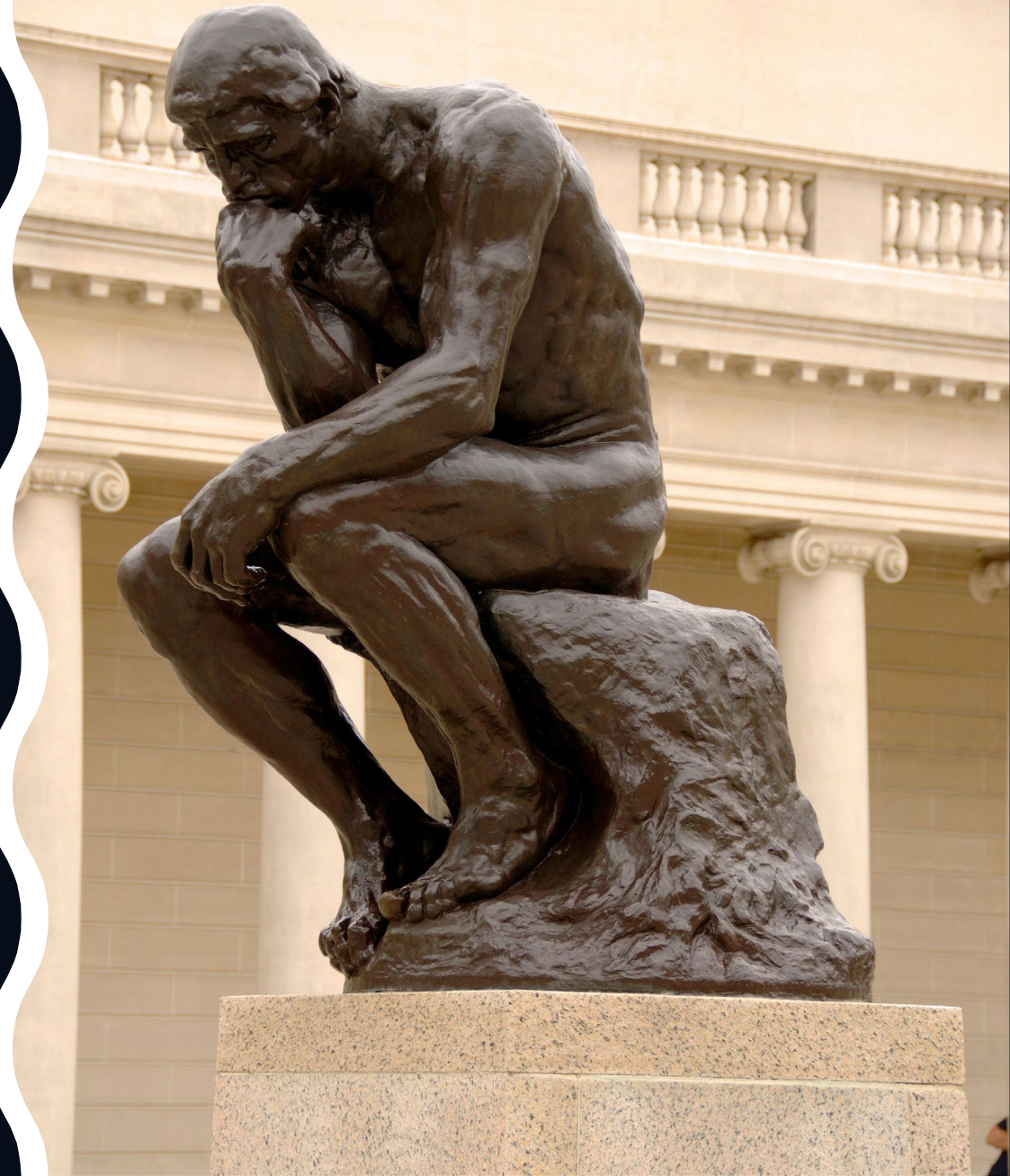


LABRUM OF THE SHOULDER

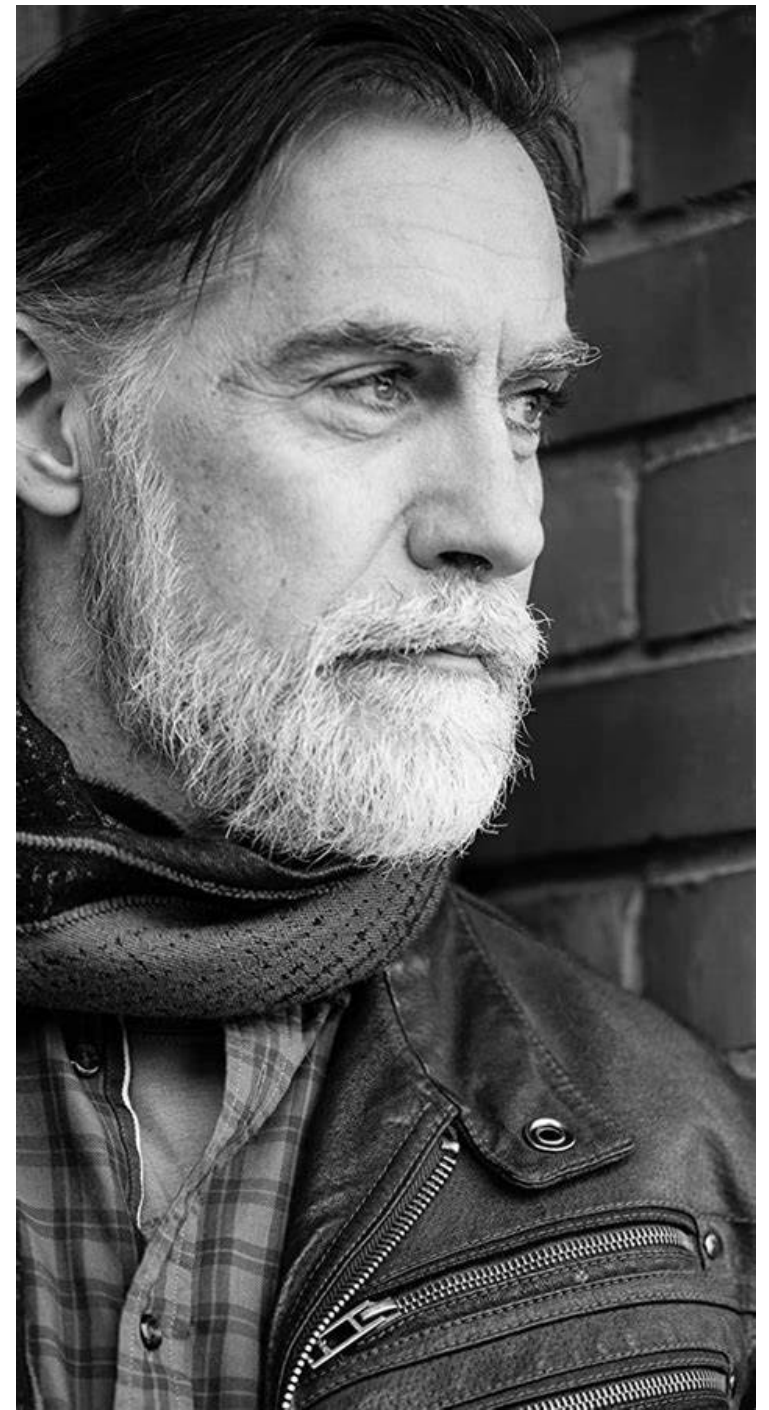
- Age 50+ more likely labral findings
- Regardless of history



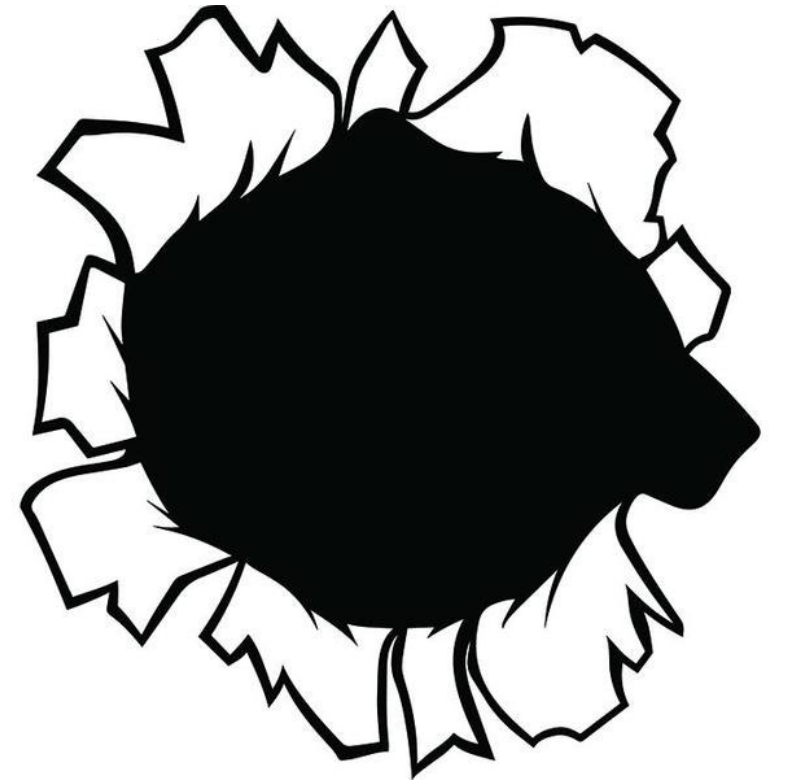
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LAST WORDS OF WISDOM....

- **Unilateral symptoms attributed to work injury**





LAST WORDS OF WISDOM....

- **Unilateral symptoms attributed to work injury**
 - **48% of patients with shoulder symptoms/ 43% knee**
 - **Worse pathologic features on the symptomatic side.**
- 



LAST WORDS OF WISDOM....

- **Occupational injury claimants 40 years of age and older with unilateral knee and shoulder symptoms ascribed to a work event tend to have bilateral age-related MRI changes.**





LAST WORDS OF WISDOM....

- **“There are no such things as false positive MRI’s...**
- **...all that MRI’s show is anatomy and it is how you damn surgeons interpret the MRI that makes it a false positive or false negative”**

LAST WORDS OF WISDOM....



THANK YOU

