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Interest in daily clinical practice of screening for gouty disease in patients with psoriatic arthritis

Vanessa Moukarzel[1,*], Marie Doussière[1], Vincent Barbier[2], Jimmy Menis[1], Laure Le Monnier[1], Sarah Salomon-Goëb[1,3], Maxime Aboudiab[1,4], Vincent Goëb[1]

[1]Department of Rheumatology, University Hospital of Amiens, Amiens, France
[2]Department of Physical Medicine and Rehabilitation, Centre Hospitalier de Corbie, Corbie, France
[3]Department of Rheumatology, Clinique Victor Pauchet, Amiens, France
[4]Department of Rheumatology, Centre Hospitalier de Beauvais, Beauvais, France

*Correspondence to: Vanessa Moukarzel, Department of Rheumatology, CHU Amiens—Picardie; 1 Rue du Professeur Christian Cabrol, 80000 Amiens, France. E-mail: moukarzel.vanessa@chu-amiens.fr

Abstract

Objectives: PsA and gout are two prevalent rheumatic diseases, that can be associated as part of a rheumatism known as 'Psout'. Both conditions are associated with cardiovascular (CV) risk, thus their co-occurrence could have significant implications for the management of CV risks and patient care. This study aimed to determine the prevalence of gout within a PsA patient cohort and, consequently, to identify factors associated with this pathological association.

Methods: This is an observational, descriptive, cross-sectional, single-center study, including patients diagnosed with PsA. Demographic, clinical, biological and imaging data were collected. We identified the proportion of patients simultaneously affected by PsA and gout and compared characteristics between those with and without gout.

Results: The prevalence of gout among PSA patients was 9.8% (12/122), with a prevalence of 23% for asymptomatic hyperuricemia and 7.4% presenting with specific US signs of gout. Significant associated factors in the univariate analysis included weight, hypertension, diabetes, certain medications (diuretics, aspirin, lipid-lowering agents), impaired renal function, elevated fasting blood glucose, lipid abnormalities and specific US signs of gout.

Conclusion: Our study has described the existence of patients simultaneously affected by PsA and gout ('Psout'). Performing joint US along with uric acid level measurements in PsA patients can enable personalized therapeutic care.

Lay Summary

What does this mean for patients?
Psoriatic arthritis (PsA) and gout are two common rheumatic diseases that can coexist in the same individual. Not recognizing this association can pose a challenge in the usual therapeutic management of patients. For people with PsA, identifying gout can lead to better management of their rheumatism, particularly in the selection of treatment, permitting an appropriate care approach for both diseases. Furthermore, both PsA and gout are known to increase the risk of heart problems and, consequently, the likelihood of death. Highlighting this association and the higher risk of heart problems in affected patients serves as a reminder for healthcare practitioners. Indeed, the overall management of people with PsA involves conducting a comprehensive cardiovascular assessment and managing the prevention of heart problems, especially in the risk of associated gout.

Keywords: PsA, gout, hyperuricemia, ultrasonography, diagnostic imaging, cardiometabolic risk factors.

Key messages

- In a population of psoriatic arthritis patients, nearly 1/10 presented with concomitant gout.
- Uric acid levels and joint ultrasound can identify psoriatic arthritis patients at risk of gout.
- Personalized treatment and cardiovascular prevention is essential for psoriatic arthritis patients with gout

Introduction

PsA is a chronic inflammatory rheumatism affecting approximately 0.1% of the French population [1]. Current diagnosis primarily relies on the CASPAR criteria (Supplementary Data S1, available at *Rheumatology Advances in Practice* online); however, its polymorphous presentations often pose diagnostic challenges. In the case of delayed diagnosis or misdiagnosis, PsA can lead to irreversible joint destruction

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and, consequently, to functional and psychological impairment [2].

Gout is a microcrystalline rheumatism that is the most common cause of inflammatory arthritis, with an estimated frequency of 0.9% in France and up to 2.5% in Europe [3, 4]. Gout diagnosis also presents challenges. In fact, uricemia measurement is insufficient since only 5–18% of individuals with asymptomatic hyperuricemia will develop gout [5]. Moreover, uricemia levels are often within the normal range during gout attacks due to hyperuricosuria.

The current recommendations for gout diagnosis, published in 2016 by EULAR, set the identification of monosodium urate (MSU) crystals in synovial fluid as the gold standard [6]. The 2018 revision of these guidelines [7] suggests using joint ultrasound (US) to aid in the diagnosis of gouty arthropathy in cases where joint aspiration is not feasible and clinical presentation is atypical. Indeed, 15–25% of patients with asymptomatic hyperuricemia exhibit subclinical MSU crystal deposits [8].

US signs of gout have been described by the Outcome Measures in Rheumatology (OMERACT) [9]. The double contour (DC) sign or the detection of tophi represents the most specific signs (specificity ranging between 91% and 100%) [10]. Aspecific signs include: the 'snowstorm' (suggestive of a microcrystalline pathology without specificity), erosions, synovitis, tenosynovitis and intra-articular effusions, all of which can be associated with Doppler signal activity.

The association between gout and psoriasis/PsA has been described since the 1980s [11–15]. A recent article introduced the concept of a pathological overlap between microcrystalline and inflammatory rheumatism, commonly called 'Psout' [16]. This article elucidates the pathogenic role of chronic hyperuricemia and MSU crystals in the development and chronicity of PsA based on a review of the literature from 1950 to 2019. Common pathophysiological hypotheses include increased epidermal turnover in psoriatic skin, leading to uric acid release from cells and subsequent predisposition to hyperuricemia and MSU deposition [17], or activation of the Th17 pathway by uric acid and MSU crystals, involved in the genesis of spondyloarthritis and thus PsA [18].

Lastly, this study was motivated by the cardiovascular (CV) risk associated with these two pathologies [19, 20], which, when coexisting in the same patient, multiplies the risk of CV events. Indeed, PsA and gout are each considered independent CV risk factors [21–24], and CV events represent the primary cause of death in PsA patients. Moreover, PsA management recommendations underline the need to systematically assess CV risk in patients [25]. However, there exists no standardized examination or follow-up protocol. Therefore, the inclusion of gout risk and the presence of asymptomatic hyperuricemia appear important in evaluating cardio-vascular risk.

Thus, the main objective of this study was to determine the prevalence of gout in a population of PsA patients. The secondary objective was to identify factors associated with the presence of gout in PsA patients, permitting to identify a population with a higher CV risk that requires personalized therapeutic management.

Methods

Study design and study population

This is an observational, descriptive, cross-sectional and single-centre study, including patients followed for PsA at the Rheumatology department of the University Hospital of Amiens-Picardie (France). A total of 325 patients were identified from various sources, including the Amiens cohort established by Menis *et al.* [26], new patients from outpatient consultations and day hospitals, and the hospital's PMSI database (using ICD-10 coding for PsA [L405] from 2016 to 2022). All patients included in the study were aged over 18 years. Patients whose diagnosis did not meet the CASPAR criteria for PsA (incorrect coding) were excluded.

Among the 300 eligible patients, 122 underwent joint US with examination of the first MTP joints, the ankles and the knees, to identify US signs of gout. Additionally, a biological assessment was conducted, including the measurement of uric acid levels. Data from these 122 patients were included in the statistical analysis (Fig. 1).

The study was conducted from January 2022 to May 2023 using the Psoriatic Arthritis Cohort established by Menis *et al.* (project identification code PI2022_843_0090) [26], approved by the 'Direction de la recherche clinique et de l'innovation' (DRCI) of the University Hospital of Amiens-Picardie, 80000 Amiens, France, on 8 June 2022.

All included patients confirmed their non-opposition to participating in this study and provided verbal informed consent for the publication of their data, in accordance with the reference methodology MR-003 [27].

Data collection and joint ultrasound procedures

All US examinations were performed by trained rheumatologists from the Amiens-Picardie University Hospital, including Dr Touboul, Dr Le Monnier, Dr Aboudiab, Dr Salomon-Goëb, Dr Doussière, Dr Moukarzel, Dr Jesson, Dr Diep, Dr Deprez and Dr Lim, using the department's US machines (GE LOGIQ S8 R4 OLED, production in July [SN: 510647SU2] and November [SN: 508161SU2] 2019, Korea)

The objective of the US examination was to identify specific signs of gout in the first MTP joints, ankles and knees.

On the day of the US, recent blood test results were collected, and a questionnaire was completed by the rheumatologist, with patient participation, to gather information on comorbidities, use of gout-inducing medications, and particularly the history of gout attacks. Missing or uncertain data were cross-referenced with electronic medical records available on the DxCare software used at the Amiens-Picardie University Hospital, or exported from the data collection of the Menis *et al.* cohort [26].

The 2015 ACR/EULAR Gout classification score [28] (Supplementary Data S2, available at *Rheumatology Advances in Practice* online) was subsequently calculated for each patient, using the available data, to reinforce the statements of patients who reported having experienced a gout attack.

Radiographs stored in the hospital's software were reviewed to identify evidence of damage due to PsA or gout. In cases where radiographs were unavailable, interpretations were recovered from patients' medical records.

Statistical analysis

Statistical analyses were conducted using the IBM SPSS Statistics software (version 25). Initially, a descriptive analysis of the population was performed, employing percentages for qualitative variables and means for quantitative variables. The normality of distribution for each quantitative variable was assessed using a Shapiro–Wilk test. Subsequently, a univariate analysis was conducted, using the history of gout

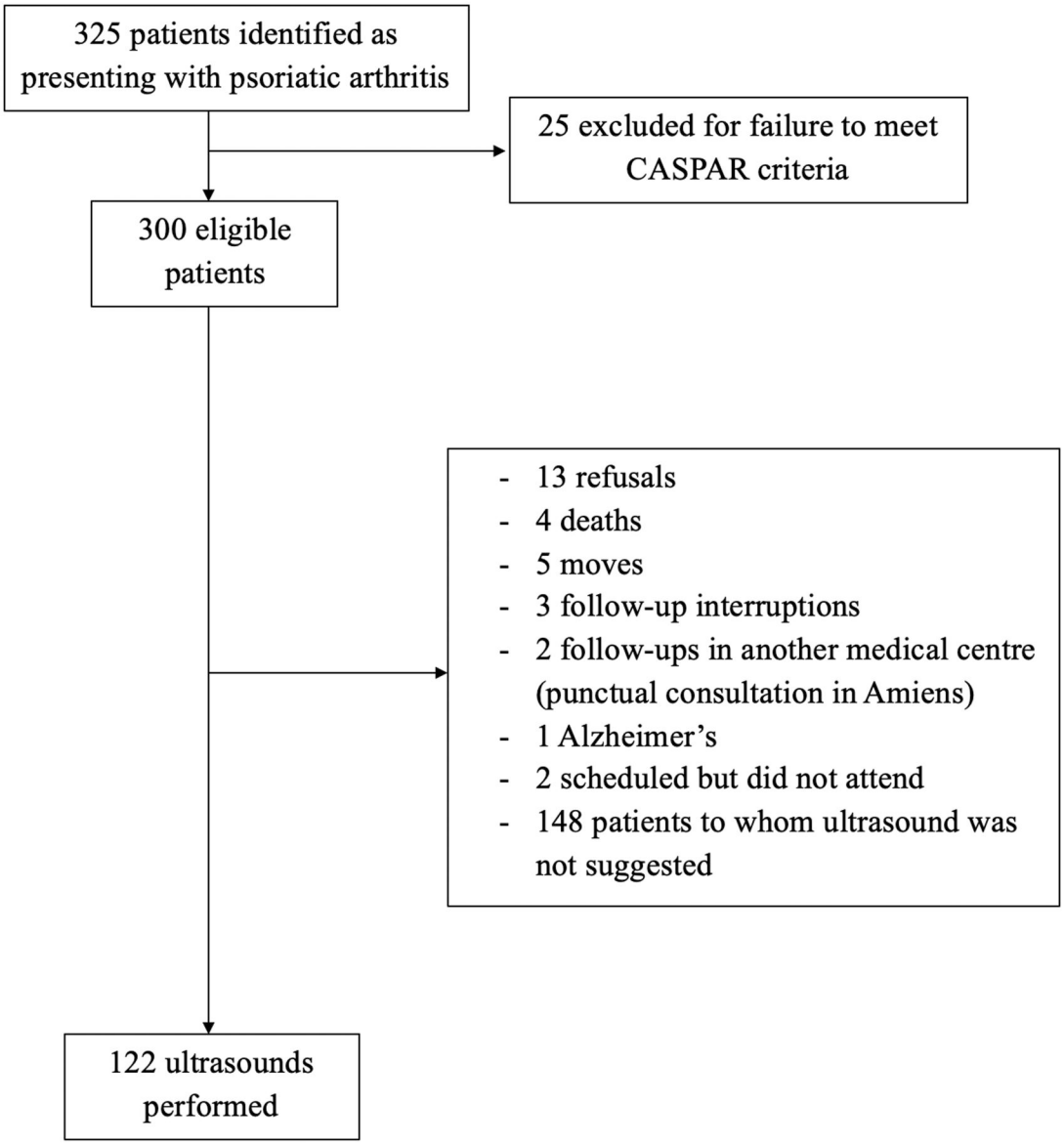

Figure 1. Flow chart

attacks as the variable of interest. The Chi-square test or Fisher's exact test was applied for qualitative variables and parametric ANOVA or non-parametric Mann–Whitney test was used for quantitative variables. A P-value < 0.05 was considered significant. Multivariate analysis was not performed due to sample size limitations.

Results

Descriptive analysis and primary objective

A total of 122 patients underwent joint US and were included in the analysis. There were more women than men (73 women representing 59.8%, and 49 men representing 40.2%), with a mean age of 55.21 years. The mean BMI was 29.1 kg/m^2, with 51% of the population classified as overweight and 46% as obese.

Purely peripheral involvement was predominantly observed (53.3%) and the average duration of the disease was 13.5 years. Three patients had no associated dermatological involvement, one patient was additionally being treated for Crohn's disease, and seven patients had a history of uveitis. *HLA-B27* was tested in 86 patients, with a positive result in 20 individuals.

Regarding the primary objective, 12 patients reported a history of gout attacks, representing 9.8% of the population. The 2015 ACR/EULAR gout score for these 12 patients ranged from 9 to 18 (Supplementary Data S3, available at *Rheumatology Advances in Practice* online). Additionally, specific US signs of gout were identified in nine patients, accounting for 7.4% of the population (Fig. 2). Concerning hyperuricemia, defined as an uric acid level exceeding 360 µmol/l [29], it was detected in 29.5% of patients, with 23% presenting with asymptomatic hyperuricemia (uric acid level $>$ 360 µmol/l without a history of gout attacks) (Fig. 3).

Table 1 summarizes all the collected characteristics. Supplementary Data S4, available at *Rheumatology Advances in Practice* online, provides an overview of the specific US signs of gout that were identified.

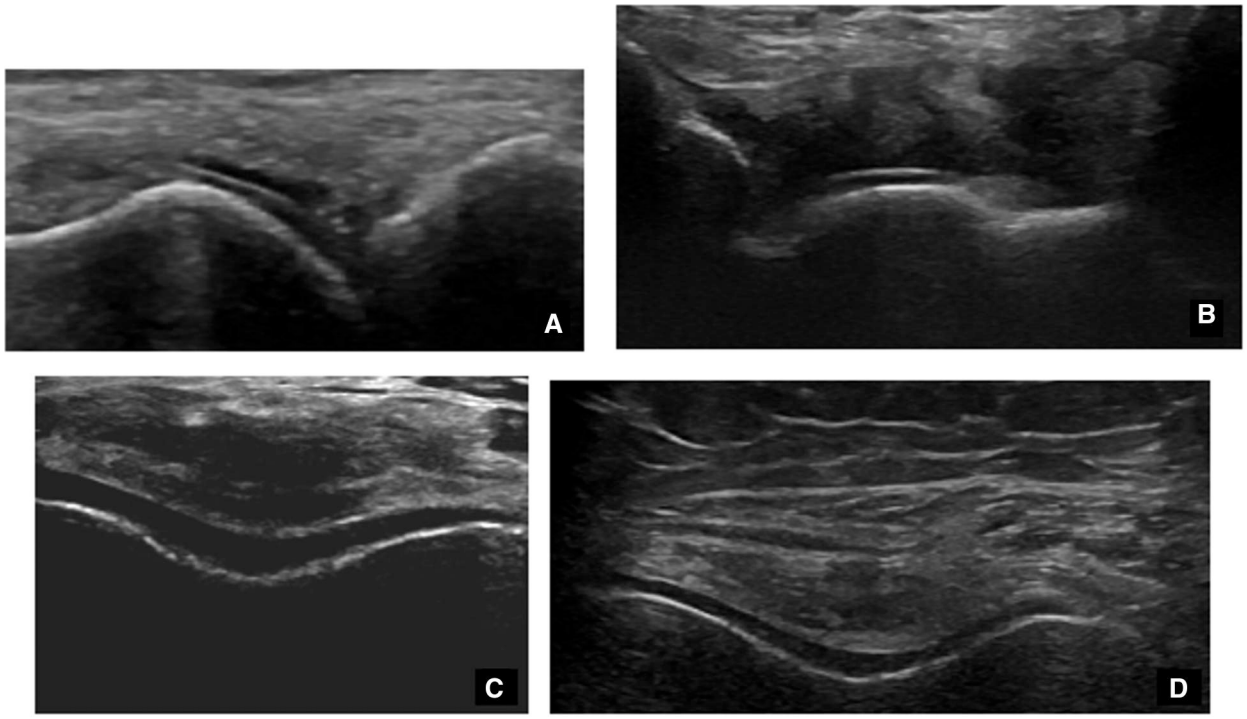

Figure 2. Examples of US signs identified in our study. (A) DC sign in the left first MTP joint. (B) DC sign in the right talocrural joint. (C and D) DC sign in the right trochlear cartilage

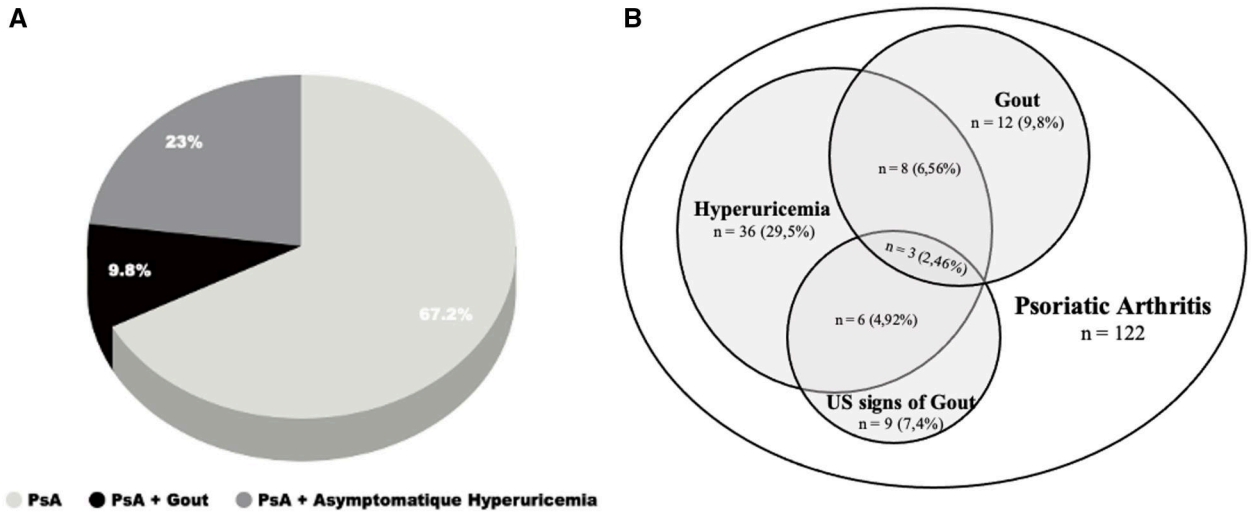

Figure 3. Distribution of the studied population according to their history of gout attacks, and presence of asymptomatic hyperuricemia and US signs of gout

Univariate analysis

To identify factors associated with the risk of developing a gout attack in patients with PsA, we compared the collected characteristics between two groups: those with a history of gout attack ($n = 12$) and those without ($n = 110$). Although there was a higher proportion of men in the 'history of gout' group compared with the 'PsA without gout' group (66.7% and 37.3%, respectively), the sex variable was not significant in univariate analysis. Similarly, BMI was not significant between the two groups (average of 31.32 kg/m^2 in the 'history of gout' group versuss 28.85 kg/m^2 in the 'PsA without gout' group). However, the weight variable was significantly higher in the 'history of gout' group with an average of 90.33 kg compared with 81.40 kg in the 'PsA without gout' group (P-value = 0.033). Various characteristics of PsA were similar between the two groups, including the duration of PsA, the form of the rheumatism and the presence of the *HLAB27* allele (P-values at 0.63, 0.407 and 0.193, respectively).

Regarding comorbidities, a significant difference was observed between the two groups for hypertension (P-value = 0.008), diabetes (P-value = 0.005) and the use of lipid-lowering agents (P-value = 0.002). No significant difference was found regarding smoking and alcohol consumption.

The use of diuretics and low-dose aspirin was also significantly different between the two groups (P-values at 0.001 and 0.021, respectively). In terms of disease-modifying anti-

Table 1. Demographic, clinical, biological, therapeutic and imaging characteristics of the study population ($N = 122$)

Demographic characteristics	
Age, mean (S.D.), years	55.21 (12.49)
Sex	
• Men, *n* (%)	49 (40.2)
• Women, *n* (%)	73 (59.8)
Weight (kg), mean (S.D.)	82.28 (13.81)
Height (cm), mean (S.D.)	167.00 (17.6)
BMI (kg/m^2), mean (S.D.)	29.1 (4.8)
• Underweight (<18.5 kg/m^2), *n* (%)	0 (0)
• Normal (18.5–25 kg/m^2), *n* (%)	25 (20.5)
• Overweight (25–30 kg/m^2), *n* (%)	51 (41.8)
• Obesity (>30 kg/m^2), *n* (%)	46 (37.7)
Characteristics of PsA	
Age at onset of joint symptoms, mean (S.D.), years	41.83 (13.23)
Duration of PsA, mean (S.D.), years	13.5 (12.22)
Form of PsA : involvement	
• Peripheral, *n* (%)	65 (53.3)
• Axial, *n* (%)	17 (13.9)
• Mixed, *n* (%)	40 (32.8)
Psoriasis, *n* (%)	119 (97.5)
• Plaque, *n* (%)	101 (82.8)
• Inverse, *n* (%)	27 (22.1)
• Guttate, *n* (%)	5 (4.1)
• Scalp, *n* (%)	55 (45.1)
• Nail, *n* (%)	35 (28.7)
• Palmo-plantar, *n* (%)	12 (9.8)
Associated IBD, *n* (%)	1 (0.8)
History of uveitis, *n* (%)	7 (5.7)
HLAB27	
• Presence, *n* (%)	20 (16.4)
• Absence, *n* (%)	66 (54.1)
• Not available, *n* (%)	36 (29.5)
Comorbidities	
History of gout attacks, *n* (%)	12 (9.8)
Hypertension, *n* (%)	44 (36.1)
Diabetes, *n* (%)	20 (16.4)
Active or quit smoking < 3 years ago, *n* (%)	28 (23)
Chronic alcohol consumption, *n* (%)	7 (5.7)
Hematological disorder, *n* (%)	0 (0)
Medical treatment[a]	
NSAIDs alone, *n* (%)	2 (1.6)
sDMARDs, *n* (%)	75 (61.5)
• Methotrexate, *n* (%)	66 (54.1)
• Leflunomide, *n* (%)	5 (4.1)
• Sulfasalazine, *n* (%)	1 (0.8)
• Apremilast, *n* (%)	3 (2.5)
bDMARDs, *n* (%)	88 (72.1)
• Anti-TNF, *n* (%)	60 (49.2)
• Anti-IL17, *n* (%)	19 (15.6)
• Anti-IL12/23, *n* (%)	2 (1.6)
• Anti-IL23, *n* (%)	4 (3.3)
• JAKi, *n* (%)	3 (2.5)
Urate-lowering therapy, *n* (%)	6 (4.9)
Diuretics, *n* (%)	15 (12.3)
Low-dose aspirin, *n* (%)	19 (15.6)
Lipid-lowering agents, *n* (%)	31 (25.4)
PPI, *n* (%)	44 (36.1)
Biological characteristics	
Uric acid (µmol/l), mean (S.D.)	326.76 (91.44)
• Hyperuricemia (>360 µmol/l), *n* (%)	36 (29.5)
Asymptomatic hyperuricemia, *n* (%)	28 (23)
Creatinine (µmol/l), mean (S.D.)	75.95 (24.73)
eGFR CKD EPI (ml/min), mean (S.D.)	87.76 (17.59)
Kidney failures:	
• Absence or mild	115 (94.3)
• Moderate (30–60 ml/min), *n* (%)	5 (4.1)
• Severe (15–30 ml/min), *n* (%)	2 (1.6)
• End stage (<15 ml/min), *n* (%)	0 (0)
Fasting blood glucose (g/l), mean (S.D.)	1.05 (0.25)
HbA1c (%), mean (S.D.)	5.84 (0.97)
LDLc (g/l), mean (S.D.)	1.18 (0.42)
HDLc (g/l), mean (S.D.)	0.54 (0.15)
TG (g/l), mean (S.D.)	1.41 (0.8)
• Hypertriglyceridemia (>1.5 g/l), *n* (%)	42 (34.4)
Imaging	
Specific US signs of gout, *n* (%)	9 (7.4)
Marginal erosions (radiographs), *n* (%)	24 (19.7)
Bone construction (radiographs), *n* (%)	17 (13.9)

[a] None of the patients included in the statistical analysis were treated with the following medications: Ciclosporin, Tacrolimus, Pyrazinamide, Ethambutol, Teriparatide or Antiretrovirals.

rheumatic drugs (DMARDs), treatment with anti-IL12/23 was significantly associated with the 'history of gout' group.

For biological values, a significant difference was observed for uric acid levels (average of 409.33 µmol/l in the 'history of gout' group versus 317.59 µmol/l in the 'PsA without gout' group; P-value = 0.001), as well as for creatinine, fasting blood glucose, and lipid profile (HDL cholesterol and triglycerides). LDL cholesterol was also significant, but with a higher value in the 'PsA without gout' group.

The presence of specific US signs of gout was significantly different between the two groups, with a P-value of 0.044 (25% in the 'history of gout' group and 5.5% in the 'PsA without gout' group). Data of the univariate analysis are presented in Table 2.

Discussion

Our study revealed a prevalence of 9.8% of patients presenting with both gout and PsA, a rate higher than the prevalence of gout in Europe, estimated between 0.9% and 2.5% [3, 4]. Additionally, a literature review published in 2020 [30] indicated the highest prevalence of gout in Australia, reaching up to 6.8%, a value still lower than what was observed in our population. These findings suggests that patients with PsA may have an elevated risk of developing concomitant gout.

Limited studies have specifically assessed the proportion or risk of gout in PsA. Two recent studies from 2015 [15] and 2019 [31] found the risk of developing gout in PsA patients to be multiplied by 4.95 (95% CI [2.72–9.01]) and 2.03 (95% CI [1.75–2.36]), respectively. Another study found a proportion of 6.2% of gout in a population of 242 patients with PsA [32].

Hyperuricemia was also prevalent in our population, with 29.5% of patients exhibiting elevated uric acid levels and 23% having asymptomatic hyperuricemia. These results are consistent with other studies, which have reported hyperuricemia rates ranging from 21% to 31.9% in PsA populations [26, 32–35].

However, due to the lack of standardized definitions for hyperuricemia, drawing definitive conclusions from these values is challenging. In our study, we defined hyperuricemia as uric acid levels >360 µmol/l, a threshold associated with an increased risk of gout attacks. Indeed, at a temperature of 35°C, MSU crystals crystallize from the level of 360 µmol/l

Table 2. Univariate analysis: Comparison of variables based on the presence or absence of a history of gout

	PsA with gout ($n = 12$)	PsA without gout ($n = 110$)	*P*-value
Age, mean (S.D.), years	61.50 (13.427)	54.53 (12.252)	0.066
Sex			0.064
• Men, *n* (%)	8 (66.7)	41 (37.3)	
• Women, *n* (%)	4 (33.3)	69 (62.7)	
Weight (kg), mean (S.D.)	90.33 (15.222)	81.40 (13.427)	**0.033**
Height (cm), mean (S.D.)	169.88 (12.523)	167.36 (18.101)	0.720
BMI (kg/m^2), mean (S.D.)			
• Underweight (<18.5 kg/m^2), *n* (%)	31.32 (4205)	28.85 (4811)	0.091
• Normal ([18.5–25[kg/m^2), *n* (%)	1 (8.3)	24 (21.8)	0.460
• Overweight ([25–30 [kg/m^2), *n* (%)	4 (33.3)	47 (42.7)	0.759
• Obesity (>30 kg/m^2), *n* (%)	7 (58.3)	39 (35.5)	0.208
Age at onset of joint symptoms, mean (S.D.), years	45.9 (14.7)	41.4 (13.1)	0.320
Duration of PsA, mean (S.D.), years	15.6 (15.7)	13.3 (11.8)	0.630
Form of PsA : involvement			0.407
• Peripheral, *n* (%)	8 (66.7)	57 (51.8)	
• Axial, *n* (%)	0 (0)	17 (15.5)	
• Mixed, *n* (%)	4 (33.3)	36 (32.7)	
Psoriasis, *n* (%)	11 (91.7)	108 (98.2)	0.269
• Plaque, *n* (%)	10 (90.9)	91 (84.3)	1.000
• Inverse, *n* (%)	2 (18.2)	25 (23.1)	1.000
• Guttate, *n* (%)	0 (0)	5 (4.6)	1.000
• Scalp, *n* (%)	3 (27.3)	52 (48.1)	0.220
• Nail, *n* (%)	4 (36.4)	31 (28.7)	0.729
• Palmo-plantar, *n* (%)	0 (0)	12 (11.1)	0.600
Associated IBD, *n* (%)	1 (8.3%)	0 (0)	0.098
History of Uveitis, *n* (%)	0 (0)	7 (6.4)	1.000
HLAB27			
• Presence, *n* (%)			0.193
• Absence, *n* (%)	0 (0)	20 (25.3)	
• Not available, *n* (%)	7 (100)	59 (74.7)	
Hypertension, *n* (%)	9 (75)	35 (31.8)	**0.008**
Diabetes, *n* (%)	6 (50)	14 (12.7)	**0.005**
Active or quit smoking < 3 years ago, *n* (%)	2 (16.7)	26 (23.6)	0.732
Chronic alcohol consumption, *n* (%)	1 (8.3)	6 (5.5)	0.525
NSAIDs alone, *n* (%)	0 (0)	2 (1.8)	1.000
sDMARDs, *n* (%)	6 (50)	69 (62.7)	0.534
• Methotrexate, *n* (%)	6 (50)	60 (54.5)	0.764
• Leflunomide, *n* (%)	0 (0)	5 (4.5)	1.000
• Sulfasalazine, *n* (%)	0 (0)	1 (0.9)	1.000
• Apremilast, *n* (%)	0 (0)	3 (2.7)	1.000
bDMARDs, *n* (%)	9 (75)	79 (71.8)	1.000
• Anti-TNF, *n* (%)	3 (25)	57 (51.8)	0.078
• Anti-IL17, *n* (%)	4 (33.3)	15 (13.6)	0.092
• Anti-IL12/23, *n* (%)	2 (16.7)	0 (0)	**0.009**
• Anti-IL23, *n* (%)	0 (0)	4 (3.6)	1.000
• JAKi, *n* (%)	0 (0)	3 (2.7)	1.000
Urate-lowering therapy, *n* (%)	5 (41.7)	1 (0.9)	**<0.001**
Diuretics, *n* (%)	6 (50)	9 (8.2)	**0.001**
Low-dose aspirin, *n* (%)	5 (41.7)	14 (12.7)	**0.021**
Lipid-lowering agents, *n* (%)	8 (66.7)	23 (20.9)	**0.002**
PPI, *n* (%)	4 (33.3)	40 (36.4)	1.000
Uric acid (µmol/l), mean (S.D.)			
• Hyperuricemia (>360 µmol/l), *n* (%)	409.33 (110.280)	317.59 (84.850)	**0.001**
• Asymptomatic hyperuricemia, *n* (%)	8 (66.7)	28 (25.9)	**0.006**
Creatinine (µmol/l), mean (S.D.)	100.45 (51.522)	73.28 (18.380)	**< 0.001**
eGFR CKD EPI (ml/min), mean (S.D.)			
Kidney failures :			
• Absence or mild	74.60 (28.480)	89.20 (15.512)	**0.006**
• Moderate ([3–60 [ml/min), *n* (%)	9 (75)	106 (96.4)	**0.004**
• Severe ([1–-30 [ml/min), *n* (%)	1 (8.3)	4 (3.6)	
• End stage (<15 ml/min), *n* (%)	2 (16.7)	0 (0)	
Fasting blood glucose (g/l), mean (S.D.)	1.23 (0.389)	1.03 (0.221)	**0.006**
HbA1c (%), mean (S.D.)	6.36 (0.999)	5.79 (0.957)	0.066
LDLc (g/l), mean (S.D.)	0.84 (0.400)	1.22 (0.405)	**0.002**
HDLc (g/l), mean (S.D.)	0.45 (0.151)	0.55 (0.153)	**0.047**
TG (g/l), mean (S.D.)	2.01 (1.181)	1.35 (0.728)	**0.006**
• Hypertriglyceridemia (>1.5 g/l), *n* (%)	7 (58.3)	35 (31.8)	0.106

(continued)

Table 2. (continued)

	PsA with gout ($n = 12$)	PsA without gout ($n = 110$)	*P*-value
Specific US signs of gout, n (%)	3 (25)	6 (5.5)	**0.044**
Marginal Erosions (radiographs), *n* (%)	4 (33.3)	20 (18.2)	0.198
Bone construction (radiographs), *n* (%)	1 (8.3)	24 (21.8)	0.673

Bold text indicates $P < 0.05$.

[29, 36]. Using this threshold, regardless of gender, aligns with diagnostic criteria for gout established by ACR/EULAR [28].

The demographic and clinical characteristics of our population were comparable to data available in the literature, particularly regarding the predominance of purely peripheral involvement, positivity rates of the *HLA-B27* allele and the presence of CV and metabolic comorbidities [19].

A female predominance was observed in our study, with 59.8% women in the studied population and 57.3% in the population of eligible patients (172/300). According to the literature, the sex ratio of PsA is around 1 [37], but female predominance is also described in a recent French epidemiological study, conducted in real-world situations and based on health insurance data (54.4% women) [1], as well as in Brazil (53.3%) [38] and Denmark (59.2%) [39]. Moreover, according to Karmachaya *et al.* [40], there is an increase in the overall incidence of PsA in women, while it stabilizes in men. This trend would explain a female predominance of PsA in the years to come. All these results suggest that our population is a representative sample of patients with PsA.

The results of our univariate analysis allowed to define a PsA patient at risk of developing gout, based on the association with metabolic characteristics and CV risk factors such as hypertension, diabetes, renal impairmentand dyslipidaemia. It should be noted that the LDLc value was significantly higher in the group without a history of gout attacks: this is explained by the more significant consumption of lipid-lowering agents in the 'history of gout' group, leading to a decrease in the LDLc value. A treatment with anti-IL12/23 was also associated with the group 'history of gout', but the limited use of this biologic therapy in our population ($n = 2$) does not allow us to confirm a significant association.

Additionally, the use of diuretics and low-dose aspirin, known risk factors for gout, were amongst the significant criteria. Indeed, low-dose aspirin increases the absorption of uric acid and decreases its excretion, thus causing hyperuricemia. This effect is enhanced by the concomitant use of diuretics [41].

BMI, overweight and obesity were not significant. This can be explained by a high proportion of overweight and obese patients in our population of PsA [19, 26]. Alcohol consumption was also not significant, which can be explained by the low prevalence of alcohol consumption in our population (5.7%).

Joint US examination revealed specific signs of gout in nine patients, representing 7.4% of the population, and their presence was significantly associated with a history of gout attack (*P*-value = 0.044). This proportion may have been underestimated since 41.7% of patients in the 'history of gout' group receiving urate-lowering therapy.

The absence of tophus during US examination may be explained by its chronic nature in gouty arthropathy, as 2/3 of patients with US signs of gout had no history of gout attacks.

Regarding the joint sites assessed by ultrasound: most studies recommend focusing on the first MTP joints and knees [42, 43]. However, our study described an equivalent number of DC signs at the talocrural and first MTP joints (8 DC versus 4 DC at the trochlear cartilages) (Supplementary Data S4, available at *Rheumatology Advances in Practice* online). This suggests the importance of including US examination of the ankles when searching for US signs of gout.

It should be noted that among the nine patients with US signs of gout, three had neither a history of gout attack nor hyperuricemia. This could be attributed to missed diagnoses during rheumatic flare in PsA patients or by a temporary reduced acid uric level in the presence of US deposit, similarly to what occurs during a gout attack. For these patients, measuring uric acid levels at a distance or investigating a history of hyperuricemia would be interesting, and further studies are needed to determine whether the presence of US signs predicts a subsequent gouty arthropathy.

Regarding gout and PsA association, Widawski *et al.* [32] recently explored the impact of hyperuricemia on PsA by comparing a group of normouricemic PsA patients with a group of hyperuricemic patients. This study revealed a more destructive rheumatism and a less favourable response to treatment in the hyperuricemic group. Thus, this association poses a challenge for physicians, necessitating tailored management strategies addressing both CV risk and treatment approaches.

Further research is needed to elucidate whether the association between these two rheumatism stems from common confounding factors or an overlapping pathophysiological mechanism. Nevertheless, given the frequency of this association, it is important for physicians to recognize it, and to adapt diagnostic and therapeutic approaches accordingly. Identifying 'Psout' as a distinct pathological entity or acknowledging a common pathophysiology between PsA and gout could have therapeutic implications that would optimize the management of patients affected by both conditions.

A suggested approach to patient care is illustrated in Fig. 4. However, the implementation of clinical recommendations regarding the management of patients at risk of 'Psout' requires the conduct of interventional and prospective studies.

This study has several strengths. First, it addresses a gap in the existing literature by specifically investigating the presence of gout in patients with PsA. While previous studies have primarily focused on the prevalence of hyperuricemia in PsA, our study recognizes the greater impact of gouty arthropathy on patient disability compared with hyperuricemia alone. Additionally, our research is unique in its exploration of characteristics associated with the development of gout in patients with PsA, enabling clinicians to identify individuals

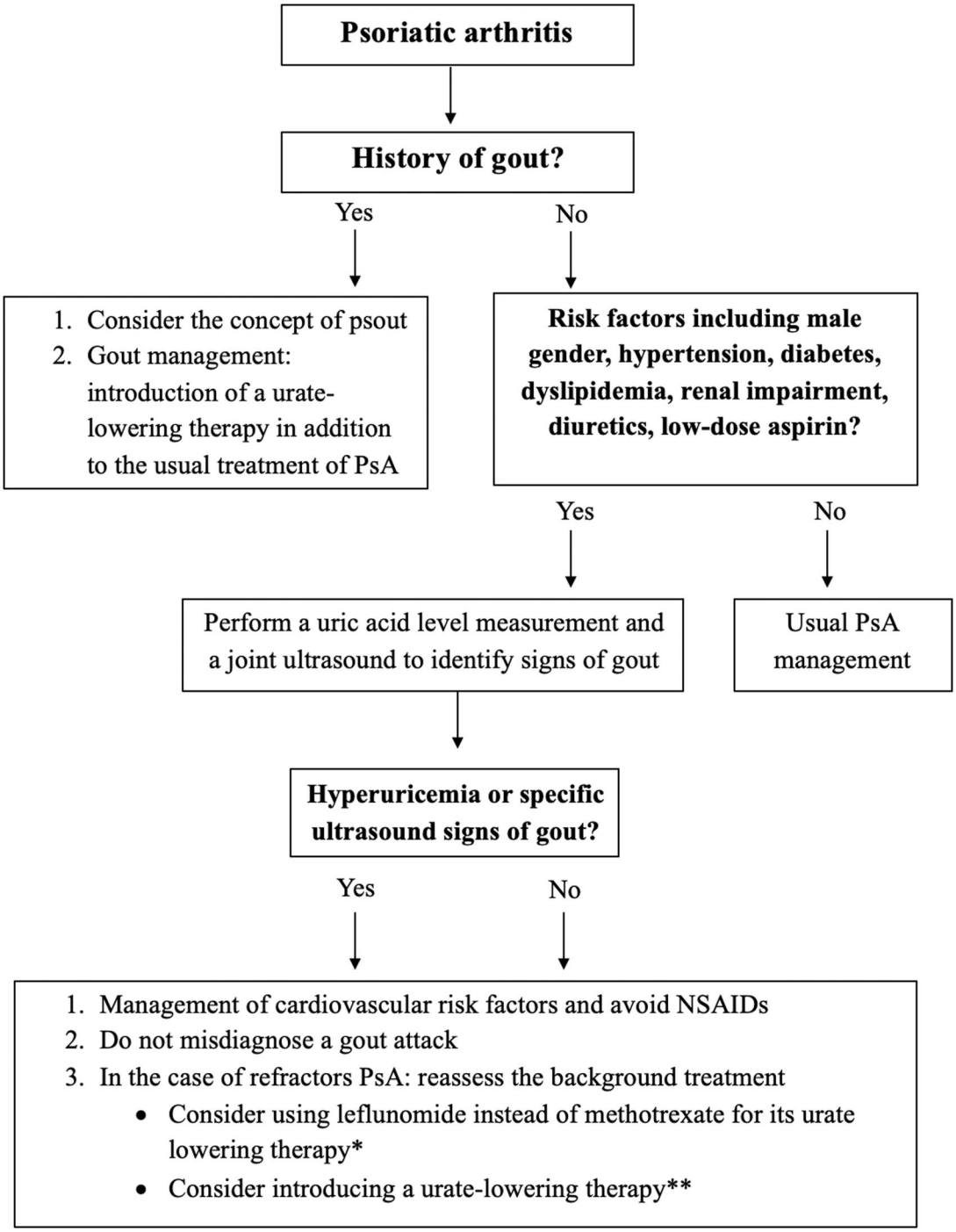

Figure 4. Management proposal for PsA patients at risk of gout. * Arida D, Silva L, Skare TL. The hypouricemiant effect of leflunomide. Joint Bone Spine. 2014; 81(3):273–4 [44]. ** Lowering uric acid levels would not only prevent gout attacks but also reduce synovial inflammation and joint destruction due to PsA (pro-inflammatory role of MSU crystals)

at risk of gout among their PsA patients. This awareness is crucial for considering gout attacks as a differential diagnosis in cases of acute arthritis among PsA patients. Furthermore, we are the first study using US imaging to search for signs of gout in patients specifically affected by PsA. Indeed, most US studies in gout have focused on patients with diagnosed gout or hyperuricemia. Our approach extends US utility in detecting gout-related signs in PsA patients. Lastly, our data collection process minimizes missing data, given the questionnaire systematically completed by the physician and the patient, along with routine blood test. This ensures a robust dataset for analysis.

This study also presents several limitations. First, its monocentric, descriptive and cross-sectional design, without longitudinal follow-up, limits the generalization of the findings, despite a studied sample comparable to the general PsA population in terms of demographic and clinical characteristics. Generalizability is further limited by geographical and demographic variations in PsA populations. Nonetheless, despite these recognized limitations, this study design was used due

to 'PSOUT' being an innovative and understudied concept. We have managed to formulate the hypothesis that needs to be confirmed by cohort or case-control studies, ideally multicentric, to establish a direct causal relationship between patient characteristics and the risk of gouty disease in PsA.

Second, the study design did not include a blinded US scan or a second reading of the US imaging. However, all participating rheumatologists from the department underwent rigorous US training, allowing the use of diagnostic and therapeutic US in their daily practice [45]. The methodology was designed as a team and each rheumatologist who participated in this work was part of the working group prior to it.

Additionally, data collection through a questionnaire may have introduced a memory bias, particularly concerning the declaration of a history of gout attack, despite confirmation of data using the patients' electronic records. The ACR/EULAR 2015 classification criteria has permitted to corroborate patients' reports with scores ranging from 9 to 18 for those in the 'history of gout' group.

Lastly, only 122 out of 300 patients underwent US imaging, potentially introducing selection bias. Specifically, patients presenting with peripheral symptoms where most likely to have been offered US examination. However, it is noteworthy that 13.9% of our population presented with isolated axial involvement.

Conclusion

This study described a population simultaneously affected by PsA and gout, whether fortuitous due to their common comorbidities or whether there exists a shared pathophysiology yet to be elucidated. The systematic measurement of uric acid levels associated with joint ultrasound, including the evaluation of the first MTPs, ankles and knees, should be considered in patients with PsA presenting the highlighted significant characteristics. Indeed, this association constitutes a major challenge for physicians, especially by increasing the CV risk. Raising awareness among healthcare practicians regarding this association would facilitate personalized patient care for those at risk. Specifically, it is imperative not to misdiagnose an initial gout attack in a patient with PsA.

Supplementary material

Supplementary material is available at *Rheumatology Advances in Practice* online.

Data availability

The data that support the findings of this study are available from the corresponding author (M.V.) upon reasonable request.

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