



# Bone Marrow Aspirate and Concentrate

COMPLICATIONS AND PITFALLS  
A MOCK CASE REPORT

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# Case Presentation:

- ▶ 63 y/o Male – presents with Mod/Severe (KG III) knee OA
  - ▶ Unilateral – primarily Medial Compartment
  - ▶ No varus deformity, no mechanical sx, occ. mild swelling after exercise
- ▶ Retired Executive
- ▶ Extremely active:
  - ▶ Skis 50+ days/year
  - ▶ Avid competitive cyclist for 20+ years
- ▶ Functional with symptoms: “getting harder to maintain lifestyle” secondary to medial knee pain
- ▶ Interested in “getting stem cells” in the hopes of avoiding knee replacement and maintaining lifestyle

# 63 y/o Male BMC Case

## ▶ PMH:

- ▶ Skin melanoma – treated successfully with local resection 2 years ago
- ▶ Chronic LBP – h/o L4/5 laminectomy 12 years ago
- ▶ Hypercholesterolemia
- ▶ Regular with Annual Physical – due in a few weeks

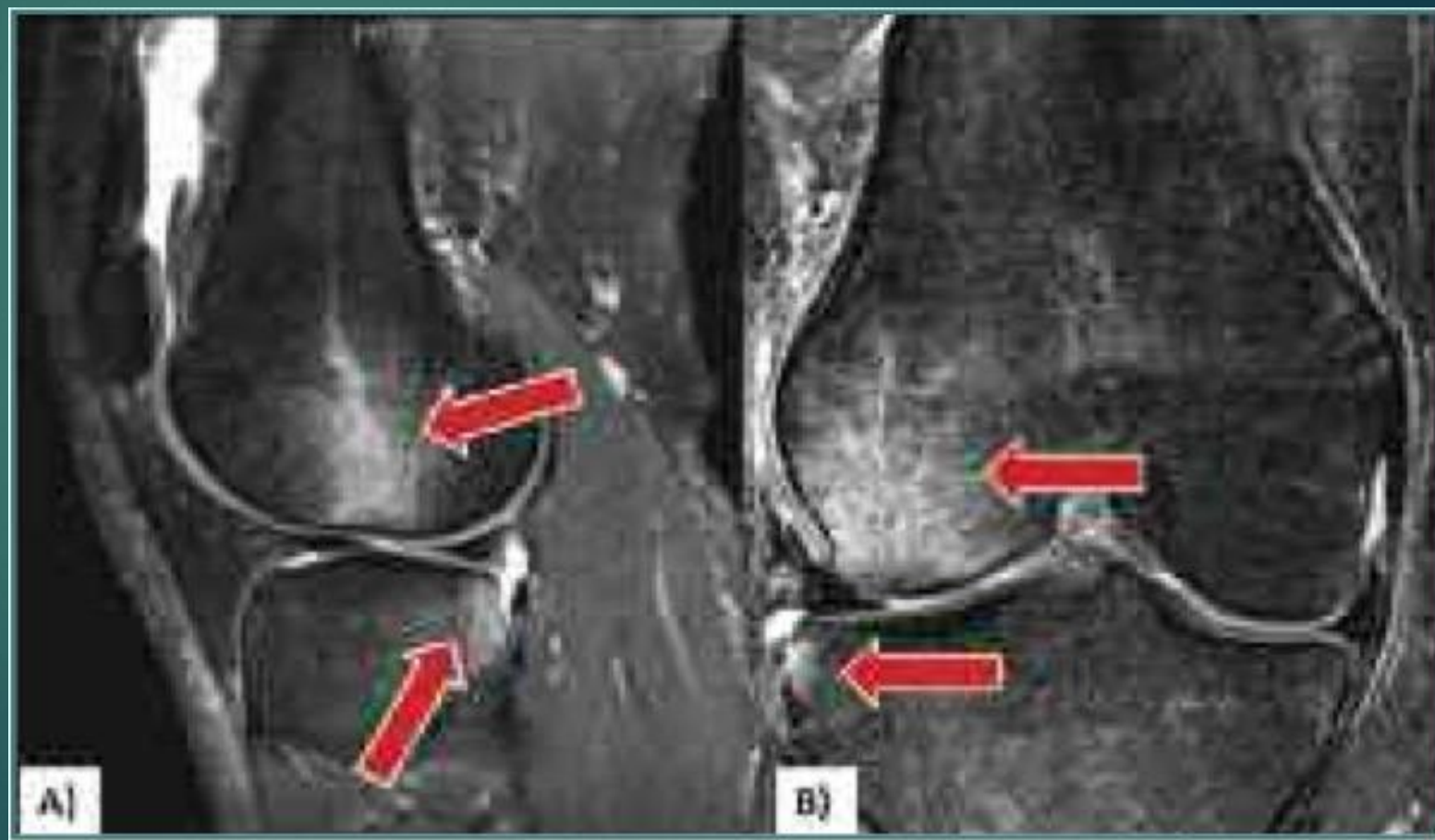
## ▶ Meds:

- ▶ Fish Oil, Vitamin Supplements
- ▶ Tadalafil
- ▶ Atorvastatin

- ▶ SH: Divorced (in a relationship), non-smoker, occasional drink with dinner (wine)
- ▶ FH: + HD (father), breast CA (mother)

# 63 y/o Male BMC Case

Images:



# 63 y/o Male BMC Case

- ▶ Options for Tx reviewed:
  - ▶ 1. NSAIDS/PT
  - ▶ 2. Arthroscopic cleanout +/- PRP
  - ▶ 3. Medial Compartment Hemiarthroplasty
  - ▶ 4. Total Joint Replacement
  - ▶ 5. Autologous BMC
    - ▶ Intra-articular approach
    - ▶ Subchondral Approach
  
- ▶ Patient opts and gives consent to proceed with IA/SC BMC

# 63 y/o Male BMC Case

## ▶ Risks on Procedural Consent:

- ▶ 1. Pain
- ▶ 2. Swelling
- ▶ 3. Infection
- ▶ 4. Allergic Reaction
- ▶ 5. Blood Clot
- ▶ 6. Bleeding/Bruising
- ▶ 7. Nerve Injury
- ▶ 8. Systemic reactions: (Light headedness, fainting, decreased blood pressure, heart rate abnormalities)

# 63 y/o Male BMC Case

- ▶ Bilateral BMA Performed:
- ▶ 120cc drawn – 60cc from both PSIS crests without difficulty using single puncture, variable depth technique
- ▶ BMA Analytics (X 10(3)/microliter):
  - ▶ WBC – 18.10
  - ▶ RBC 4.00
  - ▶ Hct 36.5
  - ▶ Mono 0.82
  - ▶ Neut 7.36
  - ▶ Plt 132

# 63 y/o Male BMC Case

▶ BMC Analytics (X 10<sup>3</sup>)/microliter)

▶ WBC – 134.41

▶ RBC 6.11

▶ Hct 55.90

▶ Mono 12.40

▶ Neut 48.20

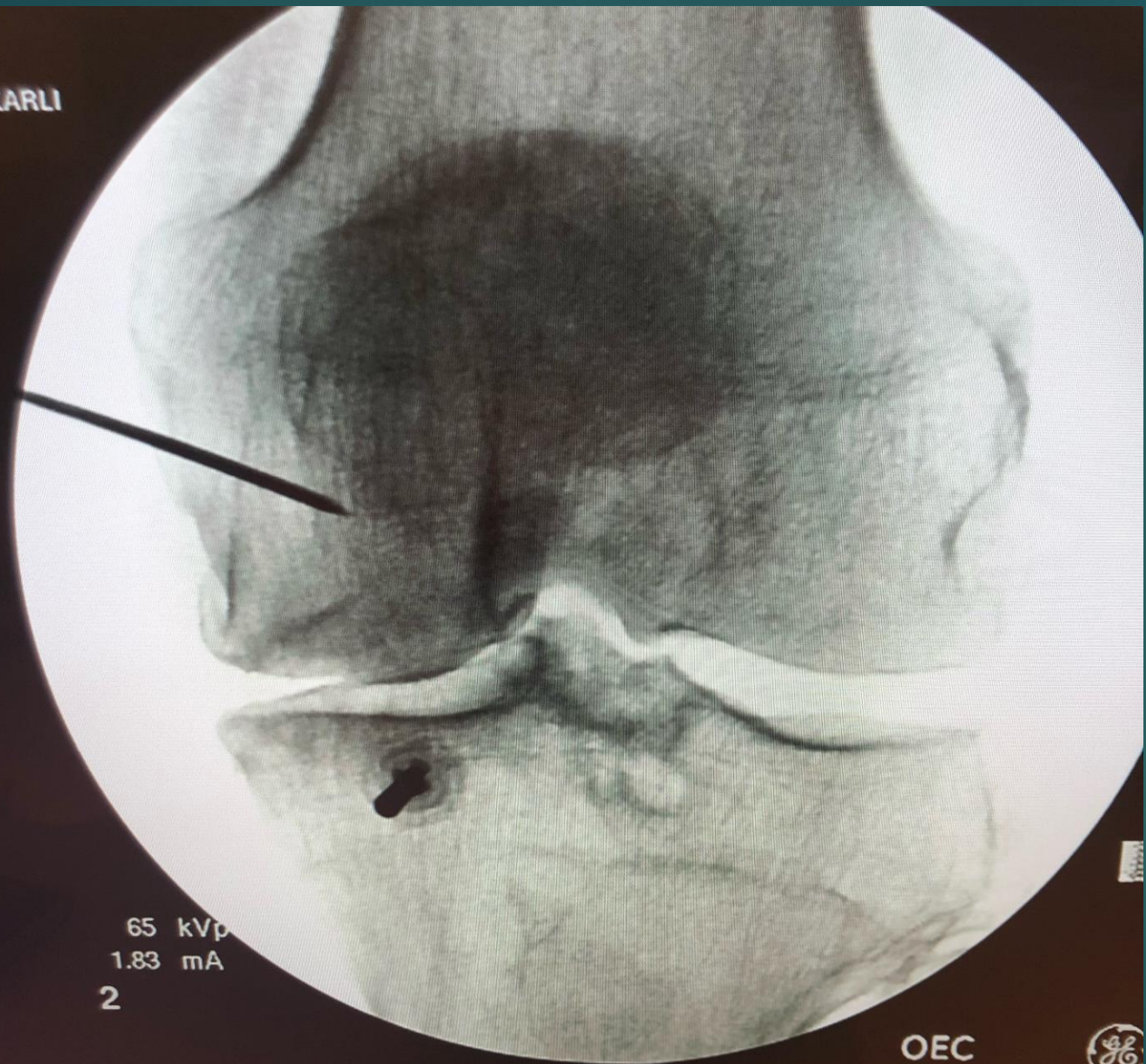
▶ Plt – 765



# 63 y/o Male BMC Case

- ▶ 10cc total BMC produced
- ▶ Pre-procedure US shows mild effusion in suprapatellar pouch, no baker's cyst
- ▶ Under Sterile Technique
  - ▶ Superior/Lateral approach
  - ▶ 12 cc yellow joint fluid aspirated (no gross blood)
  - ▶ 4 cc BMC injected into suprapatellar pouch under US visualization
  - ▶ 4 cc injected into both Distal Femoral and 2 cc into Prox Tibial subchondral regions with Fluoro
- ▶ Post-procedure protocols reviewed along with activity progression upon discharge – 6 week follow up scheduled

KARLI



65 kVp  
1.83 mA  
2

OEC



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# 63 y/o Male BMC Case

- ▶ 4 Weeks post-procedure
- ▶ Patient calls with some “bad news”:
- ▶ Went for annual physical after the procedure and blood work identified a PSA of: 10.4
- ▶ MRI of pelvis (to visualize prostate) revealed likely focal metastatic disease in L5 and S1 vertebra with evidence of irregular prostatic enlargement
  - ▶ ? One small lesion in the Ilium on the R side
- ▶ Bone scan confirms spinal involvement and increased uptake in treated knee and bilateral upper SI regions
- ▶ Seeking additional opinions from Oncology specialists for comprehensive treatment options

# 63 y/o Male BMC Case

- ▶ Patient: Should I be concerned about my stem cell procedure given this news?
- ▶ Is it possible that metastatic diseased cells from BMC was transplanted from Pelvis to treated knee?
  - ▶ Metastases are present in lower lumbar vertebrae/possibly in pelvis
  - ▶ What about the changes of the femoral and tibial components?

# 63 y/o Male BMC Case

- ▶ Take home points:
- ▶ 1. In publication – very few serious complications are reported and autologous BMC has an excellent safety profile.
- ▶ 2. Considering the age groups of patients seeking treatment for BMC related to arthritic conditions may often be in the 60s and beyond:
  - ▶ Should pre-screening protocols (including pre-treatment blood work) be performed?
  - ▶ In all patients or only those with a history of disease?
- ▶ 3. Are you measuring cell counts from your BMA/BMC?



# Aspiration Complications

# 63 y/o Male BMC Case

## ▶ Complications in publication:

▶ [Trauma Case Rep.](#) 2021 Feb; 31: 100395.

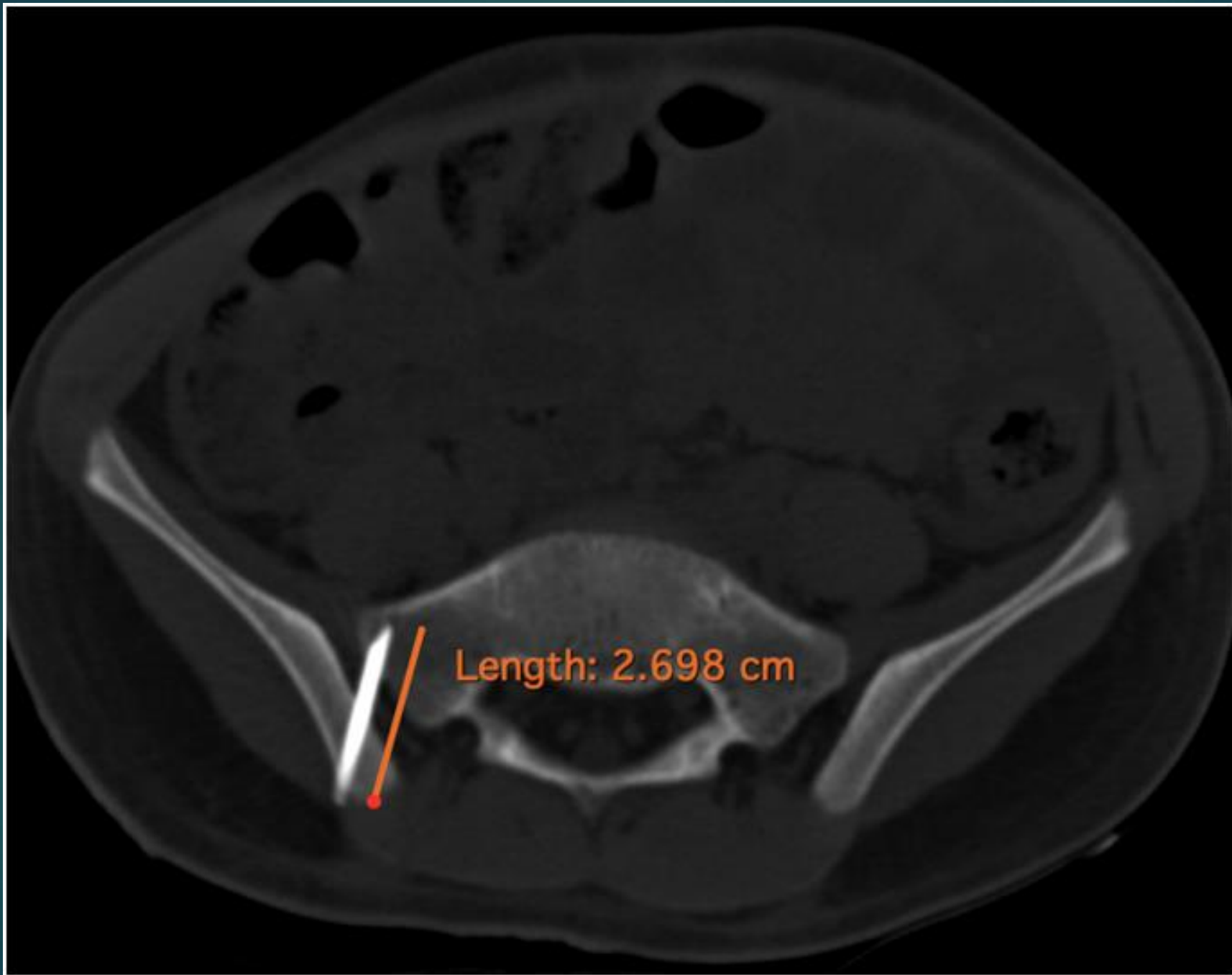
▶ Published online 2021 Jan 2. doi: [10.1016/j.tcr.2020.100395](https://doi.org/10.1016/j.tcr.2020.100395)

▶ PMID: [PMC7811160](#)

▶ PMID: [33490358](#)

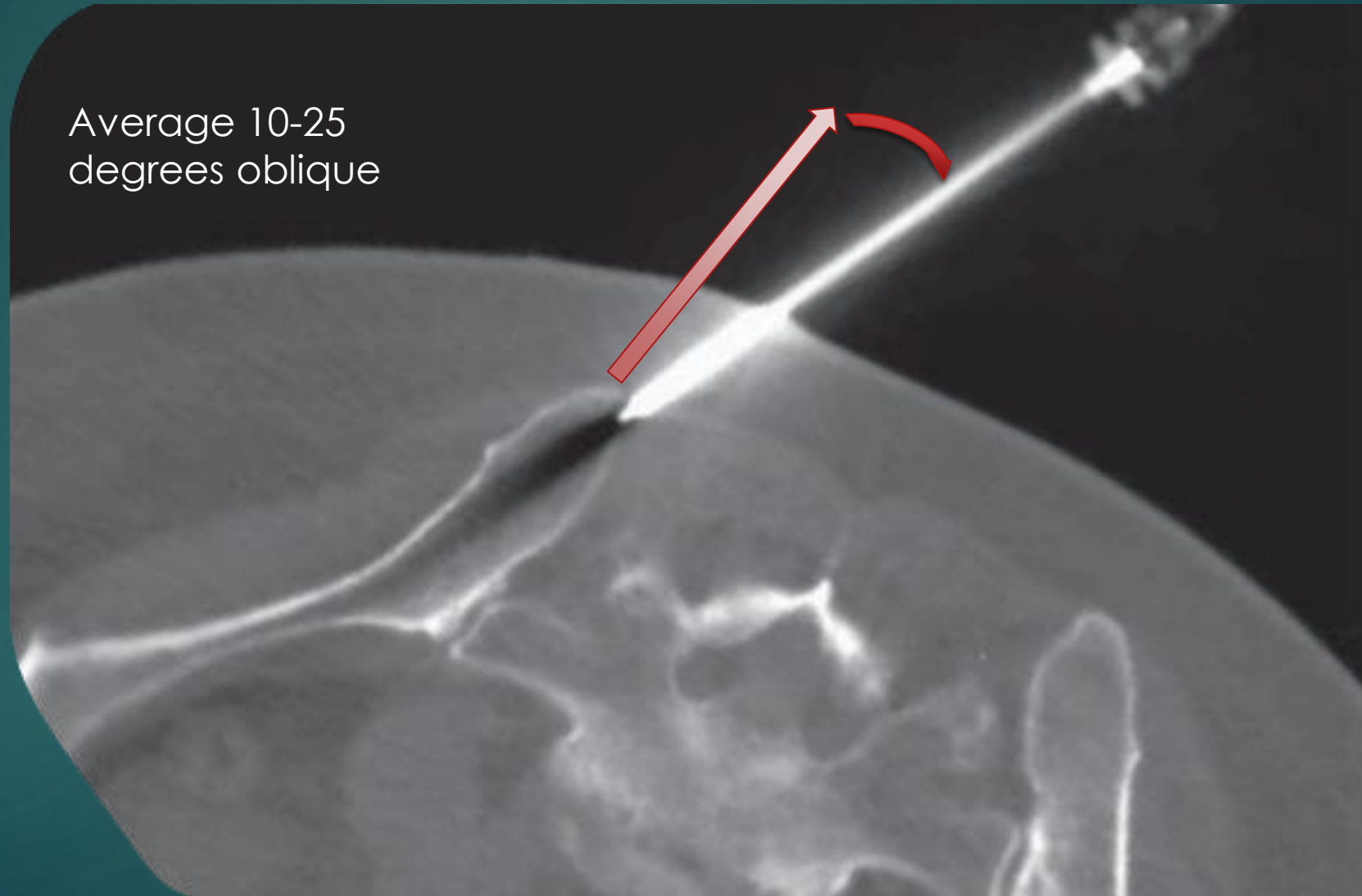
▶ **Retrieval of broken bone biopsy needle from the sacroiliac joint – A case report and review of literature**

▶ [Viraj N. Gandbhir](#),\* [Kumar Dussa](#), [Ghanshyam Kakadiya](#), [Nischay K.K.](#), and [Aseem Parekh](#)



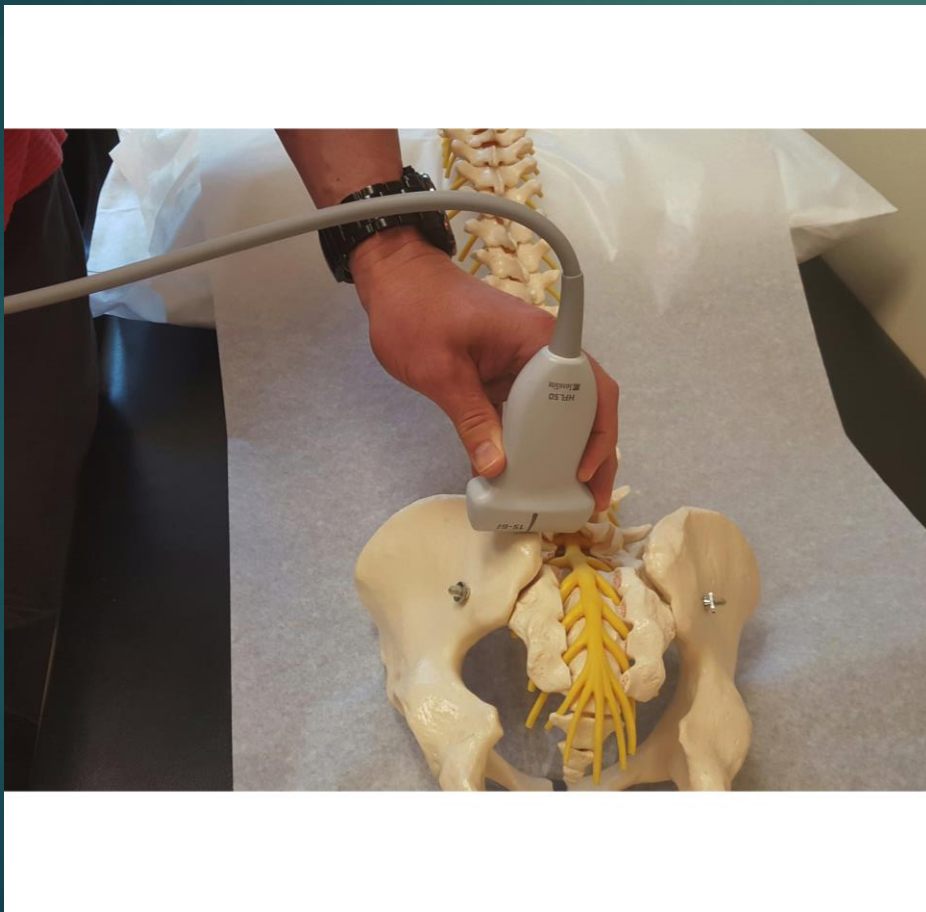


# Know Your Anatomy



# PSIS – Use Visualization

Linear Transducer



Transverse View



# PSIS – Fluoro Visualization



# Bone marrow biopsy morbidity: review of 2003

## ▶ B J Bain

- ▶ [J Clin Pathol.](#) 2005 Apr; 58(4): 406–408.
- ▶ doi: [10.1136/jcp.2004.022178](https://doi.org/10.1136/jcp.2004.022178)
- ▶ PMID: [15790706](#)

## ▶ 19,259 Procedures

## ▶ 16 Adverse Events (0.08%)

- ▶ 11/16 – hemorrhage
- ▶ 2001 – 1 retroperitoneal hemorrhage and death
- ▶ Infection – 2
- ▶ Persistent Pain – 2



# Injection Complications

# Bone Marrow Concentrate Injection Complications

- ▶ Bone marrow concentrate injections for the treatment of osteoarthritis: evidence from preclinical findings to the clinical application
- ▶ [Carola Cavallo et al.](#)
- ▶ [International Orthopaedics](#) **volume 45**, pages 525–538 (2021)
- ▶ A systematic literature search conducted on three electronic databases (PubMed, Embase, and Cochrane Library)
- ▶ 22 Studies (4 Preclinical 18 Clinical)
- ▶ **4626 Patients**

# Bone Marrow Concentrate Injection Complications

- ▶ Bone marrow concentrate injections for the treatment of osteoarthritis: evidence from preclinical findings to the clinical application
  - ▶ Cavallo et al.
- ▶ **“Safety was documented by all studies, with no severe adverse events related to the injective procedures”**
- ▶ Most Common: Temporary Pain/Joint Swelling
- ▶ Second: grinding, popping, and snapping sensations with specific movements

# 63 y/o Male BMC Case

- ▶ Should screening protocols (including pre-treatment blood work) be performed?
- ▶ Review Articles did **NOT** consider any analytics of the BMC implanted.



# 63 y/o Male BMC Case

- ▶ Upon receipt of BMA:
  - ▶ CBC and Differential
  
- ▶ Upon Completion of BMC Processing:
  - ▶ CBC and Differential

# 63 y/o Male BMC Case

## ▶ Why Measure?

- ▶ IS your BMC injectate good, bad or indifferent?
- ▶ Is it safe to inject?
- ▶ If there is an unlikely complication – Do you know what you injected?
  - ▶ Is your personal/practice liability protected?
  - ▶ It only takes one!
- ▶ How can we make these preparations better/safer over time?

# 63 y/o Male BMC Case

## ▶ Actual Case:

- ▶ Patient presented was consented for BMC injection into knee in my practice.
- ▶ Prostate Dx was made on routine screen as patient was also investigating Testosterone Therapy related to Low T symptoms
- ▶ BMC was postponed for patient to initiate full workup and treatment for CA diagnosis
- ▶ Knee lesions were not metastatic
  
- ▶ Patient returned 1 year after successful treatment of Prostate CA asking:
  - ▶ Can I still get my stem cell treatment???