

Université de Montréal  

Infiltrations musculosquelettiques avec guidage échographique (et fluoroscopique)


Mathieu Boudier-Revéret, MD, FRCPC
Martin Lamontagne, MD, FRCPC
Dien Hung Luong, MD, FRCPC
Johan Michaud, MD, FRCPC
Isabelle Denis, MD, FRCPC



1

Conflits d'intérêts

Aucun




2



3

Si vous voulez me contacter


- Mathieu Boudier-Revéret, MD, FRCPC
- Professeur Adjoint, Faculté de médecine
- Coordonnateur de l'enseignement pour la physiothérapie au CHUM
- mathieu.boudier-reveret@umontreal.ca



4

Objectifs


- Comprendre les indications et contre-indications des infiltrations musculosquelettiques
- Comprendre les principes de l'échoguidage
- Apprivoiser le positionnement, le matériel, les approches et les pièges des principales infiltrations musculosquelettiques



5


Cette présentation → Survol

- En clinique, il faut :
 - Pratiquer
 - Pratiquer
 - Pratiquer



6


Indications et contre-indications



7

Injections musculosquelettiques : indications


- Plusieurs facteurs à prendre en compte
 - Traitements déjà tentés
 - Incapacité fonctionnelle
 - Précision du diagnostic
 - Réceptivité du patient par rapport à l'injection
 - Traitements alternatifs



8

Injections musculosquelettiques : indications


- **Intra-articulaires:**
 - **Arthropathies:** OA, PAR, goutte, CPPD, arthrites séronégatives, Synovite réactionnelle, synovite post-traumatique
 - **Lésions particulières :** Capsulite
- **Extra-articulaires :**
 - Tendinopathie, ténosynovite, rétinaculopathie, Bursopathie, Ligamentopathie, Kystes arthro-synoviaux, Pts gâchettes et dlrs myofasciales
 - Névralgies périphériques : Arnold, névralgie intercostale, méralgia paresthetica)
 - Syndrome Canalaires : carpien, Guyon, tarsien, etc.
 - Névromes de Morton et post-amputation



9

Contre-indications


- Infection systémique
- Trouble de la coagulation non contrôlé
- Infection localisée ou cellulite sur le trajet de l'aiguille
- Tumeur sur le trajet de l'aiguille
- Arthrite septique
- Allergie aux produits injectés
- Dx imprécis



10

Contre-indications

- Aussi questionner :
 - Diabète insulinotraité
 - TB ancienne
 - Chirurgie d'arthroplastie à venir (habituellement, chirurgiens veulent éviter infiltration dans l'articulation à opérer dans les 3-6 mois pré-Chx).
 - Local : Articulation instable, hémarthrose, prothèse



11

Injections MSK : les agents

- Corticostéroïdes (particulés ou non)
- Prolothérapie
 - Hydrodissection
- Anesthésiants locaux
- Viscosuppléance
- Toxine botulinique
- Salin
- Sang autologue
- Plasma riche en plaquettes
- Cellules souches mésenchymateuses



12

Cortico : les inquiétudes

ORIGINAL RESEARCH - SPECIAL REPORT Radiology

Intra-articular Corticosteroid Injections in the Hip and Knee: Perhaps Not as Safe as We Thought?

Andrew J. Kompel, MD • Frank W. Roemer, MD • Akira M. Murakami, MD • Luis E. Diaz, MD • Michel D. Crema, MD • Ali Guermazi, MD, PhD

- ❑ accelerated osteoarthritis progression
- ❑ subchondral insufficiency fracture
- ❑ complications of osteonecrosis,
- ❑ rapid joint destruction with bone loss

Kompel, A. J., Roemer, F. W., Murakami, A. M., Diaz, L. E., Crema, M. D., & Guermazi, A. (2019). Intra-articular corticosteroid injections in the hip and knee: perhaps not as safe as we thought?. *Radiology*, 293(3), 656-663.

13

Cortico : effets indésirables

- ❑ Arthropathie microcristalline (synovite réactionnelle de 36 à 48 hrs)
- ❑ Lésions granulomateuses (granulomes à corps étrangers)
- ❑ Atrophie cutanée et dépigmentation
- ❑ Infection iatrogénique (<1/50 000)
- ❑ Rupture tendineuse (éviter les tendons de MEC)

14

Cortico : effets indésirables (suite)

- ❑ Atteintes nerveuses périphériques (par pct par l'aiguille)
- ❑ Saignement utérin (l'ovulation peut être inhibée, ces saignements peuvent également affecter la femme post-ménopausée)
- ❑ Hyperglycémie chez les diabétiques
- ❑ Effets néfastes possibles sur le cartilage

15

Table 4
Complications of Intra-Articular Steroid Injections

COMPLICATION	INCIDENCE (%)
Joint effects	
Post-injection flare	2 to 10
Steroid arthropathy	0.8
Joint infection	< 0.001 to 0.072
Surrounding tissue effects	
Pericapsular calcification	43
Tendon rupture	< 1
Skin atrophy/dyspigmentation	< 1
Systemic effects	
Vasovagal reaction	10 to 20
Facial flushing	< 1
Hypersensitivity reaction	< 1

Stephens, M.B., Sautter, A.I., & O'Connor, F.G. (2008). Musculoskeletal injections: a review of the evidence. *American family physician*, 78 (6), 871-8.

16

Allergie vs réaction vasomotrice

- ❑ Allergie : Plus rapide, systémique, pancorporelle pouvant aller jusqu'au choc anaphylactique (pouvant être secondaire au corticostéroïde/ anesthésique/ antiseptique).
- ❑ Vasomotrice : Touche uniquement le visage/cou/tronc sous la forme d'érythème. Secondaire aux corticostéroïdes, possiblement par libération d'histamine dans le derme. Transitoire (24 à 72 hrs) et bénin.

17

Cortico : quelles doses ?

Table 1
Summary of review findings regarding corticosteroid injections in the glenohumeral joint, subacromial space, hip joint, and knee joint

Injection	Efficacy	Steroid Type	Steroid Dose	Injectate Volume
Glenohumeral joint	Improvement in pain and function over first month	TA may be better than MPA for adhesive capsulitis	40 mg Most common, but no better than 20 mg for adhesive capsulitis	Not studied; large range of volumes
Subacromial space	Mixed reports on efficacy	MPA may be better than TA for pain	80 mg Similar to 40 mg, but 40 mg more efficacious than 20 mg	Not studied; large range of volumes
Hip joint	Short-term improvement (1-6 mo) in pain and function	Similar efficacy for MPA or TA for femoroacetabular impingement	Longer duration of improvement in 80 mg compared to 40 mg	No difference between 3 mL and 9 mL of injectate
Knee joint	Small improvement in pain and function for several weeks	TH better than TA, MP, and B	40 mg equivalent to 80 mg	Not studied; large range of volumes

TA = triamcinolone acetate; MPA = methylprednisolone acetate; TH = triamcinolone hexacetonide; B = betamethasone.

Cushman, D. M., Bruno, B., Christiansen, J., Schultz, A., & McCormick, Z. L. (2018). Efficacy of injected corticosteroid type, dose, and volume for pain in large joints: a narrative review. *Pm&R*, 10(7), 748-757.

18

Cortico : quelles doses ?

Table 1
Summary of Small-Joint Corticosteroid Injection Review


Injection	Efficacy	Type of Steroid	Dose of Steroid	Injectate Volume
Small-size Joints				
CMC Joint (11 studies, 7 RCTs)	RCTs show minimal difference compared to HA, but both groups show some improvement in pain and function for weeks to months	Not studied, variety of medications used	10-20 mg likely more efficacious than 5 mg, based on indirect evidence from overall group improvement in RCTs	Not studied, volumes typically 0.25-1.0 mL
MCP joint (4 studies)	Improvement in pain over weeks to months	Not studied, all studies used triamcinolone	Not studied, 10-40 mg reported	Not studied, 0.5-1.0 mL reported
IP joints (3 studies)	Pain relief for weeks to months	TH superior to MP based on head-to-head comparison	Not studied	Not studied, volumes typically 0.25 mL
MTP joint (2 studies)	Pain relief for at least 8 wk, functional improvement at 1 wk	Not studied, both studies used triamcinolone	Not studied, 20-40 mg reported	Not studied, 1.0 mL reported
Intermediate-size Joints				
Wrist (6 studies)	Significant pain and functional improvements for at least 12 wk	Not studied, triamcinolone and MP used	20 mg TH equivalent to 40 mg TH based on head-to-head study	Not studied, range of 1-6 mL
Ankle (1 study)	Significant improvement in pain for at least 1 mo	Not studied, only TH reported	Not studied, only 60 mg reported	Not studied, only 3 mL reported
Elbow (2 studies)	Improved pain for 1-6 mo	Not studied, both studies used TH	Not studied, studies ranged from 20-60 mg	Not studied, range from 0.5-3 mL
AC joint (1 study)	Improved pain at 24 wk	Not studied, only study used MPA	Not studied, only study used 40 mg	Not studied, only study used 5 mL

CMC = carpal-metacarpal; RCT = randomized-controlled trial; HA = hyaluronic acid; MCP = metacarpal-phalangeal; IP = interphalangeal; TH = triamcinolone hexacetate; MP = methylprednisolone; MTP = metatarsal-phalangeal; AC = acromioclavicular; MPA = methylprednisolone acetate.

Cushman, D. M., Ofek, E., Syed, R. H., Clements, N., Gardner, J. E., Sams, J. M., ... & McCormick, Z. L. (2010). Comparison of Corticosteroid Type, Dose, and Volume for the Treatment of Pain in Small-and Intermediate-Size Joint Injections: A Narrative Review. *PM&R*, 2(2), 155-164.

19

Prolothérapie : le cas du Québec



Utilisation de la prolothérapie dans le traitement des affections musculosquelettiques chroniques

Efficacité et innocuité

Février 2013

https://www.inesss.qc.ca/fileadmin/doc/INESSS/Rapports/Traitement/INESSS_prolotherapie_affections_musculosquelettiques_chroniques.pdf

20

L'ÉCHO GUIDAGE en bref

(Diapositives en partie en anglais)

21

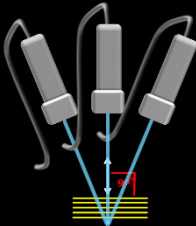
US-guided MSK interventions

- How-to: material
 - Skin cleansing
 - Sterile drapey with hole
 - Probe cleaning / probe cover
 - Sterile gloves & sterile gel
- "no touch" technique

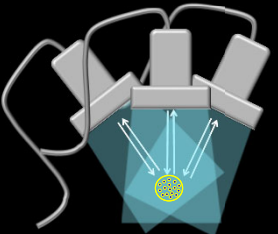


22

Manipulation de la sonde



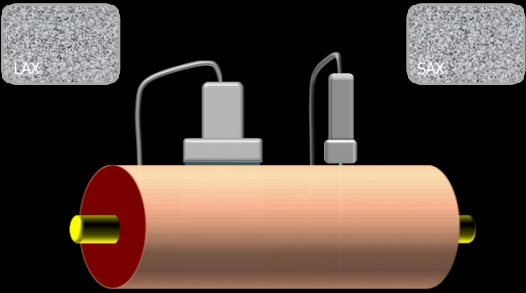
Basculer (tilt)



Anguler (rock)

23

Manipulation de la sonde



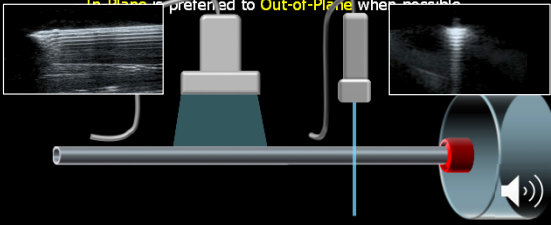
LAX

SAX

24

US-guided MSK interventions

- How-to: technique
 - Free hand technique with real time needle visualisation
 - Needle approach: **In-Plane** preferred to **Out-of-Plane** when possible

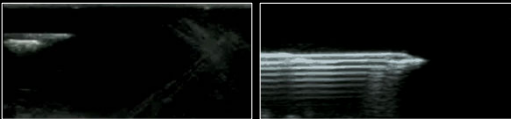


The diagram illustrates the In-Plane needle approach. It shows a 3D model of a needle and a 2D ultrasound image. The needle is shown in a blue color, and the ultrasound image shows the needle's path through the tissue. A speaker icon is located at the bottom right of the diagram.

25

US-guided MSK interventions

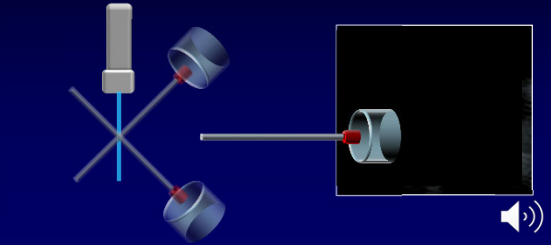
- How-to: technique
 - Free hand technique with real time needle visualisation
 - Needle approach: **In-Plane**



The diagram illustrates the In-Plane needle approach. It shows two 2D ultrasound images side-by-side. The left image shows a needle tip, and the right image shows the needle's path through the tissue. A speaker icon is located at the bottom right of the diagram.

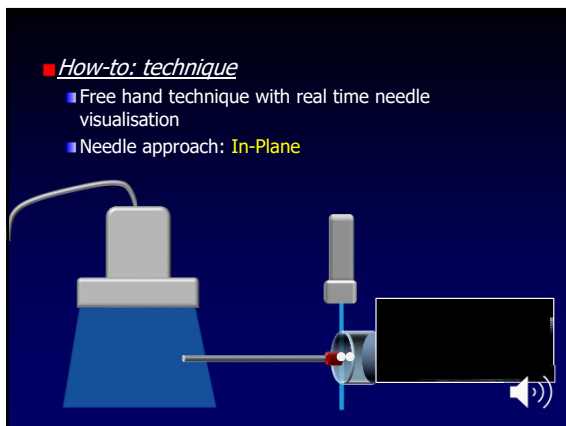
26

- How-to: technique
 - Free hand technique with real time needle visualisation
 - Needle approach: **Out-of-Plane**

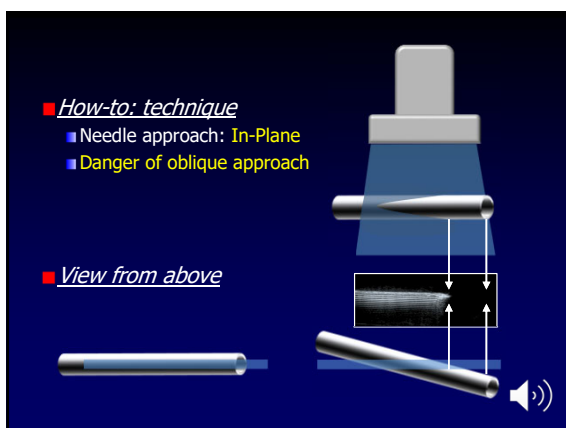


The diagram illustrates the Out-of-Plane needle approach. It shows a 3D model of a needle and a 2D ultrasound image. The needle is shown in a blue color, and the ultrasound image shows the needle's path through the tissue. A speaker icon is located at the bottom right of the diagram.

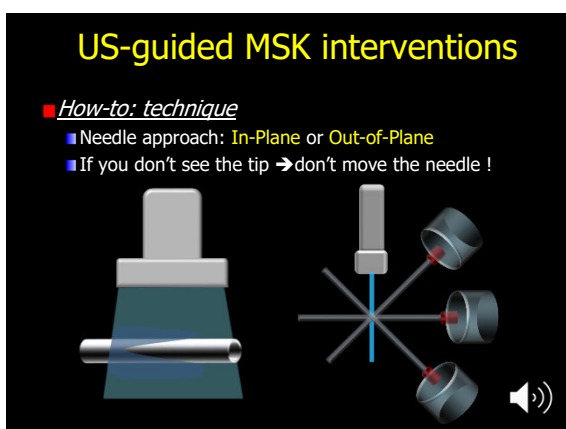
27



28



29

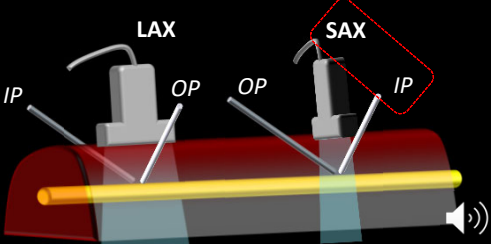


30

US-guided MSK interventions

■ *How-to: technique*

- Nerve evaluated in SAX (short axis) or LAX (long axis)
- Needle approach: IP (in-plane) or OP (out-of-plane)




The diagram shows two cross-sectional views of a muscle and nerve. On the left, labeled 'LAX', a needle is shown in an 'IP' (in-plane) approach, with the needle shaft and tip within the same plane as the ultrasound beam. On the right, labeled 'SAX', a needle is shown in an 'OP' (out-of-plane) approach, with the needle shaft and tip in a different plane from the ultrasound beam. A yellow bar represents the nerve, and a speaker icon is at the bottom right.

31

US-guided MSK interventions

■ Technique

- Enhance needle visualization
 - Jiggling movement to the needle
 - Doppler
 - Hydrolocalization (Bloc S. 2008)
 - Needle parallel to the footprint of probe



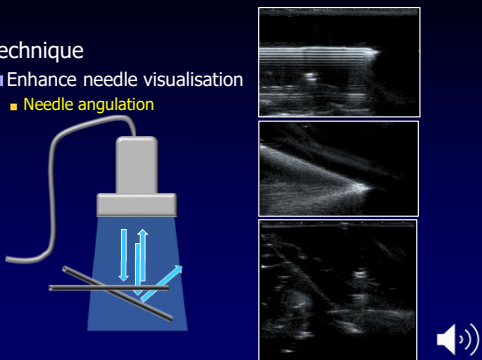
A small speaker icon is located at the bottom right of the slide.

32

US-guided MSK interventions

■ Technique

- Enhance needle visualisation
 - Needle angulation



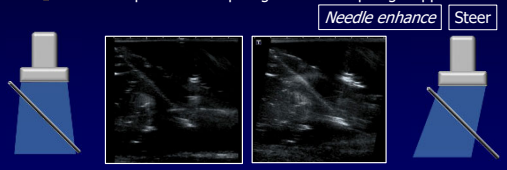
The diagram on the left shows a blue ultrasound probe with a needle inserted. Blue arrows indicate the needle's movement and angulation. To the right, three small ultrasound images show the needle at different angles. A speaker icon is at the bottom right.

33

US-guided MSK interventions

■ Technique

- Needle as parallel as possible to footprint of probe
 - Using US unit software when available: needle enhancement
 - Curvilinear probe for deep targets with steep angle approach



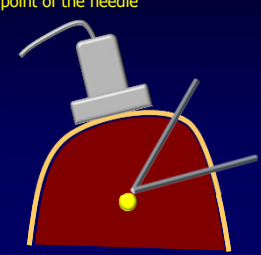
The diagram illustrates two techniques for needle placement. On the left, a blue probe is shown with a needle inserted at an angle. In the center, two ultrasound images show a needle's path through tissue, with a box labeled 'Needle enhance' highlighting the needle's tip. On the right, another blue probe is shown with a needle inserted at a different angle, with a box labeled 'Steer' indicating the needle's direction.

34

US-guided MSK interventions

■ Technique

- Needle as parallel as possible to footprint of probe
 - Entry point of the needle



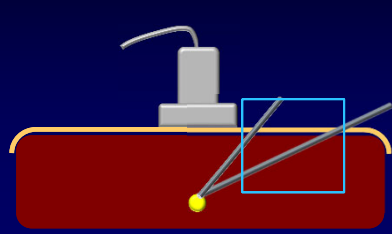
The diagram shows a cross-section of a muscle (red) with a needle (grey) inserted. A yellow dot marks the entry point of the needle into the muscle. A blue box highlights the needle's tip and the surrounding tissue.

35

US-guided MSK interventions

■ Technique

- Needle as parallel as possible to footprint of probe
 - Entry point of the needle



The diagram shows a cross-section of a muscle (red) with a needle (grey) inserted. A yellow dot marks the entry point of the needle into the muscle. A blue box highlights the needle's tip and the surrounding tissue.

36

US-guided MSK interventions

- **Technique**
 - Needle as parallel as possible to footprint of probe
 - Heel-toeing of the probe & gel oblique stand-off

37

PARAMETERS TO CONSIDER BEFORE US EXAMINATION

TABLE I.—MenUS (Ultrasound Menu).

3 P's Patient positioning, Probe selection, Probe positioning
Adjust your technical settings
Locate the bones
Search for fluid
Evaluate the soft tissues
Presence/absence, Shape/size, Echogenicity
Dynamic imaging

Özçakar, L., Kara, M., Wang, T. G., & De Maeyne, M. (2019). EURO-MUSCULUS/USPRM Basic Scanning Protocols: a practical guide for physiatrists. *Eur J Phys Rehabil Med*, 55, 472-8.

38

PARAMETERS TO CONSIDER BEFORE US EXAMINATION

- **ERGONOMIE**
 - PATIENT CONFORTABLE ET STABLE
 - Médecin CONFORTABLE ET STALBE !!!
 - CHOIX DE LA SONDE

39



40



41

PARAMETERS TO CONSIDER BEFORE US EXAMINATION

- **ERGONOMIE (suite)**
 - **ALIGNEMENT**
 - ALIGNEMENT aiguille / sonde / écran dans le même AXE
 - Sonde → main non dominante / seringue → main dominante
 - IN-PLANE
 - **STABILITÉ**
 - La main qui tient la sonde devrait se stabiliser sur le patient hors du champ stérile, pour être STABLE

A speaker icon is visible in the bottom right corner of the slide.

42

PARAMETERS TO CONSIDER BEFORE US EXAMINATION

TABLE I.—MenUS (Ultrasound Menu).

3 P's
Patient positioning, Probe selection, Probe positioning
Adjust your technical settings
Locate the bones
Search for fluid
Evaluate the soft tissues
Presence/absence, Shape/size, Echogenicity
Dynamic imaging

Ozçakar, L., Kara, M., Wang, T. G., & De Meynck, M. (2019). EURO-MUSCULUS/USPFM Basic Scanning Protocols: a practical guide for physiatrists. Part 1. *Phys Rehabil Med*, 52, 472-8.

43

PARAMETERS TO CONSIDER BEFORE US EXAMINATION

- PROFONDEUR
- FOCUS
- GAIN
- NEEDLE ENHANCE / STEER

44

TOSHIBA
Applio Star
CHUM-PHYSIATRIE
MSK 1
MBR
2019/12/10
3:55:47 PM
Precision A Pure+
18LX7
diffT 13.4
38 fps
G:80
DR:75
A:5
P:3
Tendon quad. Distal AXE COURT
Lateral
Média

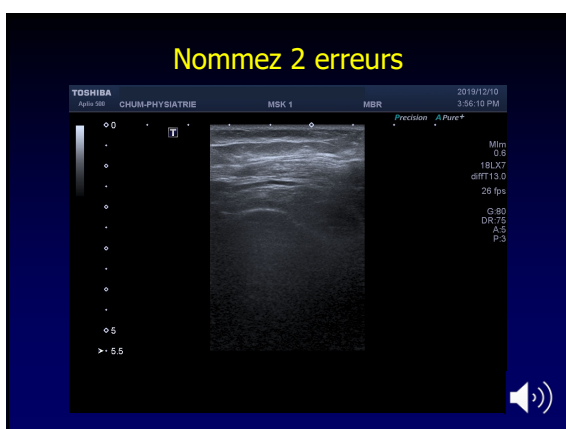
45



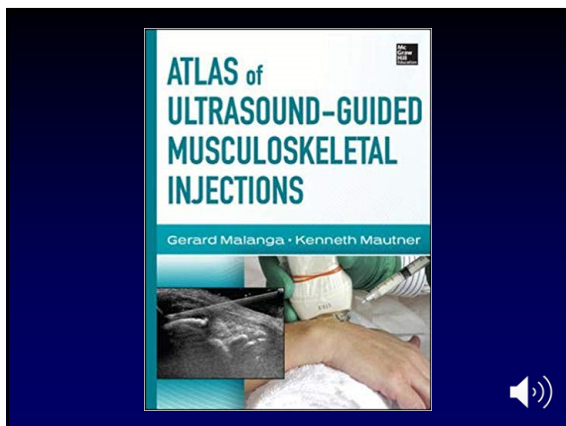
46



47



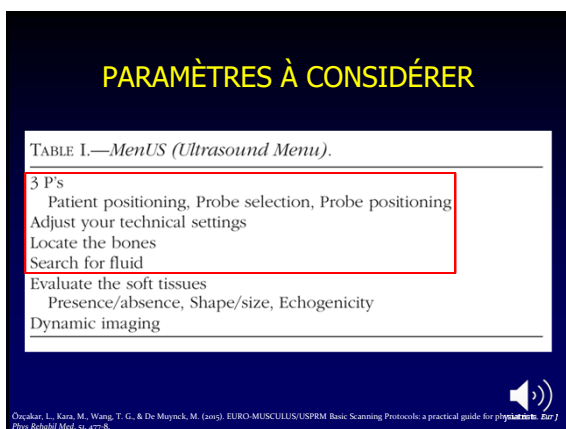
48



49




50



51


Injections échoguidées – Sites anatomiques



52

Au menu : membre supérieur


- Bourse sous-acromio-deltoïdienne
- Articulation acromio-claviculaire
- Articulation gléno-humérale
- Coude, approche radio-capitulaire
- Coude, approche récessus postérieur
- Tendon épicondylien
- Nerf ulnaire
- Nerf interosseux postérieur
- Nerf médian



53


Au menu : membre inférieur

- Articulation coxo-fémorale
- Bourse trochantérienne
- Genou, approche récessus supra-patellaire
- Articulation tibio-taliene




54

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche Longitudinale



- Décubitus dorsal, bras le long du corps en RI
- Vue LAX du SUS-ÉPINEUX
- Cible: espace virtuel entre deltoïde et Sup-épineux
- Approche:
 - IN-PLANE
 - distale → proximale
- 25G 1^{1/2}

GT



55

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche Longitudinale



DELTOÏDE
SUPRA
TÊTE HUMERALE
GT




56

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche Longitudinale




57

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche transversale


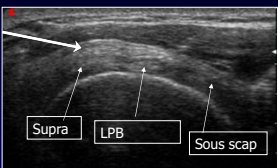



- Décubitus dorsal, bras le long du corps en RI
- Vue SAX du SUS-ÉPINEUX
- Cible: espace virtuel entre deltoïde et Sup-épineux
- Approche:
 - IN-PLANE
 - Latérale → médiale
- 25G 1^{1/2}



58

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche transversale




59

BOURSE SOUS-ACROMIO-DELTOIDIENNE
Approche transversale




60

ART. ACROMIO-CLAVICULAIRE
Approche longitudinale

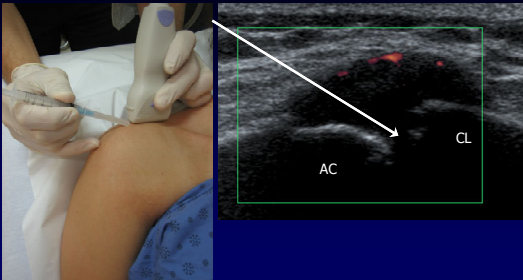


- Décubitus dorsal, bras le long du corps
- Vue LAX de l'art. acromio-claviculaire
- Cible: espace entre acromion et clavicule
- Approche:
 - IN-PLANE
 - Latérale → médiale
- 25G 1^{1/2}




61

ART. ACROMIO-CLAVICULAIRE
Approche longitudinale




- Décubitus dorsal, bras le long du corps
- Vue LAX de l'art. acromio-claviculaire
- Cible: espace entre acromion et clavicule
- Approche:
 - IN-PLANE
 - Latérale → médiale
- 25G 1^{1/2}




62

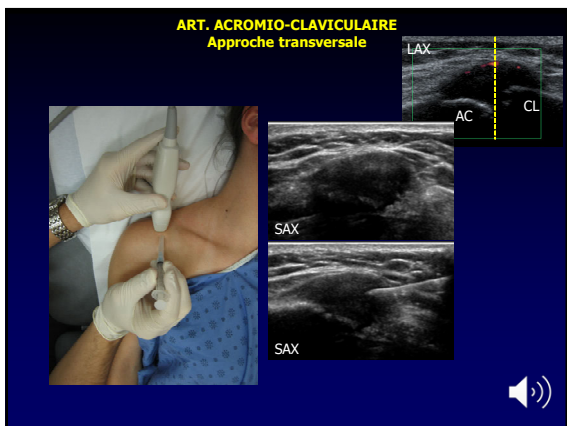
ART. ACROMIO-CLAVICULAIRE
Approche transversale



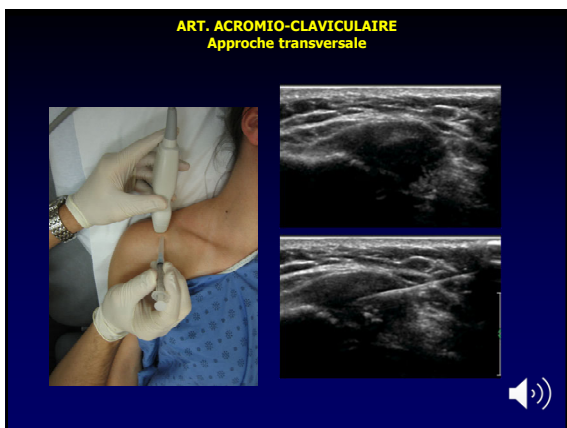
- Décubitus dorsal, bras le long du corps
- Vue SAX de l'art. acromio-claviculaire
- Cible: espace entre acromion et clavicule (pas de repères osseux)
- Approche:
 - IN-PLANE
 - antérieur → postérieur
- 25G 1^{1/2}



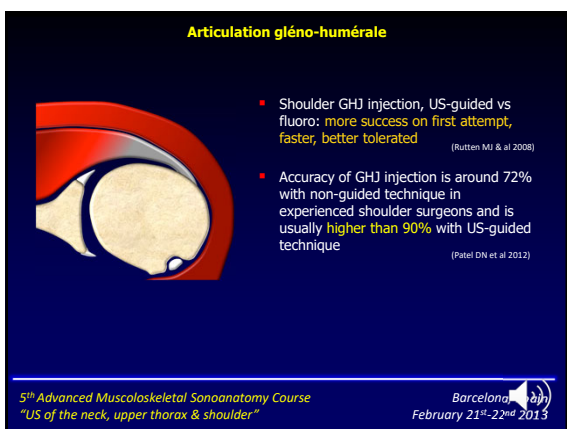
63



64



65



66

Articulation gléno-humérale
Approche postérieure

- Patient position: lateral decubitus/seated
- Target: GHJ space between post labrum and post humeral head
- US view: SAX of post shoulder
- Approach: In-Plane, ant. to post.
- Needle: 25G, 1¹/₂

67

Articulation gléno-humérale
Approche postérieure

- Patient position: lateral decubitus/seated
- Target: GHJ space between post labrum and post humeral head
- US view: SAX of post shoulder
- Approach: In-Plane, ant. to post.
- Needle: 25G, 1¹/₂

68

SCIENTIFIC REPORTS

OPEN Effectiveness of Glenohumeral Joint Dilatation for Treatment of Frozen Shoulder: A Systematic Review and Meta-analysis of Randomized Controlled Trials

Received: 10 March 2017
Accepted: 10 August 2017
Published online: 01 September 2017

Wei-Ting Wu^{1,2}, Ke-Yin Chang^{1,2}, Der-Sheng Hsu^{1,2,3}, Chung-Hsun Chang¹, Fu-Sai Yang⁴ & Chih-Peng Lin⁵

In conclusion, distension of the glenohumeral joint provides a similar long-term efficacy to all reference treatments. A single dose of a corticosteroid-contained regimen introduced through the ultrasound-guided posterior approach is a preferable practice of capsular distension for the management of frozen shoulder.

69

Articulation du coude (radiocapellaire)

Radio-capitellar approach

- Patient position: supine (seated), elbow flexed, forearm pronated
- Target: radio-capitellar joint
- US view: LAX of radio-capitellar joint (LAX of radius)
- Approach: Out-of-Plane, radial to ulnar
- Needle: 25G, 1^{1/2}

70

Coude
Approche postérieure

Posterior recess approach

- Patient position: prone, elbow flexed
- Target: posterior recess (deep to fat pad)
- US view: SAX of distal triceps tendon
- Approach: In-Plane, medial to lateral or lateral to medial
- Needle: 25G, 1^{1/2}

71

TENDON ÉPICONDYLIEN
Approche longitudinale

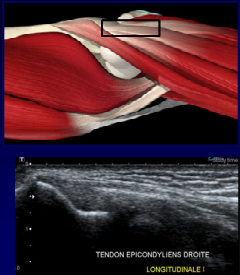
- Positionnement:
 - Patient en déc. Dorsal
 - Coude fléchi à 90°
 - Main posée sur le ventre OU sur la table d'examen
- Vue LAX du tendon commun des épicondyliens
- Approche:
 - IN-PLANE
 - Approche distale → proximale
- 25G 1^{1/2}

72


TENDON ÉPICONDYLIEN
Approche longitudinale

TECHNIQUE D'INFILTRATION

- Cible:
 - Infiltration en superficie du tendon des épicondyliens
- Entrée de l'aiguille:
 - À la hauteur de la tête radiale



TENDON EPICONDYLIENS DROITE
LONGITUDINALE



73

TENDON ÉPICONDYLIEN
Approche longitudinale

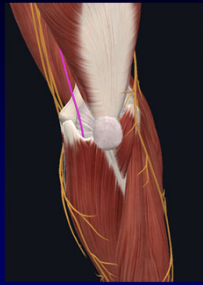


Genex
83
DR
66




74

TUNNEL CUBITAL
HYDRODISSECTION DU NERF ULNAIRE, AXE COURT, IN-PLANE

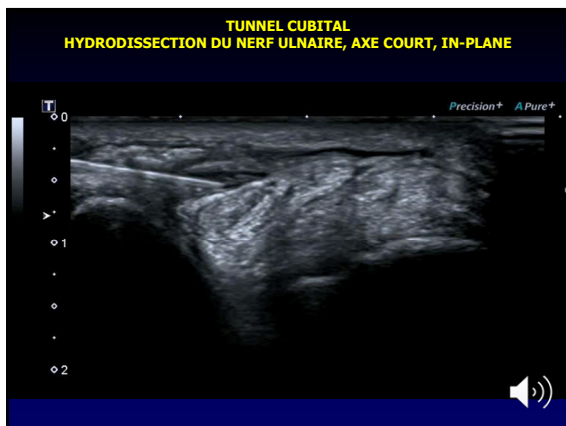


- Cible:
 - Nerf ulnaire au niveau du tunnel cubital
- Approche IN-PLANE, en axe court du nerf, de médial à latéral
- Aiguille 25 1/2

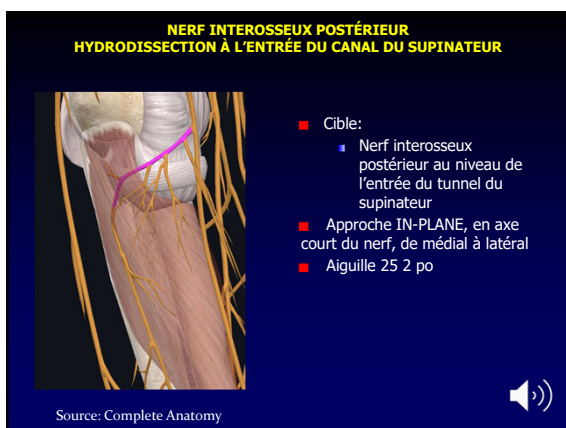
Source: Complete Anatomy



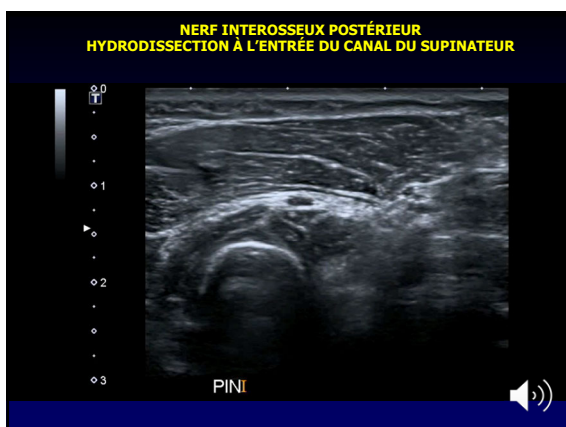
75



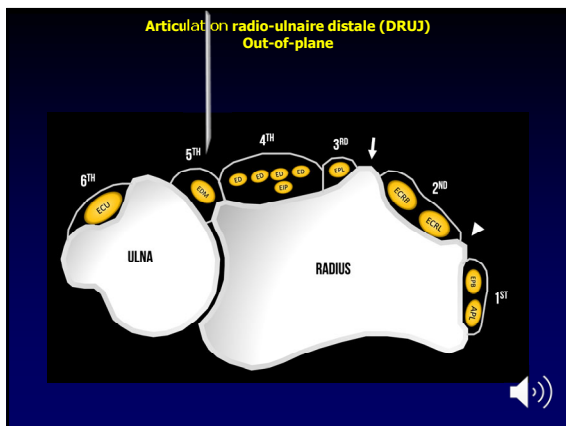
76



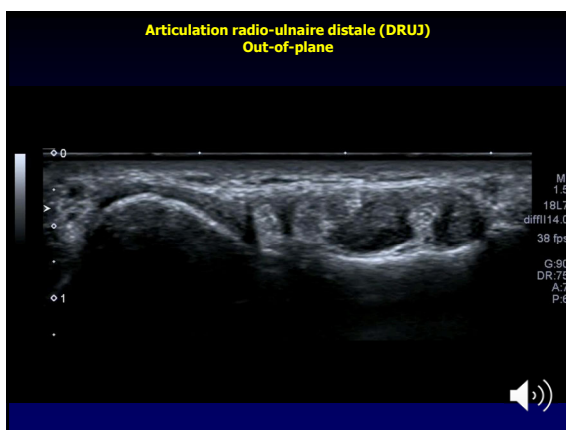
77



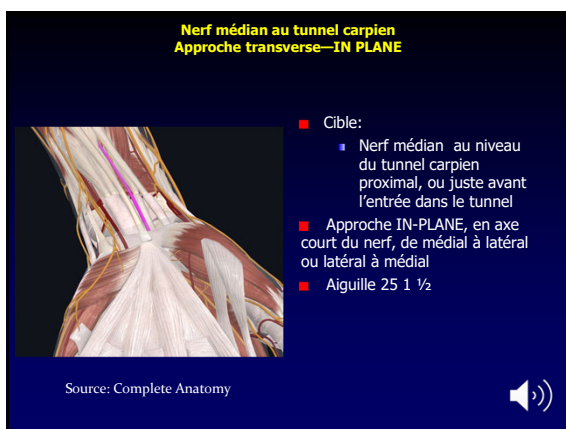
78



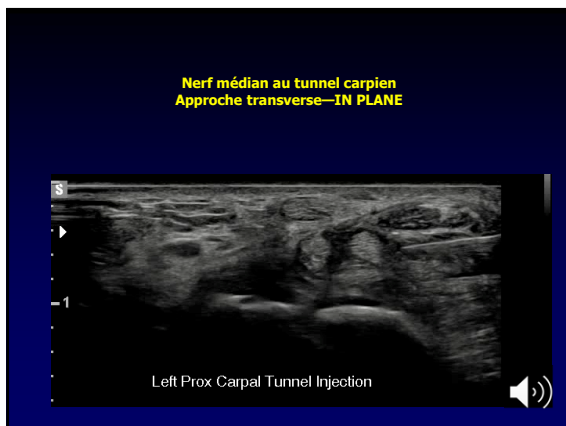
79



80



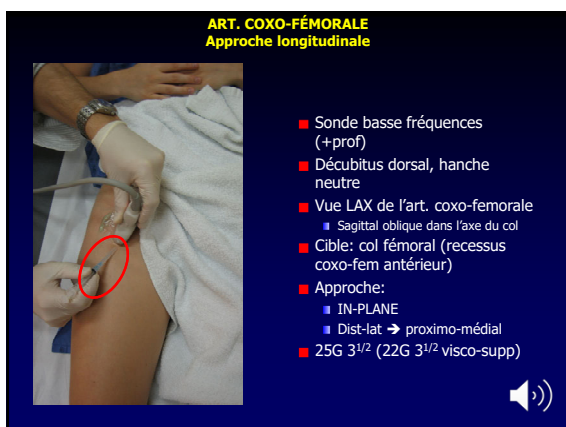
81



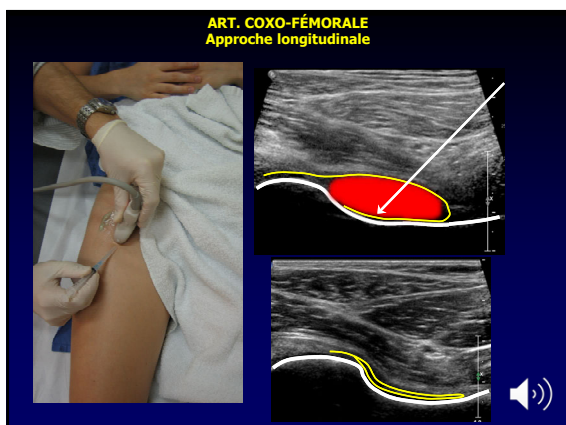
82



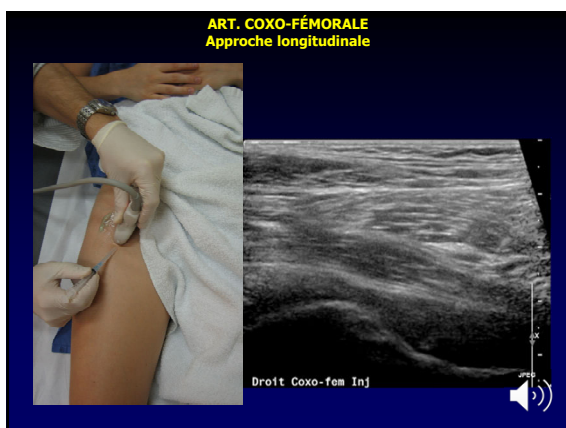
83



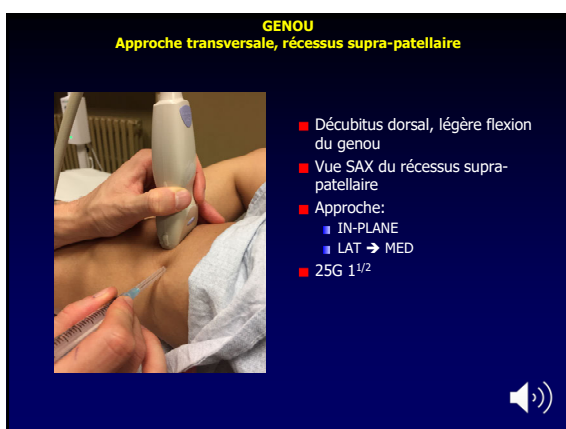
84



85



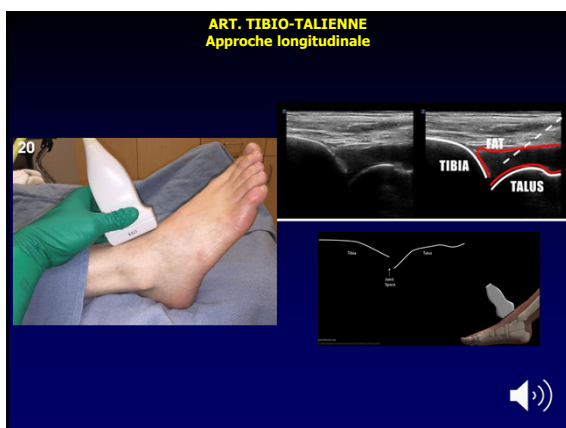
86



87



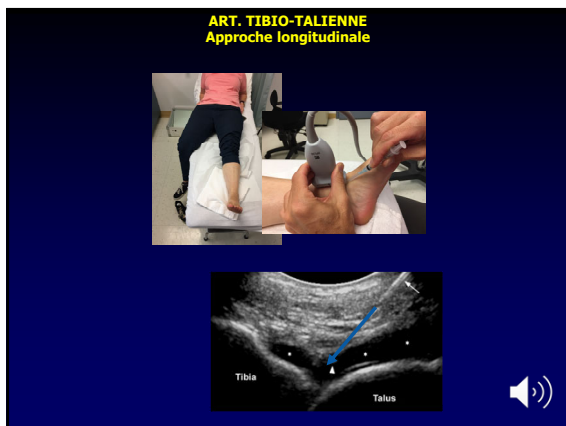
88



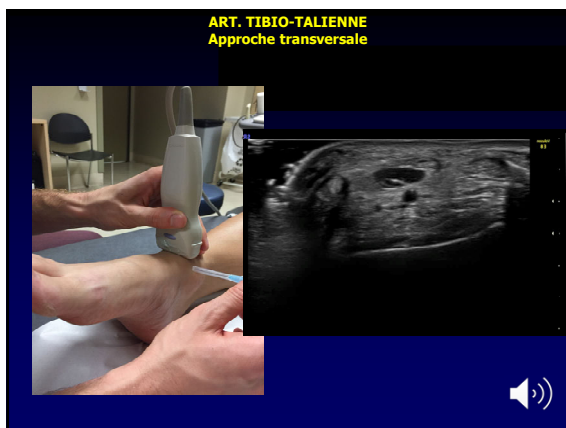
89



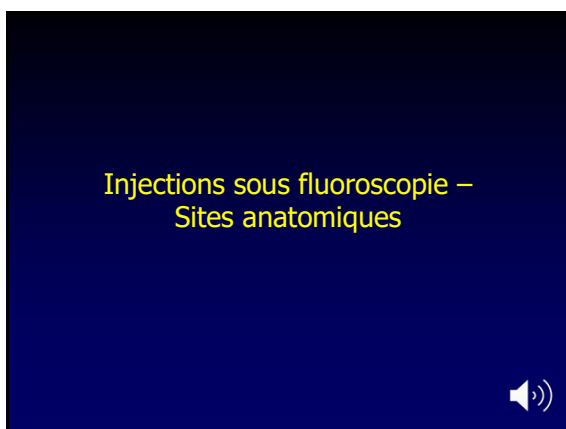
90



91




92



93

Au menu

- Articulation gléno-humérale
- Articulation coxo-fémorale
- Genou



94

**ART. GLÉNO-HUMÉRALE
APPROCHE ANTERIEURE-SCOPIE**

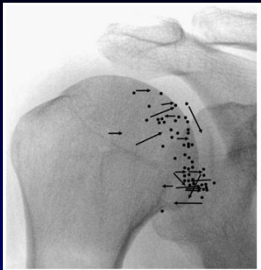



Fig. 6 Anterior approach. AP shoulder radiograph demonstrates needle trajectories (arrows) for anterior approach (arrowheads denote needle endpoints). Black dots indicate needle position with a direct vertical anterior approach (no angulation)



Shortt, C. P., Morrison, W. B., Roberts, C. C., Deely, D. M., Gopez, A. G., & Zoga, A. C. (2009). Shoulder, hip, and knee arthroscopic needle placement using fluoroscopic guidance: practice patterns of musculoskeletal radiologists in North America. *Skeletal radiology*, 38(4), 377-385.

95

**ART. GLÉNO-HUMÉRALE
APPROCHE POSTERIEURE-SCOPIE**



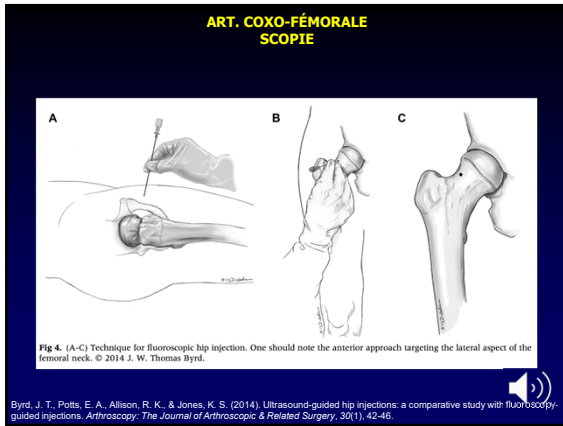


FIG. 7 Posterior approach. Grashey view shoulder radiograph demonstrates needle trajectories (arrows) for posterior approach (arrowheads denote needle endpoints). Black dots indicate needle position with a direct vertical posterior approach (no angulation)

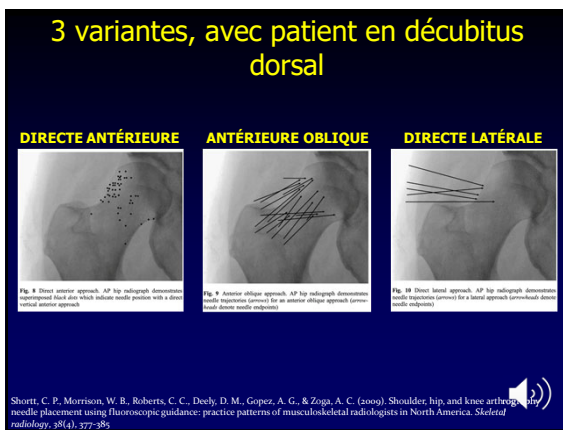


Shortt, C. P., Morrison, W. B., Roberts, C. C., Deely, D. M., Gopez, A. G., & Zoga, A. C. (2009). Shoulder, hip, and knee arthroscopic needle placement using fluoroscopic guidance: practice patterns of musculoskeletal radiologists in North America. *Skeletal radiology*, 38(4), 377-385.

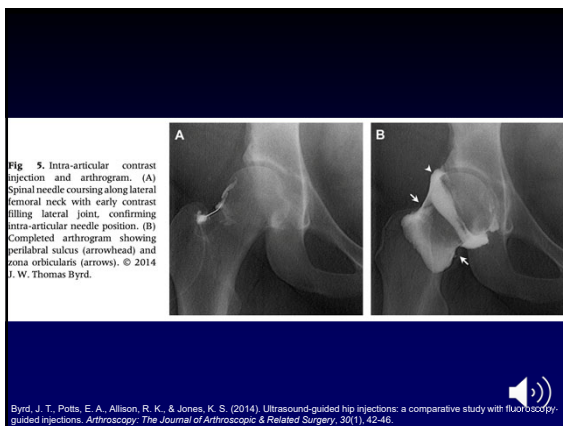
96



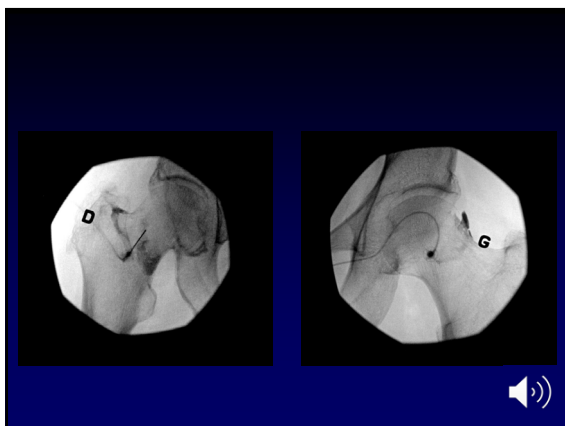
97



98



99



100

ART. COXO-FÉMORALE

- Injection par échographie aussi précise que par fluoroscopie (Martínez-Martínez, A., García-Espinoza, J., Ruiz-Santiago, F., Guzmán-Álvarez, L., & Castellano-García, M. M. (2016). Comparison of ultrasound and fluoroscopic guidance for injection in CT arthrography and MR arth.
- Dans une étude, approche échographique préférée par les patients qui avaient été exposés aux 2 méthodes (Byrd, J. T., Potts, E. A., Allison, R. K., & Jones, K. S. (2014). Ultrasound-guided hip injections: a comparative study with fluoroscopy-guided injections. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 30(1), 42-46.)
- Aucune radiation, aucun agent de contraste avec l'échographie

Byrd, J. T., Potts, E. A., Allison, R. K., & Jones, K. S. (2014). Ultrasound-guided hip injections: a comparative study with fluoroscopy-guided injections. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*, 30(1), 42-46.

101

MÉDIALE

Fig. 12 Medial approach. Lateral radiographs demonstrate superimposed black dots which indicate needle positions with a direct medial approach.

LATÉRALE

Fig. 11 Lateral approach. Lateral radiographs demonstrate superimposed black dots which indicate needle positions with a direct lateral approach.

Shurtz, C. P., Morrison, W. B., Roberts, C. G., Deely, D. M., Grizer, A. G., & Zoga, A. C. (2009). Shoulder, hip, and knee arthroscopy needle placement using fluoroscopic guidance: practice patterns of musculoskeletal radiologists in North America. *Skeletal radiology*, 38(4), 377-385

102

Aiguilles et volumes

Table 1 Mean values of years experience, needle gauge, gadolinium concentration and total injected volume for all three joints

	Shoulder	Hip	Knee
Mean experience (years) [range]	13.5 [1-35]	12.8 [1-35]	13.0 [2-37]
Needle gauge			
18G	0 (0%)	0/68 (0%)	1/65 (1.5%)
20G	11/66 (16.5%)	15/68 (22%)	12/65 (18.5%)
21G	1/66 (1.5%)	0/68 (0%)	1/65 (1.5%)
22G	46/66 (70%)	53/68 (78%)	36/65 (55.3%)
23G	1/66 (1.5%)	0/68 (0%)	5/65 (7.7%)
25G	7/66 (10.5%)	0/68 (0%)	10/65 (15.5%)
Gadolinium concentration			
1/200 (0.5%)	45/66 (68.5%)	47/68 (69%)	46/65 (71%)
1.5/200 (0.75%)	7/66 (10.5%)	7/68 (10.3%)	7/65 (11%)
2/200 (1%)	7/66 (10.5%)	7/68 (10.3%)	6/65 (9%)
Other*	7/66 (10.5%)	7/68 (10.3%)	6/65 (9%)
Total injected volume (ml) [range]	12.7 [5-30]	11.5 [5-20]	28.2 [5-60]

Shortt, C. P., Morrison, W. B., Roberts, C. C., Deely, D. M., Gopez, A. G., & Zoga, A. C. (2009). Shoulder, hip, and knee arthrography: needle placement using fluoroscopic guidance: practice patterns of musculoskeletal radiologists in North America. *Skeletal radiology*, 38(4), 277-285

103

Conclusions

- Poser le diagnostic le plus précis possible
- Discuter avec le/la patient(e) des avantages/inconvénients d'une procédure d'infiltration guidée
- Choisir la substance à infiltrer
- Effectuer la technique en prenant le temps d'optimiser le positionnement, l'ergonomie et les paramètres échographiques ou fluoroscopiques
- Effectuer un suivi adéquat

104