# Pourquoi réaliser une infiltration par PRP


- Audrey MOGILANY di IORIO
- Luc COURT
- Denis MONTAGNON
- Asma HABCHI
- Marion BARMA
- Manfred GLENAT
- Anh Quoc NGUYEN


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# Introduction

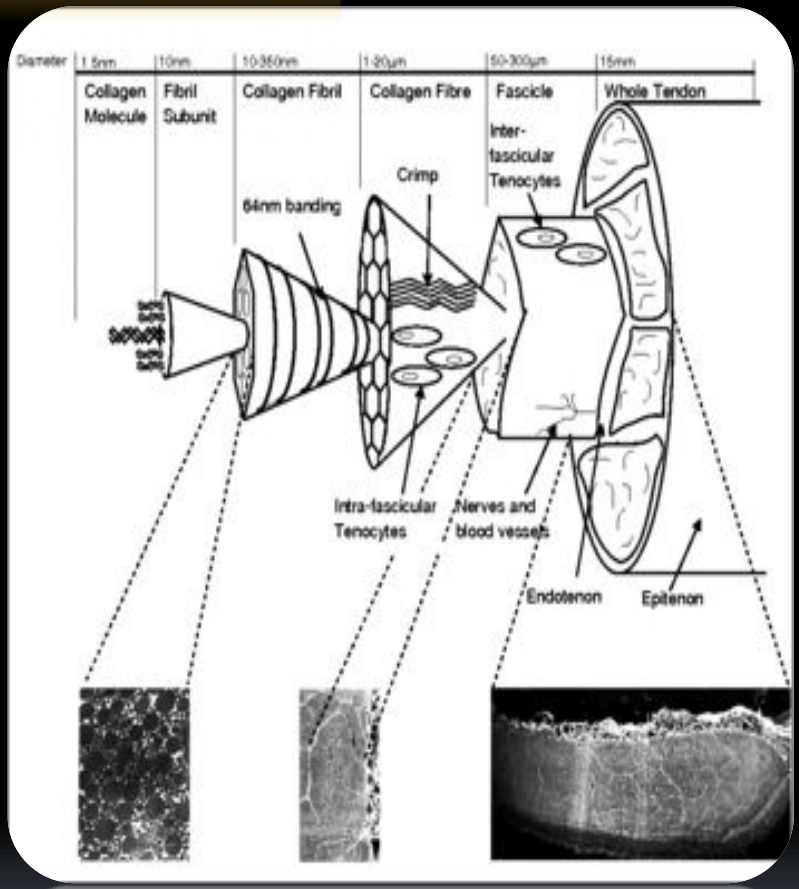
- Les blessures musculo-squelettiques sont la cause la plus fréquente de douleurs sévères à long terme et d''incapacité physique, selon l'Organisation mondiale de la Santé (OMS)[1].

- Au cours des dernières années, le rôle des plaquettes dans la libération de protéines bioactives chargée d'activer les macrophages, les cellules souches mésenchymateuses, et les ostéoblastes, a été mis en évidence. Ce processus favorise l'élimination des tissus nécrosés, ainsi que la régénération des tissus et la cicatrisation [2]

# Rappel

- Le tendon normal est constitué de fibres de collagènes alignées de façon homogène et d'eau , au sein d'une matrice constituée de ténocytes.

- La tendinopathie est la conséquence d'un processus de cicatrisation inadapté du tendon : elle se caractérise par une altération et une désorganisation des fibres de collagène[8].




From:
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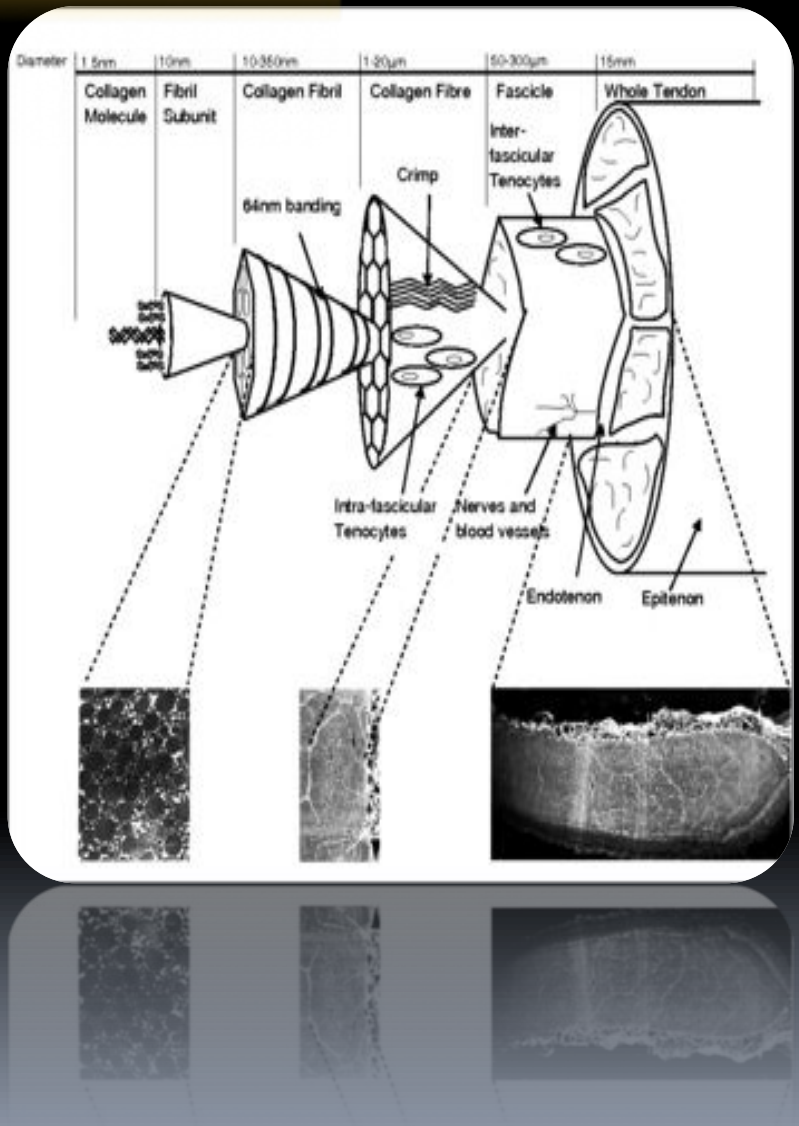
# Rappel

- Une néo-angiogenèse s'y associe en phase précoce et au décours du processus de guérison, avec l'apparition de néovaisseaux et de fibres nerveuses [10;11].

- L'objectif de l'ensemble des traitements  est de favoriser le remodelage du tendon, par l'amélioration de la synthèse de fibres de collagène [9].

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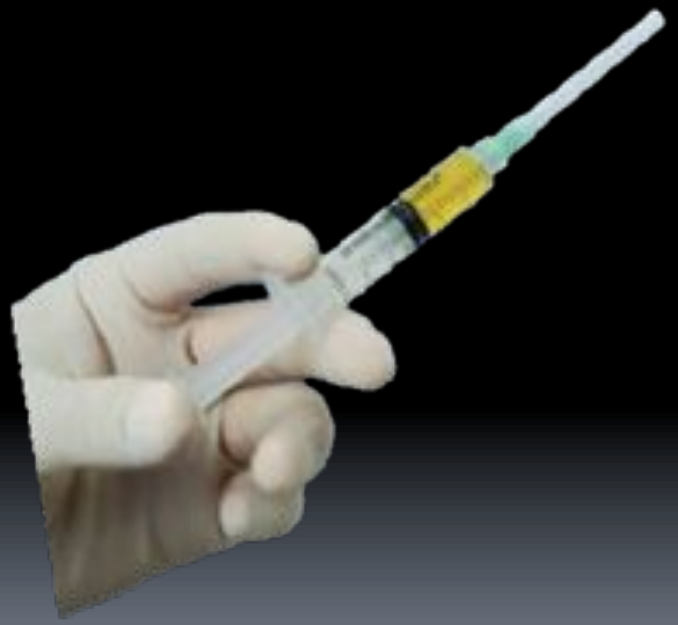
# Historique du PRP

- Vétérinaire
- Chirurgien dentiste : favorise la régénération osseuse
- Tendinopathies
- Déchirures musculaires

# Pourquoi le PRP ?

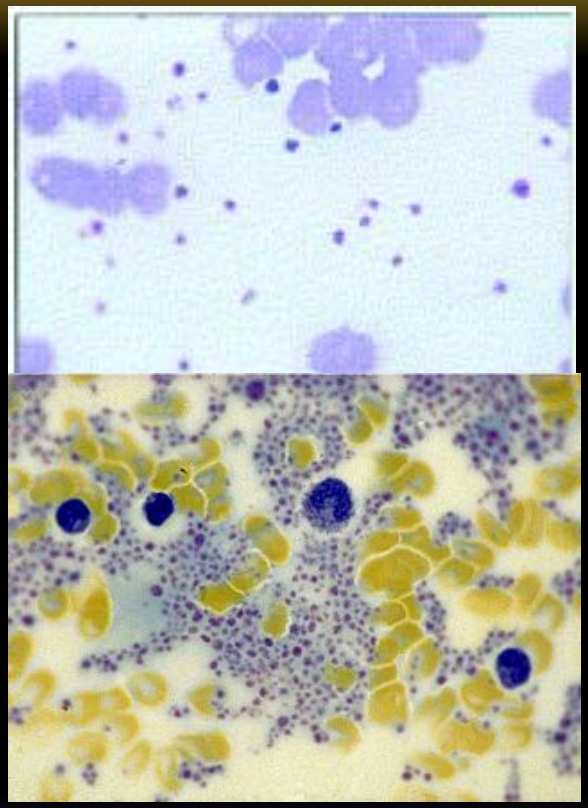
- Le sang est composé des globules rouges et blancs, et des plaquettes qui contiennent les facteurs de croissance et de coagulation utiles à la cicatrisation.

- Un échantillon de sang contient environ 93 % de GR, 1 % de GB et 6 % de plaquettes.



# Plasma Riche en Plaquettes : ?

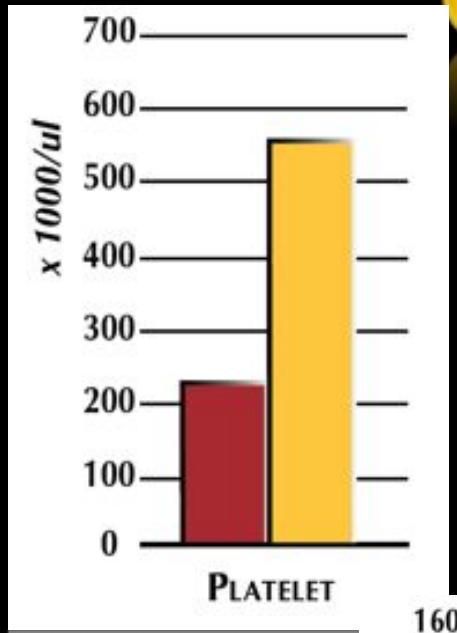
- Le concentré plaquettaire apporte des facteurs de croissance localement
- Stimule la prolifération de cellules germinales mésenchymateuses (précurseurs entre autres des ténocytes)
- Accélération nette et prouvée chez le rat du processus de cicatrisation (pic à 21 j)
- Fonction de la qtée de plaquettes injectées
  - Concentration plaquettaire
  - Nombre de c

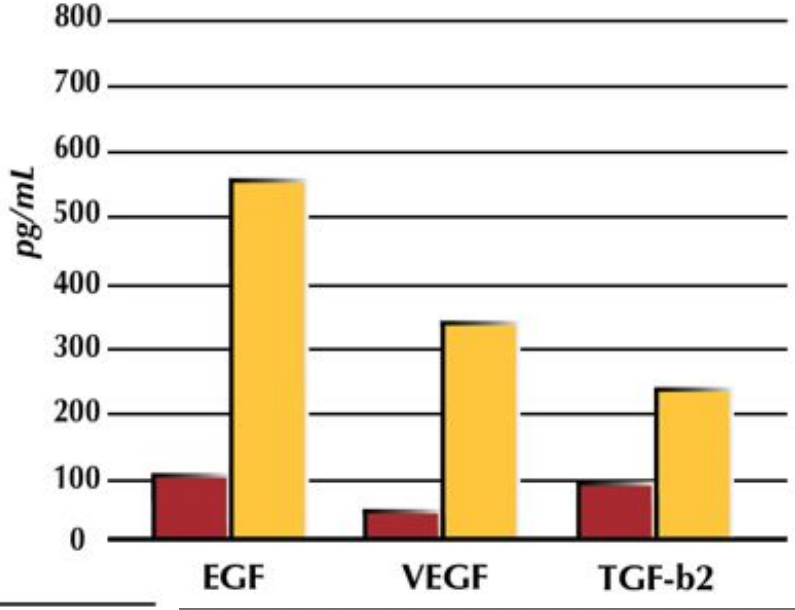


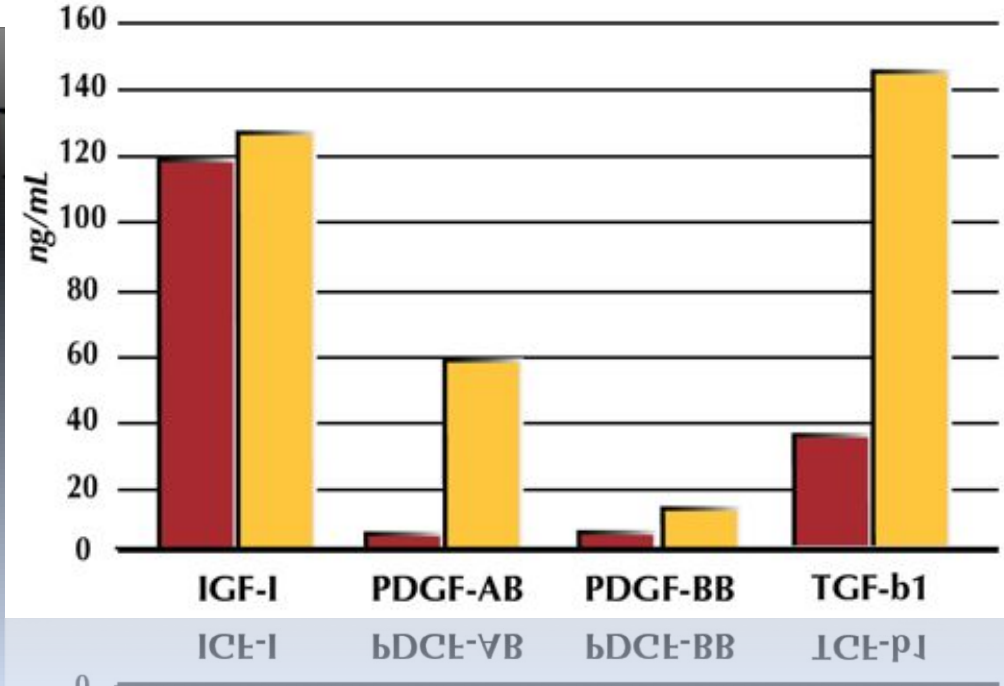
| | Physiological CLOT | PRP CLOT |
|---|---|---|
| Red Blood Cells | 35-50% hematocrit | <1% hematocrit |
| Platelets | Native level | 2-3 times native level |
| Growth Factor | Native level | 2-3 times native level |
| Fibrinogen | Native level | Native level |

Remerciements Ph Peetro

# PRP:facteurs de croissance plaquettaires



# PRP en pratique

- Platelet Rich Plasma

**PLASMA**

Plaquettes , facteurs de croissance

**GLOBULES ROUGES**

# Mode d'action

- Hypothèse physiopathologique :

Les protéines libérées par les plaquettes agissent comme des médiateurs humoraux pour déclencher la cascade de la cicatrisation via:

- le recrutement des cellules souches tendineuses.
- la vascularisation locale.
- la production de collagène par les fibroblastes du tendon[12;6].

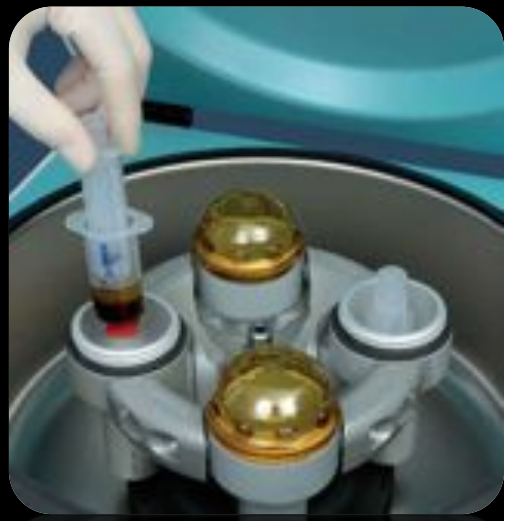
# Préparation du PRP

- Les plaquettes du patient sont recueillies grâce à un système de centrifugation.

- Recueil de 15 cc de sang veineux du patient en conditions d'asepsie, immédiatement avant le geste.

# Préparation du PRP

- Centrifugation pendant 5 minutes, à 1500 tours/minute.



- Recueil de la couche superficielle, correspondant au concentré plaquettaire : 3 à 4 mL de PRP peuvent être recueillis.

- La durée totale depuis la préparation du PRP jusqu'à l'injection doit être inférieure à 10 minutes

# Méthode d'injection du PRP

- Avant le geste : [13]

  – Intervention discutée avec clinicien spécialisé.

  – Information préalable du patient, si possible > 48 heures avant le geste, par oral et par écrit.

  – Consentement éclairé signé par le patient.

  – Contre indication aux AINS 5 jours avant, et 15 jours après le geste, afin de ne pas diminuer l'efficacité du traitement.

# Méthode d'injection du PRP

- Avant le geste : [13]

  – Prise en compte des situations spécifiques concernant les anti-coagulants, les anti-aggrégants plaquettaires, les infections en cours.

  – Patient informé de la nécessité d'une mise en décharge de l'articulation traitée pendant les 24 premières heures, et d'un repos sportif de 7 à 15 jours

# Méthode d'injection du PRP

- Pendant le geste :[13]

  – Recueil du sang du patient : idéalement sur place immédiatement avant le geste, évitant toute confusion possible.

  – Manipulation du sang en circuit fermé, grâce à un kit de prélèvement adapté.

  – Réalisé en ambulatoire.

  – Patient si possible accompagné (possibilité de phénomènes douloureux post injection).

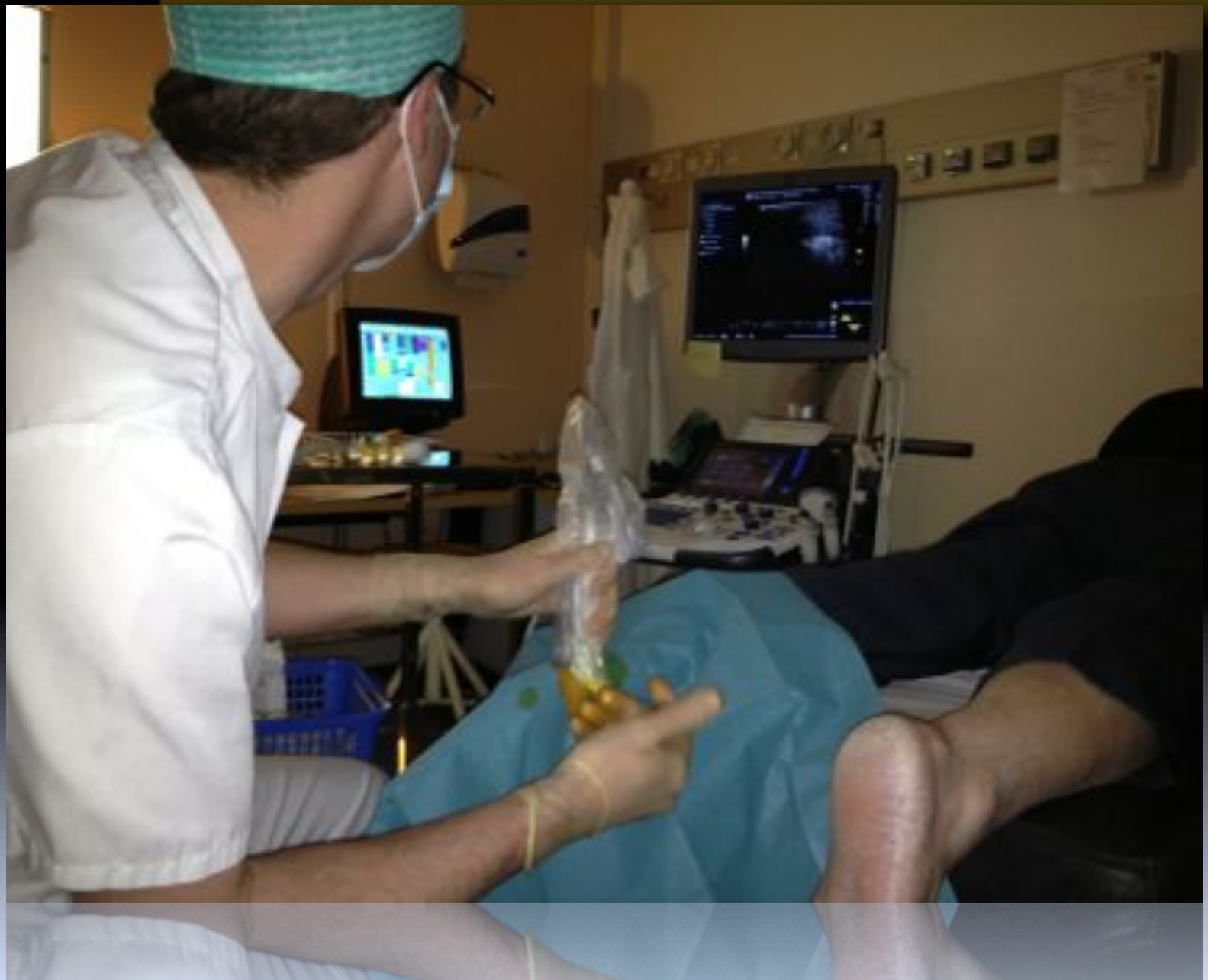
  –Règles d'asepsie stricte : désinfection en 3 temps champ fenêtré.

# Méthode d'injection du PRP

- Pendant le geste :[13]

  - Patient allongé (risque de réaction vagale).
  - L'utilisation d'un anesthésique local avant l'injection de PRP doit etre évité, afin de ne pas inhiber la cascade de la cicatrisation.
  - Condition d'asepsie stricte et sous guidage échographique adapté.
  - Ponction par une aiguille adaptée (21 à 25 G)
  - Glaçage de la zone traitée pendant 15 minutes immédiatement après le geste afin de diminuer les phénomènes douloureux post injection.

# Injection



# Site d'injection

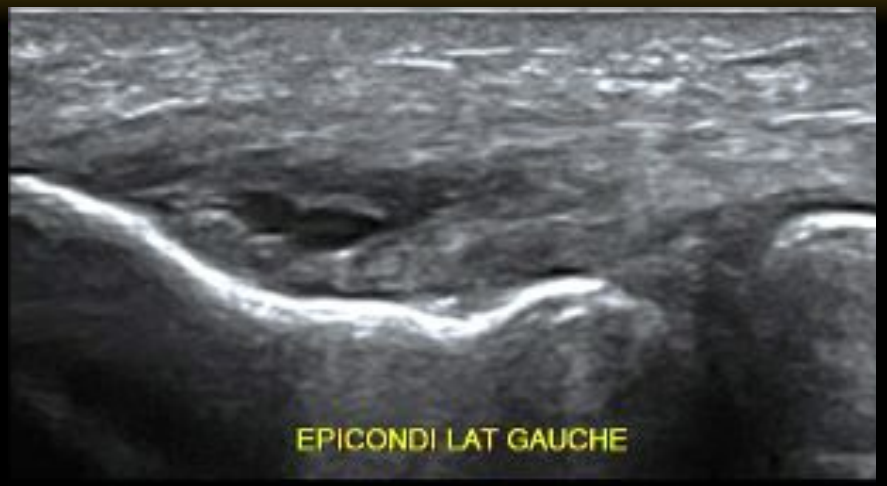
**ALT**

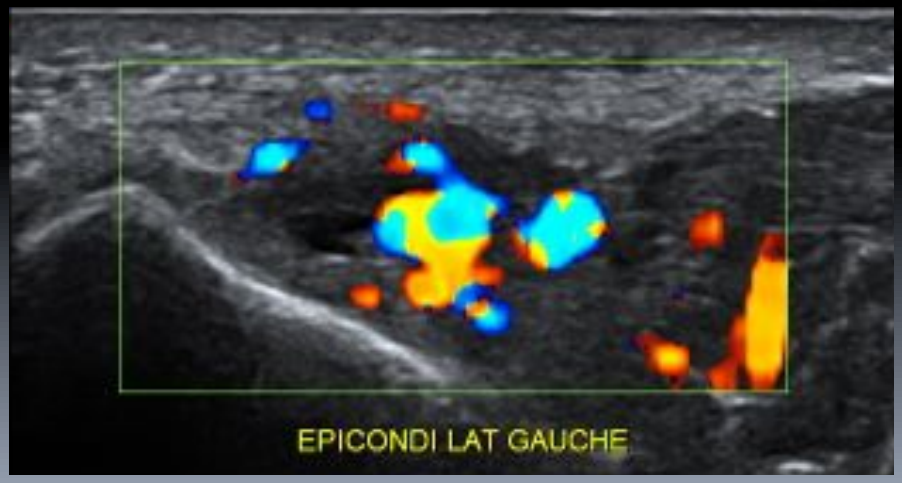
institut radiologique mutualiste

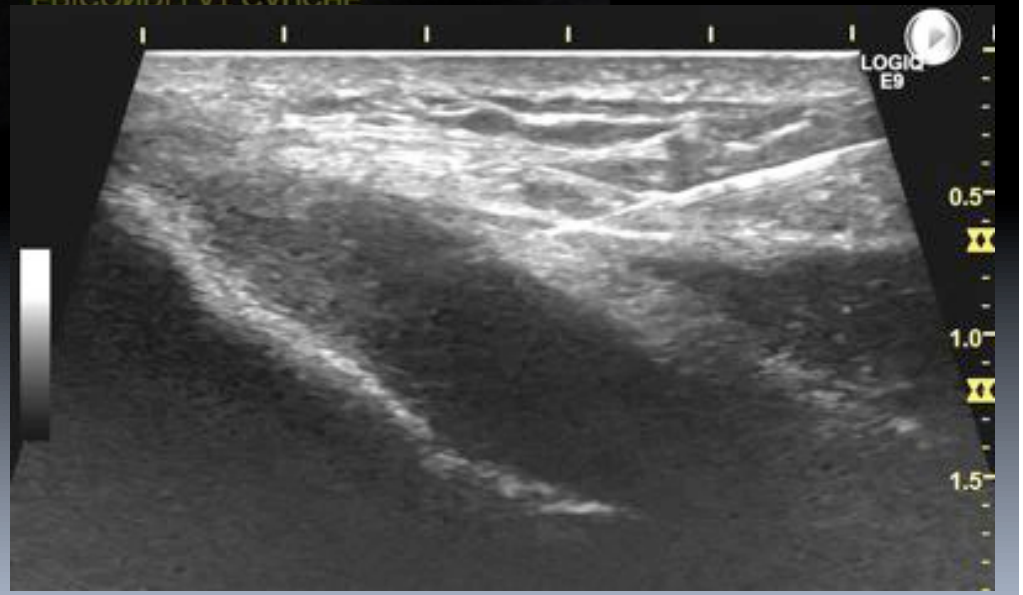
# PRP : Indications

## Epicondylites

- Hyperhémie
- Fissures



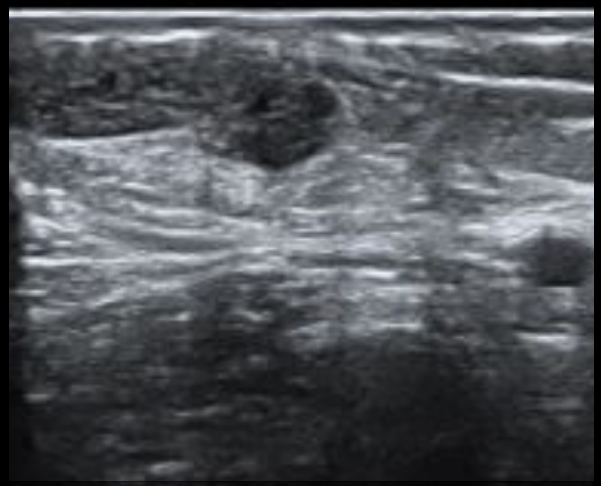



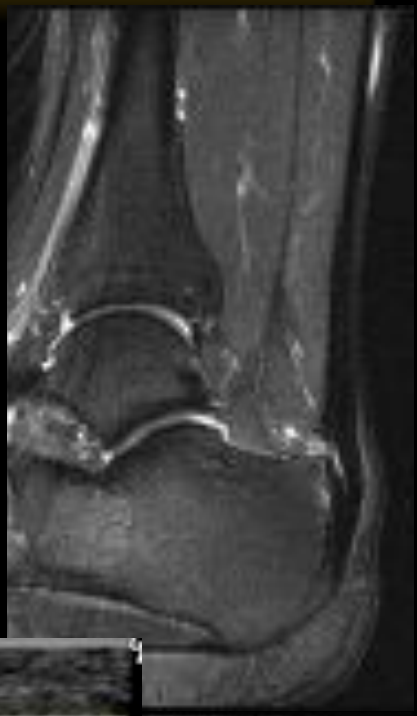



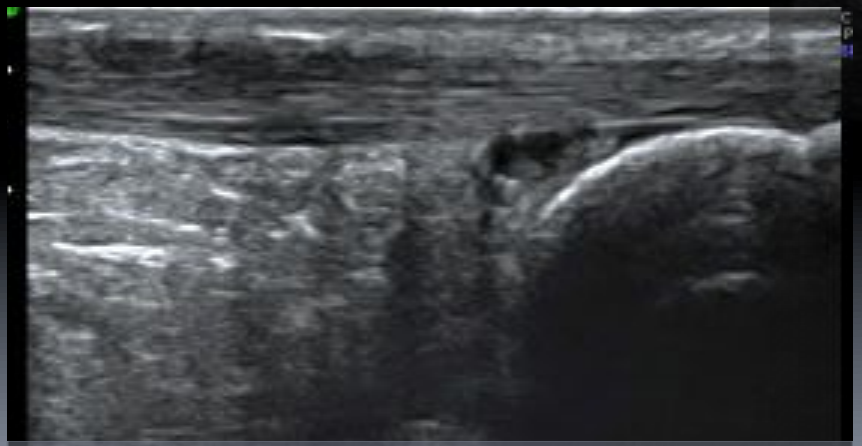
# PRP : Indications

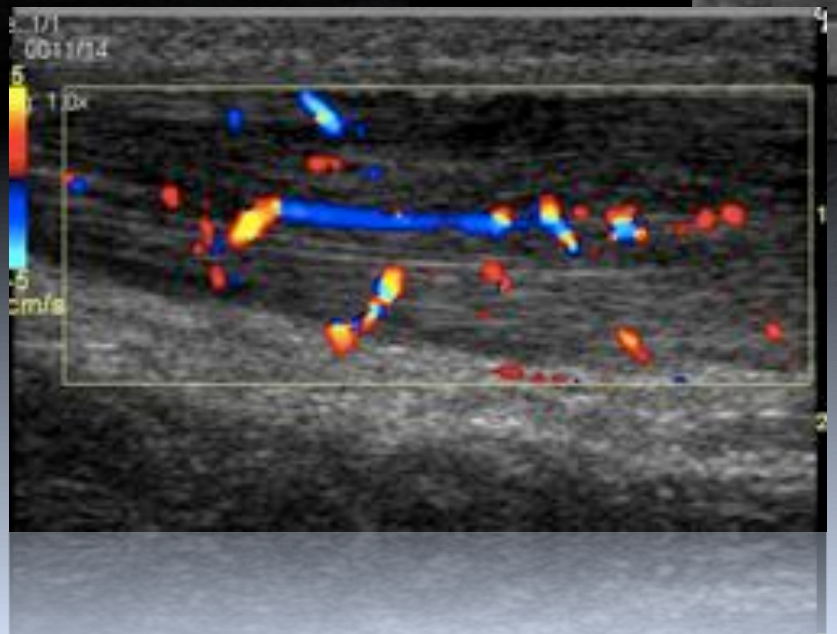
## TP Achille

- Hyperhémie
- Fissures





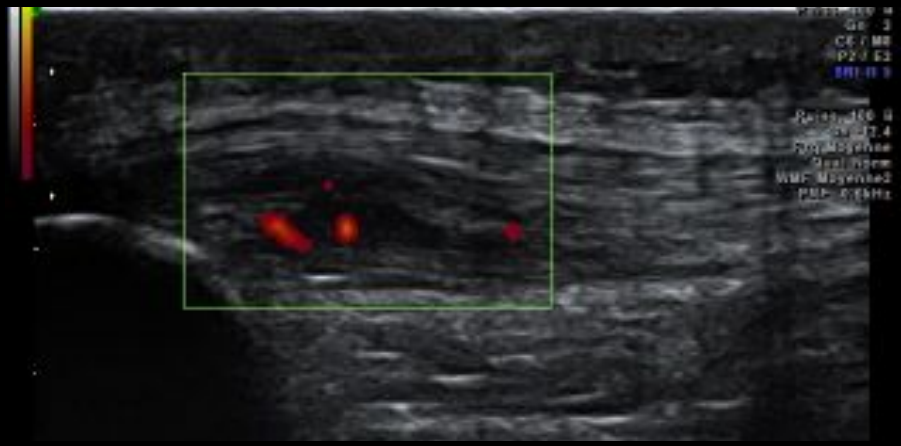


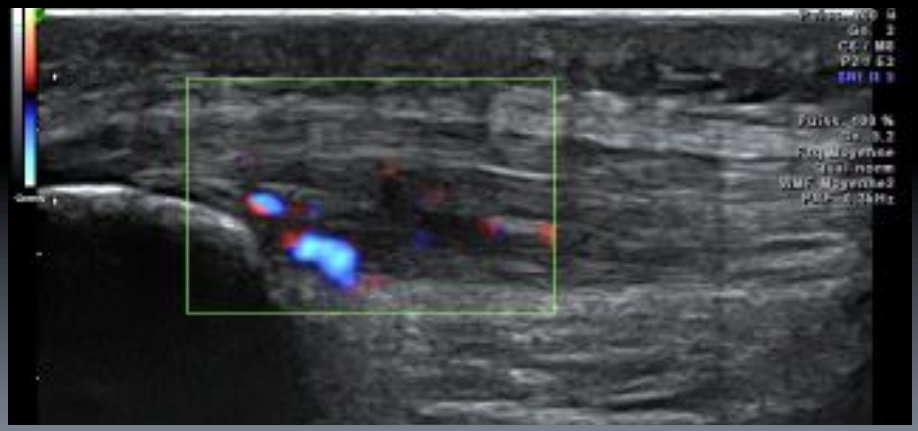


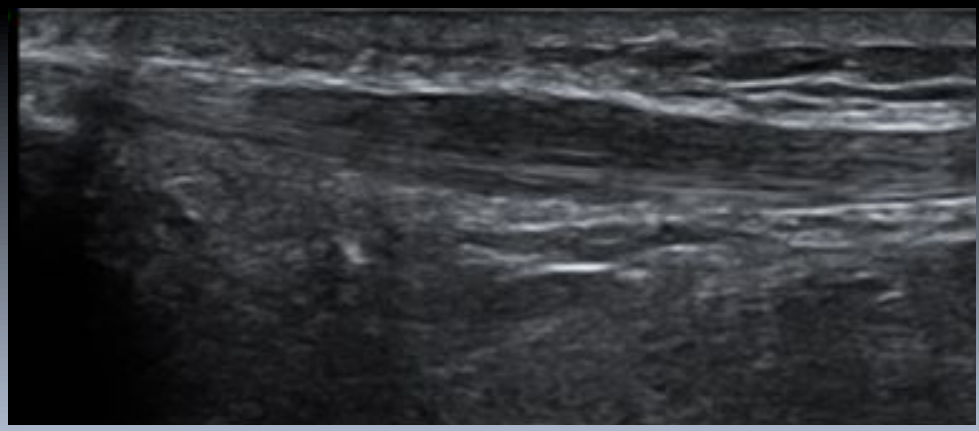
# PRP : Indications

## TP rotuliennes

- Hyperhémie
- Fissures

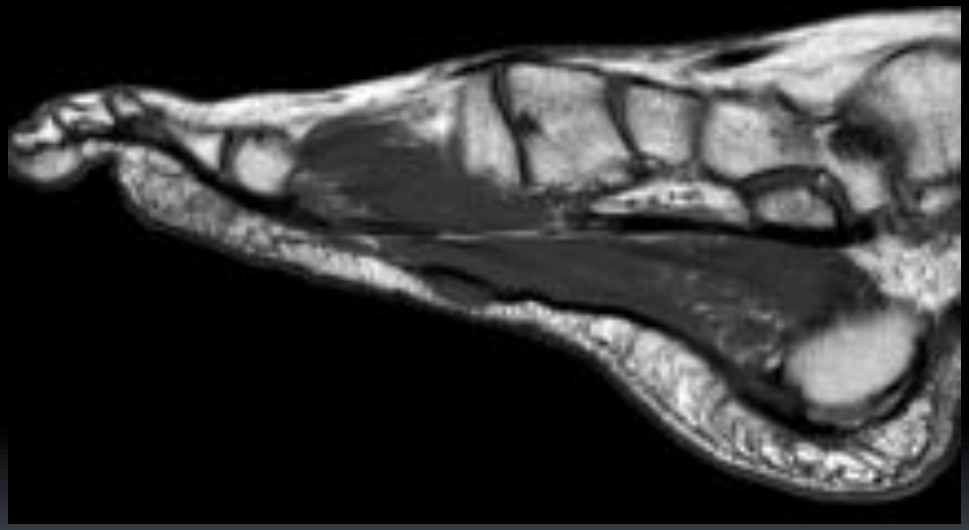


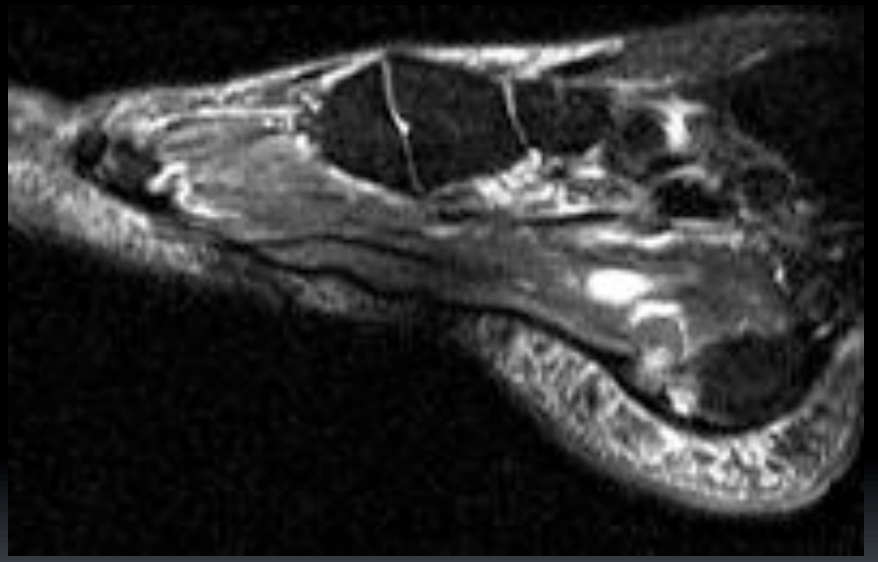




# PRP : Indications

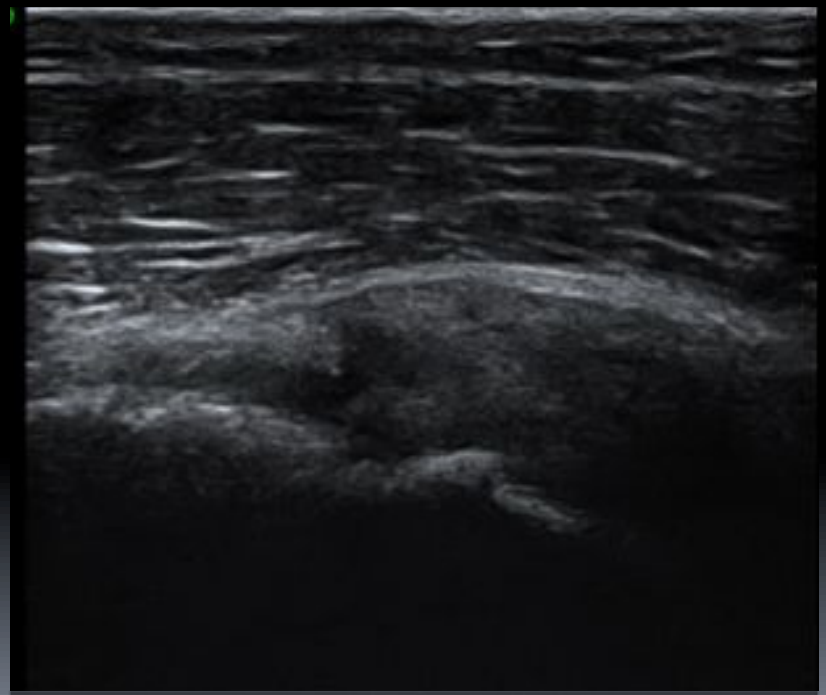
## Ap plantaire

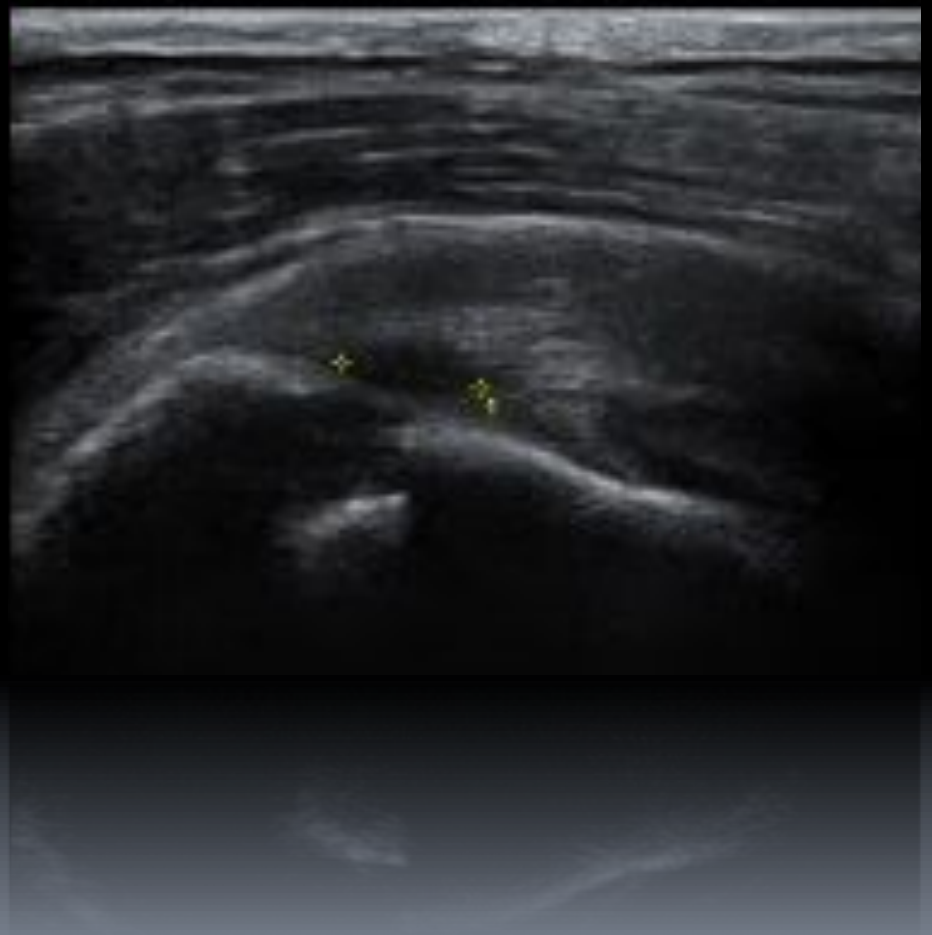




# PRP : Indications

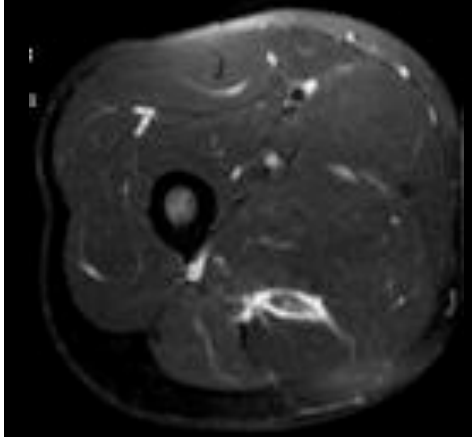
Sus épineux?

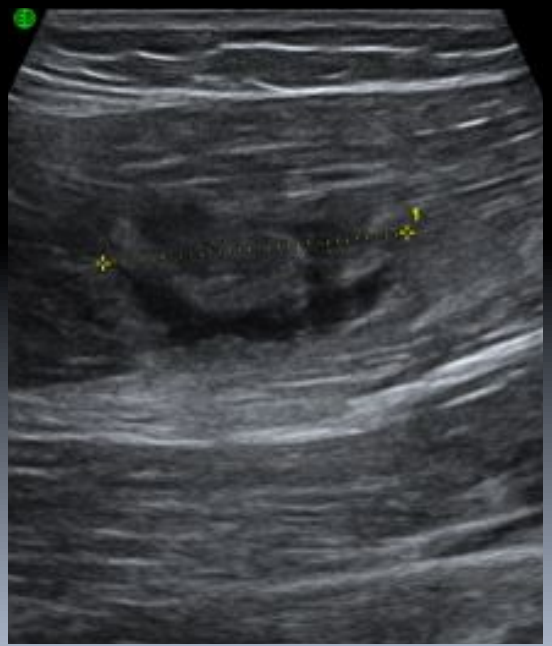


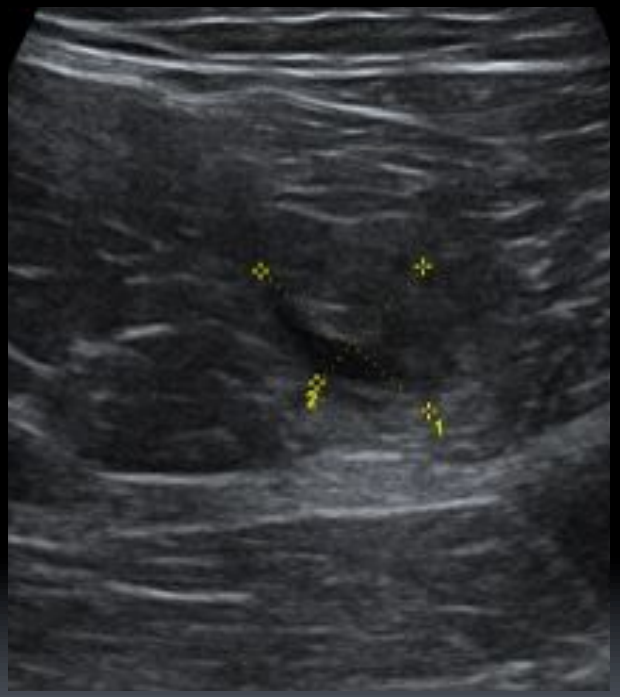


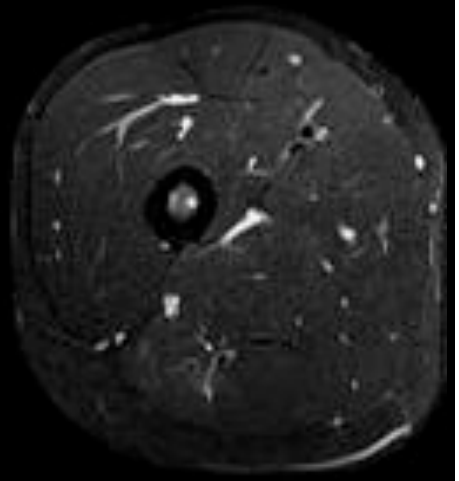
# PRP : Indications

## Muscles?









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# 2 retrospective studies on PRP local injections as a treatment for tendinopathy

D.Montagnon ,L.Court ,A.Mogilany Di Iorio ,M.Barma ,A.Habchi
M. Glénat , Anh Quoc Nguyen
Institut Radiologique Mutualiste Saint Etienne

# étude 1

Procédures : 407

Patients inclus dans l'étude rétrospective: 284

Questionnaire postal

Réponses exploitables 205

# Questionnaire

1 - Date et organe infiltré
2 - Douleur actuelle de 1 à 10
3 - Reprise activité : AVQ / Professionnelle / Sport
4 - si oui totale ou partielle?
5 - Délai pour maximum d'efficacité ( en mois)
6 - Evolution tardive de la douleur
7 - Traitement complémentaires?
8 - Recommandations aux proches
9 - Accident du travail ?

# Protocole d'étude

ETUDE PRP
Durée : du 02/10/12 au 26/10/2015
284 questionnaires envoyés ou remis aux patients
Réponses : 205 patients
79 patients sans réponses dont 7 avec retour de changement d'adresse
Taux de réponse : 72,2 %
Taux de non-réponse : 27,8 %

# Cohorte des patients

Sexe :

| | | |
|---|---|---|
| Femmes : | 79 | soit 38,5% |
| Hommes : | 125 | soit 61,5% |

| | | |
|---|---|---|
| Age: | < 20 | 3% (6) |
| | 20-29 | 7% (15) |
| | 30-39 | 13,6% (28) |
| | 40-49 | 33,6% (69) |
| | 50-59 | 27,8% (57) |
| | 60-69 | 10,2% (21) |
| | >70 | 4,4% (9) |

# Localisations

| | |
|---|---|
| Epicondyliens latéraux | 38,3% (80) |
| Tendons d'Achille | 24,4% (51) |
| Tendons rotuliens | 10% (21) |
| Aponévroses plantaires | 6,7% (14) |
| Divers | 19% (39) |

# Quantité de PRP injectée (mL) :

| | |
|---|---|
| <=1 | 3,8% (8) |
| 1,1 - 2 | 16,7% (35) |
| 2,1 - 3 | 34% (71) |
| 3,1 - 4 | 23% (48) |
| >= 4,1 | 2,9% (6) |
| ? | 19,6% (41) |

# Evolution hyperhémie

| Hyperhémie | J0 | M2 |
|---|---|---|
| Absence | 4,8% (10) | 9,6% (20) |
| Présent+ | 38,8% (81) | 41,1% (86) |
| Présent++ | 6,7% (14) | 5,3% (11) |
| Présent +++ | 2,4% (5) | 2,9% (6) |
| Non précisé | 47,4% (99) | 41,2% (86) |

# Evolution EVA

**Evolution EVA J0/M2/A distance:**

| EVA | J0 | M2 | A terme | Différence EVA J0/A term<br>Négative : 9,6% (20) |
|---|---|---|---|---|
| 0 | 0,5% (1) | 7,6% (16) | 29,2% (61) | 6,7% (14) |
| 1 | 1% (2) | 10% (21) | 14,4% (30) | 3,8% (8 |
| 2 | 3,3% (7) | 12% (25) | 12,9% (27) | 8,1% (1 |
| 3 | 6,2% (13) | 11% (23) | 12,4% (26) | 9% (19 |
| 4 | 8,1% (17) | 8,6% (18) | 3,3% (7) | 11,5% (24 |
| 5 | 10,5% (22) | 8,1% (17) | 9,6% (20) | 7,2% (15) |
| 6 | 15,3% (32) | 2,4% (5) | 2,9% (6) | 7,6% (16 |
| 7 | 12,4% (26) | 5,3% (11) | 5,7% (12) | 6,7% (14 |
| 8 | 13,4% (28) | 3,3% (7) | 3,3% (7) | 2,9% (6 |
| 9 | 6,2% (13) | 0% (0) | 0,5% (1) | 1,9% (4 |
| 10 | 2,9% (6) | 0,5% (1) | 4,3% (9) | 1,4% (3 |
| Non précisé | 20% (42) | 30,6% (64) | 4,3% (9) | 23,4% (49) |

# Evolution EVA

**Evolution EVA J0/M2/A distance:**

| EVA | J0 | M2 | A terme | Différence EVA J0/A term<br>Négative : 9,6% (20) |
|---|---|---|---|---|
| 0 | 0,5% (1) | 7,6% (16) | 29,2% (61) | 6,7% (14) |
| 1 | 1% (2) | 10% (21) | 14,4% (30) | 3,8% (8 |
| 2 | 3,3% (7) | 12% (25) | 12,9% (27) | 8,1% (1 |
| 3 | 6,2% (13) | 11% (23) | 12,4% (26) | 9% (19 |
| 4 | 8,1% (17) | 8,6% (18) | 3,3% (7) | 11,5% (24 |
| 5 | 10,5% (22) | 8,1% (17) | 9,6% (20) | 7,2% (15) |
| 6 | 15,3% (32) | 2,4% (5) | 2,9% (6) | 7,6% (16 |
| 7 | 12,4% (26) | 5,3% (11) | 5,7% (12) | 6,7% (14 |
| 8 | 13,4% (28) | 3,3% (7) | 3,3% (7) | 2,9% (6 |
| 9 | 6,2% (13) | 0% (0) | 0,5% (1) | 1,9% (4 |
| 10 | 2,9% (6) | 0,5% (1) | 4,3% (9) | 1,4% (3 |
| Non précisé | 20% (42) | 30,6% (64) | 4,3% (9) | 23,4% (49) |

# Evaluation EVA

Si seuil d'efficacité= différence d'EVA de 3 points:
Bon résultats : 63% (101)  Mauvais résultats : 36% (59)

Si seuil d'efficacité=différence  d'EVA de 4 points :
Bon résultats : 51% (82)  Mauvais résultats : 49% (78)

# Délai d'efficacité maximum

◊Délai d'efficacité maximum (mois):

| | |
|---|---|
| 0 | 14,4% (30) |
| <3 | 19,1% (40) |
| 3-6 | 32% (67) |
| 6-9 | 18,2% (38) |
| 9-12 | 8,6% (18) |
| >12 | 4,3% (9) |
| Non précisé | 3,3% (7) |

# Résultats par cibles

Résultats en fonction des localisations traitées avec différence d'EVA de 3 et en neutralisant les réponses non exploitables:

| | | | |
|---|---|---|---|
| Epic. Lat. | 65 | Bons résultats | 40 soit 62% |
| T Achille | 42 | Bons résultats | 29 soit 69% |
| T Rot. | 17 | Bons résultats | 11 soit 58% |

# Evaluation fonctionnelle

**Reprise de l'activité de la vie quotidienne/sportive/professionnelle après PRP**

| | AVQ | Sport | Travail |
|---|---|---|---|
| Pas de reprise | 9,6% (20) | 29,2% (61) | 15,3% (32) |
| Reprise partielle | 14,4% (30) | 7,7% (16) | 9,6% (20) |
| Reprise totale | 67,5% (141) | 46,4% (97) | 54,5% (114) |
| Autre (retraités… ) | 8,6% (14) | 16,7% (31) | 20,6% (39) |

Si les retraités et les travailleurs indépendants sont exclus

Reprise totale AVQ 73% Sport 54% Travail 68%

# Traitements en cas d'échec

Traitement post-PRP :

2 de PRP : 7,2% (15)
Infiltration: 19,6% (41)
Chirurgie : 12,9% (27)

# Complications

2 thromboses veineuses profondes précoces

Dépistées rapidement devant un tableau clinique très évocateur au telephone
Aspect hyper échogène des 2 veines soléaires
Résolution rapide après traitement adapté
Causes: mise au repos totale
et/ou diffusion du concentré plaquettaire?

# Avis des patients

Patients qui recommandent la PRP pour les personnes ayant les mêmes atteintes :

79% (163)

# PRP study 2

300 patients treated with PRP
between january 2015 and may 2017

Epicondylitis, Achilles and Patellar tendinopathies ,
Gluteal tendino-bursopathies, plantar fasciitis

Same questionnaire than in previous
retrospective study but with phone

# PRP study 2

RESULTS :

95 patients included from january 2015 until end of april 2017.

Mono-centric, Institut Radiologique Mutualiste Saint-Etienne.

| | |
|---|---|
| Épicondylitis | 31/95 = 32.7% |
| Patellar tendons | 27/95 = 28.4% |
| Achilles tendons | 13/95= 13.7% |
| Gluteal tendons | 11/95 =11,5% |
| Anckle | 4/95 = 4.2% |
| Plantar Fasciitis | 6/95 = 6.3% |
| Miscellaneous | 3/95 = 3.2% |

# PRP study 2

## Reduction in pain:

if ≥ 3/10 on VAS: 63/95 = 66.3%

No difference for 16 patients (16.8%)

## Back to work:

total activity : 33 (45.8%)
partial activity: 39 (54.2%)
retired and unemployed people :23 (excluded)

# PRP study 2

back to sport activity : 67.4 %

# PRP study 2

Schedule for efficacy in 79 patients.

Before (30.4%)

3 months : 24

Between (51.9%)

3 to 6 months : 41

6 to 9 months: 11

(13.9%)

9 to 12 months : 2 (2.5%)

Later than 12 months: 1 (1.2%)

# PRP study 2

Additional treatments:

No: 68 = 71.6%
Yes: 27 = 28.4%

# PRP study 2

PRP Recommendation :

Yes: 71 = 74.7%
No: 24 = 25.3%

# PRP study 2

epicondylitis: 31 patients :

Improvement ≥3 : 21 = 68%
no significant effect :10 = 32%.

Additional treatment : 11 / 31 patients =35%.

# PRP study 2

Patellar tendon: 27 patients :

Improvement ≥3 : 17/27
63%
No significant effect : 10 /27
37%

Additional treatment for 8 patients
29,6%.

# PRP study 2

Achilles Tendon: 13 patients

Improvement ≥ 3 : 9/13
69.3%
No significant effect 4/13
30.7%

Secondary treatment: 4/13
30,7%.

# PRP study 2

HIP : 11 patients

Improvement ≥3 : 6/11
54.5%.

no significant effect : 5/11
45.5%

Secondary treatment : 4 /11
36.5%.

# PRP study 2

## Ankle: 4 patients

improvement ≥ 3 : 1 / 4 25%.

## Plantar fasciitis :6 patients

improvement ≥ 3 : 5/6 83%

# Follow up post PRP study 2

## 28 Patients (2015) with follow up ≥ 2 years :

12 elbows
4 hips
6 knees
1 anckle
3 plantar fasciitis
2 Achilles tendons

## Résults :

improvement ≥ 3 : 20/28
72 %.

No significant effect 8/28
28 %

Back to work :total activity : 11
partial activity :14 so 25 out of 28 patients worked again

**Recommendation PRP : 24 / 28= 85,7%**

# PRP study 2

## BIAS

Monocentric and retrospective study. Information collected by phone, but by 2 Junior residents to avoid to influence the answers.

Different volumes injected, different times for injections.

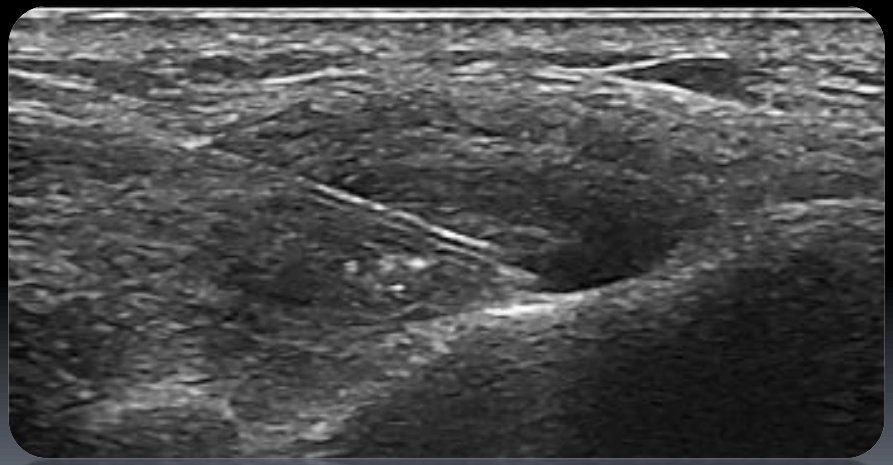
Rest in sport activity or in occupational activity are difficult to evaluate.

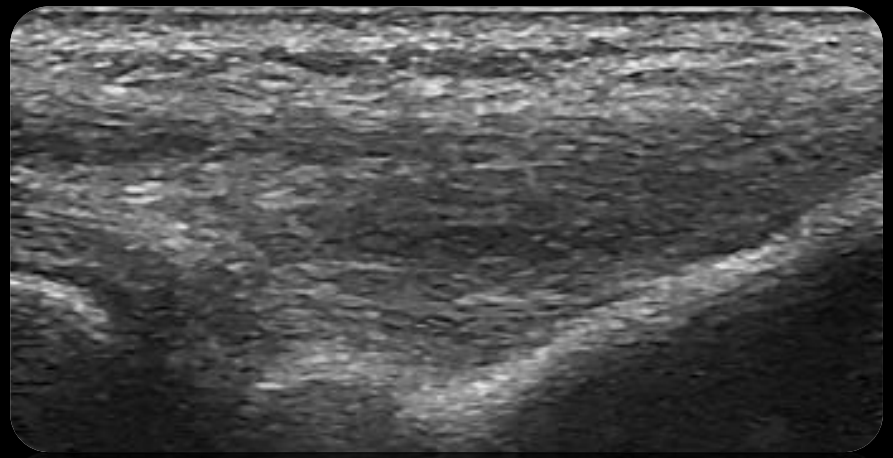
Nevertheless painfull and expensive injection contribute to increase placebo effect that we can't neglect.

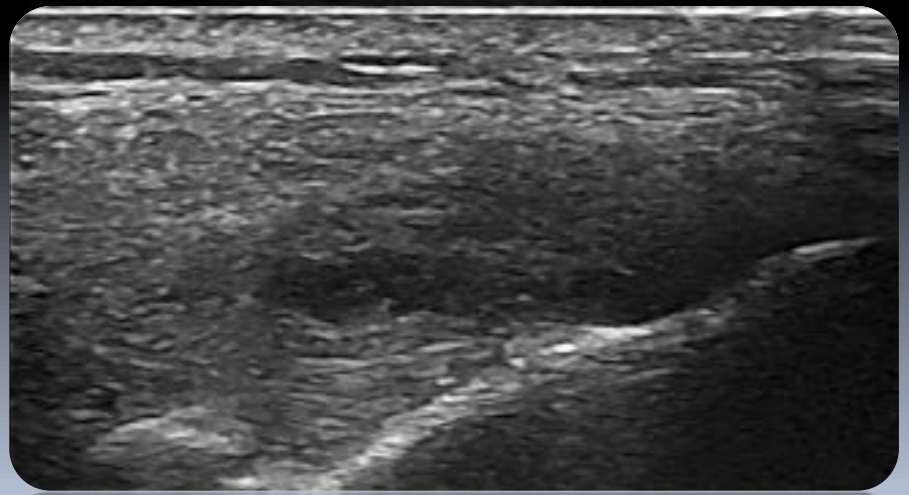
# Bibliographie

# Epicondylite

- Injection au sein du tendon commun des épidondyliens latéraux.
- Indication la plus fréquente.







# Epicondylite

- Plusieurs études randomisées  récentes  montrent une efficacité clinique significative du traitement, une étude démontre des résultats non significatifs.

- Le retour à une structure échographique non pathologique du tendon n'est pas démontrée [14;16]

# Epicondylite

- L'étude Peerboms et al a inclus 100 patients. 24 des 49 patients (49%) dans le groupe corticoïdes et 37 des 51 patients (73%) dans le groupe PRP ont présenté une amélioration clinique, soit une différence statistiquement significative (P <. 001)[14]

- L'étude de Mishra et al [15] publiée en 2013 a inclus 230 patients ayant présenté un échec au traitement conventionnel, le suivi a été de 24 semaines. Le taux de réussite pour les patients atteints était de 83,9 % dans le groupe PRP contre 68,3 % dans le groupe contrôle (P = .012 )[15].

- L'étude de Krogh et al[16] publiée en 2013 a évalué l'efficacité de l'infiltration de PRP versus solution salée isotonique. L'injection de PRP ne démontrait pas de meilleure efficacité que la solution saline en matière de réduction de la douleur  à 3 mois.

# Bibliographie

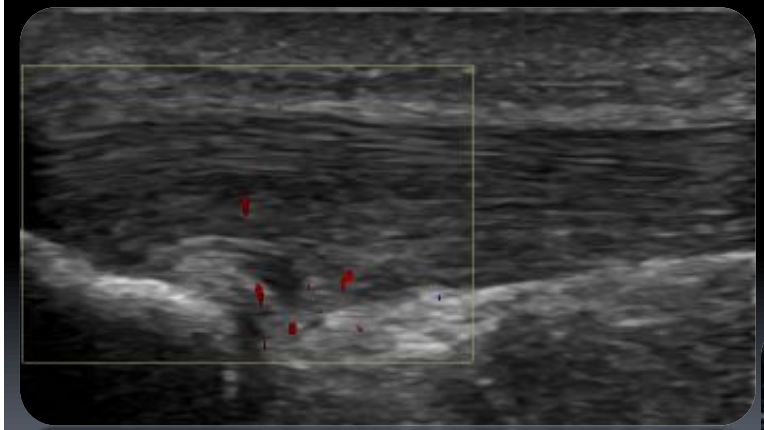
- Platelet-Rich Plasma Compared With Other Common Injection Therapies in the Treatment of Chronic Lateral Epicondylitis.
- Rodik T[1], McDermott B.
- CLINICAL SCENARIO:
- Lateral epicondylitis (LE) is a relatively common pathology capable of producing chronic debilitation in a variety of patients. A newer treatment for orthopedic conditions is platelet-rich plasma (PrP) local injection.
- FOCUSED CLINICAL QUESTION:
- Is PRP a more appropriate injection therapy for LE than other common injections such as corticosteroid or whole blood?
- SUMMARY OF KEY FINDINGS:
- Four studies were included: 1 randomized controlled trial (RCT), 2 double-blind RCTs, and 1 cohort study. Two studies involved comparisons of PRP injection to corticosteroid injection. One of the studies involved a 2-y follow-up while another involved a 1-y follow-up. Another study involved the comparison of PRP injection with whole-blood injection with a 6-mo follow-up. The final study included a PRP-injection group and control group. The 2 studies involving PRP vs. corticosteroid injections with 2-y and 1-y follow-ups both favored PRP over corticosteroid injection in terms of pain reduction and function increases. The third study favored PRP injections over whole-blood injections at 6 months regarding pain reduction. All studies demonstrated significant improvements with PRP over comparison injections or no injection. Clinical Bottom Line: PRP injections provide more favorable pain and function outcomes than whole blood and corticosteroid injections for 1-2 y after injection.
- STRENGTH OF RECOMMENDATION:
- Consistent findings from RCTs suggest level 1b evidence in support of PRP injection as a treatment for LE.

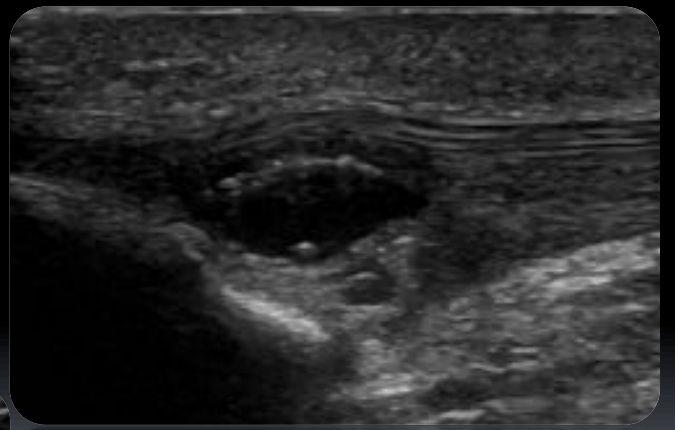
# Bibliographie

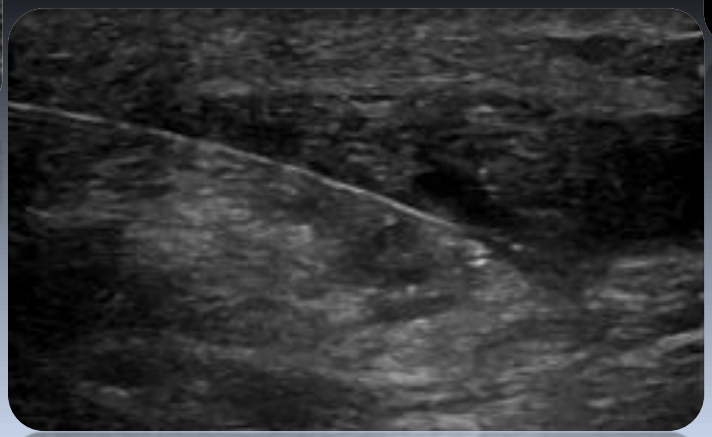

- Inefficacy of ultrasound-guided local injections of autologous conditioned plasma for recent epicondylitis: results of a double-blind placebo-controlled randomized clinical trial with one-year follow-up.
- Montalvan B[1], Le Goux P[2], Klouche S[3], Borgel D[4], Hardy P[5], Breban M[6].
- OBJECTIVES: The aim was to assess the efficacy of two intra-tendinous injections of platelet-rich plasma (PRP) on epicondylitis of recent evolution (≤3 months).
- METHODS: Our study was a double-blind placebo-controlled randomized trial. Two US-guided injections of either PRP (autologous conditioned plasma) or saline solution were performed with an interval of 4 weeks. The exclusion criterion was previous CS infiltration. Patients were monitored by an independent evaluator blinded to treatment at baseline and 1, 3, 6 and 12 months of follow-up. The primary evaluation criterion was the relative improvement from baseline to 6 months in pain score on visual analog scale (0-10). Secondary criteria were the Roles-Maudsley score and the assessment of pain on isometric contraction of extensor carpi radialis brevis and extensor digitorum communis.
- RESULTS: Twenty-five patients were randomly assigned to each group. Three patients in each arm dropped out before 6 months. In both groups, the pain score [mean (s.d.)] decreased significantly between two consecutive visits from 6.8 (0.8) (PRP) and 7 (1) (saline) at baseline to 2.5 (1.6) and 1.6 (1.5) (PRP) and to 2.1 (1.6) and 1.8 (2.1) (saline) at 6 and 12 months, respectively. At 6 months, no statistically significant difference was found between groups for relative improvement in pain score [autologous conditioned plasma: -63.2 (22.4%); saline: -69.7 (25.1%); P = 0.24]. No significant difference was found for the secondary criteria
- .CONCLUSION: Two US-guided PRP injections for epicondylitis of recent evolution were not more efficacious than saline injections, until 6- and 12-months follow-up.
- Rheumatology (Oxford). 2016 Feb;55(2):279-85. doi: 10.1093/rheumatology/kev326. Epub 2015 Sep 8.

# TP achilléenne, rotulienne et rupture du tendon d'Achille

- Tendinopathies :
  - Efficacité clinique démontrée dans la littérature sur plusieurs série de cas , mais pas d'études randomisées en double aveugle [17;18]



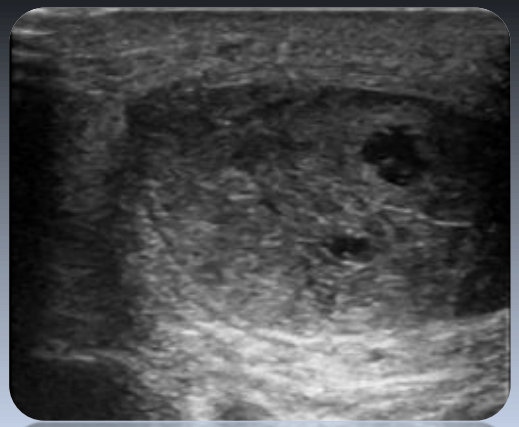


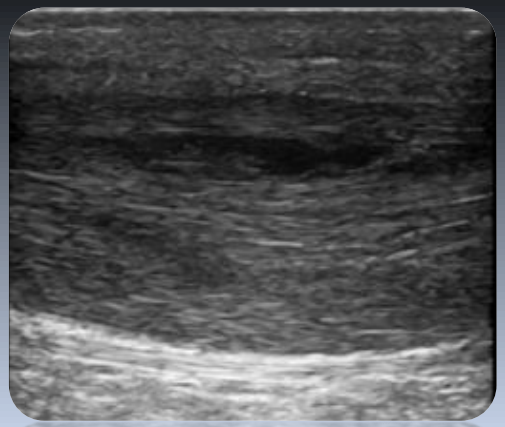


# TP achilléenne, rotulienne et rupture du tendon d'Achille

- L'étude prospective de Ferrerro et al [17] publiée en 2012, réalisée sur 48 patients , retrouve une amélioration des données cliniques et échographiques 6 mois après injection de PRP, avec une réduction des zones hypoéchogènes dans 26 tendons  associé à une amélioration de l' échostructure du tendon et une diminution de l'hyperhémie.

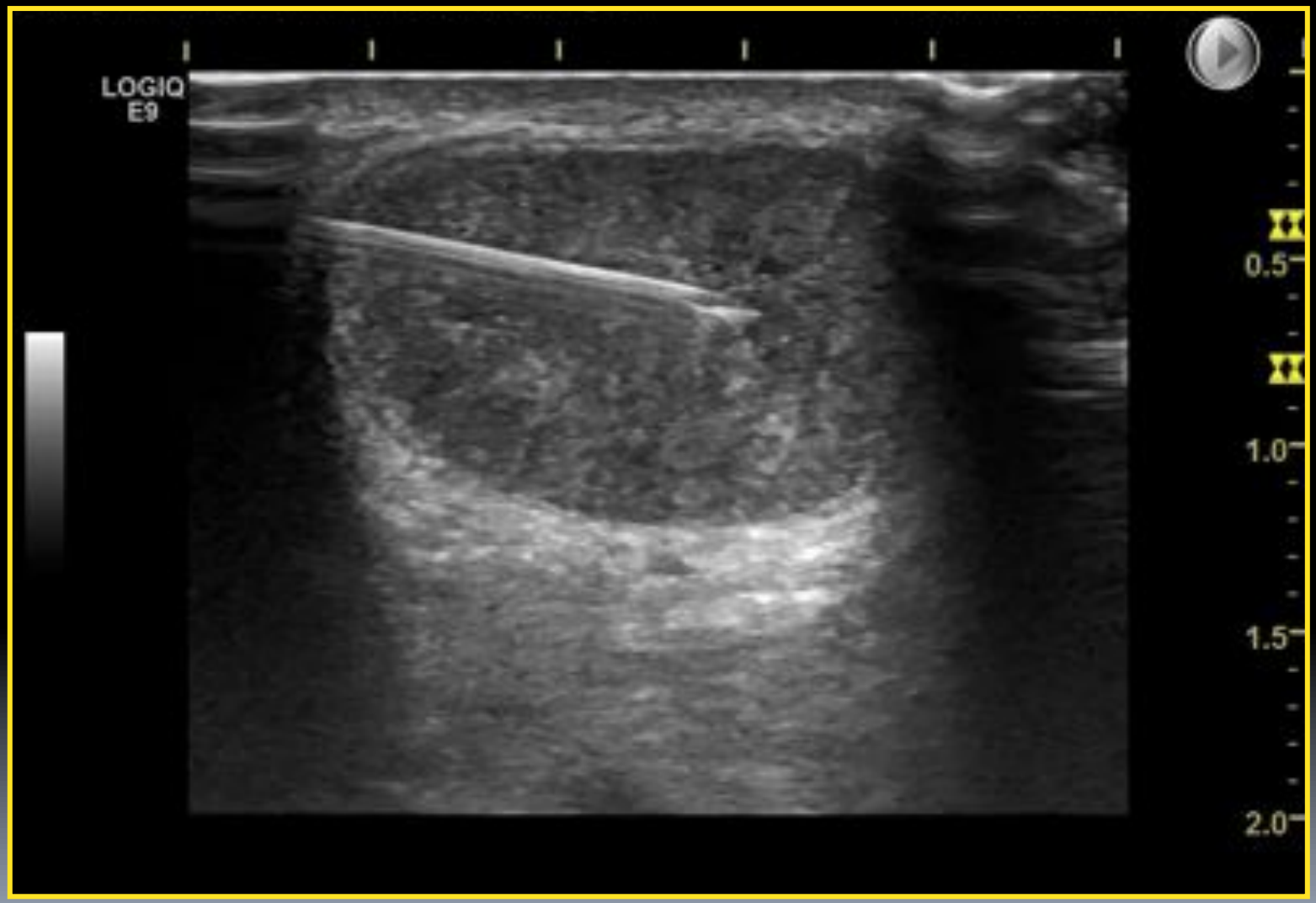
- L'injection de PRP serait efficace  pour le traitement complémentaire des ruptures du tendon d'Achille (revue de la littérature)[18].





TP fissuraire d'achille
post injection de PRP

institut radiologique mutualiste



# Aponévrosite plantaire

- Efficacité clinique
- Pas d'étude randomisée de grande ampleur

- Kim et al [19] ont évalué l'efficacité de la PRP dans les aponévrosites résistantes vs injection de dextrose+lidocaïne. La moyenne des scores clinques était plus élevées dans le groupe PRP mais de façon non statistiquement significative.
- Martinelli et al [20] ont suivis 14 patients à 12 mois. L'évaluation de la douleur était significativement diminué, passant de 7,1 ± 1,1 avant le traitement à 1,9 ± 1,5 à la fin du suivi ($p < 0,01$).

# Bibliographie

- Platelet-rich plasma as a treatment for chronic patellar tendinopathy: comparison of a single versus two consecutive injections.

- Zayni R[1], Thaunat M[2], Fayard JM[2], Hager JP[2], Carrillon Y[2], Clechet J[2], Gadea F[2], Archbold P[2], Sonnery Cottet B[2].
- BACKGROUND:
- platelet-rich-plasma is increasingly used in chronic patellar tendinopathy. Ideal number of PRP injections needed is not yet established. This study compares the clinical outcomes of a single versus two consecutive PRP injections.
- METHOD:
- between December 2009 and January 2012, 40 athletes with proximal patellar tendinopathy were treated by PRP injection. Patients received single (20 patients) or two PRP injections 2 weeks apart (20 patients). All patients underwent prospective clinical evaluation, including Victorian Institute of Sport Assessment-Patella (VISA-P) score, visual analog scale (VAS) for pain, and Tegner scale before PRP and after a minimum of 2 year follow-up.
- RESULTS:
- 9 patients failed PRP treatment and needed surgery. 1 patient was lost to follow-up. For the remaining patients, the VISA-P, VAS, and Tegner scores all significantly improved from 35.2 to 78.5 ($p = 0.0001$), 6.6 to 2.4 ($p = 0.0001$), and 4.8 to 6.9 ($p = 0.0003$). Patients who received two injections had better scores than those who received single injection with VAS of 1.07 versus 3.7 ($p = 0.0005$), Tegner score of 8.1 versus 5.9 ($p = 0.0003$) and VISA-P of 93.2 versus 65.7 ($p = 0.0001$).

- CONCLUSIONS: two consecutive PRP injections in chronic patellar tendinopathy showed better improvement in outcomes when compared to single injection.

# Bibliographie

- Platelet Rich Plasma Therapy in Non-insertional Achilles Tendinopathy: The Efficacy is Reduced in 60-years Old People Compared to Young and Middle-Age Individuals.
- Salini V[1], Vanni D[1], Pantalone A[1], Abate M[1].

BACKGROUND:

- Platelet Rich Plasma (PRP) has shown positive and long-lasting effects in patients with tendinopathies. However, information about age-related differences in the clinical outcome is limited. Aim of this retrospective study was to compare the efficacy of PRP therapy in young and elderly subjects suffering for Achilles tendinopathy.
- MATERIALS AND METHOD:
- Patients with recalcitrant non-insertional Achilles tendinopathy were enrolled. Clinical (VISA-A) and instrumental (ultrasonography) data were collected at baseline and after 1, 3, 6, and 12 months. PRP injections (once a week for 3 weeks) were performed in sterile conditions and under ultrasound (US) control.
- RESULTS:
- Forty-four subjects (29 young: mean age 39.5 ± 6.9; 15 elderly: mean age 61.5 ± 5.3) were retrospectively evaluated. At baseline, no significant differences were observed in the clinical and US parameters. Throughout the whole length of the study, a significant increase of VISA-A score was seen in both groups (from 50.3 ± 8.8 to 76.1 ± 6.6 in the young group, and from 48.7 ± 7.6 to 61.1 ± 9.4 in the elderly group); however, the infra-groups comparison showed better results in young patients, compared to the aged counterpart.
- CONCLUSION:Our results show that PRP is less effective in aged people. This finding can be ascribed to several biochemical and biomechanical differences documented in tendons of young and elderly subjects (reduced number and functionality of tenocytes and tenoblasts), which becomes more evident in the long-term tissue healing.

# Bibliographie

## Long-term beneficial effects of platelet-rich plasma for non-insertional Achilles tendinopathy.

Guelfi M[1], Pantalone A[2], Vanni D[2], Abate M[2], Guelfi MG[3], Salini V[2].

BACKGROUND:
The aim of this retrospective study is evaluating the long-term clinical outcome in patients affected by mid-portion Chronic Recalcitrant Achilles Tendinopathies (CRAT) treated with administration of single platelet-rich plasma (PRP).
METHODS:
A total of 83 tendons (73 patients, 59 males and 14 females; age 43±17.5 years) affected by non-insertional CRAT were treated with single PRP injection. These were evaluated with the Victorian Institute of Sport Assessment - Achilles (VISA-A) questionnaire, Blazina score and satisfaction index at baseline at intervals of 3 weeks, 3 months, 6 months. Final follow-up was carried out at a mean of 50.1 months (range, 24-96).
RESULTS:
Baseline VISA-A was 45±15. Results relative to the final follow-up improved significantly to a mean of 88±8 (p<00.1). Blazina was used for patients practicing sports (54 tendons out of 46 different patients): 37 tendons were grade IIIa, 11 II, and 6 IIIbis. Final follow-up Blazina scores improved for 45 grade 0, 5 I, 4 II (p<00.5). Seventy-six tendons (91.6%) were rated as satisfactory and patients would repeat the treatment. Seven tendons (8.4%) were classified as unsatisfactory at the 6 months follow-up and underwent a second PRP injection. In addition to this, patients reported no Achilles tendon rupture.
CONCLUSIONS:
The study shows beneficial effects and low complication rate following of single PRP injections on a large cohort of patients with mid-long-term follow-up. No cases reported Achilles tendon rupture, in contrast to literature, which described CRAT as one of the most common risk factors. The use of a single PRP injection can therefore be a safe and attractive alternative in the treatment of non-insertional CRATs.

# Bibliographie

- Greater Trochanteric Pain Syndrome: Percutaneous Tendon Fenestration Versus Platelet-Rich Plasma Injection for Treatment of Gluteal Tendinosis.

- Jacobson JA[1], Yablon CM[2], Henning PT[3], Kazmers IS[4], Urquhart A[5], Hallstrom B[5], Bedi A[5], Parameswaran A[6].
- OBJECTIVES: The purpose of this study was to compare ultrasound-guided percutaneous tendon fenestration to platelet-rich plasma (PRP) injection for treatment of greater trochanteric pain syndrome.
- METHODS: After Institutional Review Board approval was obtained, patients with symptoms of greater trochanteric pain syndrome and ultrasound findings of gluteal tendinosis or a partial tear (<50% depth) were blinded and treated with ultrasound-guided fenestration or autologous PRP injection of the abnormal tendon. Pain scores were recorded at baseline, week 1, and week 2 after treatment. Retrospective clinic record review assessed patient symptoms.
- RESULTS: The study group consisted of 30 patients (24 female), of whom 50% were treated with fenestration and 50% were treated with PRP. The gluteus medius was treated in 73% and 67% in the fenestration and PRP groups, respectively. Tendinosis was present in all patients. In the fenestration group, mean pain scores were 32.4 at baseline, 16.8 at time point 1, and 15.2 at time point 2. In thePRP group, mean pain scores were 31.4 at baseline, 25.5 at time point 1, and 19.4 at time point 2. Retrospective follow-up showed significant pain score improvement from baseline to time points 1 and 2 (P< .0001) but no difference between treatment groups (P= .1623). There was 71% and 79% improvement at 92 days (mean) in the fenestration and PRP groups, respectively, with no significant difference between the treatments (P >.99).
- CONCLUSIONS: Our study shows that both ultrasound-guided tendon fenestration and PRP injection are effective for treatment of gluteal tendinosis, showing symptom improvement in both treatment groups.
- J Ultrasound Med. 2016 Nov;35(11):2413-2420. Epub 2016 Sep 23.

# Bibliographie

- PRP IN THE TREATMENT OF TROCHANTERIC SYNDROME: A PILOT STUDY.
- Ribeiro AG[1], Ricioli W Junior[1], Silva AR[2], Polesello GC[1], Guimarães RP[1].

OBJECTIVE: To compare the efficacy of platelet rich plasma (PRP) against corticosteroid on the treatment of trochanteric pain syndrome **.**

- METHODS: From July 2011 to November 2012, eighteen patients (20 hips) with trochanter pain syndrome were randomized in two groups and treated with platelet rich plasma or triamcinolone infiltration guided by ultrasound. Pain and function were evaluated prior to the intervention and after 10, 30 and 60 days, through the Facial Expressions Scale for Pain and the Western Ontario McMaster and Harris Hip Score questionnaires. Inter-group analysis was performed by Student t-test and intragroup analysis by ANOVA, followed by Bonferroni post hoc test. Statistical significance was set at $p < 0.05$ **.**
- RESULTS: There was no difference between the groups**.** The triamcinolone group showed pain reduction ($p=0.004$) and improved function ($p=0.036$) through the Harris Hip Score questionnaire at 10, 30 and 60 days after treatment, when compared with the pre- intervention period. The platelet rich plasma group showed no statistical improvement in any of the variables **.**
- CONCLUSION: Up to 60 days, PRP infiltration has no influence on pain relief and function improvement in trochanteric syndrome treatment.
- ***Level of Evidence II, Prospective Comparative Study.***
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# Bibliographie


- Platelet-Rich Plasma Injections With Needle Tenotomy for Gluteus Medius Tendinopathy: A Registry Study With Prospective Follow-up.
- Lee JJ[1], Harrison JR[1], Boachie-Adjei K[1], Vargas E[1], Moley PJ[1].
- BACKGROUND: Gluteal tendinopathy is a prevalent condition that can be associated with significant pain and disability. To date, no studies have prospectively assessed the efficacy of intratendinous platelet-rich plasma (PRP) injections as a minimally invasive treatment for gluteus medius tendinopathy.
- PURPOSE: To prospectively assess the efficacy of intratendinous PRP injections as treatment for chronic recalcitrant gluteus medius tendinopathy.
- STUDY DESIGN: Case series; Level of evidence, 4.
- METHODS: During the study period between July 2011 and November 2015, data were collected from the Hospital for Special Surgery Center for Hip Preservation Outcomes Registry on participants who underwent ultrasound-guided intratendinous PRP injections for recalcitrant gluteus medius tendinosis and/or partial tears of the tendon associated with moderate to severe lateral hip pain for longer than 3 months. All participants were assessed pre- and postinjection with 4 outcome measures: modified Harris Hip Score (mHHS), Hip Outcome Score-Activities of Daily Living subscale (HOS-ADL), Hip Outcome Score-Sport-Specific subscale (HOS-Sport), and the International Hip Outcome Tool-33 (iHOT-33). Demographic data, including age, sex, height, weight, body mass index, and smoking status, were also collected.
- RESULTS:
- A total of 21 patients were included in the study, with a mean follow-up of 19.7 months (range, 12.1-32.3 months).
- CONCLUSION :we found ultrasound-guided intratendinous PRP injections to be a safe and effective treatment option for chronic recalcitrant gluteus medius tendinopathy due to moderate to severe tendinosis and/or partial tendon tears.
- Med Ultrason. 2016 Dec 5;18(4):463-468. doi: 10.11152/mu-874.

# Bibliographie

- Ultrasound-Guided Injection Therapy of Achilles Tendinopathy With Platelet-Rich Plasma or Saline: A Randomized, Blinded, Placebo-Controlled Trial.
- Krogh TP[1], Ellingsen T[2], Christensen R[3], Jensen P[4], Fredberg U[2].
- BACKGROUND:Achilles tendinopathy (AT) is a common and difficult to treat musculoskeletal disorder.
- PURPOSE:To examine whether 1 injection of platelet-rich plasma (PRP) would improve outcomes more effectively than placebo (saline) after 3 months in patients with AT.
- METHODS:A total of 24 patients with chronic AT (median disease duration, 33 months) were randomized (1:1) to receive either a blinded injection of PRP (n = 12) or saline (n = 12). The primary endpoint was improvement in Victorian Institute of Sports Assessment-Achilles (VISA-A) score at 3 months. Secondary outcomes were pain at rest, pain while walking, pain when tendon was squeezed, ultrasonographic changes in tendon thickness, and color Doppler activity.
- RESULTS:
- After 3 months, all 24 patients were reassessed (no dropouts). No difference between the PRP and the saline group could be observed with regard to the primary outcome (VISA-A score: mean difference [MD], -1.3; 95% CI, -17.8 to 15.2; P = .868). Secondary outcomes were pain at rest (MD, 1.6; 95% CI, -0.5 to 3.7; P = .137), pain while walking (MD, 0.8; 95% CI, -1.8 to 3.3; P = .544), pain when tendon was squeezed (MD, 0.3; 95% CI, -0.2 to 0.9; P = .208), color Doppler activity (MD, 0.3; 95% CI, -0.2 to 0.8; P = .260), and tendon thickness (MD, 0.8 mm; 95% CI, 0.1 to 1.6 mm; P = .030). After the 3-month follow-up, a large dropout was observed: 75% of patients in the PRP group and 33% in the saline group.
- CONCLUSION:
- PRP injection did not result in an improved VISA-A score over a 3-month period in patients with chronic AT compared with placebo. The only secondary outcome demonstrating a statistically significant difference between the groups was change in tendon thickness; this difference indicates that a PRP injection could increase tendon thickness compared with saline injection.
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- Am J Sports Med. 2016 Aug;44(8):1990-7. doi: 10.1177/0363546516647958. Epub 2016 Jun 2.

# Bibliographie

- Conservative treatment for Insertional Achilles Tendinopathy: platelet-rich plasma and focused shock waves. A retrospective study.
- Erroi D[1], Sigona M[1], Suarez T[1], Trischitta D[1], Pavan A[2], Vulpiani MC[1], Vetrano M[1].
- BACKGROUND:
- Insertional Achilles tendinopathy (IAT) represents a serious challenge for both physiatrists and surgeons. Here we analyse the results obtained by two conservative treatments [platelet-rich plasma (PRP) injections and focused extracorporeal shock-wave therapy (ESWT)] in physically active patients with IAT.
- METHODS:
- During two consecutive periods, 45 consecutive patients with IAT were treated with 3 sessions of ESWT (2400 impulses at 0.17-0.25 mJ/mm$^2$ per session) (24 cases between September 2011 and July 2013) or with 2 autologous PRP injections over two weeks (21 cases between September 2013 and July 2015). All patients were evaluated at 0, 2-, 4-, 6-month follow-up after therapy. The outcome measures were VISA-A, VAS, Patient Satisfaction.
- RESULTS:
- Intra-group analysis showed a significant improvement of VISA-A and VAS scores in both groups at all time-points. No differences between groups were observed for VAS and VISA-A scores at all time-points, excepted for VISA-A at 4-months in favour of ESWT group (P=0.049). Patient satisfaction increased progressively (>70% at 6 months) and with no differences between two groups.
- CONCLUSION:
- Both ESWT and PRP therapy are effective and safe. Our study confirms the success of these conservative treatments in Achilles tendinopathy, even in the insertional one.

# Bibliographie

- The Effectiveness of Platelet-Rich Plasma Injections in Gluteal Tendinopathy: A Randomized, Double-Blind Controlled Trial Comparing a Single Platelet-Rich Plasma Injection With a Single Corticosteroid Injection.
- Fitzpatrick J[1,2,3], Bulsara MK[4], O'Donnell J[5], McCrory PR[6], Zheng MH[1,7].
- METHODS:There were 228 consecutive patients referred with gluteal tendinopathy who were screened to enroll 80 participants; 148 were excluded (refusal: n = 42; previous surgery or sciatica: n = 50; osteoarthritis, n = 17; full-thickness tendon tear, n = 17; other: n = 22). Participants were randomized (1:1) to receive either a blinded glucocorticoid or PRP injection intratendinously under ultrasound guidance. A pain and functional assessment was performed using the mHHS questionnaire at 0, 2, 6, and 12 weeks and the patient acceptable symptom state (PASS) and minimal clinically important difference (MCID) at 12 weeks.
- RESULTS:
- Participants had a mean age of 60 years, a ratio of female to male of 9:1, and mean duration of symptoms of >14 months. Pain and function measured by the mean mHHS showed no difference at 2 weeks (corticosteroid: 66.95 ± 15.14 vs PRP: 65.23 ± 11.60) or 6 weeks (corticosteroid: 69.51 ± 14.78 vs PRP: 68.79 ± 13.33). The mean mHHS was significantly improved at 12 weeks in the PRP group (74.05 ± 13.92) compared with the corticosteroid group (67.13 ± 16.04) ( P = .048). The proportion of participants who achieved an outcome score of ≥74 at 12 weeks was 17 of 37 (45.9%) in the corticosteroid group and 25 of 39 (64.1%) in the PRPgroup. The proportion of participants who achieved the MCID of more than 8 points at 12 weeks was 21 of 37 (56.7%) in the corticosteroid group and 32 of 39 (82%) in the PRP group ( P = .016).
- **CONCLUSION:**
- Patients with chronic gluteal tendinopathy >4 months, diagnosed with both clinical and radiological examinations, achieved greater clinical improvement at 12 weeks when treated with a single PRP injection than those treated with a single corticosteroid injection..
- Am J Sports Med. 2018 Jan 1:363546517745525. doi: 10.1177/0363546517745525. [Epub ahead of print]

# Tendinopathies de la coiffe

- Kesikburun et al [23] ont évalué l'efficacité de PRP versus solution saline chez 40 patients. A 1 an , le PRP a été plus efficace que le placebo (associé à un traitement par kinésithérapie).

- Pas d'autre étude randomisée

# Bibliographie

- Subacromial injection of autologous platelet-rich plasma versus corticosteroid for the treatment of symptomatic partial rotator cuff tears.
- Shams A[1], El-Sayed M[2], Gamal O[1], Ewes W[3].
- OBJECTIVE: Rotator cuff tears are one of the most common causes of chronic shoulder pain and disability. They significantly affect the quality of life. Reduced pain and improved function are the goals of conventional therapy, which includes relative rest, pain therapy, physical therapy, corticosteroid injections and surgical intervention. Tendons have a relative avascular nature; hence, their regenerative potential is limited. There is some clinical evidence that the application of autologous platelets may help to revascularize the area of injury in rotator cuff pathologies.
- PATIENTS AND METHODS: This prospective randomized controlled study was done to evaluate the results of subacromial injection of platelet-rich plasma (PRP) versus corticosteroid injection therapy in 40 patients with symptomatic partial rotator cuff tears. All patients were assessed before injection, 6 weeks, 3 and 6 months after injection, using the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), the Constant-Murley Score (CMS), the Simple Shoulder Test (SST) and a Visual Analog Scale (VAS) for pain. An MRI was performed before and 6 months after the injection for all the included patients and was graded on 0-5 scale.
- **RESULTS:** Both injection groups showed statistically significantly better clinical outcomes over time compared with those before injection. There was a statistically significant difference between RPP group and corticosteroid group 12 weeks after injection, regarding VAS, ASES, CMS and SST in favor of the RPP group. MRI showed an overall slight non significant improvement in grades oftendinopathy/tear in both groups, however, without statistically significant differences between the two groups.
- **CONCLUSION**: PRP injections showed earlier better results as compared to corticosteroid injections, although statistically significant better results after 6 months could not be found. Therefore, subacromial RPP injection could be considered as a good alternative to corticosteroid injection, especially in patients with a contraindication to corticosteroid administration.
- Eur J Orthop Surg Traumatol. 2016 Dec;26(8):837-842. Epub 2016 Aug 20.

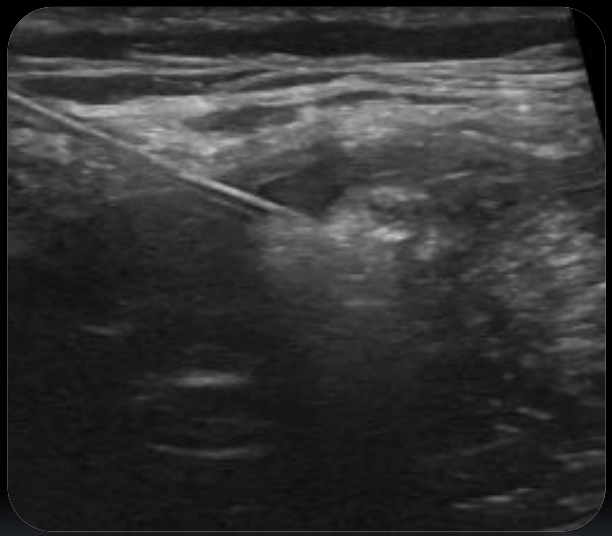
# Bibliographie

- Ultrasound-guided platelet-rich plasma injection for distal biceps tendinopathy.
- Barker SL[1], Bell SN[1], Connell D[2], Coghlan JA[1].

- BACKGROUND:
- Distal biceps tendinopathy is an uncommon cause of elbow pain. The optimum treatment for cases refractory to conservative treatment is unclear. Platelet-rich plasma has been used successfully for other tendinopathies around the elbow.
- METHODS:
- Six patients with clinical and radiological evidence of distal biceps tendinopathy underwent ultrasound-guided platelet-rich plasma (PRP) injection. Clinical examination findings, visual analogue score (VAS) for pain and Mayo Elbow Performance scores were recorded.
- RESULTS:
- The Mayo Elbow Performance Score improved from 68.3 (range 65 to 85) (fair function) to 95 (range 85 to 100) (excellent function). The VAS at rest improved from a mean of 2.25 (range 2 to 5) pre-injection to 0. The VAS with movement improved from a mean of 7.25 (range 5 to 8) pre-injection to 1.3 (range 0 to 2). No complications were noted.
- DISCUSSION:
- Ultrasound-guided PRP injection appears to be a safe and effective treatment for recalcitrant cases of distal biceps tendinopathy.
- Am J Sports Med. 2015 Oct;43(10):2583-90. doi: 10.1177/0363546514560726. Epub 2014 Dec 18.
-

# Pathologies musculaires

- Etudes cliniques en cours étudiant l'effet des injections écho guidées de PRP sur la douleur, la récupération clinique et la régénération musculaire dans les lésions musculaires aigues.
- Les résultats sont controversés.
- Plusieurs études récentes ne montrent pas de différence significative avec les traitements conventionnels [21].



- Une série de cas démontrant une efficacité en cas d'échec du traitement conventionnel, notamment pour les lésions musculaires des ischio jambiers [22].

# Pathologies chondrales

- L'étude sur modèle animal est en faveur d'une efficacité de l'injection de PRP sur la réparation chondrale [24].

- Les applications cliniques sont néanmoins encore controversées.

- Alternative possible au traitement des chondropathies du genou [25]

# Limites

- Indications :
  - Validation scientifique pour certaines indications , notamment dans le cadre des épicondylites.
  - Peu de validation par essais randomisés pour les autres indications.
  - Aucune complication infectieuse décrite dans la littérature , le risque inhérent à toute injection ne peut cependant pas être écarté.
  - 2 complications vasculaires (thrombose) dans notre première série.

# Conclusions

- En pratique :

  - Indication validée avec un clinicien spécialisé.
  - Patient informé de l'évaluation actuelle de la technique.
  - Réalisation en condition d'asepsie stricte comme pour toute infiltration.
  - Préparation sur place du PRP avec injection immédiate (traçabilité)
  - Réalisation d'une seule injection, avec repos strict 48 h et repos sportif 2 semaines.
  - Contrôle clinique et échographique à 1 et/ou 2 mois.
  - 2eme injection « à la demande ».

# Conclusions

Injection de PRP:

Expérience très favorable à l'Institut Radiologique Mutualiste (Étude rétrospective sur grand nombre)

globalement encourageantes à ce jour!

Indications: Tendinopathies résistantes aux traitements habituels: Stanish-infiltrations-ondes de choc…

# Take home message 1

Toutes les tendinopathies sont fissuraires

Ce traitement « bio » paraît rationnel

Nos résultats sont encourageants

# Take home message 2

MAIS

L’injection et les suites sont parfois douloureuses.

Nécessité d ’un repos strict avec  immobilisation par attelle 7 jours
Prise en charge Kiné :  excentrique à 15 jours

La guérison « échographique » est  retardée

L’amélioration clinique  est progressive (6 mois)
Avec moins d'échec chez le sportif de haut niveau

# Take home message 3

Il ne faut pas sous estimer
l'effet Placebo, renforcé par
« l'effet dernière chance »
La douleur à l'injection,
le coût de la procédure
et …le repos!

institut radiologique mutualiste

# Merci de votre attention!

# Revue rétrospective 2013:

Mautner et al,PM R mars 2013, *Outcomes after ultrasound-guided platelet-rich plasma injections for chronic tendinopathy: a multicenter, retrospective review.*

4 centres académiques de médecine sportive aux E-U

180 pts, ≈ 18 mois sx, questionnaire post –PRP tout sites (++ épicondyles), **avis à 15 mois post-tx PRP**

- **82%** amélioration/ satisfaction

Remerciements Ph Peetrons

# Plasma riche en plaquettes : Quand? Pour qui ?

Tendinopathies réfractaires au traitement kinésithérapique : méthode de Stanish excentrique (étirement puis renforcement) avec ou sans fissurations tendineuses visibles

Tendinopathies d'insertion (épicondyles, rotule)

Tendinopathie du corps du tendon (tendon d'Achille)

- Injections dans ligaments et muscles

# Applications de l'injection de PRP

- Tendinopathies
- Pathologies musculaires
- Pathologies chondrales