

US-guided Musculoskeletal Interventions in the Hip with MRI and US Correlation

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Abbreviations: HA = hyaluronic acid, IFS = ischiofemoral space, ITB = iliotibial band, LFCN = lateral femoral cutaneous nerve, PRP = platelet-rich plasma, QFS = quadratus femoris space

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Content Codes: **IR** **MK** **MR** **US**

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INTRODUCTION

- ▶ Hip pain common condition, many possible causes
- ▶ Injections may
 - ▶ Narrow list of possible sources of pain
 - ▶ Serve as a primary method of managing pain
 - ▶ Serve as a bridge to delayed surgery

TEACHING POINTS

- The complexity of the hip region and myriad of potential sources of pain can make clinically isolating and managing the cause of a patient's hip pain challenging. Within this context, US-guided injections to manage hip pain have emerged as valuable tools for diagnostic and therapeutic applications.
- Corticosteroid injections have several established potential adverse effects. These include rare but serious complications such as septic arthritis, tendon rupture, chondrotoxicity, and cutaneous atrophy and depigmentation. More common and transient adverse events include corticosteroid flare, facial flushing, transient headache, nausea and vomiting, stomach upset, hyperglycemia, hypertension, and chest fluttering.
- Regardless of the technique used, the most important safety tip is to always visualize the needle tip before advancing it toward the target. Real-time knowledge of the needle tip location will prevent unintended consequences of neurovascular injury.
- Therapeutic injections are elective and are typically deferred in cases of active infection owing to the risk of seeding the targeted structure in the patient. Patients are advised to reschedule their procedure for a time either after their symptoms have resolved or at least 1 week after they have stopped antibiotic therapy.
- The effect of corticosteroids is gradual, and symptom relief may not begin until 3–5 days after the procedure. Patients must be made aware that corticosteroids do not correct or heal the underlying insult that leads to the pain and that the therapeutic benefit typically lasts an average of 4–6 weeks.

SA-CME LEARNING OBJECTIVES

After completing this journal-based SA-CME activity, participants will be able to:

- Identify the clinical manifestations and imaging findings of common hip conditions that may warrant US-guided intervention.
- Describe the various indications for, contraindications to, and methods of performing US-guided hip interventions.
- Discuss the potential complications and expected outcomes associated with US-guided hip interventions.

See rsna.org/learning-center-rg.

The background features abstract, overlapping geometric shapes in various shades of green, ranging from light to dark, creating a modern and professional aesthetic. The shapes are primarily triangles and polygons, some with thin white outlines, set against a white background.

BASIC PRINCIPLES OF IMAGING-GUIDED INTERVENTIONS

Key Medications: Corticosteroids

- ▶ Triamcinolone acetonide and Methylprednisolone acetate:
 - ▶ Insoluble in water, particulate
 - ▶ Microcrystalline suspension
 - ▶ Slower onset and longer duration
 - ▶ Cutaneous atrophy and depigmentation
- ▶ Dexamethasone
 - ▶ soluble in water, nonparticulate
 - ▶ preferred in superficial nerve blocks

Table 1: Potential Adverse Effects of Corticosteroids

Rare complications

Septic arthritis

Tendon rupture

Chondrotoxicity

Cutaneous atrophy and depigmentation

Relatively common transient adverse effects

Corticosteroid flare

Facial flushing

Transient headache

Nausea and vomiting

Stomach upset

Hyperglycemia

Hypertension

Chest fluttering

Key Medications: Viscosupplements

- ▶ Hyaluronic acid
 - ▶ Present naturally in cartilage and synovial fluid
 - ▶ Lubricant and regulator of cellular activities
 - ▶ Osteoarthritis reduces its mechanical and viscoelastic properties

Key Medications: Platelet-rich Plasma

- ▶ Coagulation cascade
- ▶ Essential role in tissue healing
- ▶ Activate healing by releasing growth factors
- ▶ Long-term relief, promote healing
- ▶ Platelet concentration x5 of whole blood ($1 \times 10^6 / \mu\text{L}$) x 3-5 mL
- ▶ Avoid using NSAIDs 2wks before and 2wks after

Table 3: Instructions for Activity after PRP Treatment

Immobilization for 24–72 hours after the procedure, with early range of motion allowed according to pain level

Resume physical therapy within 1–2 weeks

Gradual increase in activity at 4–6 weeks

Activity, as tolerated, at 2 months

US-guided Injections

- ▶ Safety
 - ▶ Team vs individual operator approach
 - ▶ Always visualize needle tip before advancing toward target
 - ▶ Real-time knowledge of tip location
 - ▶ Prevent unintended consequences of neurovascular injury
- ▶ Equipment
 - ▶ High (6-15 MHz) vs low (5-12 MHz) frequency
 - ▶ Needles 25G to 30G for local anesthetic at 1.5 in (3.8 cm)
 - ▶ CTC 22G 3-5 in (8.9 cm) spinal needles

Table 2: Suggested Target Site–based Corticosteroid–Local Anesthetic Mixtures

Target Site	10 mg/mL Preservative-free Lidocaine HCL 1%	5 mg/mL Ropivacaine HCL 0.5%	40 mg/mL Triamcinolone Acetonide	10 mg/mL Dexamethasone Sodium Phosphate	Total Volume Injected
Anterior hip					
Hip joint	2 mL (20 mg)	2 mL (10 mg)	1 mL (40 mg)	...	5 mL
Iliopsoas bursa	2 mL (20 mg)	2 mL (10 mg)	1 mL (40 mg)	...	5 mL
Ilioinguinal nerve	3 mL (30 mg)	1 mL (10 mg)	4 mL
LFCN	3 mL (30 mg)	1 mL (10 mg)	4 mL
Lateral hip					
Trochanteric bursa	...	2 mL (10 mg)	1 mL (40 mg)	...	3 mL
ITB	...	2 mL (10 mg)	1 mL (40 mg)	...	3 mL
Posterior hip					
Ischiogluteal bursa	...	4 mL (20 mg)	1 mL (40 mg)	...	5 mL
Piriformis	...	2 mL (10 mg)	1 mL (40 mg)	...	3 mL
IFS	1 mL (10 mg)	1 mL (5 mg)	1 mL (40 mg)	...	3 mL

Note.—HCL = hydrochloride, IFS = ischiofemoral space, ITB = iliotibial band, LFCN = lateral femoral cutaneous nerve.

US-guided Injections

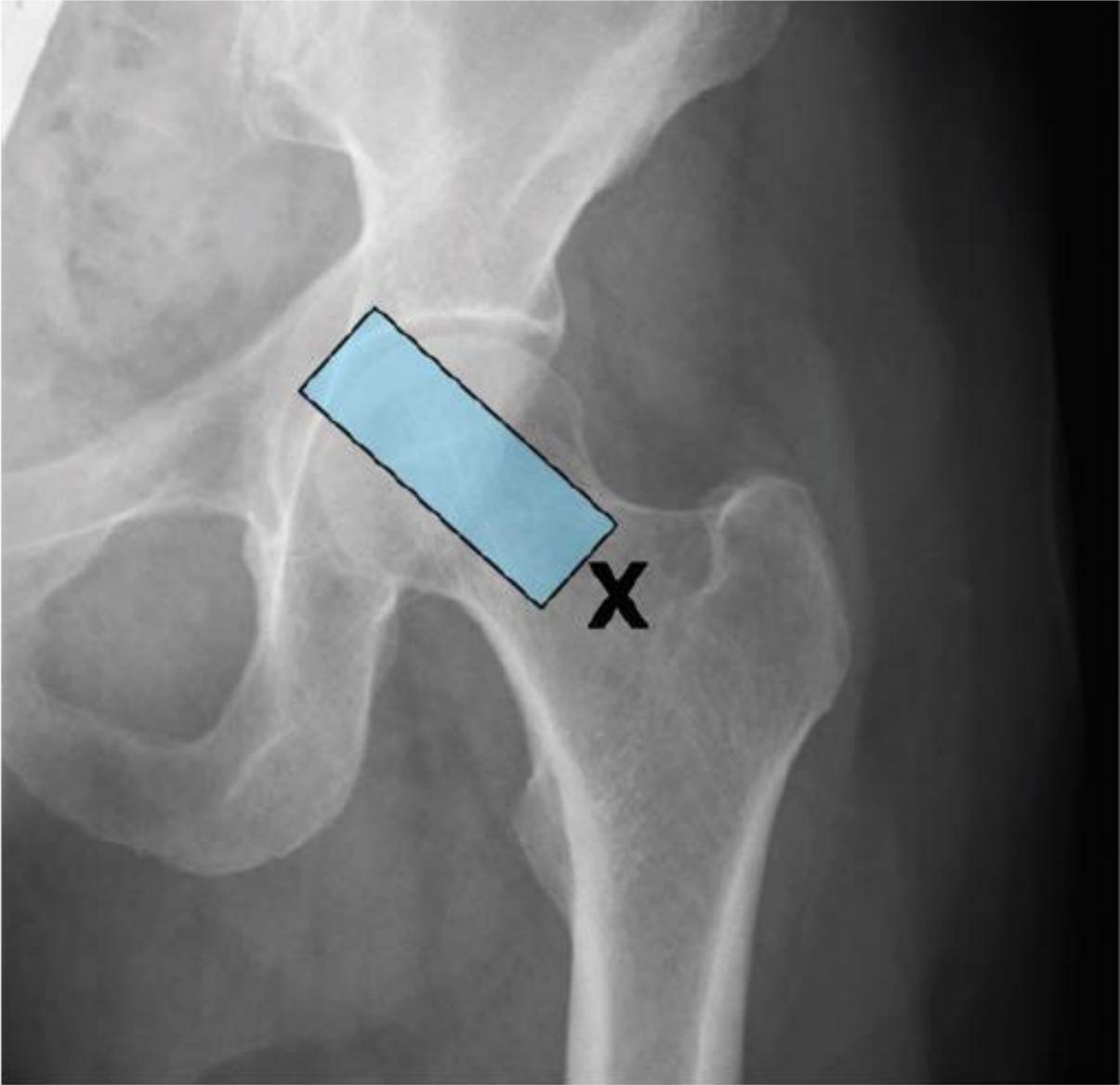
- ▶ Procedural Risks
 - ▶ Pain
 - ▶ Infection
 - ▶ Bleeding
 - ▶ Allergic reaction
 - ▶ Risks of CTC
 - ▶ Common adverse effects, self limiting (1-2 d)
 - ▶ Serious side effects, rare

ANTERIOR HIP

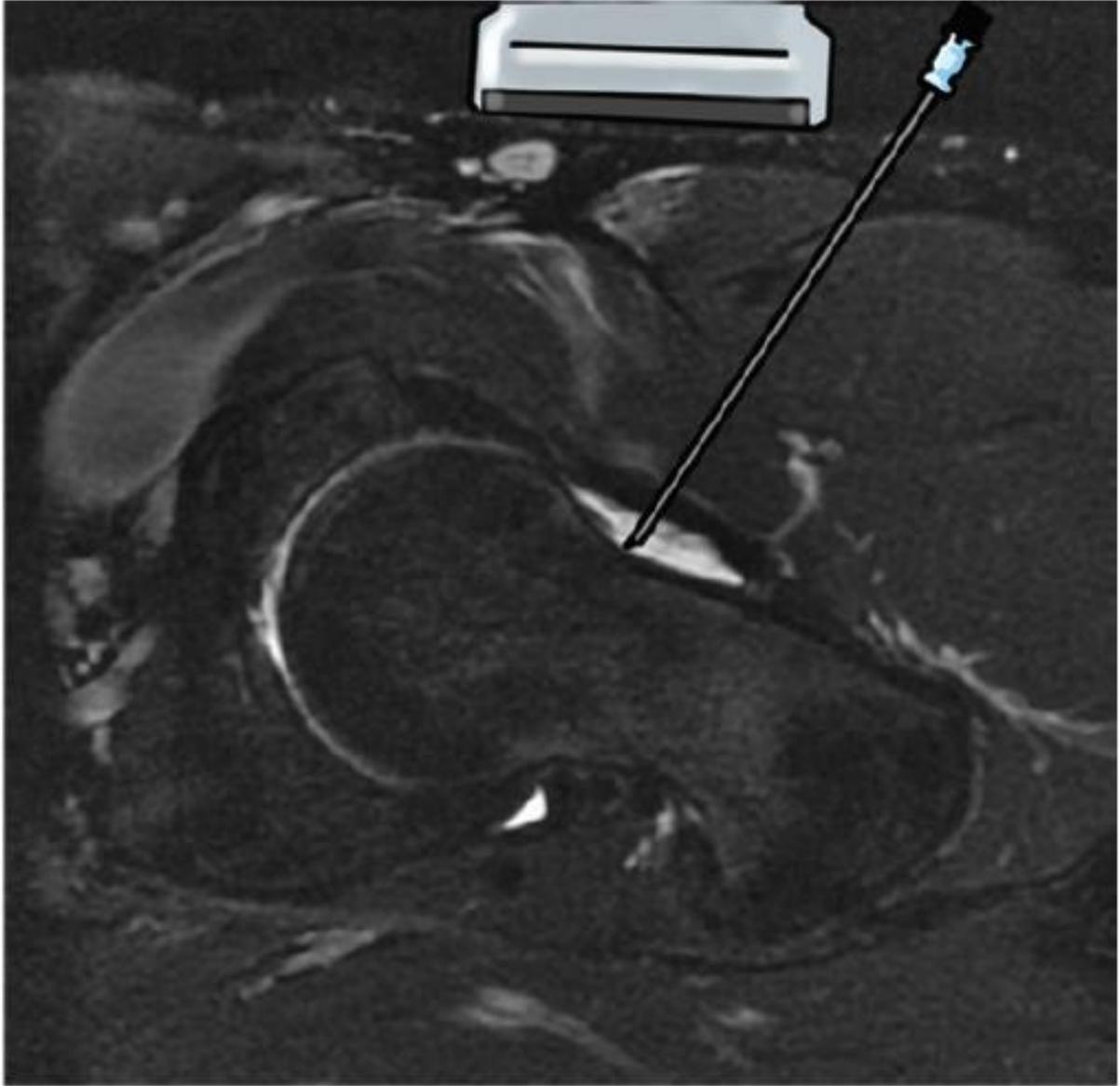
- ▶ Hip Joint
- ▶ Ilioinguinal Nerve
- ▶ Lateral Femoral Cutaneous Nerve



FIGURE 1

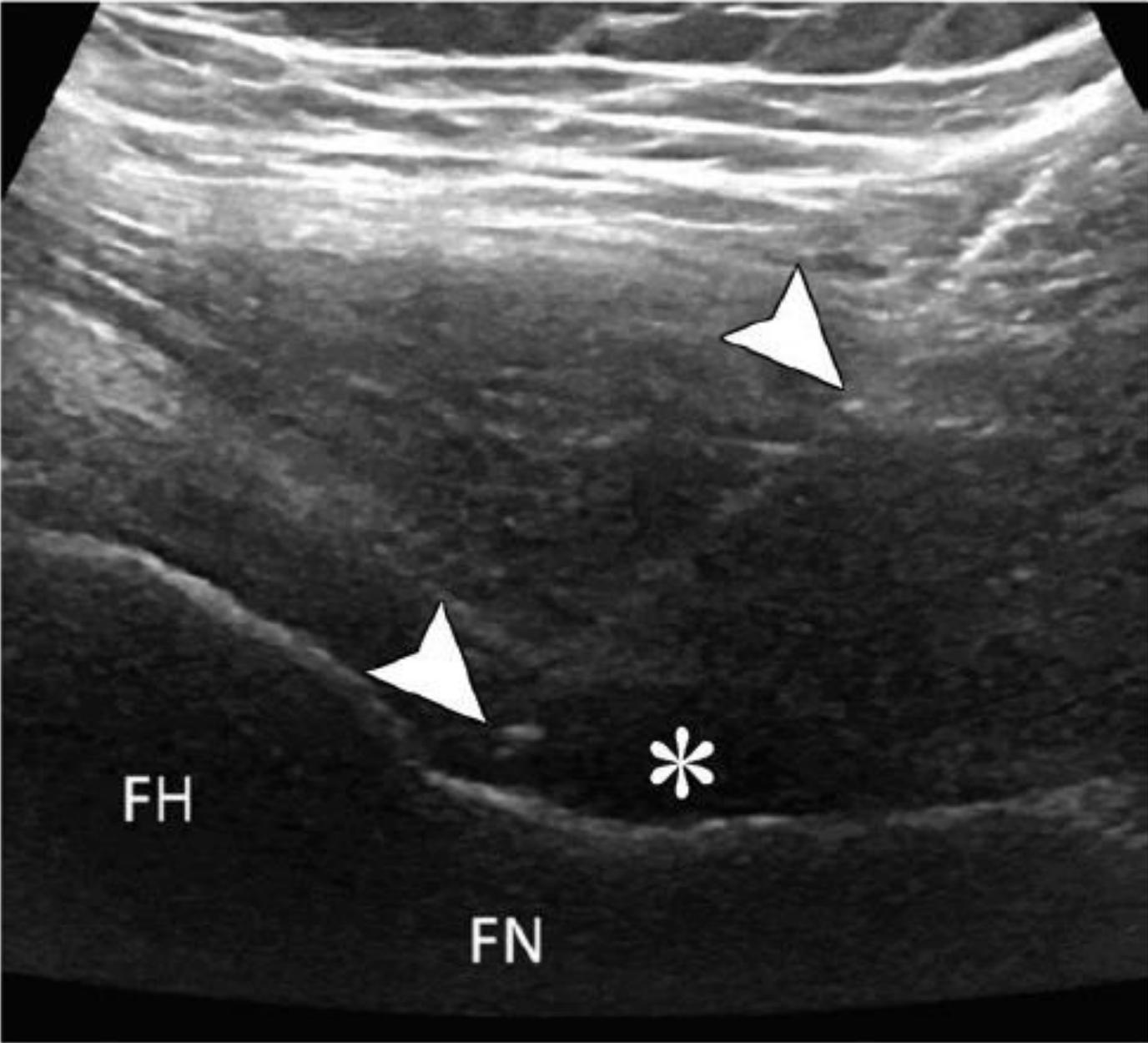


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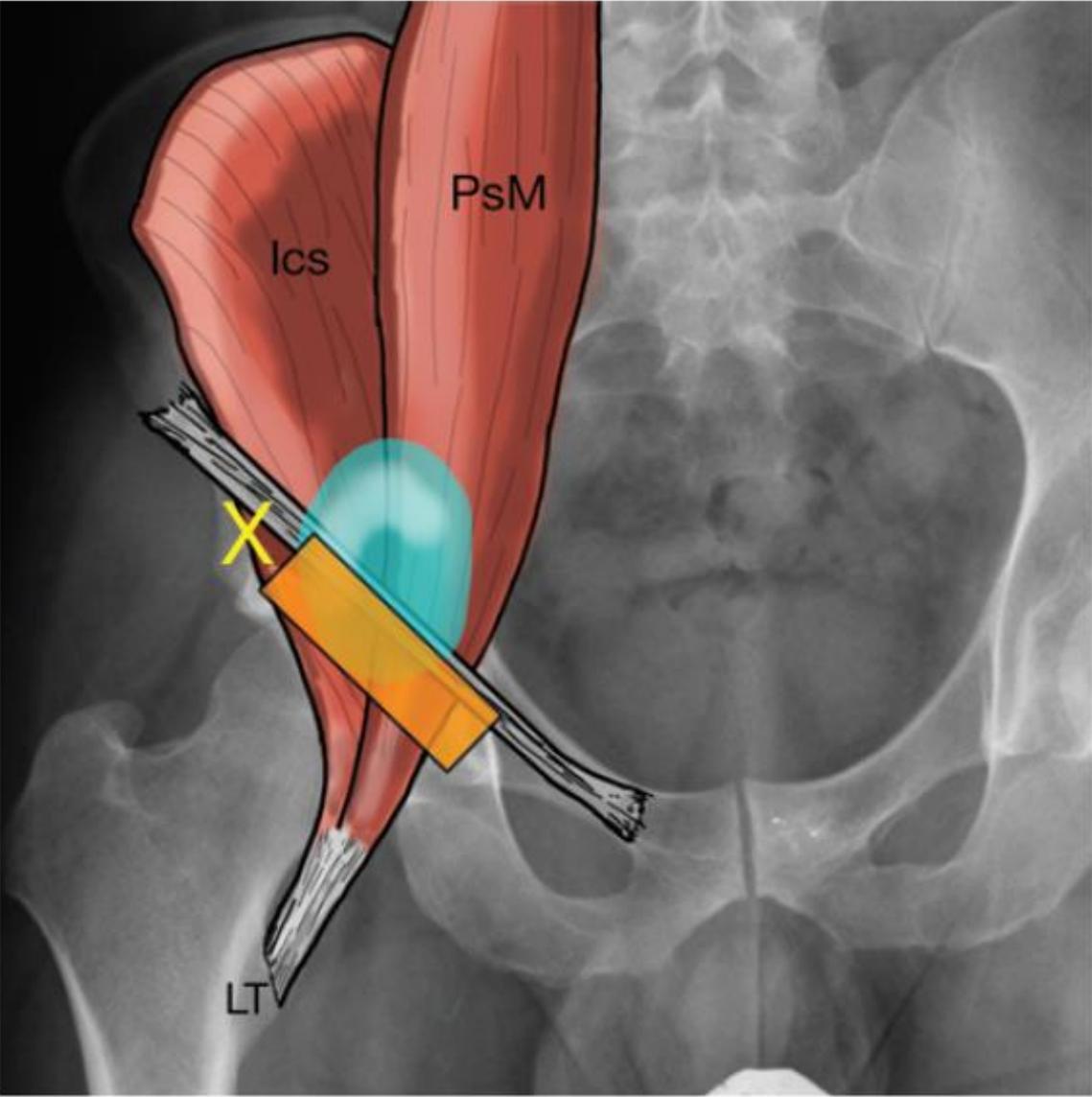
b.

FIGURE 1



C.

FIGURE 2

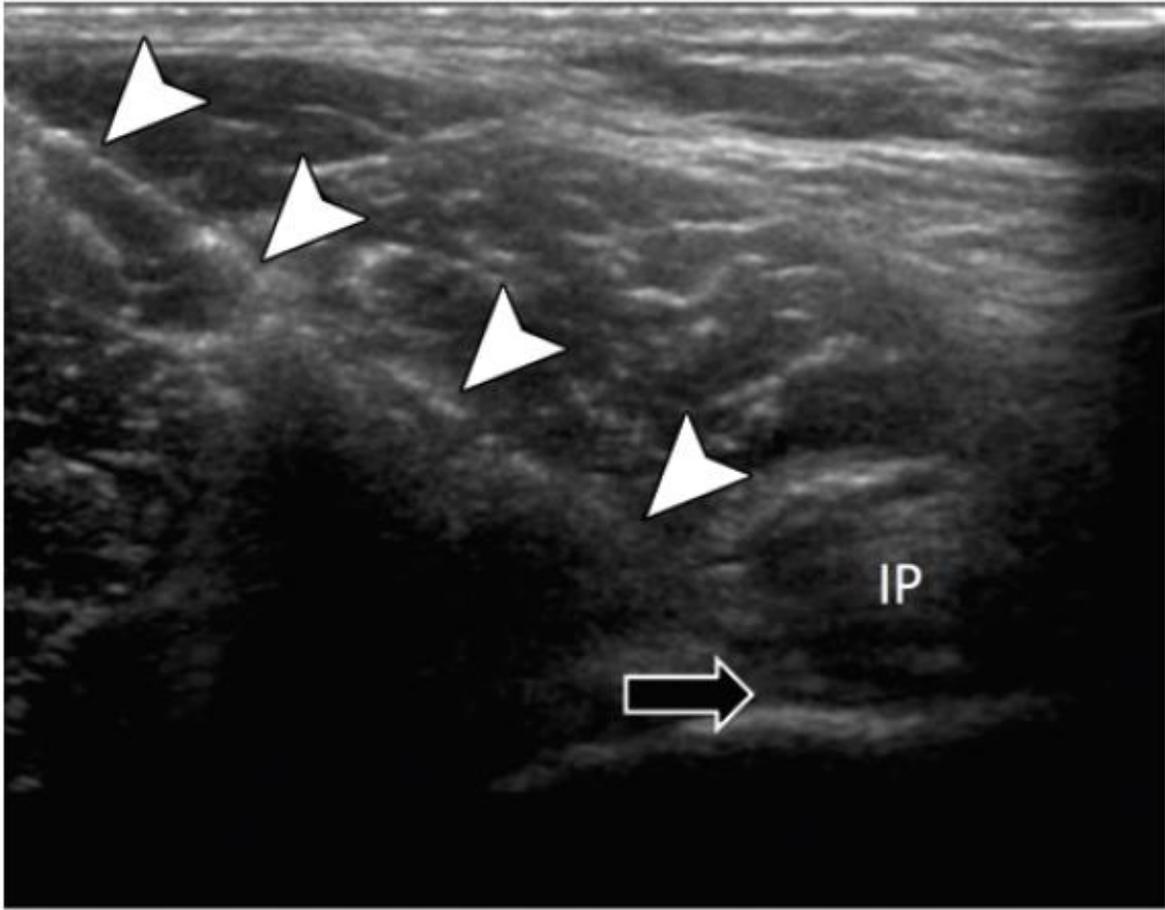


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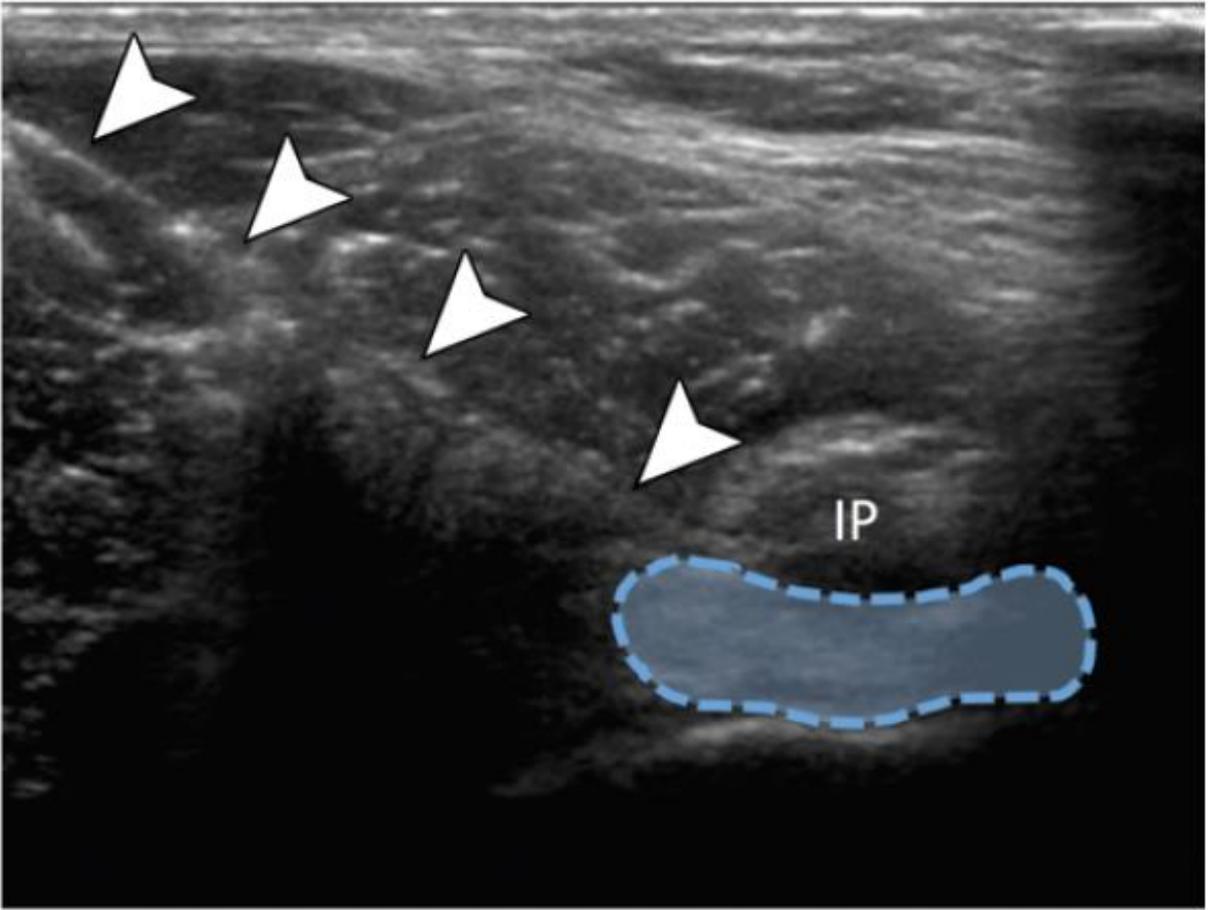


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FIGURE 2



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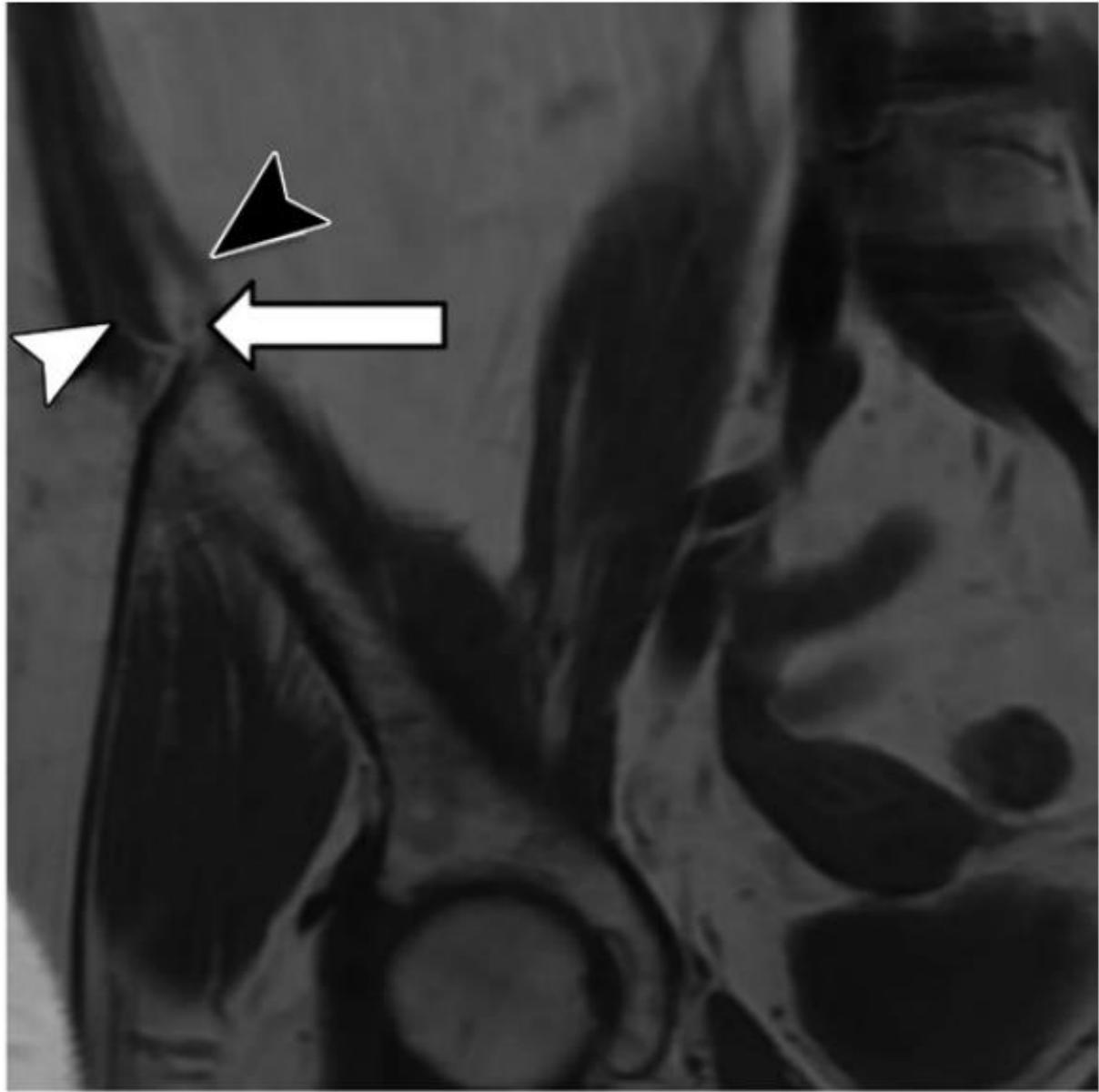


d.

FIGURE 3

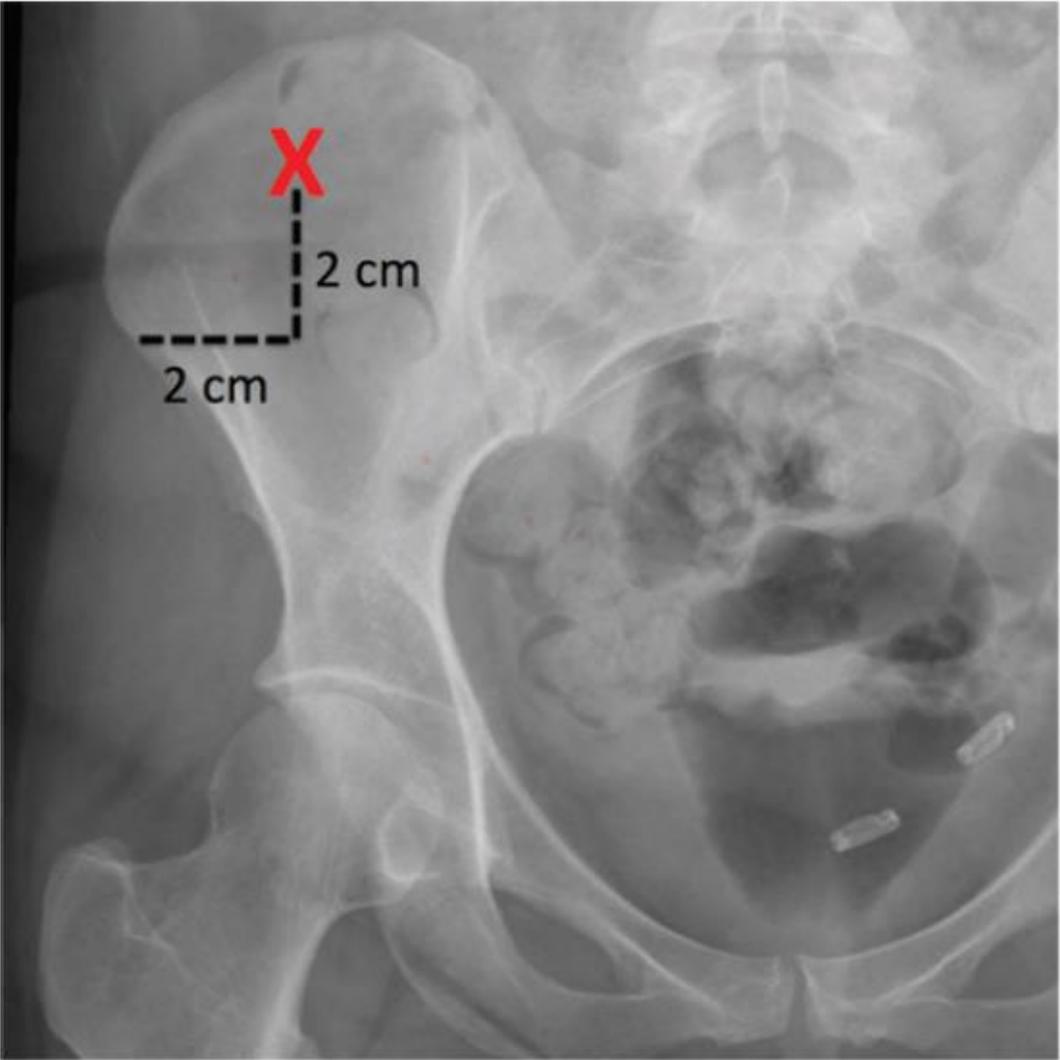


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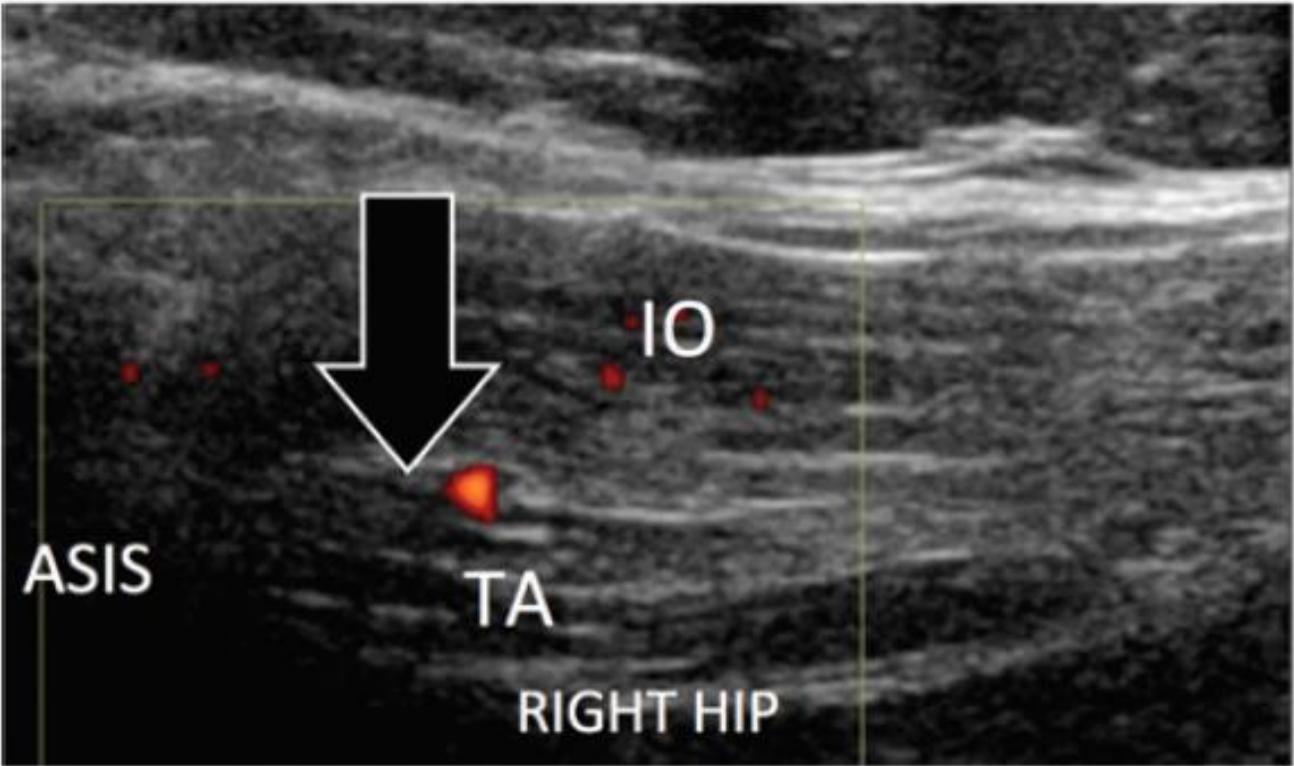


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FIGURE 4



a.



b.

FIGURE 4

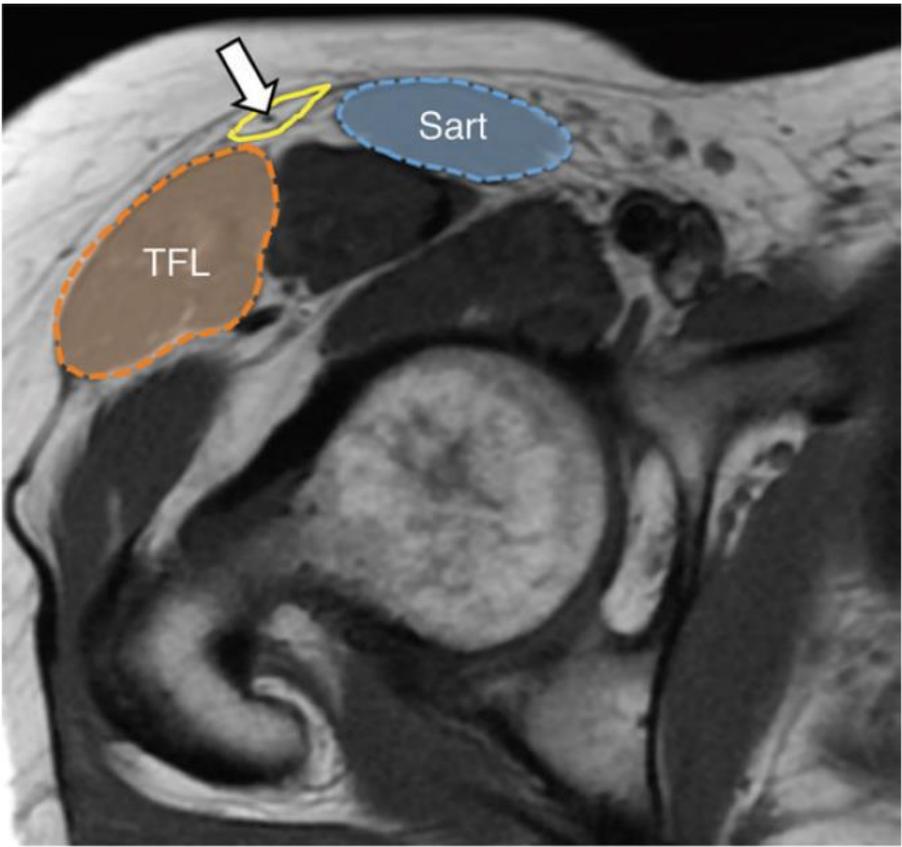
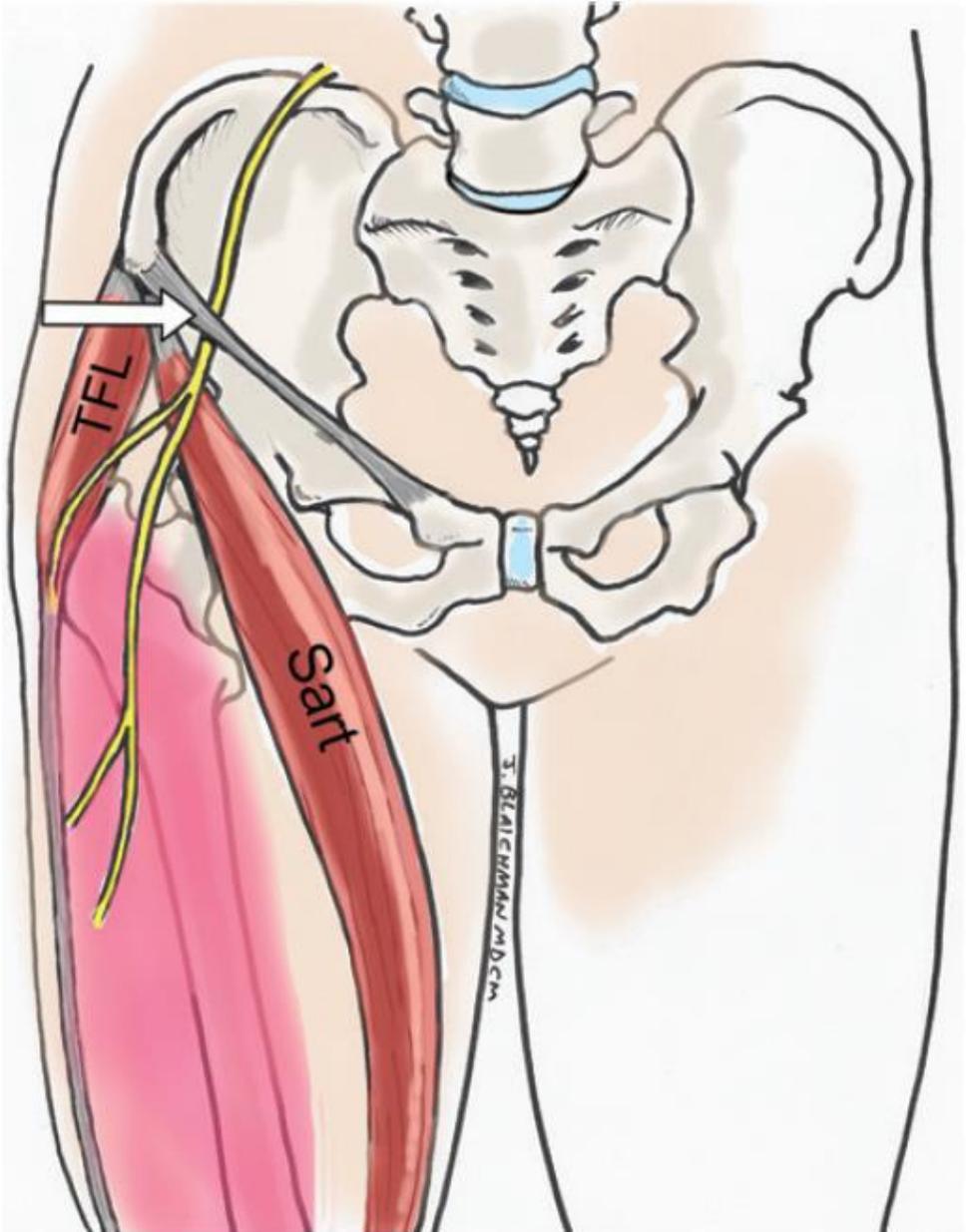
Microwave Ablation of Ilioinguinal Nerve

- ▶ More durable alternative for pain relief
- ▶ US-guided procedure
- ▶ Antenna probe 17G, 15-cm
- ▶ Position just underneath short axis of ilioinguinal nerve
- ▶ Level of antero-superior iliac spine
- ▶ Three cycles of 30W at 30" each (1' intervals)
- ▶ Follow-up as outpatient at 2 wks

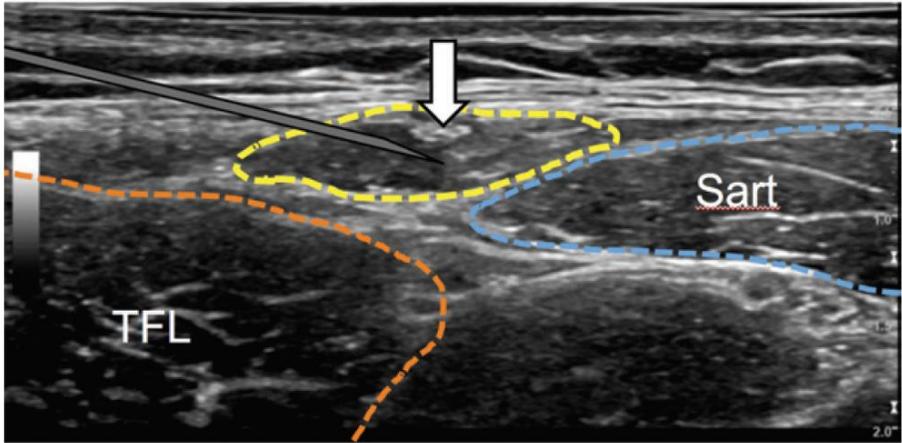


C.

FIGURES 5 and 6

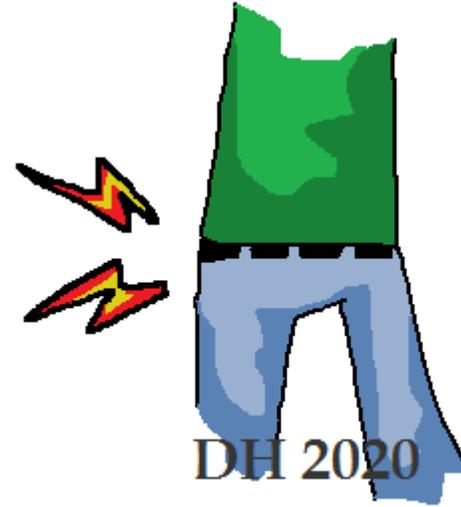


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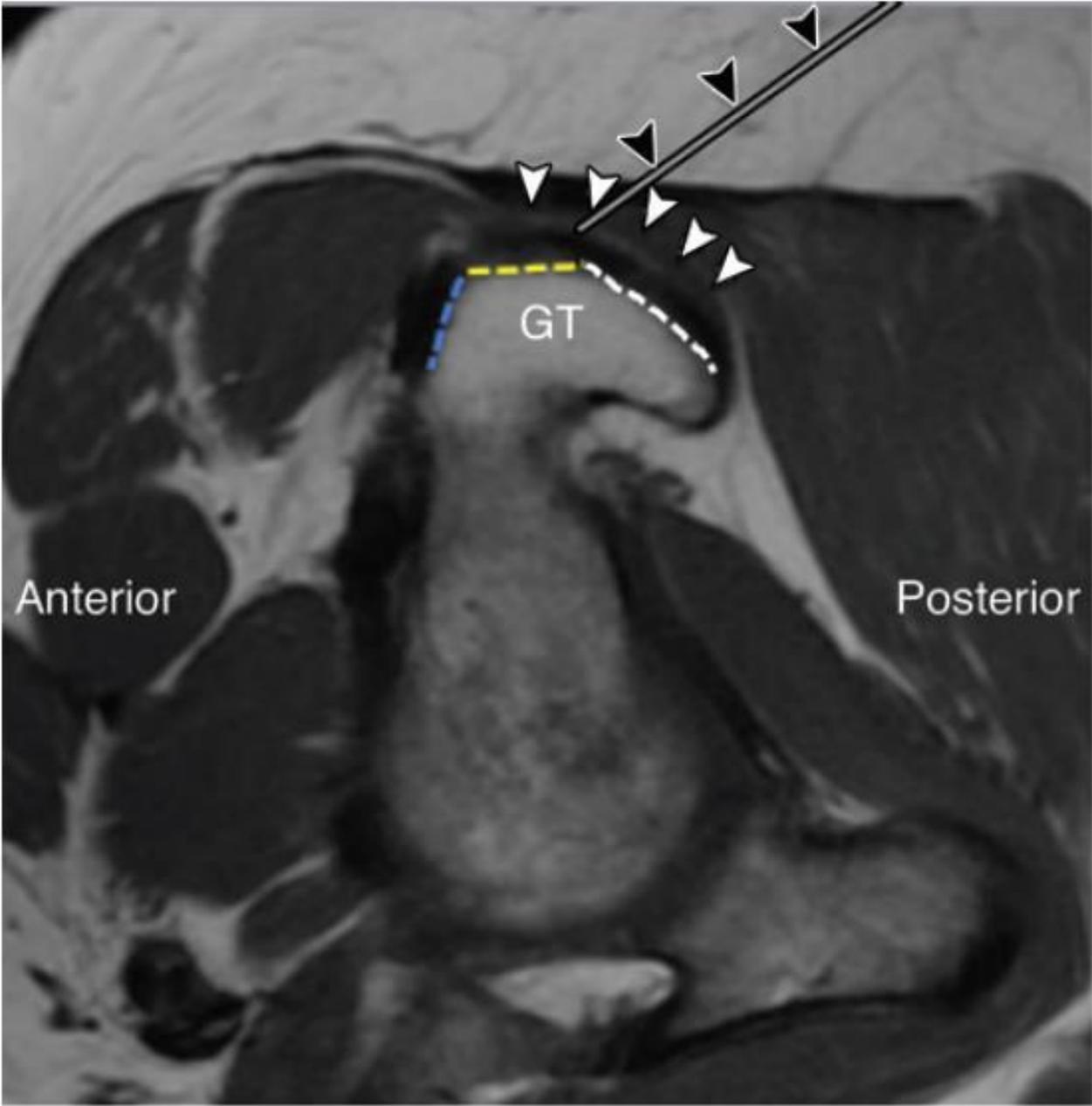
b.

LATERAL HIP



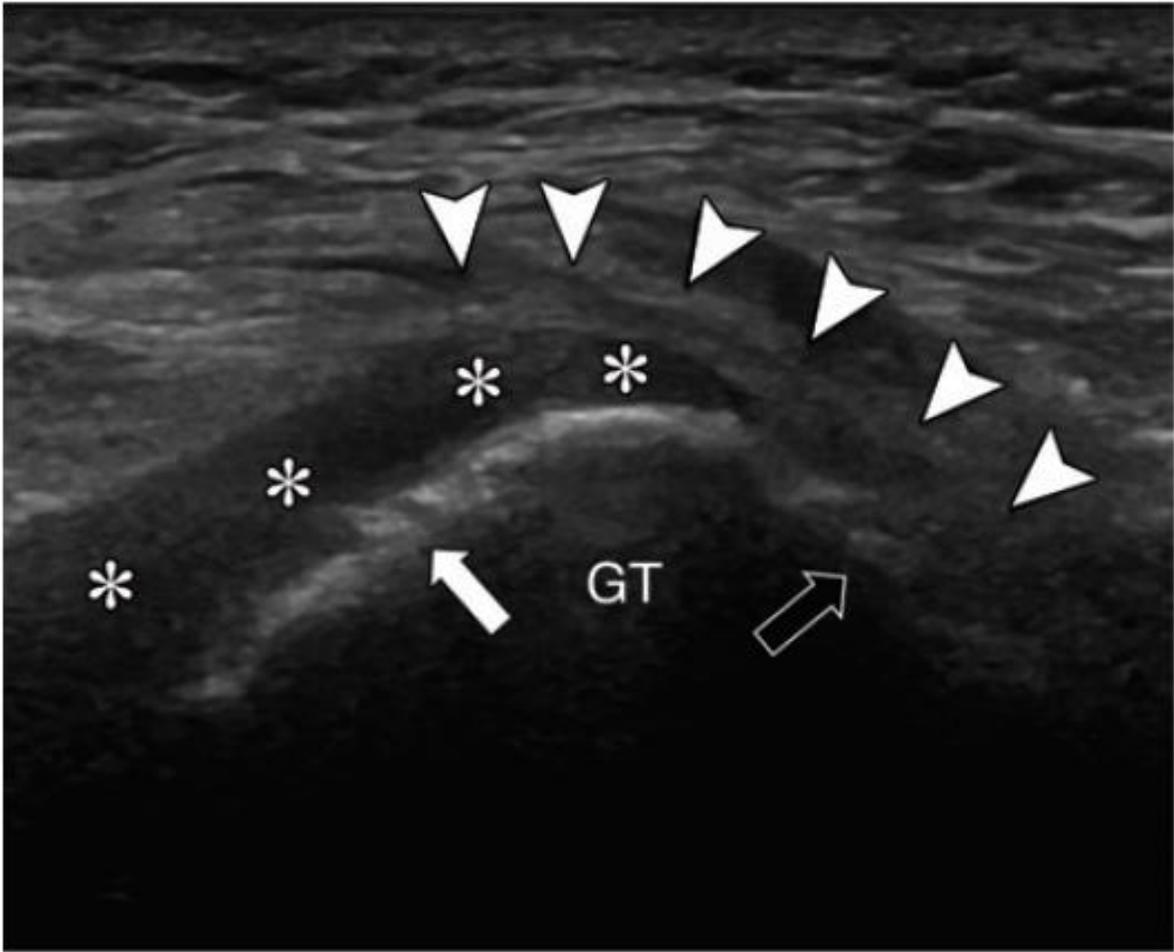
- ▶ Greater Trochanteric Bursa
- ▶ Iliotibial Band

FIGURE 7



a.

FIGURE 7



b.



c.

FIGURE 8

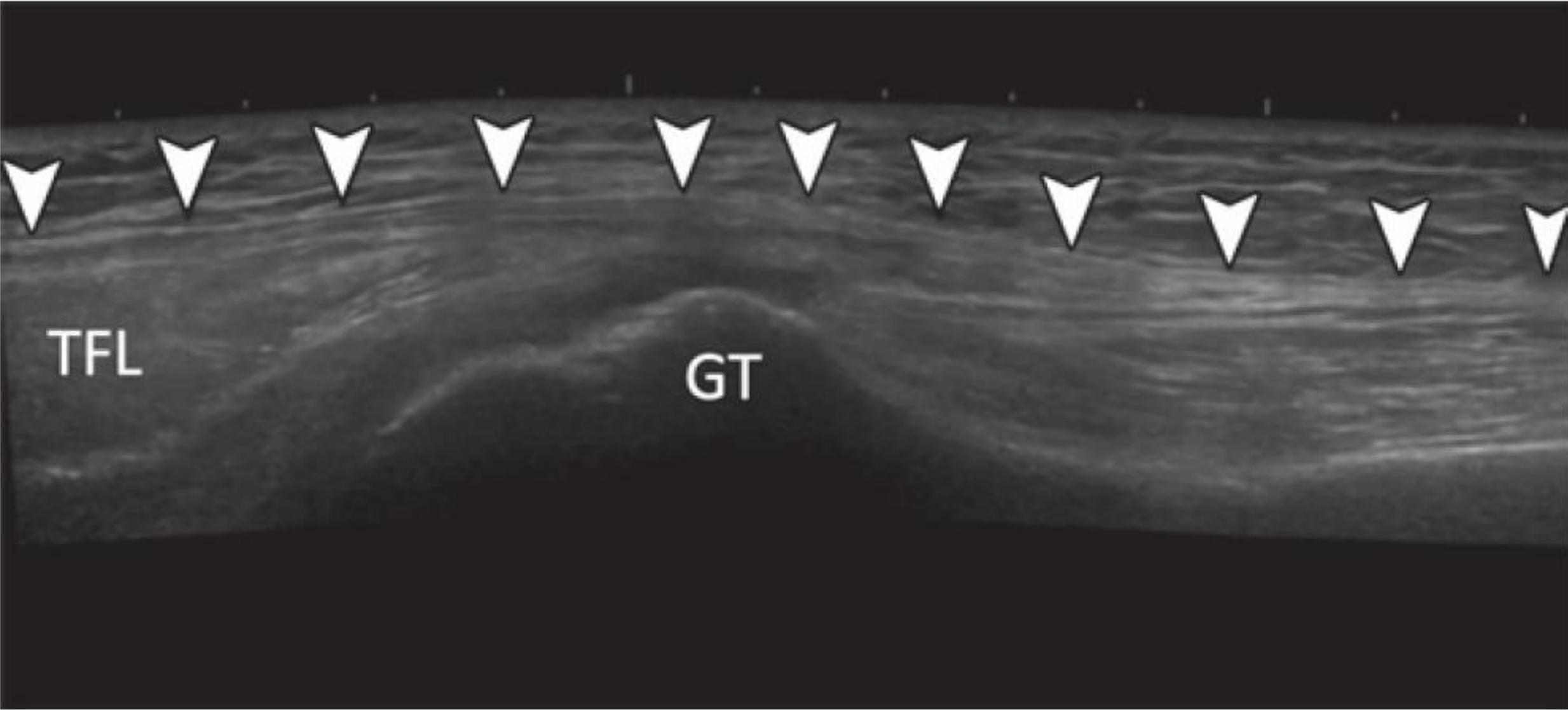
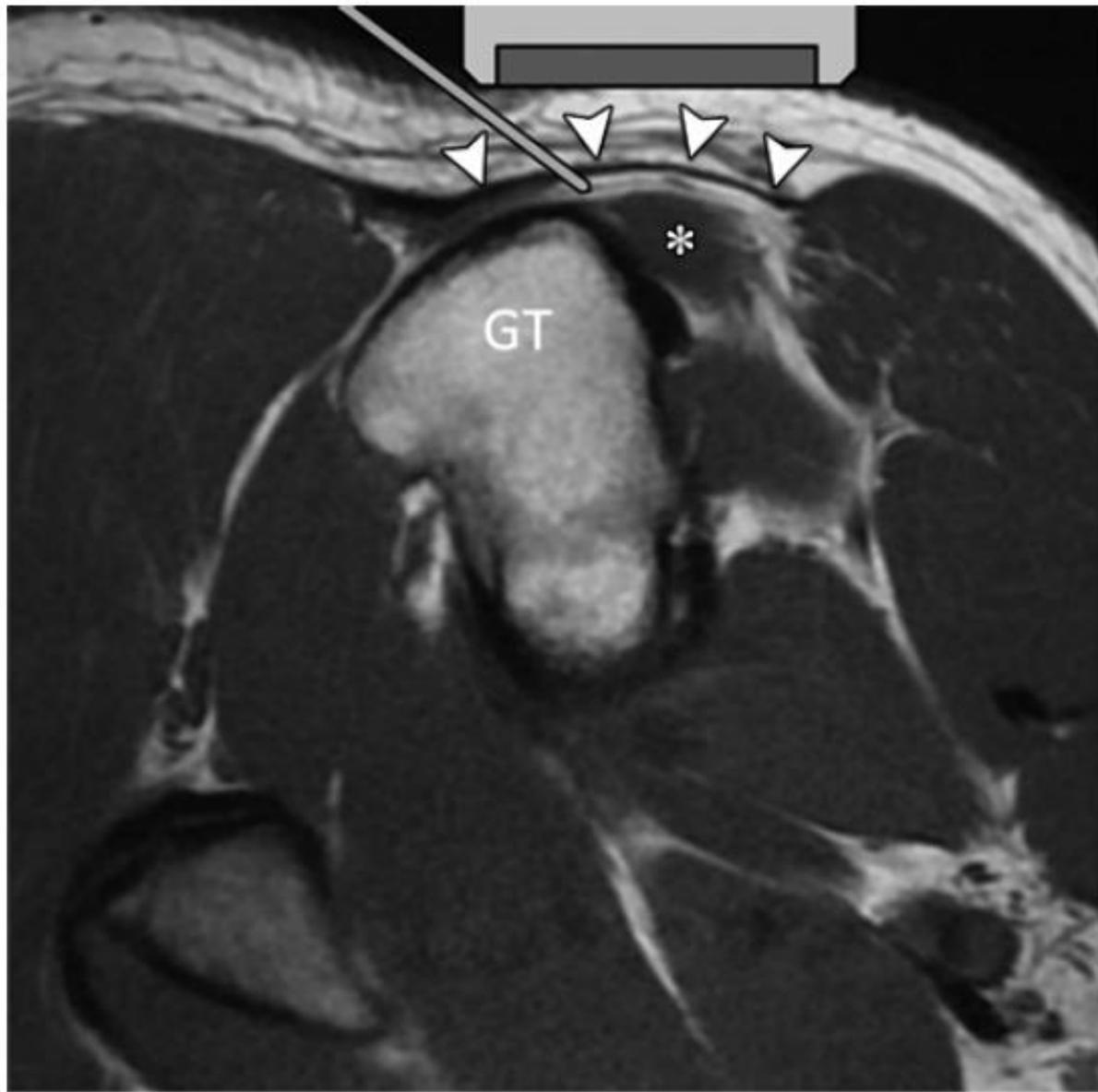
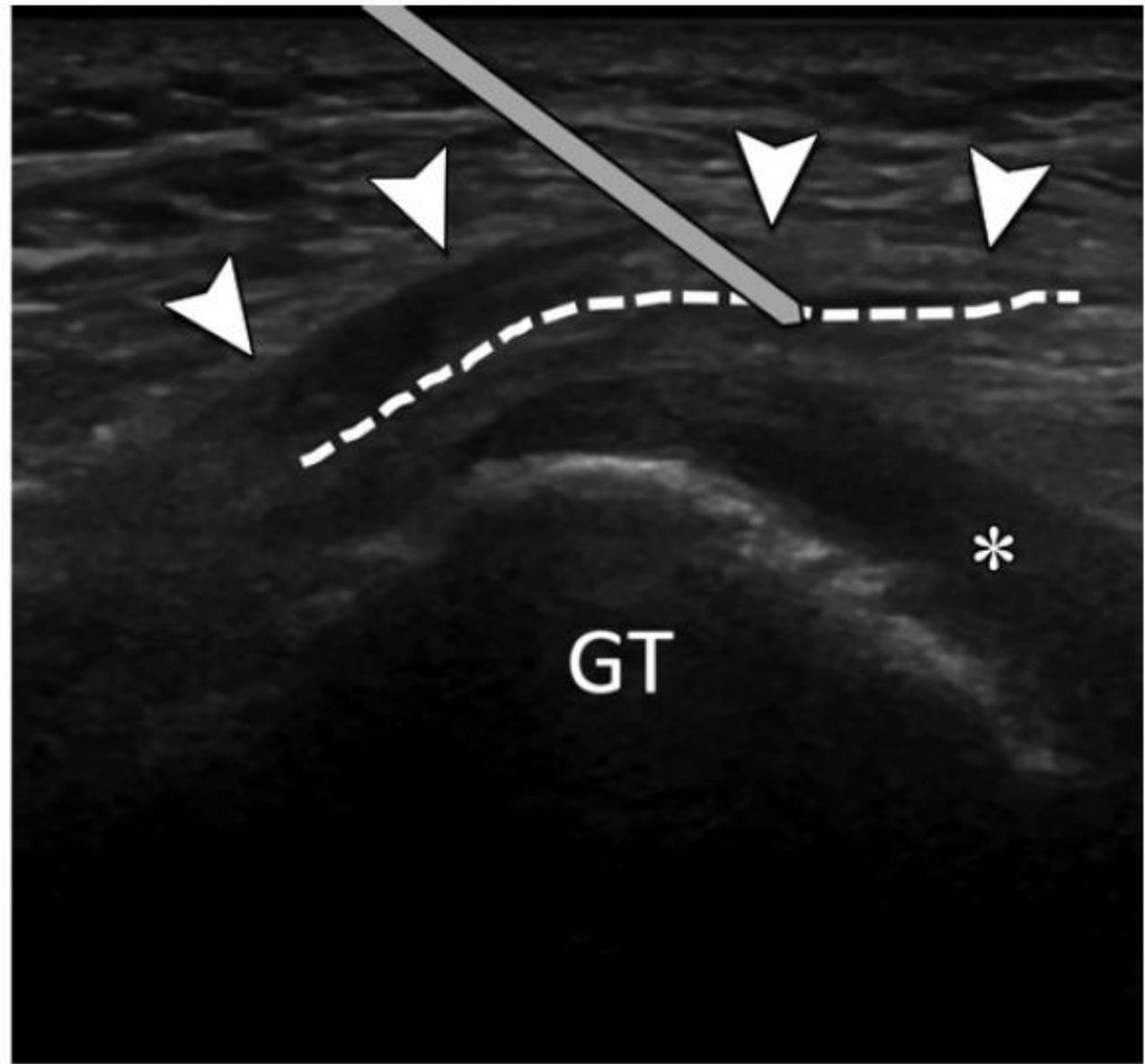


FIGURE 9



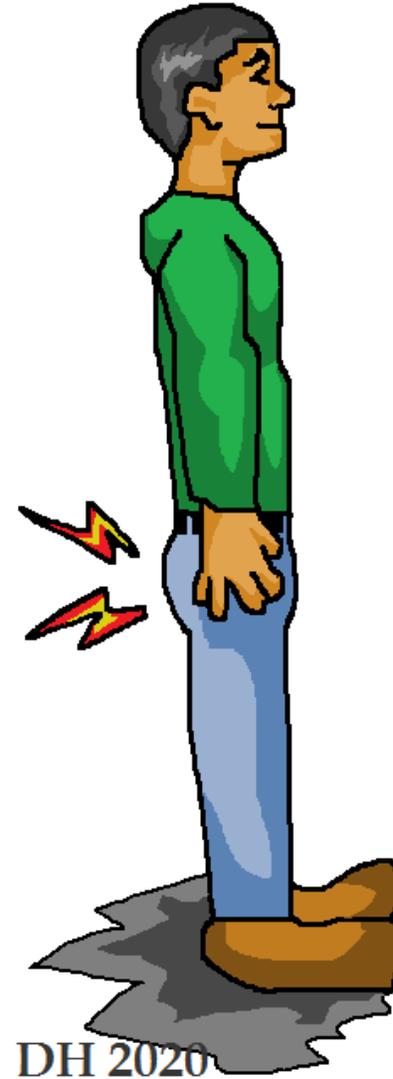
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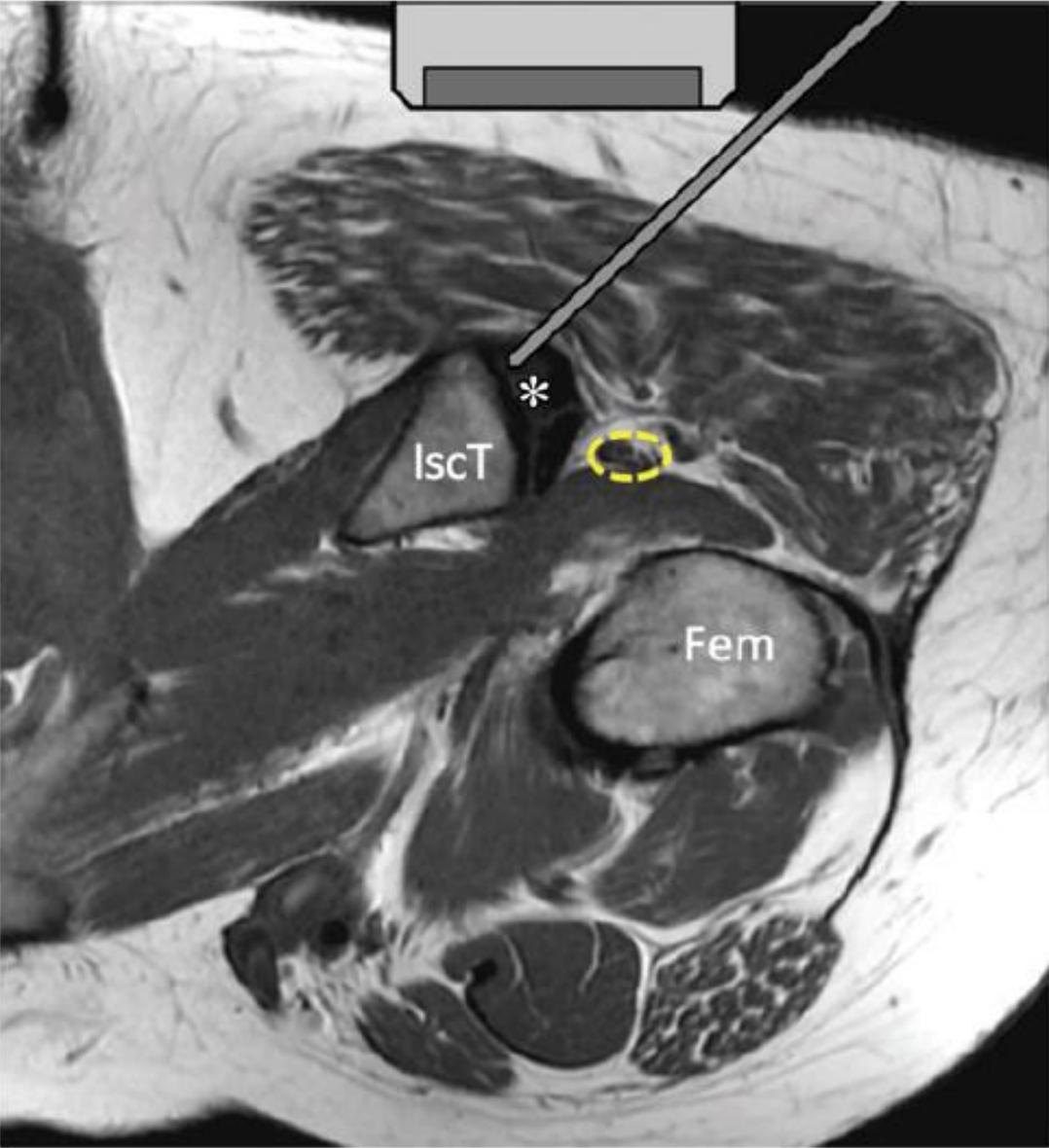
POSTERIOR HIP

- ▶ Hamstring Tendon Origin
- ▶ Ischiogluteal Bursa
- ▶ Piriformis Muscle
- ▶ Quadratus Femoris Muscle



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FIGURE 10

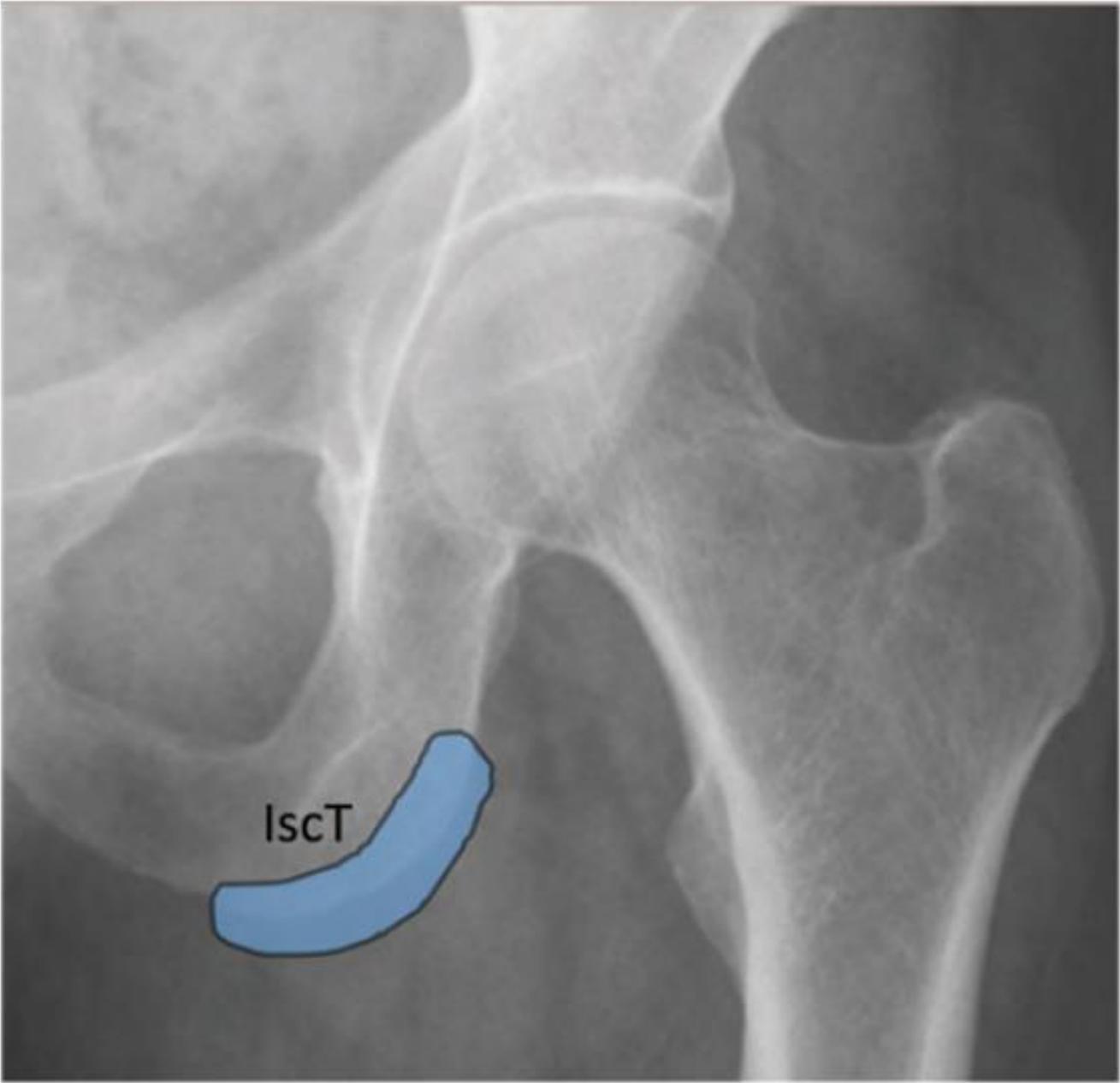


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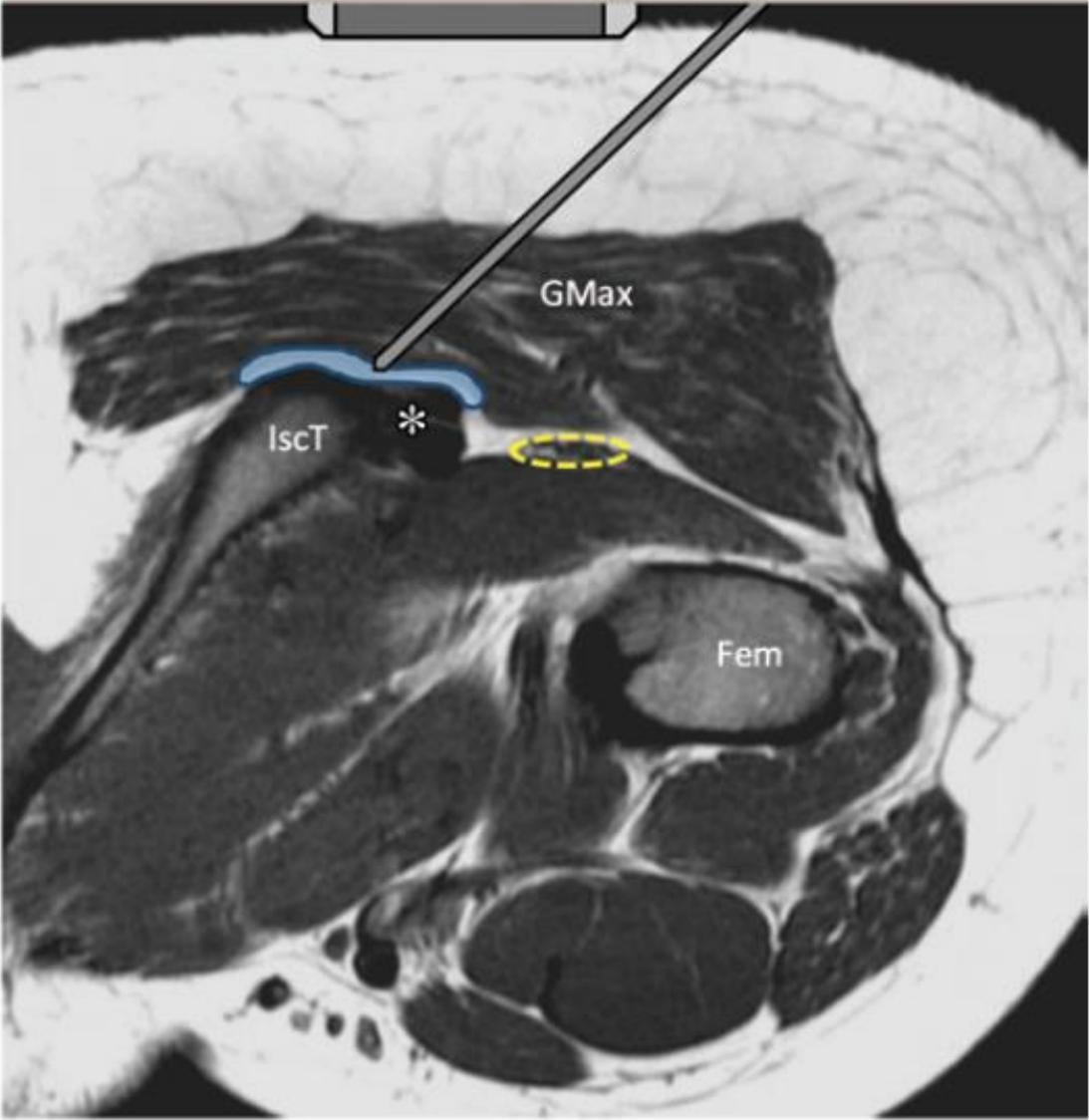
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FIGURE 11



a.

FIGURE 11

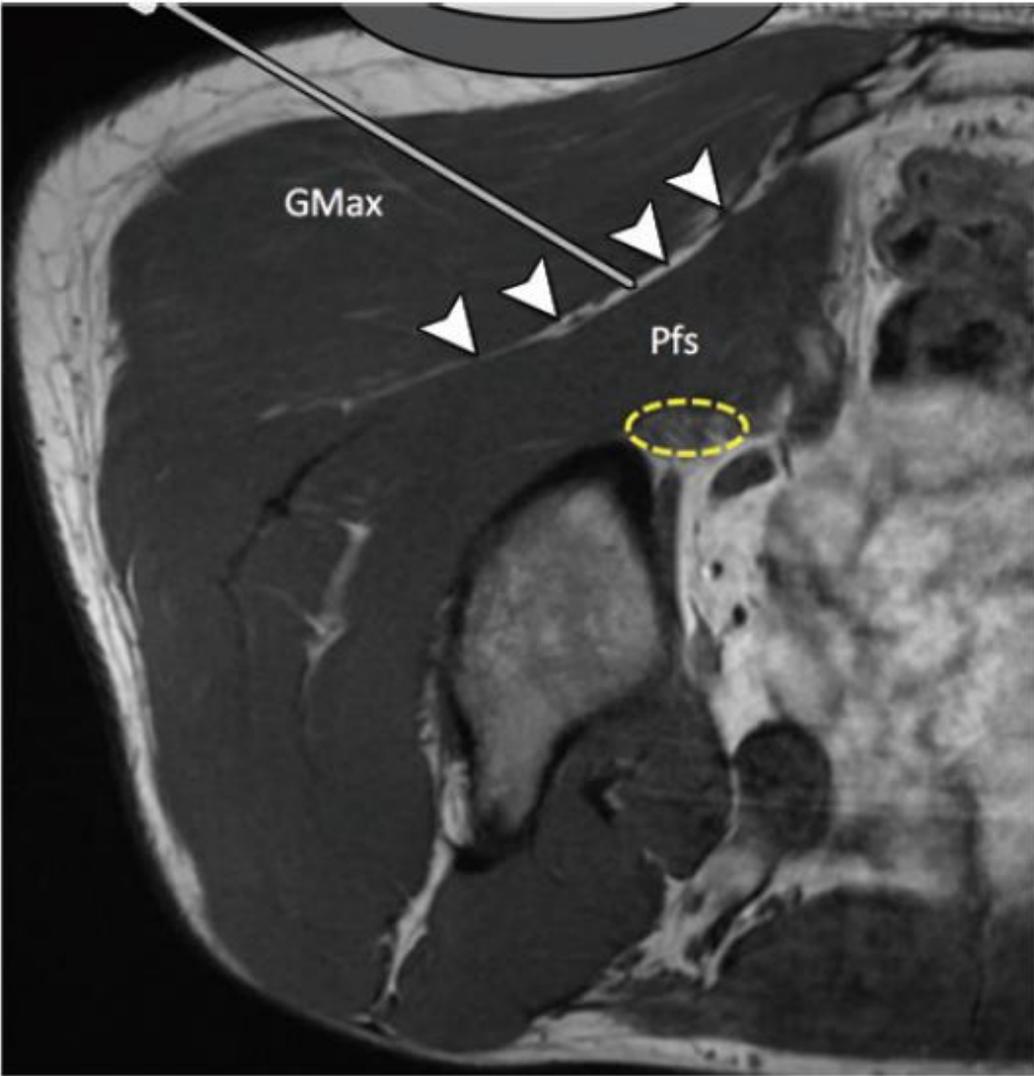


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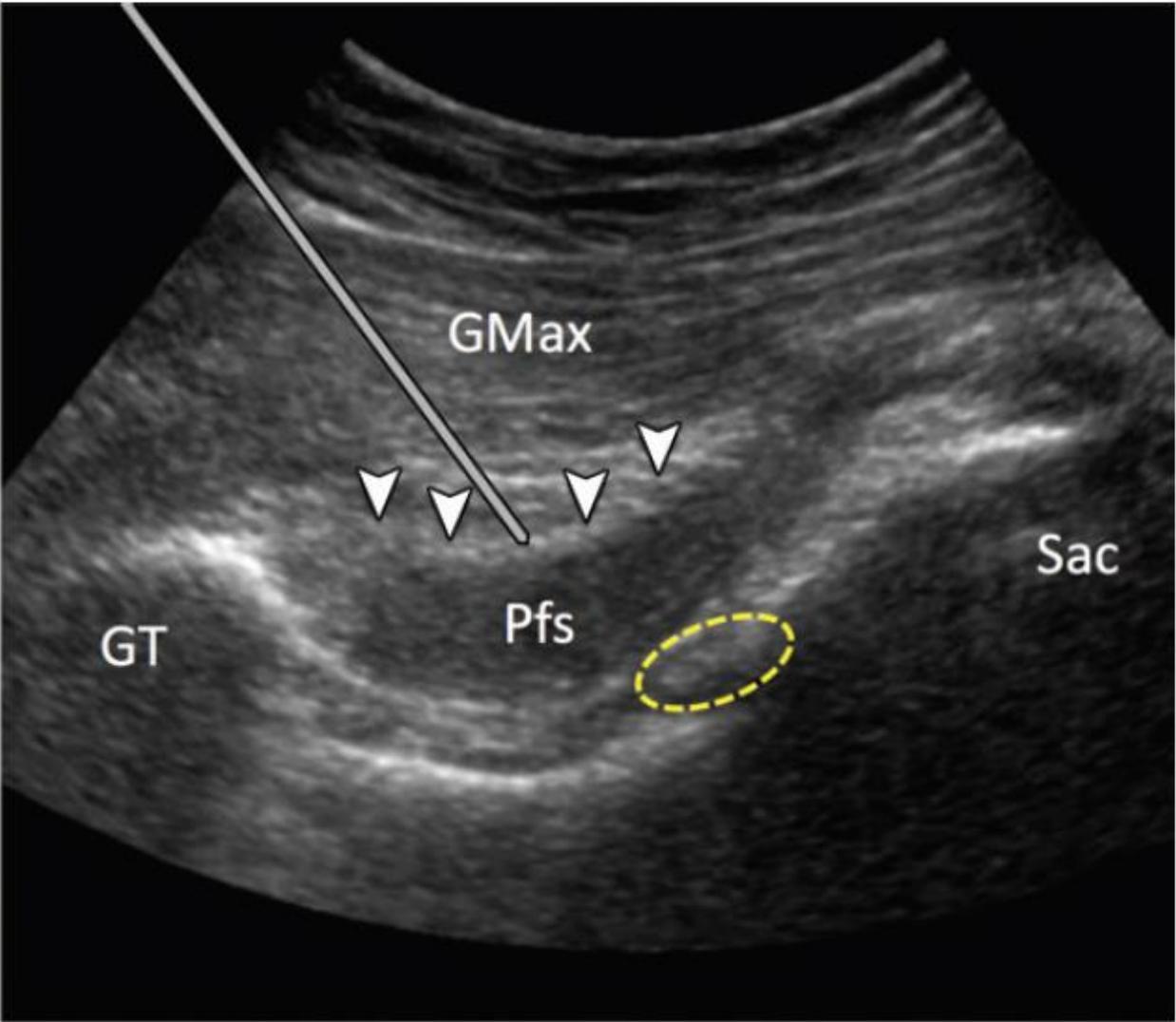


c.

FIGURE 12



a.



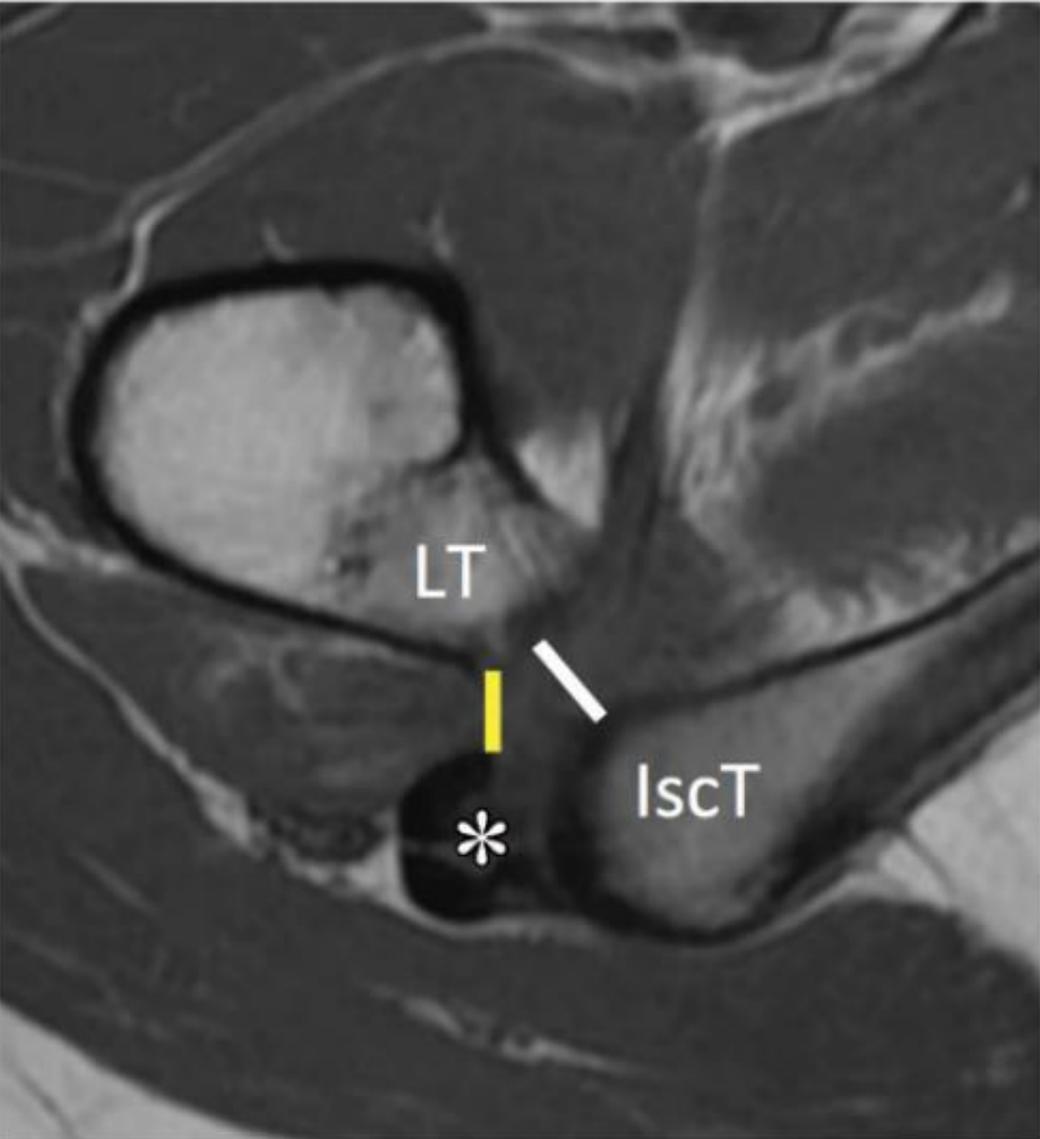
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FIGURE 13

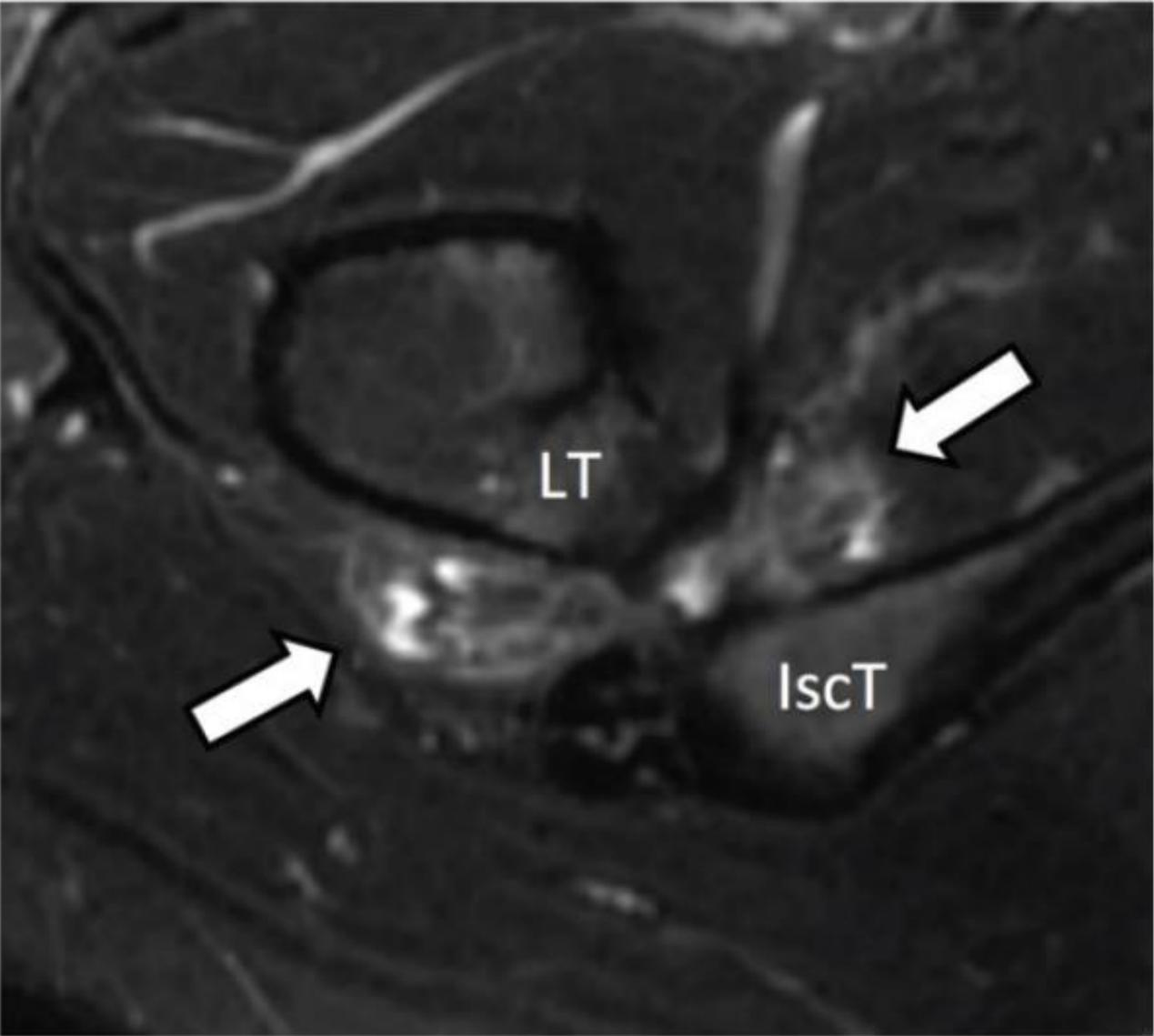


a.

FIGURE 13

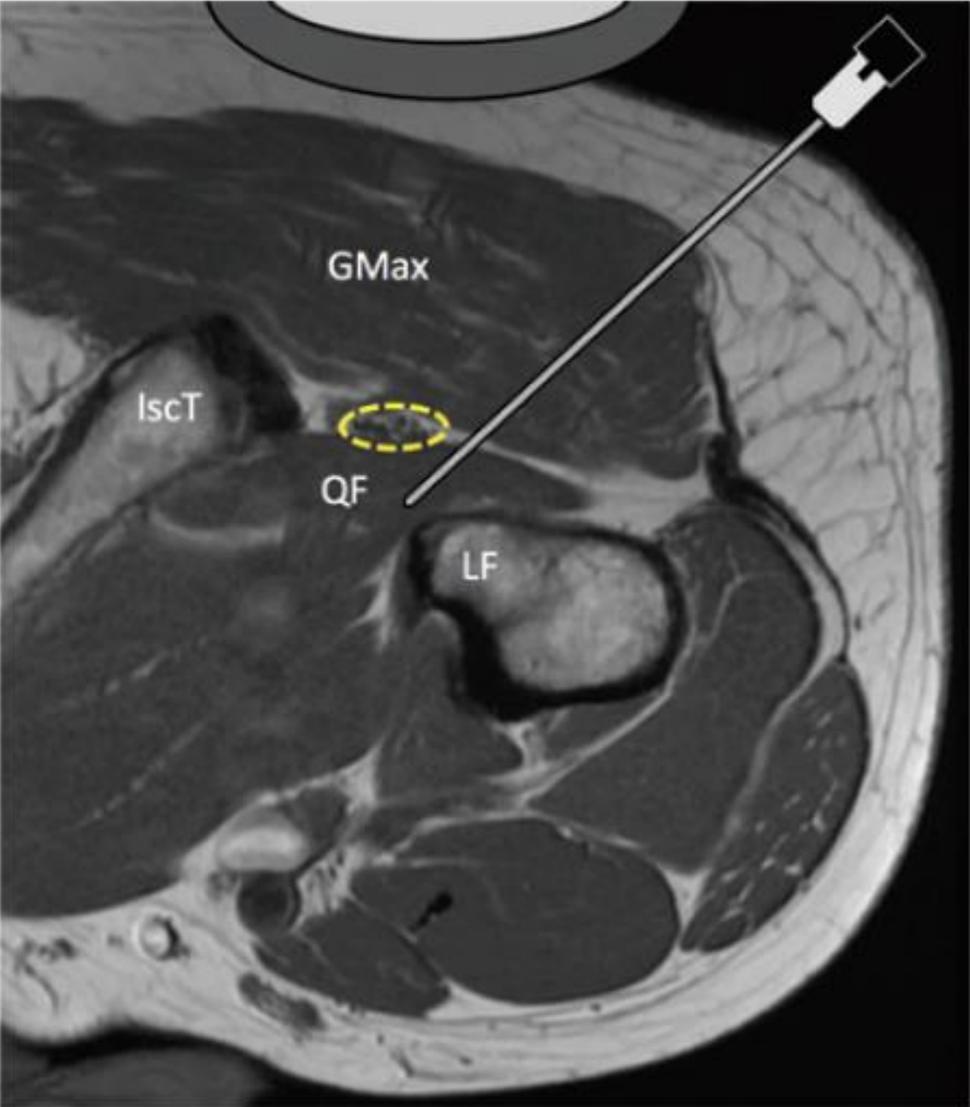


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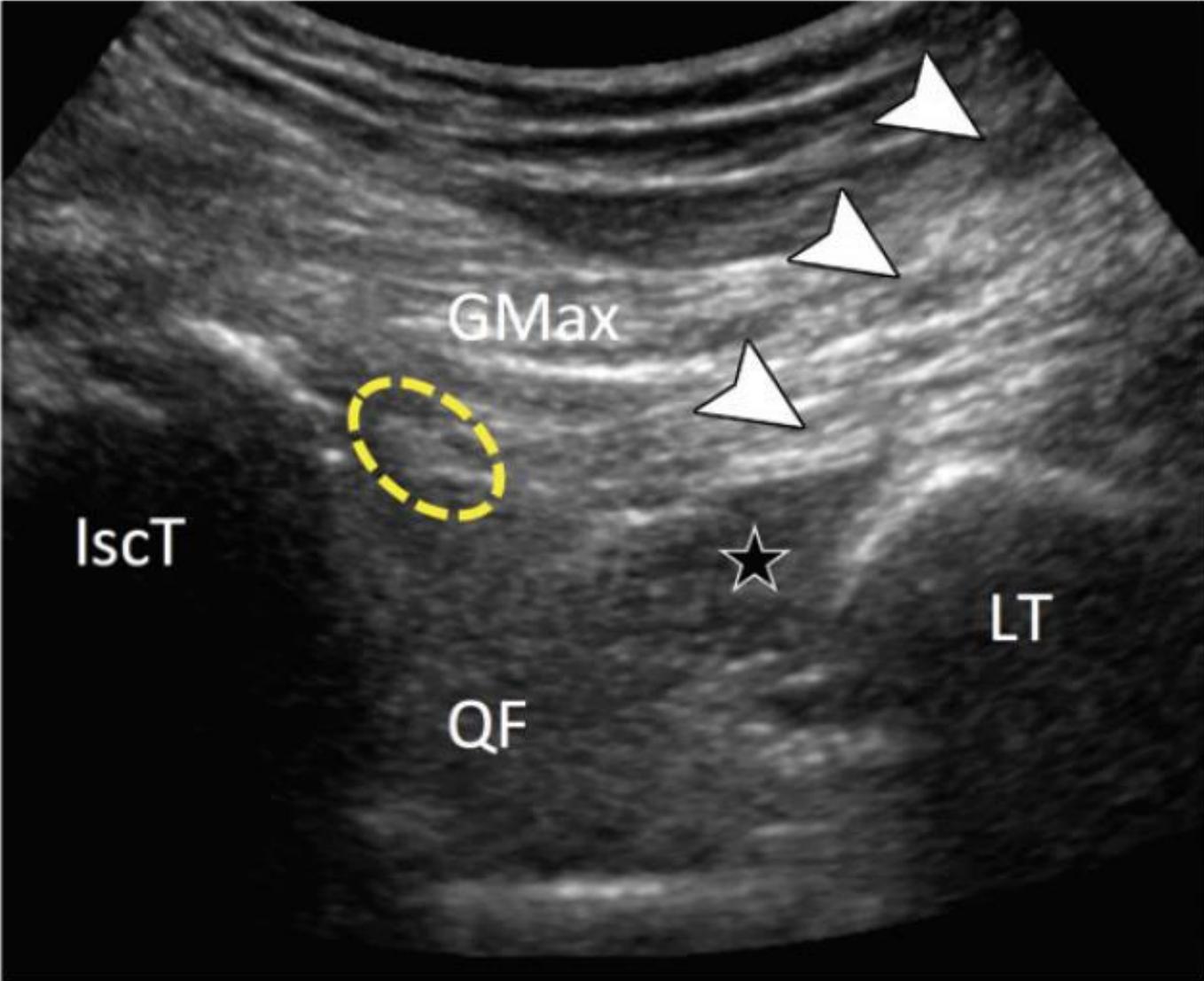


c.

FIGURE 14



a.



b.

CONCLUSION

- ▶ Debilitating condition
- ▶ Wide variety of causes

- ▶ Key role of radiologist
 - ▶ Diagnostic examination
 - ▶ Therapeutic management
 - ▶ Percutaneous intervention

- ▶ US ideal modality for imaging guidance
- ▶ Familiarity with interventions in and around hip
- ▶ Confidently and safely assist in managing hip pain

Thank you!