

Diabetic Foot in Algeria Diabetic Charcot Foot our Philosophy

Nadia Boudjenah*

General Surgeon, Diabetic Foot Surgeon, Diabetic Foot center, Algiers, Algeria

*Corresponding author: Nadia Boudjenah, General Surgeon, Diabetic Foot Surgeon, Diabetic Foot center, Algiers, 132 Route Outed Fayet, Amara, Chéraga, Algiers 16014, Algeria, Tel:+213661890017; +33681599800; E-mail: drboudjenah@yahoo.fr

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Abstract

The aim of this study is to define early stages before the onset of bone destruction in the diabetic Charcot foot.

1214 CHARCOT FOOT was the subject of this study over a period of 31 months.

Our choice of investigation focused on the practice of Magnetic Resonance Imaging (MRI) of the foot and ankle.

The conclusions were surprising in that a posterior lesion axis of the foot and ankle was highlighted. For this reason, we ask the medical scientific society to address the issue in order to help suffering patients and also to reduce the exorbitant costs associated with these disabling complications [1-2].

Introduction

The definition of philosophy proves to be a complex task, difficult to grasp in a few words. That is why, rather than attempting to define it, we have chosen two eloquent quotes that seem particularly relevant to the theme of our publication. For VOLTAIRE, in philosophy, one must be wary of what one believes to understand too easily as well as of the things one does not understand (Lettres philosophiques XV). For Jules LAGNEAU, philosophy is nothing other than the effort of the mind to account for the obvious (Revue philosophique, February 1880) we will explain why it is important to reflect on the issue of Charcot foot in diabetics, approaching this problem from a philosophical perspective.

Currently, the theories proposed do not allow for a complete and satisfactory understanding of the lesions we can observe.

Indeed, if we adopt a pragmatic perspective, several questions arise concerning Charcot foot in diabetics.

These questions shape our objectives:

- Firstly: what happens in diabetic feet before the onset of Charcot foot?

- And consequently, secondly, can early stages be identified to enable effective prevention?

For this, we have decided to carry out radiological examinations and to conduct a survey [3-6].

Materials, Methods and Techniques

We opted for the practice of Magnetic Resonance Imaging (MRI) of the foot and ankle, with the aim of analyzing the bone environment and initial bone lesions.

For consistency of results, all MRIs were performed by the same Radiology team, using the same machine, meaning under the same conditions, with a jointly defined analysis protocol, which refined itself as the explorations progressed.

The examination technique was carried out on an MRI machine MAGNETOM SEMPRA 1.5 T installed and commissioned in June 2021 within the Medical Imaging Center of Professor Matouk YAICI. Examination conducted without Gadolinium injection. Sequences: T1 TSE SAG / STIR SAG / t2_tse_TRA / DP FS DIXON TRA.

Exam process (Figures 1-4)

Evolution of Ideas

This study unfolded in three stages:

- First stage: only clinically detectable Charcot foot patients benefited from an MRI of the affected foot and ankle, just to ultimately identify the damage!

- Second stage: gradually, we explored the contra lateral foot, apparently healthy; to assess its anatomical state since this foot becomes the weight-bearing foot and therefore a foot at risk.

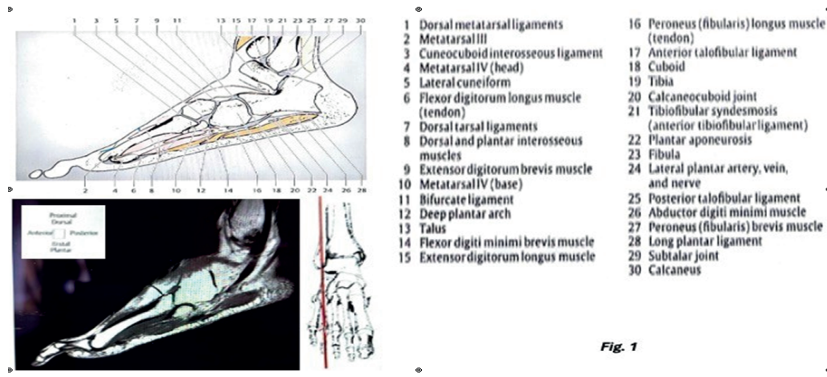


Fig. 1

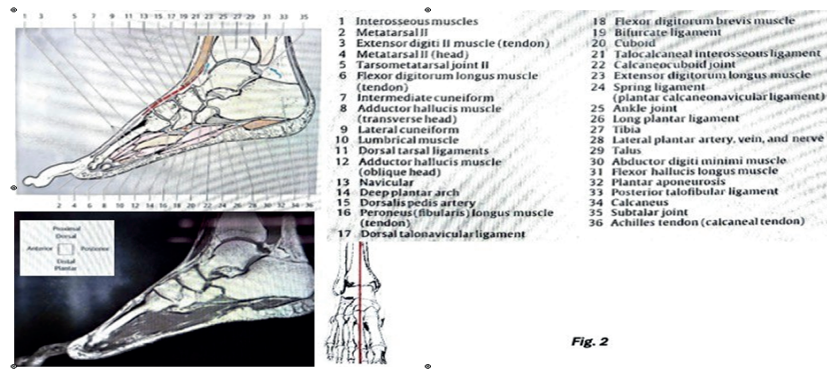


Fig. 2

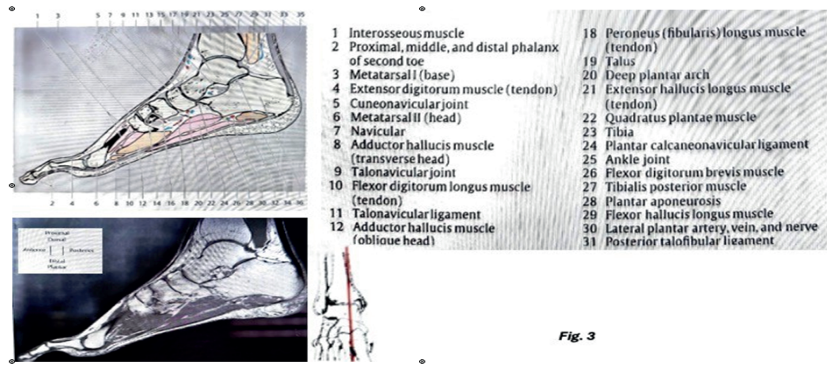


Fig. 3

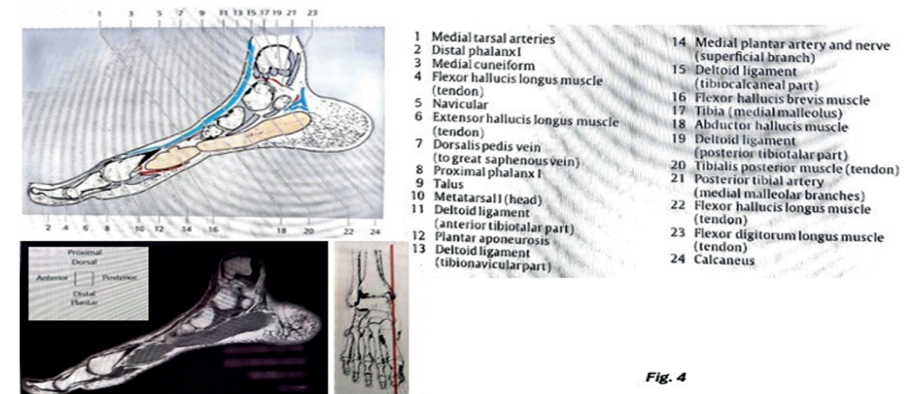


Fig. 4

Figures 1-4 are sourced from the reference book used for our radiological study: "Pocket Atlas of Sectional Anatomy, Volume III: Spine, Extremities, Joints-Computed Tomography and Magnetic Resonance Imaging." by Torsten Bert Möller and Emil Reif.

• Third stage: The results of this second stage being unexpected led us to modify our approach.

We thus extended the exploration to both feet for every diabetic patient presenting at our consultation [7-8].

Classification

Given the complexity of this study, to simplify it, we have established a radiological classification with three stages:

- **Stage I:** There is a focal or multifocal bone signal involvement, associated or not with soft tissue edema.
- **Stage II:** To the radiological bone involvement is added the presence or absence of soft tissue edema, ligamentous and/or tendon involvement, and the existence of joint or periligamentous effusions.
- There is neither destruction, nor infection, nor inflammatory magma, nor architectural changes. These conditions define ***Stage III.**

Reservations

- It seemed obvious to us to exclude **Stage III** from this study.
- And in this series, there is no acute form.

Recruitment

This study took place over a period of 31 months, from June 2021 to January 2024.

All patients came to our consultation, diabetics with or without wounds, and all suffer from severe neuropathy.

We studied 1214 Charcot foot cases that were examined, distributed as follows:

- 766 cases in men
- 448 cases in women.

The above-described classification allowed us to categorize:

Stage I: A total of 31 cases in 16 men and 15 women.

Stage II: A total of 777 cases in 489 men and 288 women.

Since Stage III was excluded, in total, the subject of our study focused on 808 explored feet [9].

The gender difference only reflects the difference in access to care (Figure 5).

Results

The Talus is identified as the most prevalent site for primary bone lesions, followed by the Calcaneus and then the Tibia (Figure 1.1).

THUS, A POSTERIOR AXIS of the foot and ankle is delineated, with the Talus as its center.

This is confirmed by the most frequent ligamentous involvement, represented by the Talocalcaneal ligament in the hedge of the tarsal sinus (Figure 2.2).

(Figure 6-9)

In conclusion, the initial manifestations are found in the posterior area of the foot and ankle, whether it be bone, ligamentous, or articular involvement.

Discussion

What benefits can be derived from this situation?

Since the beginning of our exclusive practice with diabetic foot, we have recommended, for offloading purposes, the use of orthopedic shoes on both feet, for the following reasons:

- Overloading on the “non-affected” weight-bearing foot, in principle
- Imbalance of the pelvis and back due to the height difference generated by the thickness of the sole when using only one shoe. (We have remained faithful to the SBI MOLLITER shoe.)

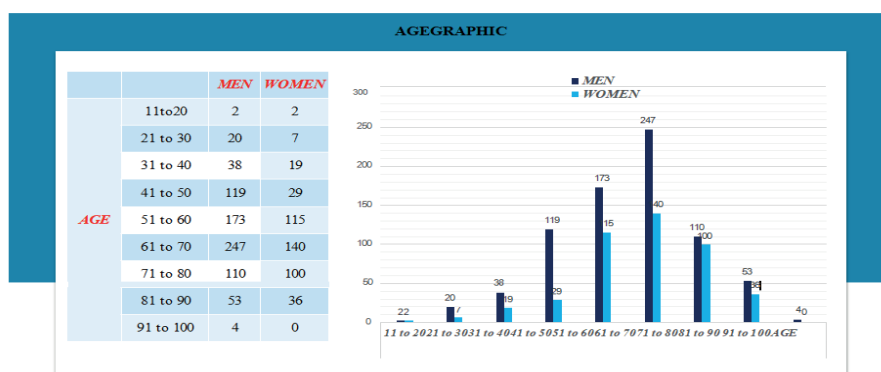
Currently, these reasons have become obsolete since we are resting diabetic Charcot foot at Stage II, which are clinically normal.

We have shifted from a preventive approach to a therapeutic one.

The MRI of both feet has become systematic in our practice, just like the arterial and venous Doppler ultrasound of the lower limbs and the Electroneuromyography (ENMG) of all four limbs.

In continuation, we intend to monitor the patients of this study by MRI, after wearing SBI-type shoes for a period of 1 to 2 years (we have already started with encouraging results).

We ask simple questions and invite the interested scientific community to find answers:



Figures 5: The age curve shows a predominant involvement in the sixth decade closely followed by the fifth decade. This means that if a preventive action is to be implemented, it should target the third and fourth decades.

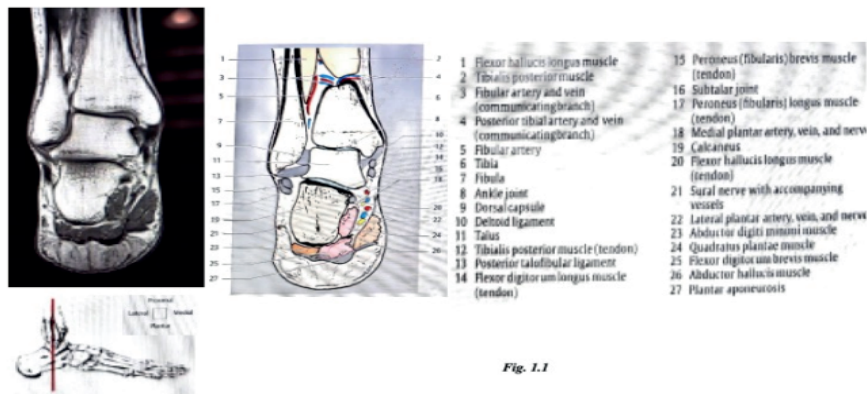


Fig. 1.1

The 2 bundles of the interosseous talocalcaneal ligament, seen in line from the sinus tarsi
1. posterior bundle
2. Anterior bundle

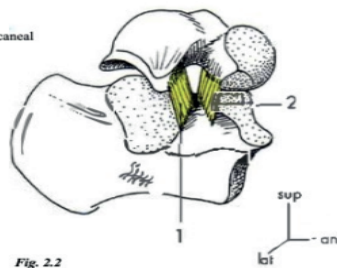


Fig. 2.2

Figure 1.1 is sourced from the reference book used for our radiological study: "Pocket Atlas of Sectional Anatomy, Volume III: Spine, Extremities, Joints - Computed Tomography and Magnetic Resonance Imaging" by Torsten Bert Möller and Emil Reif.

Figure 2.2 is sourced from the internet.

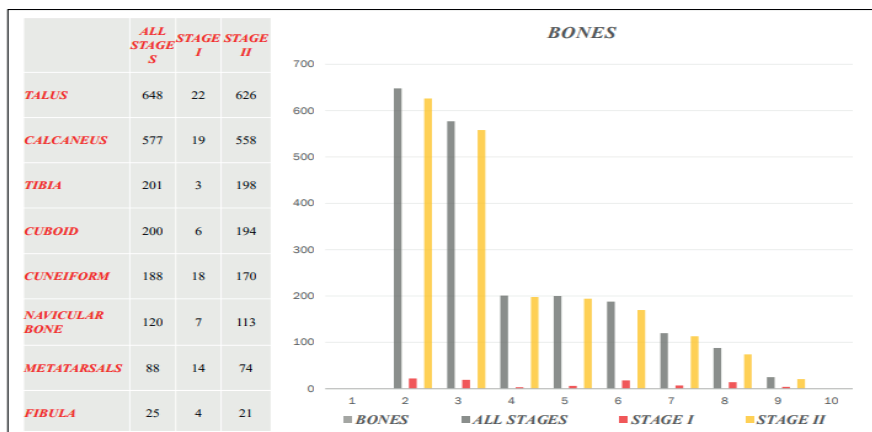


Figure 6: Graphical representation of bone lesions.

1. What triggers the appearance of focal or multifocal bone involvement?
2. What causes the appearance of edema and an effusion, meaning what alters the bone environment?
3. Is this condition the cause of the bone involvement? Or is it independent and of concomitant evolution?
4. Can we hope to halt the progression towards a Stage III Charcot foot when there is no bone destruction?

The answers provided could improve the quality of life for millions of diabetics around our planet and prevent so many amputations. When the bone architecture is destroyed, although surgery has evolved well, it remains disappointing in the long term and is not accessible to everyone. Prevention would be of great benefit.

Illustration

This is an example of what we encounter daily:
Bilateral Charcot foot in a 65-year-old diabetic.

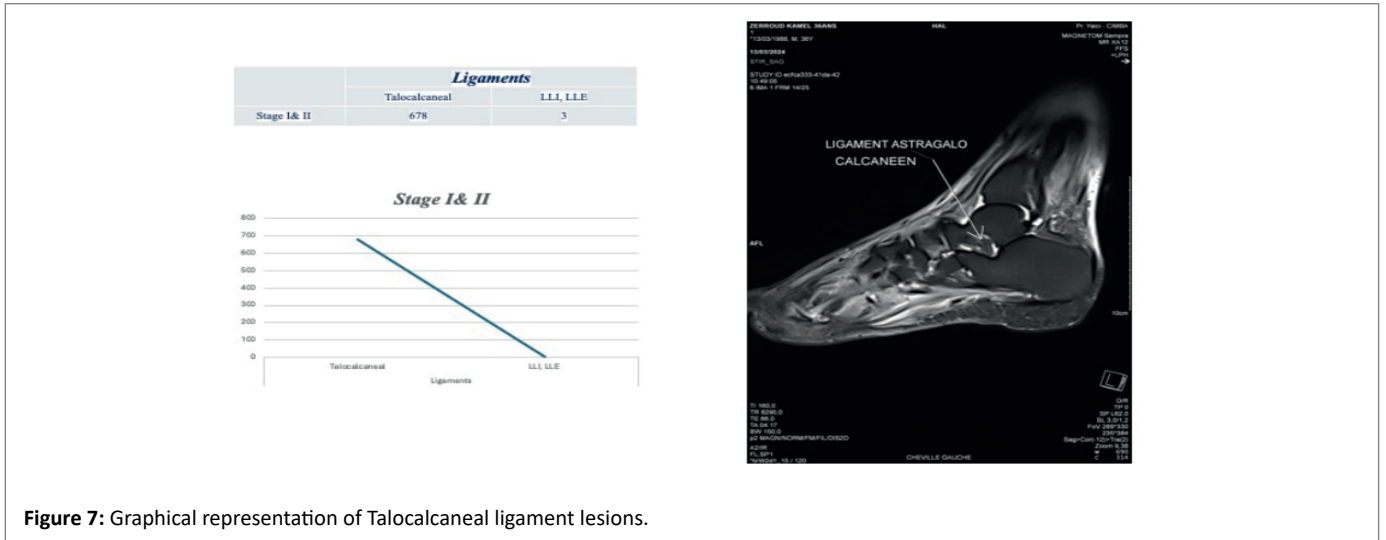


Figure 7: Graphical representation of Talocalcaneal ligament lesions.

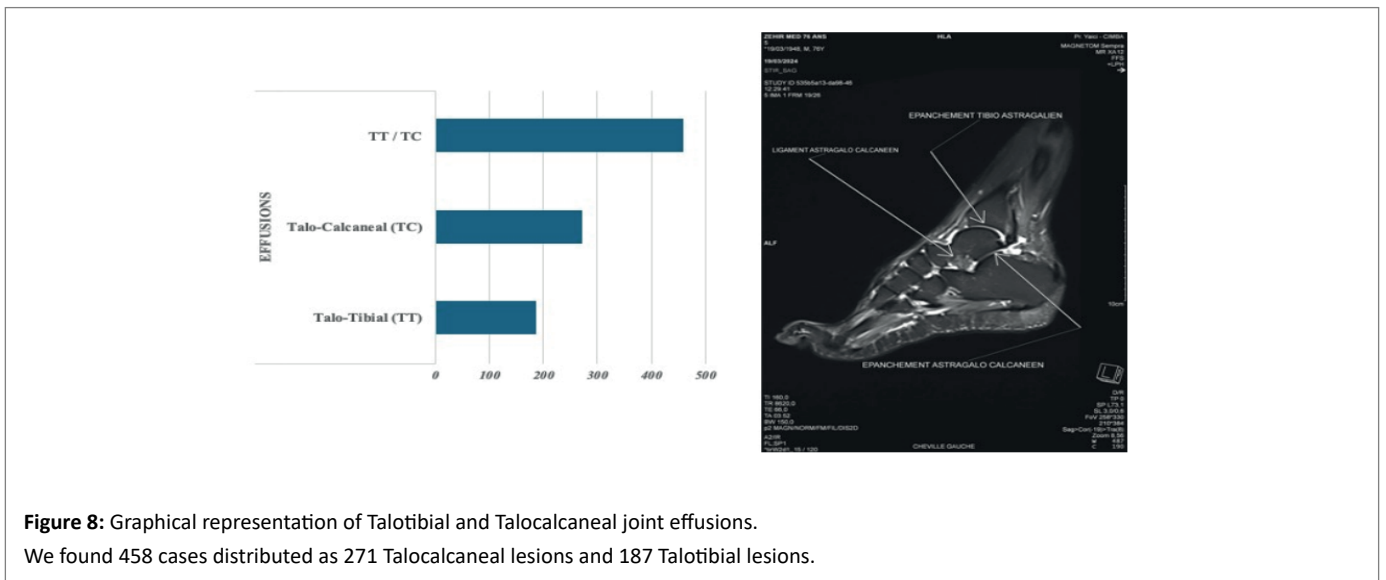


Figure 8: Graphical representation of Talotibial and Talocalcaneal joint effusions. We found 458 cases distributed as 271 Talocalcaneal lesions and 187 Talotibial lesions.

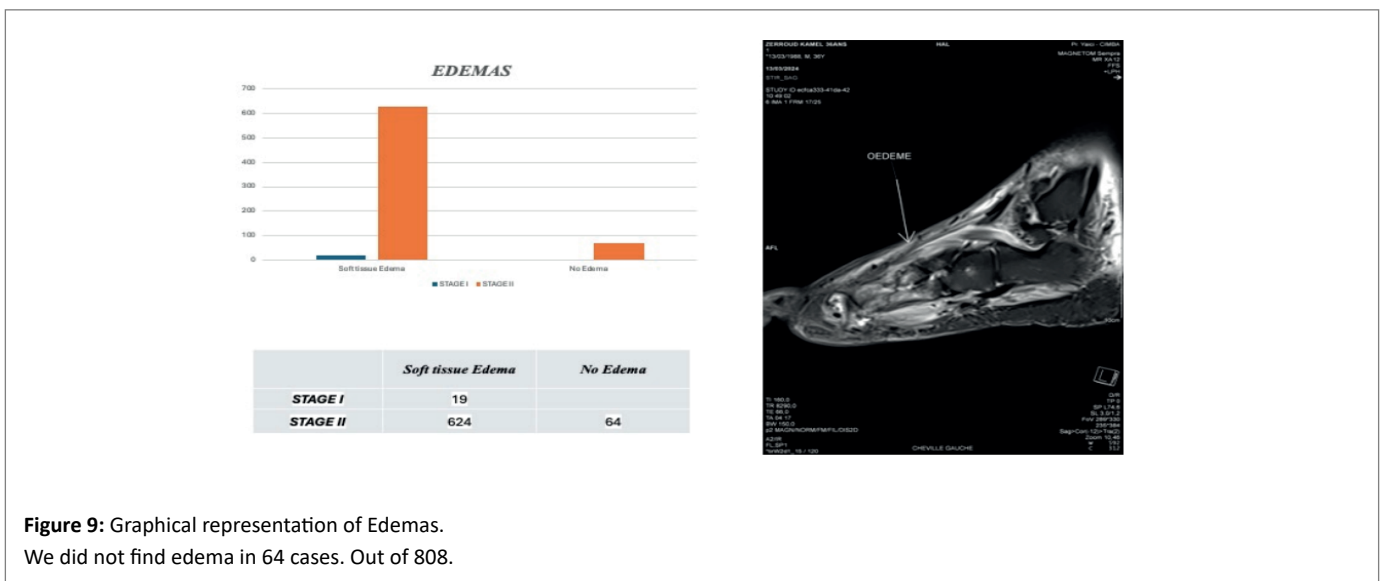


Figure 9: Graphical representation of Edemas. We did not find edema in 64 cases. Out of 808.



Figure 10: Before and after treatment of foot.

• Ulceration and significant infection on the right: Radiological **Stage III**.

• A wound on the big toe of the left foot: Radiological **Stage II**. (Figure 10)

- The infection is treated with targeted antibiotic therapy.
- The edema is treated by total offloading requiring anticoagulant therapy, especially since this patient has arterial and venous thrombosis.
- Carbomedtherapy sessions.
- Passive physical activity.
- And of course, the rebalancing of the patient's diabetes.

These results were obtained in 5 months for the right foot and in 1 ½ month for the left foot.

The patient is awaiting the orthopedic shoes, which will allow her to stand upright [10-13].

Conclusion

This situation is deeply concerning and requires swift scientific action.

In summary, focusing on prevention not only has the potential to improve clinical outcomes and the quality of life for people with diabetes but also represents a cost-effective approach to healthcare by reducing the need for complex surgeries and long-term care associated with amputations and other serious complications.

By prioritizing research into the underlying causes and triggers of bone changes and edema in diabetic patients, the scientific medical community can develop more effective preventive and therapeutic strategies that address the root of the problem rather than just its symptoms.

Supplement Information



Professeur Matouk YAICI

IRM- Scanner- Échographie- Echo doppler couleur- Echo endo cavitaire
Mammographie - Panoramique dentaire - Radiologie générale et spécialisée

Date : 08/02/2024
Nom du patient : -----XY-----
Age : 62 ans

IRM DE LA CHEVILLE ET DU PIED – PIED GAUCHE

Matériel : IRM MAGNETOM SEMPRA 1.5 T installée et mise en service en juin 2021
Technique : Examen réalisé sans injection de Gadolinium.
Séquences : T1 TSE SAG / STIR SAG / t2_tse_TRA_384 / DP FS DIXO
TRA_F / DP FS DIXO TRA_W.
Un CD ROM contenant l'ensemble de l'examen a été remis au patient.

Médecin traitant : Dr Nadia Boudjenah

RESULTATS :

- / **Au niveau osseux :**
 - / Alteration de signal punctiforme (hypo signal T1- hyper signal T2) de l'astragale et du calcaneum.
- / **Au niveau articulaire :**
 - / Discret épanchement liquidien tibio astragalien, astragalo calcanéen
- / **Au niveau ligamentaire:**
 - / **Tibio tarsienne :**
Tous les ligaments de la tibio tarsienne sont visibles :
 - Le LLI est de taille normale, sans épanchement liquidien adjacent, et sans signe de rupture
 - Le LLE est de taille normale, sans épanchement liquidien adjacent, et sans signe de rupture
 - / **Sous astragalienn**
 - Le ligament astragalo calcanéen en haie du sinus du tarse est épaissi avec un discret épanchement p ligamentaire.
- / **Au niveau tendineux :**
 - / Tendon jambier postérieur : homogène sans signe de rupture ni de désinsertion.
 - / Tendon jambier antérieur: homogène sans signe de rupture ni de désinsertion .
 - / Tendons péroniers latéraux : indemnes.
 - / Péroniers latéraux : homogènes, sans signe de rupture ni de désinsertion.
 - / Tendon d'Achille: indemne
- / **Au niveau des parties molles :**
 - / Œdème des parties molles de la face supérieure du pied.
 - / Œdème circonférentiel des parties molles du tiers inférieur de la jambe.

CONCLUSION :

- Alteration de signal punctiforme (hypo signal T1- hyper signal T2) de l'astragale et du calcaneum
- Discret épanchement liquidien tibio astragalien, astragalo calcanéen
- Ligament astragalo calcanéen en haie du sinus du tarse épaissi avec un discret épanchement péri ligamentaire.
- Œdème des parties molles de la face supérieure du pied.
- Œdème circonférentiel des parties molles du tiers inférieur de la jambe.
- Syndrome du carrefour postérieur de la cheville gauche (en rapport avec une queue longue de l'astragale).

ASPECT COMPATIBLE AVEC UN PIED GAUCHE DE CHARCOT.

TRANSLATION

Date: 08/02/2024
Patient's name: -----XY-----
Age: 62 years

OF THE ANKLE AND FOOT – LEFT FOOT

Equipment: MRI MAGNETOM SEMPRA 1.5 T installed and commissioned in June 2021
Technique: Examination performed without injection of Gadolinium.
Sequences: T1 TSE SAG / STIR SAG / t2_rse_TRA_384 / DP FS DIXO TRA_F / DP FS DIXO TRA_W_A
CD-ROM containing the entire examination was given to the patient.

Attending Physician: Dr. Nadia Boudjenah

RESULTS:

/ **Bone level:**

/ Focal signal alteration (hypo T1 signal - hyper T2 signal) of the talus and calcaneus.

/ **Joint level:**

/ Mild tibio-Astragalar and Astragalo-calcaneal joint effusion.

/ **Ligament level:**

/ **Tibiotalar:**

All ligaments of the tibiotalar are visible:

- The ATFL is of normal size, without adjacent joint effusion, and without signs of rupture.
- The CFL is of normal size, without adjacent joint effusion, and without signs of rupture.

/ **Subtalar:**

- The astragal-calcaneal ligament at the sinus tarsi is thickened with a mild peri-ligamentary effusion.

/ **Tendon level:**

/ Posterior tibial tendon: homogeneous without signs of rupture or detachment.

/ Anterior tibial tendon: homogeneous without signs of rupture or detachment.

/ Peroneal tendons: intact.

/ Peroneal tendons: homogeneous, without signs of rupture or detachment.

/ Achilles tendon: intact.

/ **Soft tissue level:**

/ Soft tissue edema of the upper part of the foot.

/ Circumferential soft tissue edema of the lower third of the leg.

CONCLUSION:

- Focal signal alteration (hypo T1 signal - hyper T2 signal) of the talus and calcaneus.
- Mild tibio-Astragalar and astragalo-calcaneal joint effusion.
- Thickening of the astragalo-calcaneal ligament at the sinus tarsi with a mild peri-ligamentary effusion.
- Soft tissue edema of the upper part of the foot.
- Circumferential soft tissue edema of the lower third of the leg.
- Left ankle posterior intersection syndrome (related to a long tail of the astragalus).

APPEARANCE COMPATIBLE WITH A LEFT CHARCOT FOOT.

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