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Atlas of Elbow Soft Tissue Pathologies Using Magnetic Resonance Imaging at the Saint Camille Hospital in Ouagadougou and the Polyclinique Notre Dame de la Paix (Burkina Faso)

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Abstract

Introduction: The elbow is a superficial joint, particularly exposed to direct impact, forced movement, and overstrain. Our work aimed to study magnetic resonance imaging (MRI) pathologies of the soft tissues of the elbow through illustrative cases. **Methodology:** This was a retrospective and prospective cross-sectional study covering a period of one year, from June 2020 to June 2021, at the Saint Camille Hospital in Ouagadougou and the Polyclinique Notre Dame de la Paix. **Results:** In general, this study found that the pathologies diagnosed on MRI were lateral epicondylitis, subcutaneous type V elbow lipoma and liposarcoma, anteromedial cortical fracture of the radial cup, cortical detachment fracture of the lateral epicondylitis, medial epicondylitis, villonodular articular synovitis, simple dermo-hypodermatitis, sequellar fibrosis of the ulnar nerve, Workman's syndrome (median and ulnar nerves) and osteoarthritis of the elbow. Lateral epicondylitis was the most frequent pathology, and most patients consulted for elbow pain predominantly associated with pressure on the epicondyle, with relative functional impotence and, occasionally, elbow swelling. **Conclusion:** MRI, as a complement to ultrasound and radiography, remains the most informative examination for exploring soft-tissue pathologies of the elbow.

Keywords

Magnetic Resonance Imaging, Soft Tissue, Elbow

1. Introduction

The elbow is a superficial joint, particularly exposed to direct impact, forced movement, and overload. It's a complex joint made up of three articulations: the humero-radial, humero-ulnar, and proximal radio-ulnar joints, all surrounded by a single synovial sleeve. These three congruent joints are held together by various capsulo-ligamentary and musculo-tendinous structures, ensuring stability during movement [1]. The elbow is frequently the site of trauma in road accidents, leisure activities, and simple falls. It can also be affected by inflammatory, infectious, or tumoral processes responsible for absolute or relative functional impotence, depending on the lesions. Lateral epicondylitis is the main cause of elbow pain (4 to 7 per thousand) [2]. It is responsible for sudden or progressive onset pain in the lateral compartment of the elbow, exacerbated by constrained extension of the wrist, long fingers, and forced supination [2]. Investigation begins with standard radiographs. However, they do not allow optimal analysis of the soft tissues [1]. Hence the importance of other, more appropriate imaging techniques, such as computed tomography (CT) and magnetic resonance imaging (MRI). Although CT can analyze soft tissue, its low contrast does not make it the examination of choice [1]. It has been superseded by MRI, the examination of choice for soft-tissue analysis due to its absence of irradiation, enabling:

- A very precise anatomical and lesion definition,
- Assess the injury mechanism,
- Guide management [2].

We therefore propose to study MRI pathologies of the soft tissues of the elbow through illustrative cases.

2. Materials and Methods

2.1. Study Design, Period and Setting

This was a cross-sectional study with retrospective and prospective data collection, carried out at the Polyclinique Notre Dame de la Paix (PNDP) and Hôpital Saint Camille de Ouagadougou (HOSCO). It lasted one year, from June 2020 to June 2021.

2.2. The Study Population

Our study population was made up of patients referred to the radiology and medical imaging department for MRI.

2.3. Inclusion Criteria

All patients with a traumatic or non-traumatic indication for an MRI of the elbow were included in the study.

All patients who gave their consent and underwent an MRI of the elbow were included in the study.

2.4. Non-Inclusion Criteria

The study did not include any altered or incomplete MRI records for which the indication could not be provided.

2.5. Data Collection and Analysis

The variables collected were:

- Age and gender;
- Profession;
- Nationality;
- Prescriber;
- Circumstance of occurrence;
- Functional signs;
- Examination quality;
- Lesion site;
- Pathologies found.

Data were collected confidentially, using an individual data collection form with appropriate variables, entered, and analyzed using Microsoft Excel software. These forms were completed after reading the MRI scans of the elbow.

We performed a descriptive analysis of the variables collected in the form of pro-portions.

3. Results

3.1. Epidemiological Data

A total of 13 patients were selected for the study. The mean age of patients was 40 ± 2.75 years, with extremes of 19 and 61 years. The population aged between 20 and 40 represented 92.3% (n = 13). The male population represented 53.84% and the female 46.15% of patients, i.e. a sex ratio of 1.16. The absence of any notion of elbow trauma was noted in 53.84% of patients, and the notion of trauma in 46.15% of patients (n = 13). By nationality, nine patients (69.77%) were Burkinabe, and four patients (30.23%) were expatriates. The distribution of patients by prescriber is shown in **Table 1**.

About the different occupations, 46.15% of patients were mining civil servants. **Table 2** shows the distribution of patients by profession.

3.2. Clinic

The distribution of patients according to the functional signs that prompted MRI is shown in **Table 3**.

Table 1. Distribution of patients by prescriber (n = 13).

Prescribers	Frequency	Percentage (%)
Rheumatologists	5	38.46
General practitioners	2	15.38
Orthopedic physicians	4	30.76
Surgical health attaché	1	7.69

3.3. Lesion Assessment

The distribution of patients according to the location of the various lesions is shown in Figure 1 and the distribution of patients by diagnosis in Table 4.

3.4. Iconography of Pathologies Found in the Study and Discussion

3.4.1. Lateral Epicondylitis

A 35-year-old sportsman and civil servant in the mines, consulted for mechanical pain of the left elbow without functional impotence, with persistent pain despite oral treatment. Figure 2 illustrates his case.

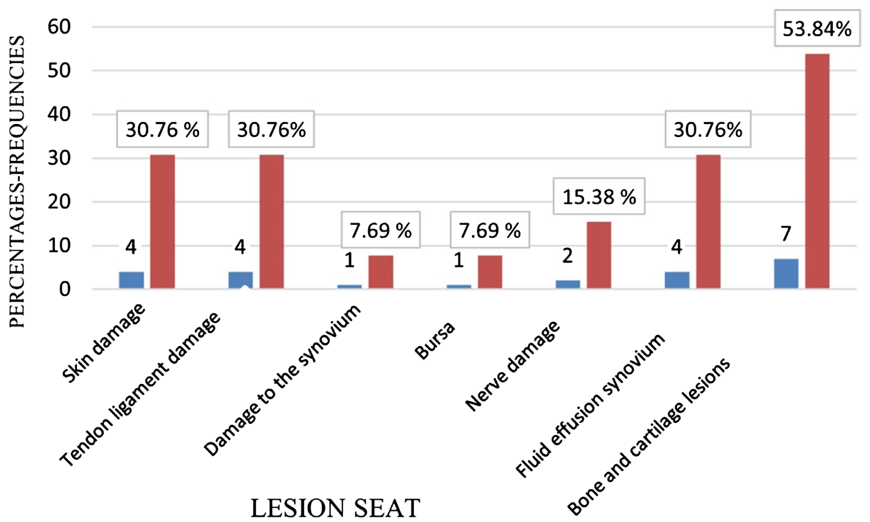
Table 2. Distribution of patients by profession (n = 13).

Prescribers	Frequency	Percentage (%)
Mining officials	6	46.15
Retailers	3	23.07
Radiologist	1	7.69
Factory worker	2	15.38
Student	1	7.69

Table 3. Distribution of patients according to functional signs (n = 13).

Functional symptoms	Frequency	Percentage (%)
Mechanical and chronic pain	6	46.15
Inflammatory and chronic pain	7	53.84
Moderate impotence	6	46.15
Ankylosis	3	23.07

NB: The same patient may present several functional symptoms.



NB: Several lesions may be observed in the same patient.

Figure 1. Distribution of patients according to lesion location (n = 13).

Table 4. Distribution of patients according to pathologies found.

Pathologies	Frequency (n)
Nerve damage: -Sequential fibrosis of the ulnar nerve -Workman's syndrome (median and ulnar nerves)	02
Villo-nodular articular synovitis	01
Simple dermo-hypodermatitis	01
Medial epicondylitis	02
Lateral epicondylitis	03
Subcutaneous type V lipoma and liposarcoma of the elbow	02
Osteoarthritis of the elbow	01
Normal	01
Anteromedial cortical fracture of the radial cup	01
Cortical detachment fracture of the lateral epicondyle	01

NB: The same patient may present with several pathologies.

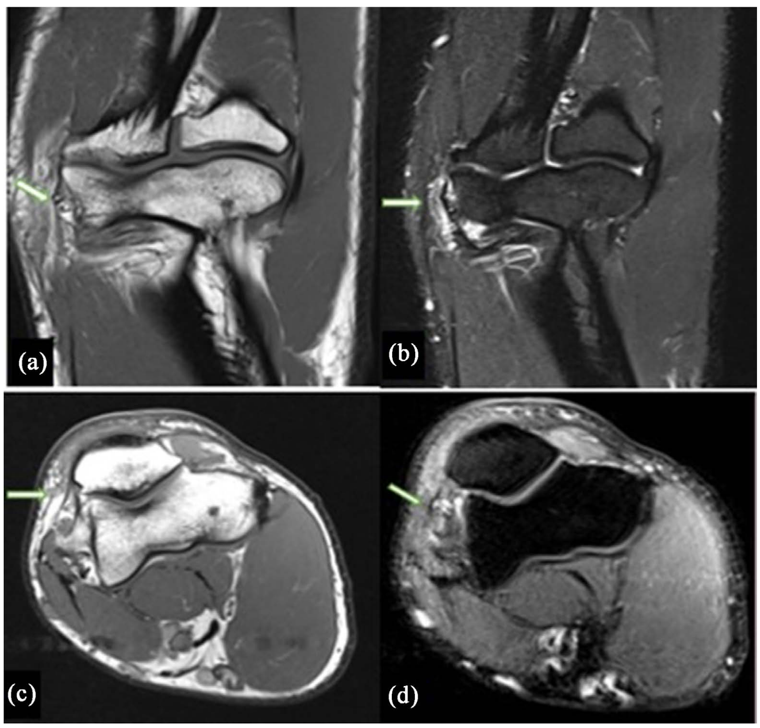


Figure 2. MRI of the right elbow: lateral epicondylitis: T1 DP coronal section (a), T1 DP fat saturation (FS) gadolinium (GADO) coronal section (b), T1 SE axial section (c), T1 SE FS GADO axial section (d). Thickening of the epicondylar tendon and hypersignal of the tendon insertion (white arrow). Discrete infiltration of subcutaneous fat and superficial external fascia with enhancement on injected sequences.

During the study period, three cases of lateral epicondylitis were encountered (right elbow: 2 patients and left elbow: 1 patient), two of which were associated with traumatic lesions. One patient had a history of SC hemoglobinopathy and radial bone infarction and presented with bilateral epicondylitis. Most patients consulted for elbow pain, predominantly on epicondylar pressure, associated with relative functional impotence, and occasionally, elbow swelling. In one case, the radial collateral ligament and lateral ulnar collateral ligament were affected.

On MRI, T1, T2, and fluid-attenuated inversion recovery (FLAIR) hypersignal abnormalities are seen in the common tendon of the lateral epicondyle muscles. In some cases, a liquid-type hypersignal may be present, in connection with a tendon rupture [3]. In the imaging centers where collection took place, the same protocol was used, and the descriptions led to the same conclusions.

3.4.2. Elbow Liposarcoma

A 19-year-old female patient with no pathological history, was seen for firm well-limited soft-tissue swelling of the elbow with chronic inflammatory pain. Her images are shown in **Figure 3**.

Two cases of lipomatous lesions were also found (one simple with benign features and another complex with several signs of malignancy). This was a grade V liposarcoma according to the World Health Organization (WHO) classification.

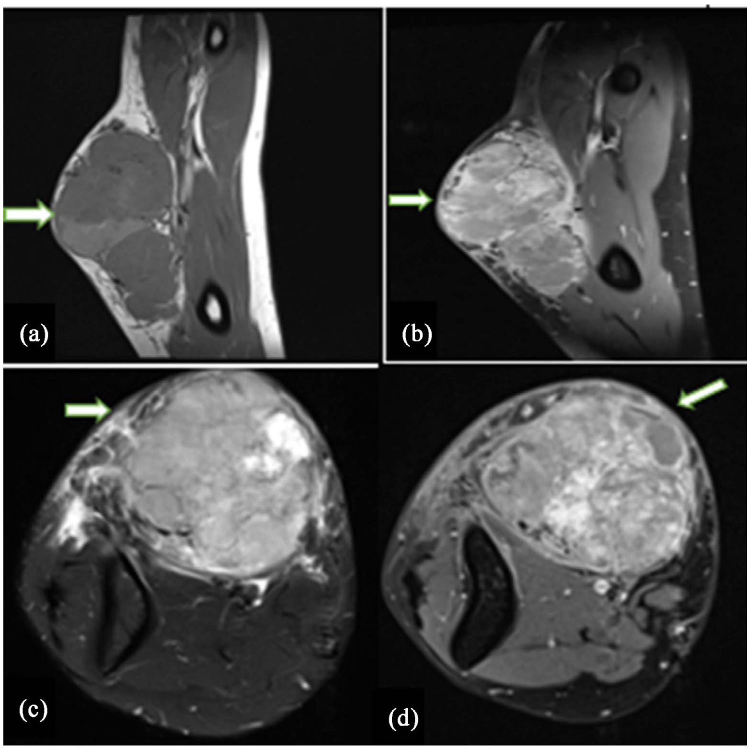


Figure 3. MRI of the left elbow with sagittal section T1 TSE (a), sagittal section T1 TSE FS GADO (b), axial section T2 STIR (c), axial section T1 SE FS GADO (d): heterogeneous tissue mass (white arrow) in the anteromedial region measuring 120 mm in height, 68 mm in transverse diameter and 60 mm in thickness. It is hypo signal T1, hyper signal T2, and STIR multi-partitioned, evenly contoured, and encapsulated. The enhancement is heterogeneous. The mass develops within the subcutaneous fat. It pushes back muscle structures without invading them. Vascular and neural structures are at a distance from the lesion. Integrity of bone structures.

Liposarcomas are classified into five WHO subtypes: well-differentiated, differentiated type, myxoid, pleomorphic, and mixed. These tumors are very rarely associated with neurofibromatosis, representing the most serious complication of this disorder [4].

3.4.3. Ulnar Tunnel Syndrome

A 42-year-old patient presented with a long-standing (8-months) trauma to the right elbow, presenting with mechanical pain with moderate functional impotence and a sensory-motor deficit in the ulnar nerve territory (weakness of thumb-index pinch). **Figure 4** illustrates his case.

On MRI, the main signs to look for are abnormalities in size and shape, as well as signal modification, which is variable. MRI can also be used to identify denervation lesions, showing hypersignal of muscle masses. MRI helps to distinguish between axonotmesis (possible nerve regeneration) and neurotmesis (definitive lesion). In the case of axonotmesis, muscle hyperintensity peaks in three to four weeks and then diminishes in six to eight weeks with functional recovery of the muscle. In the case of neurotmesis, the hypersignal persists

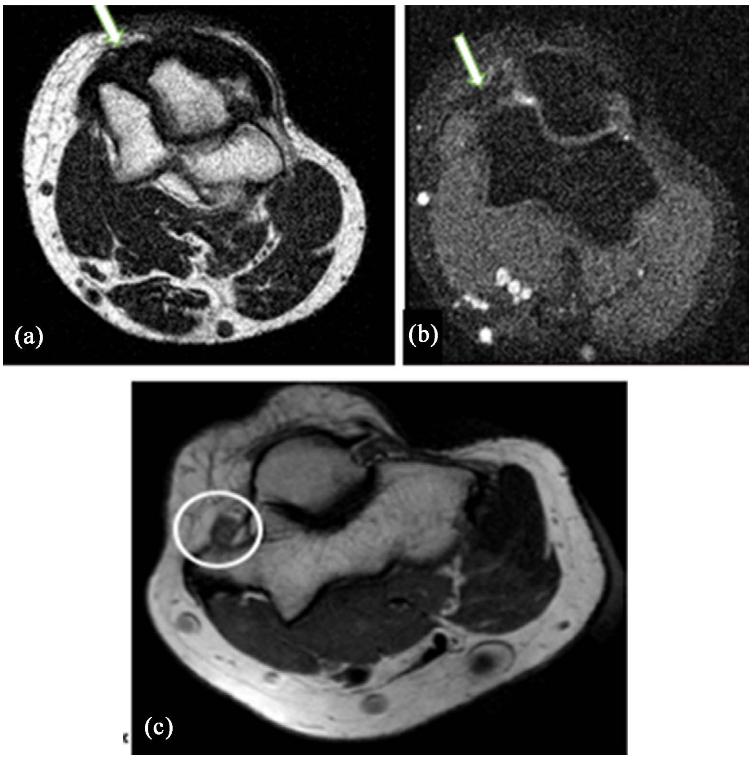


Figure 4. MRI of the left elbow: ulnar tunnel syndrome conflicting peri-nerve fibrosis of the ulnar nerve. Axial section T2 SE (a), axial section T1 SE FS (b), axial section T2 SE (c) normal elbow. Normal ulnar nerve (white circle). T1 and T2 hyposignal with peripheral fibrosis (T2 hyposignal) (white arrow). The ulnar nerve is followed in its normal course through the epitrochleo-olecranial defilement, which appears T1 and T2 hyposignal. Its caliber is discreetly increased, to a maximum of 10 mm, and its contours are blurred: moderate thickening of its fibers with no evidence of hypersignal. No visible continuity of the bony structures of the epitrochlear-olecranial canal. No ulnar nerve contrast after injection of gadolinium chelates, discrete peripheral contrast due to fibrosis.

beyond six to eight weeks. Muscle atrophy and fatty degeneration, best visualized in T1-weighted sequences, occur in cases of chronic denervation and are an indicator of irreversible muscle damage. MRI not only has a prognostic role but also a topographical one, by pinpointing the precise muscular distribution of denervation [2].

3.4.4. Villonodular Synovitis of the Elbow

A 33-year-old shopkeeper, presented with chronic swelling, mechanical pain, and ankylosis of the left elbow suggesting chronic synovitis on ultrasound. His images are shown in **Figure 5**.

Villonodular Synovitis (VNS) is a rare benign condition with an estimated annual incidence of 1.8 cases per million populations. It occurs mainly in young adults between the 3rd and 5th decade, as in our patient, and both sexes are equally affected. The etiopathogenesis of SVN remains unknown, but various hypotheses have been put forward: a local disorder of lipid metabolism, inflammatory synovial hyperplasia, repeated trauma, and hemorrhage. A distinction is made between localized forms affecting the joints, bursae, and tendon sheaths, and diffuse, mainly intra-articular forms. Localized forms account for 77% of

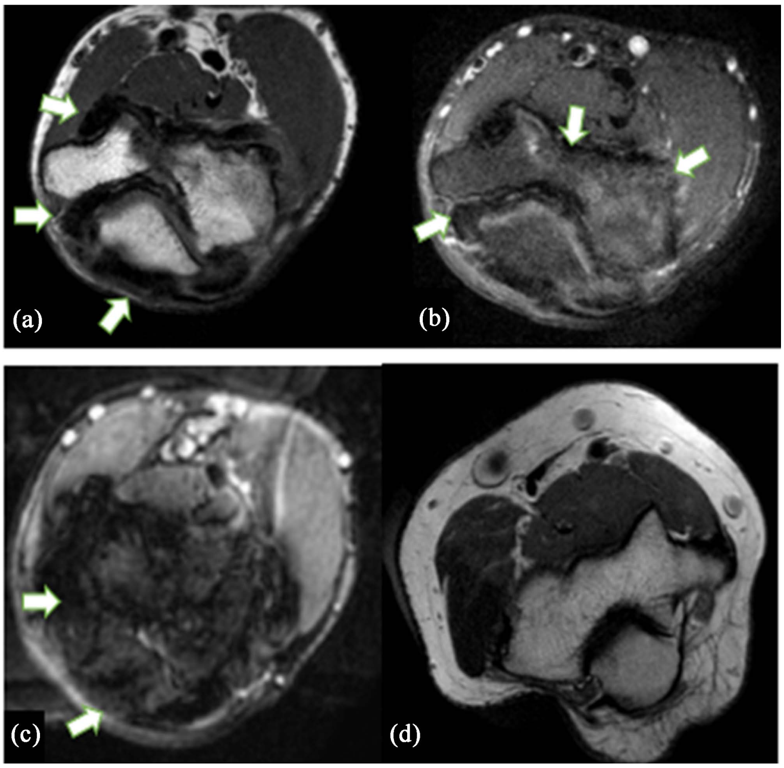


Figure 5. MRI of left elbow T1 TSE axial section (a), T1 TSE FS GADO axial section (b), T2 EG axial section (c), T1 TSE axial section (d) normal elbow. Heterogeneous periarticular tissue thickening in hyposignal T1, T2, DP but especially T2 EG (white arrow). There was contrast enhancement of this formation after injection of gadolinium chelates; multiple bone erosions involving the cortex of the olecranon (medial border), humeral paddle (epicondyles), and radial cup (medial border); diffuse hypersignal of the bone framework of the humeral paddle, cup, neck of the radius and olecranon (bone edema).

cases, mainly affecting the knee. Diffuse forms of SVN mainly affect the knee in 66% - 80% of cases, the hip in 4% - 16%, then the ankle, shoulder, and finally the elbow. Localization to the elbow is very rare (25 cases reported in the literature) [5]. As in our patients, clinical symptoms are highly variable and often misleading, leading to delayed diagnosis. Synovial biopsy, carried out arthroscopically or openly, enables the diagnosis of SVN to be made with certainty [6].

3.4.5. Dermohypodermatitis of the Right Elbow

A 39-year-old female patient with known diabetes, was seen for inflammatory-type swelling and pain with moderate functional impotence of the right elbow. Figure 6 illustrates his case.

3.4.6. Radial Cup Fracture and Lateral Epicondylitis

A 39-year-old female patient was seen for mechanical elbow pain with moderate functional impotence and had a history of trauma one month ago. Her images are shown in Figure 7.

3.4.7. Bilateral Epicondylitis and Radial Bone Infarction

A 39-year-old female radiologist, AS hemoglobinopathic, came with chronic

Figure 6. MRI of the right elbow: coronal section T1 SE SPAIR GADO (a) normal, sagittal section T1 TSE elbow normal (c). DP SPAIR GADO coronal section (b) and T1 TSE sagittal section (d): thickening and T2-weighted hypersignal and DP FAT SAT visible in the posterolateral soft tissues of the right elbow, consistent with edema (white arrow). There was no noticeable organized collection or contrast uptake of this infiltrate visible after injection of gadolinium contrast.

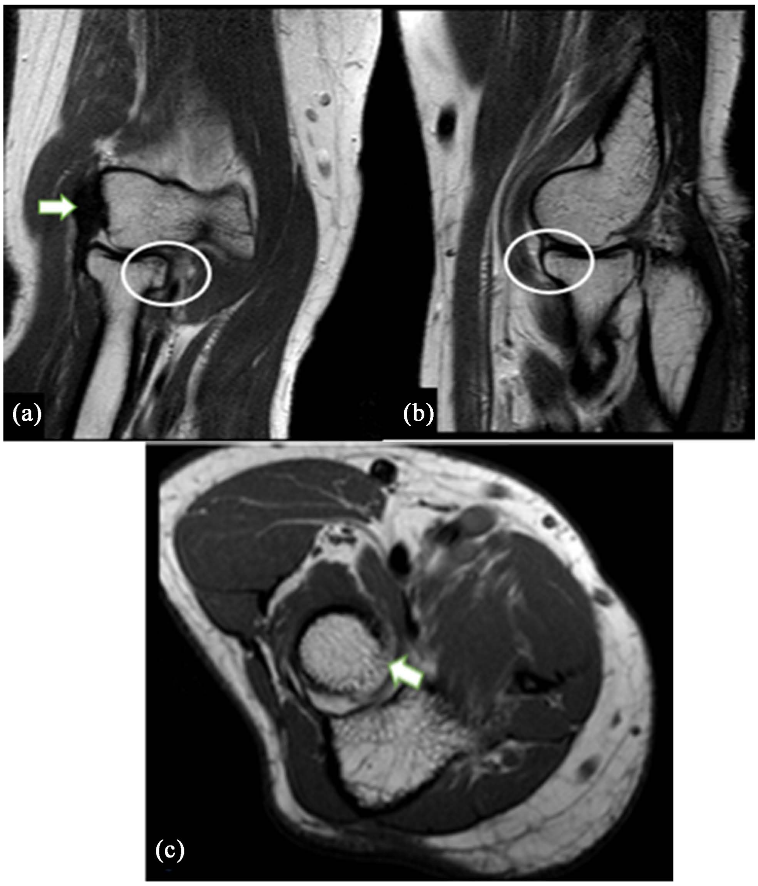


Figure 7. MRI of the left elbow T1 coronal section TSE (a), T1 sagittal section TSE (b), T1 axial section DP (c): irregularity of the anteromedial cortex of the cup with a line in DP hyposignal with no notable solution of continuity (circle and white arrow); thickening of the lateral epicondylar tendon and hypersignal at its insertion (white arrow).

inflammatory pain of the left elbow with moderate functional impotence. Figure 8 illustrates her case.

3.4.8. Epicondylar Detachment Fracture and Intra-Articular Bone Fragment

A 32-year-old patient was seen for chronic mechanical pain of the left forearm and bursitis demonstrated on ultrasound. His images are shown in Figure 9.

3.4.9. Normal Elbow MRI for Suspected Ulnar Canal Syndrome

A 61-year-old patient was admitted for right elbow trauma with mechanical pain, functional impotence of the left thoracic limb, and ulnar nerve compression syndrome (paresthesia of the 5th finger). Figure 10 illustrates his case.

4. Conclusion

MRI, as a complement to ultrasound and radiographic assessment, remains the most informative examination for exploring soft-tissue pathologies of the elbow. Our atlas consisted of images of the main pathologies found in our context, dominated by epicondylitis, some of which were associated with traumatic and

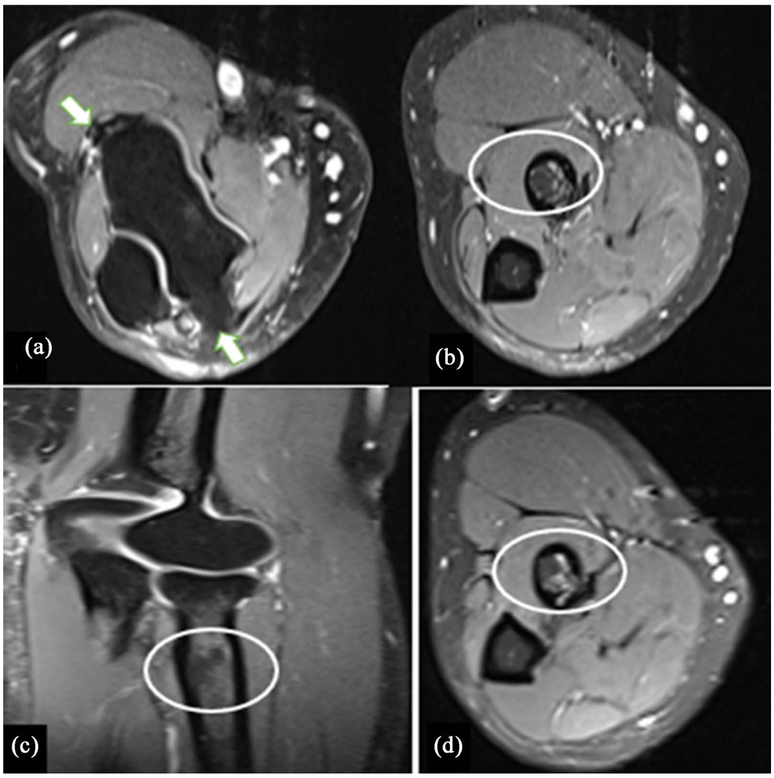


Figure 8. MRI of the left elbow T1 axial section TSE FAT SAT (a), T1 axial section TSE FAT SAT (b), T1 coronal section TSE FAT SAT (c), T2 axial section TSE FAT SAT (d): the focus of bone infarction in the upper third of the radius (white circle) measuring 8 × 6 mm, in T1 hypo signal (b) and T2 and FLAIR hyper signal (d), with irregular contours and not enhanced after gadolinium injection; bilateral thickening of the epicondylar tendons and discrete hyper signal at the tendon insertion (white arrow).

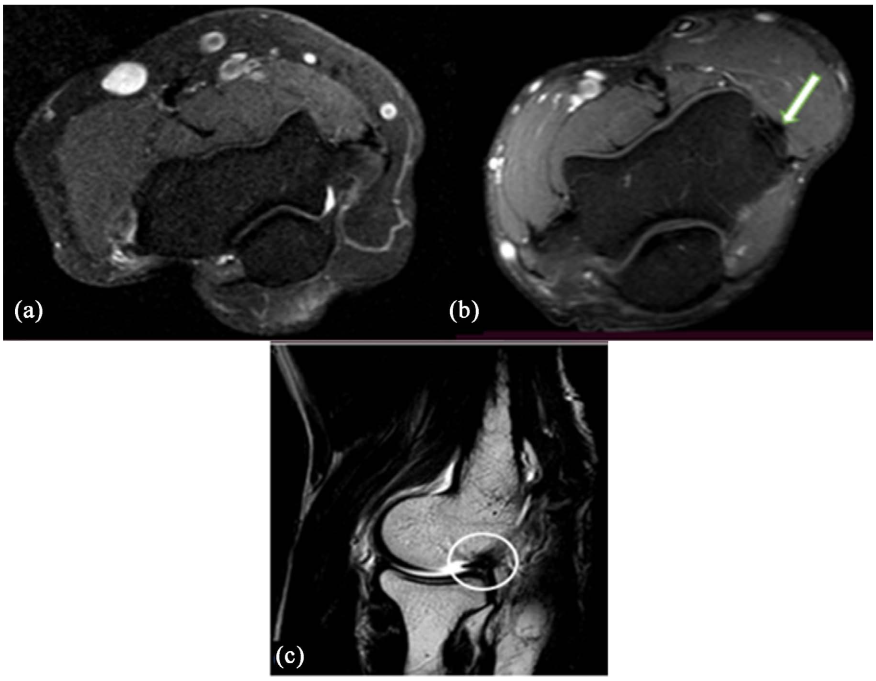


Figure 9. MRI of the right elbow axial section T1 FAT SAT GADO (a) normal elbow, axial section T1 FAT SAT GADO (b), and sagittal section T2 SE (c): irregularity with continuity solution over 8 mm of the cortex of the lateral epicondyle (white arrow); 6 mm bone fragment intra capsular joint between the radial head and the humeral paddle (white circle).

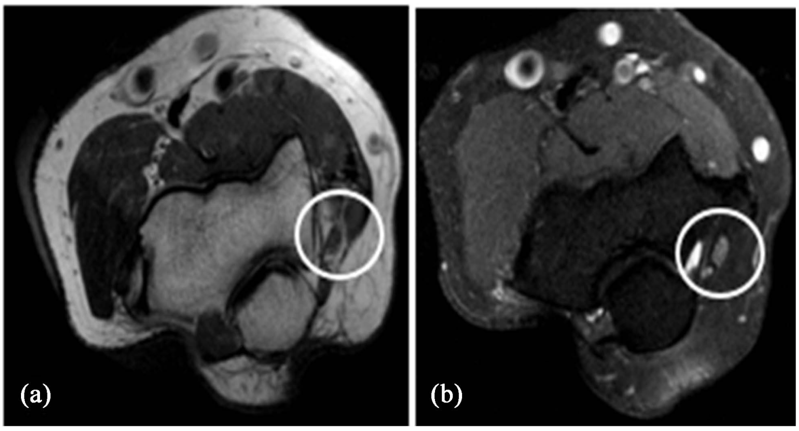


Figure 10. MRI of normal left elbow, section through the epitrochleo-olecranial canal: normal ulnar nerve (white circle); T1 axial section TSE (a), T2 axial section FAT SAT GADO (b): normal ulnar nerve isosignal T1 and hypersignal T2 GADO. The ulnar nerve, followed in its normal anatomical course through the epitrochleo-olecranial defilement, shows normal caliber (5 mm) and regular contours with no thickening of its fibers or hypersignal. There was no visible bony continuity of the epitrochleo-olecranial canal. There were no significant signal abnormalities or periarticular or intraarticular soft tissue collections. Signal integrity of the flexor and extensor tendons of the right elbow was noted.

non-traumatic bone lesions. These were followed by subcutaneous lipomatous lesions, namely lipoma and liposarcoma. Villonodular synovitis, ulnar tunnel syndrome, and elbow dermo-hypodermitis were lesions found in our study, whose images, through several sequences, provided a good understanding of these pathologies. The protocols used were those established by the French College of Radiologists. However, non-systematic sequences (gradient echo, diffusion, and gadolinium injection) were used specifically according to the lesion found. Pain, the most frequent reason for consultation, was most often chronic, having previously motivated other radiological modalities (standard radiography, ultrasound). MRI of the elbow remains a rare indication in our context, which explains the size of the study population, but it remains the best indication for all chronic elbow conditions.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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