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Ultrasonography signs in metacarpophalangeal and metatarsophalangeal joints in children suffering from juvenile idiopathic arthritis : Comparison of clinical assessment .

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ABSTRACT

The objective of our study was to search for the ultrasonographic afflictions of the metacarpophalangeal and metatarsophalangeal joints notably ultrasonographic synovitis , intra articular liquid accumulations , cartilaginous vascularisation as well as bone erosion and to compare them with the clinical aspects (pain , swelling , limitations of mobility). It was a transverse study ,comprising exclusively the cases of JIA corresponding to the criteria of ILAR 2001 . All the patients were clinically examined to look for pain , synovitis or articular limitations. Linear sound echography (14 MHz) with doppler power , was used . The OMERACT criteria were utilised for evaluating the ultrasonograhic synovitis ; The software SPSS21 was employed as test statistic. 34 patients were included , with 612 joints . The mean age was 10,80 ± 3,29 . Total number of painful articulations of 31 (94%); synovitic articulations was 4 (12%); total number of ultrasonography synovitis was 110 (18 %). In patients with normal clinical examination, ultrasound showed abnormalities in 159 (27 %) joints , the most frequent localization was at the MTP joints in 86 (54%) $p < 0,001$.Presence subclinical synovitis for 73(66 %) $p< 0,001$ .Our study detected subclinical synovitis ;this study suggests that ultrasound is an important supplement to clinical examination and should be performed in a systematic way to evaluate the activity of the disease.

Introduction

Juvenile idiopathic arthritis is the most common inflammatory arthritis in children[1]. This disease can potentially lead to severe bone and joint destruction [2] or even disable the child, thus requiring early diagnosis, rendering an opportunity for effective therapy [3 - 6]. It is important to plan follow-ups of these patients. Clinical evaluation of joint damage in juvenile idiopathic arthritis is often difficult [7]. It is wise to supplement these with other radiological means. The musculoskeletal ultrasound is a useful tool for early detection and monitoring of subclinical synovitis [8-11]. Amongst the adult, The musculoskeletal Ultrasound is a good development in the evaluation of chronic inflammatory joint disease with OMERACT criteria defining ultrasound synovitis.

The objective of our study was to : search for the ultrasonographic afflictions of metacarpophalangeal and metatarsophalangeal joints notably ultrasonographic synovitis, the intra articular liquid accumulations , the cartilaginous vascularisation, bone erosion and to compare them with the clinical aspects (pain , swelling , limitations of mobility).

Materials and Methods

We conducted a transverse study . We included children fulfilling the criteria of JIA defined by ILAR 2001 .The verbal consent made by the children and / or their parents. Variables such as [sex , age , duration of the disease, subgroup of JIA , inflammatory status (ESR et CRP) , and immunologic (rheumatoid factor)] were included for each patients. Clinical assessment:a bilateral clinical examination was performed by a senior rheumalogist , to search for the presence or abscence of swelling ,pain , limitation of mobility of MCP 2 at 5 and MTP 1 at 5. Ultrasonographic assessment:

Characteristics of the ultrasonography:

Linear sound echography (14 MHz) with doppler power less than 3 days after clinical evaluation, on blinding the clinical data. Bilateral Examination (MCP 2 at 5 and MTP 1 at 5) with longitudinal and transverse exploration by the dorsal route [figure1]. Ultrasound examination was performed by a senior sonographer rheumatologist.

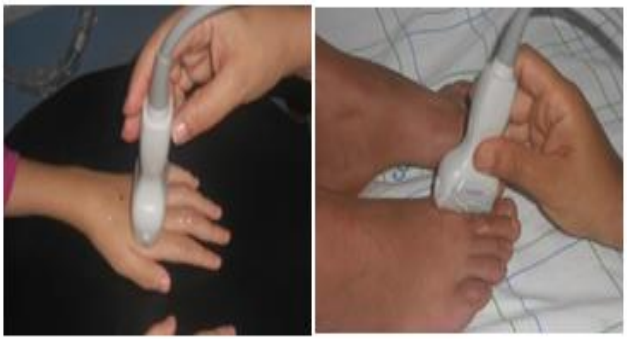

Figure 1. Explorations by dorsal route transverse for MCP and longitudinal for MTP.

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Ultrasonographic signs: presence or absence of ; ultrasonography synovitis: semi quantitative evaluation criteria OMERACT (Grade1 : simple hyperaemia with 3 simple spots or 2 confluent spots or 1 confluent spot associated with a simple spot ; grade2 : moderate hyperaemia involving less than 50% synovial hypertrophy ; grade 3 : marked hyperaemia involving more than 50% synovial hypertrophy); Doppler Power of ultrasonographic synovitis ; intra-articular liquid collection ; cartilaginous Vascularization ;bone Erosion.

Statistical analysis: the variables were summarized by frequency (in percentage).The software SPSS21 was employed ;(chi 2) was used as test statistic , with p fixed at 0,05.

Results

34 patients were included , with 612 joints in total. The mean age was 10,80 ± 3,29 ; *sex ratio* was 0,90 (18 girls for 16 boys) ; the duration of JIA was 5,70 years ± 2,73 ; the mean diagnostic delay was 6years ± 3. Our study found 11 cases (32,40%) of systemic arthritis, 8(23,50%) poly-articular seronegative, oligoarticular 8(23,5%), arthritis enthesitic 5(14,7%). The clinical examination revealed pathology in 33 (5,40 %) articulations with pain present in 31 (94%) of them[table 1] . 12(35%) of the patients had the ESR with 7 (58) had a ESR greater than 20mm/h .10 (29%) patients did the CRP and 4(40%) had a CRP greater than 6 mg/l .

Table 1. Descriptive characteristics of clinical and ultrasonography signs.

	Frequency
Total number of joints	612
Clinical examination pathologic	33(5,4%)
MCP	18 (55%)
MCP3	7(22%)
MTP	15 (45%)
MTP2	5(15%)
Pain	31 (94%)
Swelling	4 (12%)
Limitations	2(6%)
echographically pathologic joints	184(30%)
ultrasonography synovitis	110 (60%)
ultrasonography synovitis doppler positive	33 (18%)
cartilaginous vascularization	68 (37%)
bone erosion	17 (9%)

-The percentage of clinical signs obtained with the number of clinical examination pathologic joints (N=33).

-The percentage of ultrasonography signs obtained with the number of echographically pathologic joints (N = 184).

Number of joints echographically pathologic was 184 (30%) . Total number of ultrasonographic synovitis was 110 (60%) [figure2]; total number of bone erosions was 17 (9%) and these signs were respectively more pronounced in the MCP4 17 (15,45%) , MCP5 5(29%). [Table1 and 2] .

Patients with normal clinical examination, ultrasound showed abnormalities in 27% (159/579) of joints , the most frequent localization was MTP joints 54% (86/159) mainly MTP1 joints 40 /159(25%) p < 0,001 .The ultrasound was normal , whereas of all the patients, 30% (10/33) had joints with at least one clinical sign, the most frequent localization was MTP in 80 % (8/10) mainly MTP 2 at 30 % (3/10) p < 0,001. We obtained 66% (73/110) of subclinical synovitis which is very statistically significant

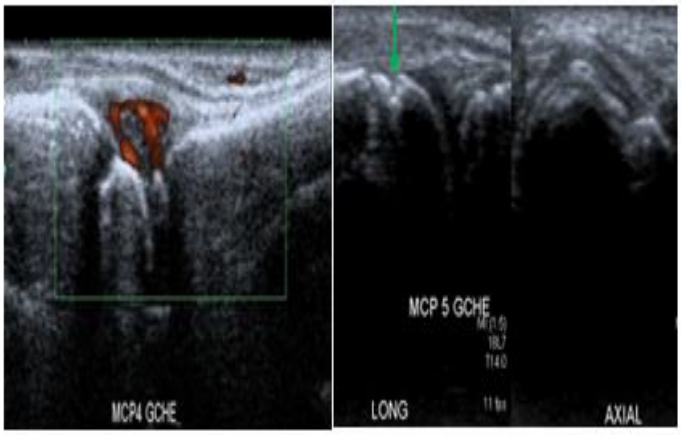

Figure 2 : Power Doppler synovitis positive MCP 4 left ; bone erosion MCP 5 left , dorsal longitudinal and axial cuts .

Table 2 . localization of ultrasonography signs.

	ultrasonography synovitis (N = 110)	**Frequency ultrasonography synovitis DP+ (N = 33)**	**Bone erosion (N =17)**
MCP	56 (51%)	25(76%)	10 (59%)
MCP2	13 (11,82%)	5(15%)	4 (24%)
MCP3	13 (11,82%)	8(24%)	-
MCP4	17 (15,45%)	7 (22%)	1 (6%)
MCP5	13 (11,82%)	5(15%)	5 (29%)
MTP	54 (49 %)	8(24%)	7 (41%)
MTP1	27 (24,55%)	5 (15%)	1 (6%)
MTP2	12 (11%)	3 (9%)	-
MTP3	8 (7,27%)	-	1 (6%)
MTP4	4 (3,64%)	-	-
MTP5	3 (2,73%)	-	5 (29%)

DP+ : Positive Power Doppler.

p < 0,001 and localization at MCP 51% (37/73) [table 3]. ultrasound confirmed clinical synovitis in 100 % (4/4) p=0,043. According to the distribution of ultrasound synovitis vis a vis type of JIA , we obtained respectively in systemic form 48% (53/110), polyarticular sero-negative form 30%(33/110), oligo articular form 13%(14/110) ,arthritis and enthesitic form9%(10/110). The bone erosions were present in 35%(6/17) of the systemic form, 47% (8/17) of the polyarticular seronegative form. Amongst the patients having limitation of movement, none of them had had bone erosion. The Doppler positive synovitis was associated with bone erosion in 29% (5 /17) of the cases p < 0,001. The modification of diagnosis obtained in oligo articular form 2/ 34 (5,8%).

Table3 . Ultrasonography synovitis association with clinical characteristic and other ultrasonography signs.

	Ultrasonographic synovitis		**P**
	Yes(N = 110)	**NO (N =502)**	
Clinical examination normal	73 (66%)	427 (85%)	< 0.001
systemic JIA	29 (26%)		
Polyarticular	20 (18 %)		
Oligo articular	14 (13 %)		
pathologic	37 (34%)	75 (15%)	
Intra-articular liquid collection	29 (26%)	32 (6%)	< 0.001
cartilaginous Vascularization	24 (22%)	43 (9 %)	< 0.001
Bone Erosion	5 (4,5%)	9 (2 %)	0.087

Table 4 . Localization of subclinical synovitis.

	Frequency (N=73)
MCP	
MCP 2	8 (11%)
MCP 3	6 (8 %)
MCP 4	10 (14%)
MCP 5	8 (11%)
MTP	
MTP1	18(25%)
MTP2	9(12%)
MTP3	5(7%)
MTP4	5(7%)
MTP5	4(5%)

Discussion

Ultrasound is useful in the detection of subclinical synovitis in JIA[12]. In our study, the proportion of subclinical synovitis was 66%(73/110).This result was greater than that obtained in the Sylvain Breton and Al (55,1%) study[13].Also the synovitis afflictions of the MCP was more frequent (51%) than those of the MTP according to our results , and yet according to Sylvain Breton and Al , the subclinical synovitis was more pronounced in the MTP (76.5 %) [13]. According to the study of Karmazyn and Al , the frequency of bone erosions (12,5%) obtained only in the MCP was more pronounced that found in the MCP and MTP (3%) In our study [14]. Our result was similar to that of sylvain Breton and Al [13] in regard to the existence of bone erosion and ultrasonographic synovitis, where this association was not statistically significan. By contrast, according to our study, a statistically significant link existed between the Doppler positive synovitis and bone erosion in 29% (5/17) of the cases .

In our study, the modification of clinical form of JIA was obtained in 2/34 (5.8%). This result is similar to that found by Haslam and Al (5.9%)[9]. This change could improve the therapeutic management of these patients.

The criteria permitting the evaluation of the ultrasonographic synovitis in our series, was the OMERACT criteria used to explore the synovitis in Rheumatoid Polyarthritis. More studies are needed to establish the interest of ultrasound in JIA , in particular the OMERACT criteria.

The inclusion of a bigger population sample would permit to obtain a wealthier data bank of SE that will enhance improvements in the treatment of patients suffering from JIA.

Conclusion

Our study not only detected subclinical synovitis, with the most common level MTP1 localization, but she found changes JIA class. This study suggests that ultrasound is a useful supplement to clinical examination and should be performed in a systematic way to evaluate the activity of the disease.

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