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Microvascular Changes in Patients with Psoriatic Arthritis as Shown in Nail Fold Capillaroscopy

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Abstract

Microvascular changes play an important role in the pathogenesis of many manifestations and complications of psoriatic arthropathy. Early diagnosis play an important role in the management of the disorder and probable long term complications. Nail fold Video Capillaroscopy (NVC) is an effective, non-invasive, easily accessible and cheap method of microvascular investigation. The aim of this study was to evaluate nail fold capillaroscopic findings in patients with psoriatic arthritis. This cross-sectional study was conducted in Ressalat Hospital Nail Fold Capillaroscopic Center and capillaroscopic findings of 54 patients referred to the center between 2011 and 2014were reviewed. Nail fold capillaroscopy was performed on all fingers (10 fingers for each patient). Microvascular architecture; capillary distribution, morphology and density; efferent/afferent limb ratio, sub-papillary venular plexus and morphological abnormalities were recorded and reviewed. Results were reported as scleroderma pattern, nonspecific morphological abnormalities and normal. Results were analyzed qualitatively and quantitatively using SPSS 21 software. "Chi square" test was used to analyze the relationships between variables.

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P-value less than 0.05 was considered statistically significant.Participants had a mean age of 44.25±12.20; 34 patients (62.9%) were female and 20 (37.03%) were male. Tortuosity of capillaries was observed in 54 cases and angiogenesis in 40 patients. Early scleroderma pattern was observed in 15 cases (27.77 %) and 39 patients fell into the normal category(72.22%). The morphological abnormalities, except angiogenesis and avascular area, was significantly more frequent in patients with scleroderma pattern, compared with patients with normal pattern (P<0.05).

As a conclusion we can say that Nail fold capillaroscopy, considered by many expert the gold standard method of microvascular investigation play an important role in evaluation and follow up of patients with psoriasis and the results potentially affect prognosis.

Keywords: Psoriasis; Nail fold Video Capillaroscopy (NVC); Scleroderma pattern.

1. Introduction

Psoriatic arthritis is an inflammatory seronegative arthritis with unknown etiology [1]. Diagnosis of the disease is difficult and problematic in cases where there are no characteristic skin and nail involvement. Musculoskeletal involvement is categorized under different names and forms [2, 3]. Although the pathogenesis is multifactorial, microvascular disorders in dermal papilla, psoriatic plaque [4-6] and synovium [7] play an important role in patients with articular involvement.

Non-invasive methods, such as NVC, are invaluable in the diagnosis of microvascular changes in connective-tissue disorders, particularly systemic sclerosis [8-9].

Few studies on patients with psoriatic arthritis have shown specific changes in NVC [10-12] while quantitative investigations on these patients with articular and/or nail involvement are shown to be quite controversial [13-16].

2. Materials and Methods

2.1 Patients

This dara of this cross-sectional study was collected from patients with psoriatic arthritis aged 17-70 since October 2011 to October 2014 in Capillaroscopic Center of Ressalat Hospital. The study included 54 patients with psoriatic arthritis, who have been affected for at least one year, based on medical records and laboratory studies.

Patients were diagnosed according to the criteria of Moll & Wright [1]. The enrolled patients should not have used topical steroids for the last two weeks on DIP joints and nails. Exclusion criteria consisted of any evidence of cardiovascular disease, other vascular disorders, hypertension, hepatitis, other collagen vascular diseases, skin diseases, smoking, infection, drug abuse and incomplete data.

2.2 Capillaroscopic Nail fold Study

All patients underwent nail fold capillaroscopic examination using a video-capillaroscope: Videocap D1 (Medica DC, Sr1, Milan, Italy, 2011). Optical microscope was connected to a digital camera and computer. Participants were studied between 9 and 12 AM. They were asked to refrain from caffeine and smoking for 12 hours before the test. Patients were positioned in supine position for 15 minutes at room temperature (22 to 25°C), while the hands were placed on the heart.

One drop of cleanup oil was spilled on finger nails to maximize transparency and due to variations in morphology, 10 nail folds in each patient were examined. For each image, capillaroscopic parameters including microvascular architecture, capillary distribution (morphology with numbers), capillary density (total number of perfused capillaries per square millimeter of skin), efferent/afferent limb ratio, sub-papillary venular plexus (as defined by Wertheimer criteria, modified by Terry et al.), and morphological abnormalities (hypercapillaries, Raynaud's rings, Mega capillaries) were evaluated by the same rheumatologist.

Results were announced as non-specific morphologic abnormalities, normal and scleroderma pattern.

Disorganization of capillaries normal distribution, decrease in the number of rings (>30 on 5 mm on distal of nail fold), budding (increased volume) of capillaries, bleeding, capillary loss by decreased density (7-10 capillaries/mm as the average reference value), new vessels and reduced blood flow are diagnosed as early capillaroscopic changes. We divided the patients into two groups, according to Cutolo et al:

- Patients with two or more abnormal morphologic parameters (in at least two nails) were categorized in the group with sclerodermic pattern.

- Participants with homogeneous distribution of capillaries in form of clips (such as the structure of a comb), capillary density of 9 to 14 per mm, or only one abnormal parameter (nonspecific morphological abnormalities) were considered as normal capillaroscopic pattern.

Finally, all collected data were statistically analyzed.

2.3 Statistical Analysis

Capillaroscopic images of all patients was quantitatively and qualitatively analyzed by SPSS 21.0. Data is provided with mean ± standard deviation. Chi-square test was used to analyze the relationships between variables. The value of $P<0.05$ were considered as significant.

3. Results

Participants had a mean age of 44.25±12.20; 34 patients (62.9%) were female and 20 (37.03%) were male. Early scleroderma pattern was observed in 15 cases (27.77 %) and normal pattern in 39 (72.22%).

Capillary morphology, capillary density and the efferent/afferent limb ratio was almost normal in most patients,

but microvascular architecture was abnormal in 22.2% of patients (Table 1). In addition, tortuosity of capillaries was observed in 54 cases and angiogenesis in 40 patients. Morphologic disorders were reported in all patients as shown in Figure 1.

Table 1: Capillaroscopic Findings

Variables		Total=54 (%)
Microvascular Architecture	Normal Abnormal	42 (77.7) 12 (22.2)
Capillary Distribution	Regular Irregular	49 (90.7) 5 (9.2)
Capillary Morphology	Homogeneous Nonhomogeneous	53 (98.1) 1 (1.8)
Capillary Density	Normal Decreased	54 (100) 0 (0)
Subpapillary Venular Plexus	Visible Invisible	53 (98.1) 1(1.8)
Efferent/Afferent Ratio	Normal Increased	54 (100) 0 (0)

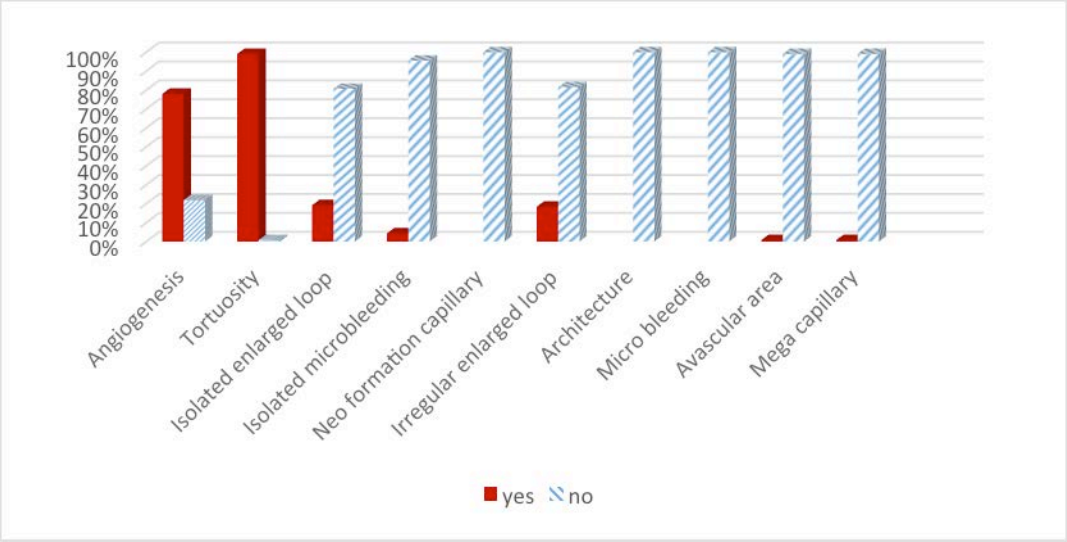

Figure 1: Morphologic findings in Capillaroscopy

Among 15 patients with scleroderma pattern, 8 were female. Tortuous capillaries, angiogenesis, altered microvascular architecture and irregular enlarged loop were the most common components of morphological abnormalities in patients with scleroderma. Based on p-values, capillaroscopic variables was not different in patients with sclerodermic pattern compared with patients with normal pattern. Also, the morphological abnormalities, except angiogenesis and avascular area, was significantly more frequent in patients with sclerodermic pattern compared with patients with normal pattern ($P<0.05$). Tables 2 and 3 show the complete data. However, mean age of patients with scleroderma pattern was not different from those with normal pattern (44.26±11.75 vs. 44.25±10.94 years). Also, no relationship was found between different patterns (normal or scleroderma), or gender of the participants ($p=0.530$).

Table 2: Comparison of capillaroscopic variables in psoriasis patients with normal and scleroderma pattern

		Normal pattern n=39 (%)	Scleroderma pattern n=15 (%)	P-value
Microvascular Architecture	Normal	32 (82.05)	10 (66.6)	0.279
	Abnormal	7 (17.09)	5 (33.3)	
Capillary Distribution	Regular	37 (94.8)	12 (80)	0.124
	Irregular	2 (5.1)	3 (20)	
Capillary Morphology	Homogeneous	39 (100)	14 (93.3)	0.278
	Nonhomogeneous	0 (0)	1 (6.6)	
Capillary Density	Normal	35 (89.7)	15 (100)	0.567
	Decreased	4 (10.2)	0 (0)	
Efferent/Afferent limb Ratio	Normal	39 (100)	13 (86.6)	0.072
	Increased	0 (0)	2 (13.3)	
Gender	Male	13 (33.3)	7 (46.6)	0.530
	Female	26 (66.6)	8 (53.3)	

4. Discussion

In this study, nail fold capillaroscopic disorders were examined in 54 patients with psoriatic arthritis and high prevalence of pathologic changes in the nail fold microvascular system were shown.

According to our findings, the morphological changes were remarkable in micro circulation of psoriatic patients.

These changes are very helpful in differntial diagnosis of systemic sclerosis and dermatomyositis [8,9]. Capillary dilatation, tortuosity and avascular area in patients with idiopathic Raynaud's and mixed connective

tissue diseases, which are not observed in normal patients, express increased risk of connective tissues disease in the next years [17-19]. In these patients, NVC has diagnostic and prognostic value for disease progression.

Clinical symptoms of psoriatic arthritis are often misdiagnosed as rheumatoid arthritis, especially the negative serology type, particularly if articular symptoms occur before dermatologic manifestations.

Table 3: Comparison of architectural abnormalities in psoriasis patients with normal and scleroderma pattern of involvement

Architectural Abnormality		**Normal Pattern N=39 (%)**	**Scleroderma Pattern N=15 (%)**	**P-Value**
Angiogenesis	Yes	28 (71.7)	12 (80)	0.733
	No	11 (28.2)	3 (20)	
Tortuosity	Yes	39 (100)	15 (100)	0.000
	No	0 (0)	0 (0)	
Isolated enlarged loop	Yes	0 (0)	4 (26.6)	0.004
	No	39 (100)	11 (73.3)	
Isolated Microbleeding	Yes	0 (0)	3 (20)	0.018
	No	39 (100)	12 (80)	
Capillary Neoformation	Yes	0 (0)	0 (0)	0.000
	No	39 (100)	15 (100)	
Irregular enlarged loop	Yes	0 (0)	7 (46.6)	0.000
	No	39 (100)	8 (53.3)	
Architectural Derangement	Yes	0 (0)	0 (0)	0.000
	No	39 (100)	15 (100)	
Microbleeding	Yes	0 (0)	0 (0)	0.000
	No	39 (100)	15 (100)	
Avascular Area	Yes	0 (0)	1 (6.6)	0.278
	No	39 (100)	14 (93.3)	
Megacapillary	Yes	32 (82.05)	1 (6.6)	0.000
	No	7 (17.09)	14 (93.3)	

Table 4 demonstrates all microvascular changes shown by NVC in male and female patients. Statistical analysis showed significant difference between the two groups in angiogenesis and isolated enlarged loop ($P<0.05$).

Table4: Comparison of microvascular abnormalities between genders

Variables	Male (%)	Female (%)	P-Value
Altered Microvascular Architecure	20	23.52	0.609
Nonhomogeneous capillary distribution	0	0	-
Nonhomogeneous capillary morphology	0	2.9	0.246
Reduced capillary density	0	0	-
Increased Efferent/Afferent limb ratio	0	0	-
Angiogenesis	85	67.6	0.007
Tortuosity	100	100	-
Isolated Enlarged loop	20	0	0.000
Isolated Microbleeding	5	5.8	1.000
Capillary Neoformation	0	0	-
Irregular Enlarged loop	15	11.7	0.680
Architectural Derangement	0	0	-
Microbleeding	0	0	-
Avascular area	5	0	0.059
Mega capillary	0	2.9	0.246

According to the studies, microvascular changes in the synovium of patients [7], like dermal papilla in plaques of psoriatic patients [4-6], possibly plays a role in the pathogenesis of psoriasis. The first study on non-specific NVC findings in patients with psoriatic arthritis was conducted in 1970 by Redisch [12]. Meandering capillaries, which is in fact a kind of angiogenesis, were observed both in the affected and unaffected skin. This change was sometimes called "typical of psoriasis" in subsequent studies [13-16]. But further studies did not confirm certain specific findings related to psoriasis patients [20-21]. Our study is in line with the latter finding (no specific findings for patients with psoriatic arthritis). Although the shape and severity of involvement and its trend may have diagnostic and predictive value that require another study.

The main limitation of the present study was the inability to assess changes in different types of psoriatic arthritis also lack of severity assessment in articular and skeletal involvement. Proving this association can raise the predictive value of NVC in the disease's course.

The strength of our study was demonstrating the ability of nail fold capillaroscopy to detect microvascular changes in Psoriasis. Also a study of this magnitude has not been performed in Iran and our results are a good source for comparison with other studies.

5. Conclusion

Our results showed that Psoriatic arthritis significantly affect the morphology and structure of the micro-circulation and may lead to severe complications. In addition, nail fold capillaroscopy is a non-invasive diagnostic method with potential diagnostic and prognostic value in psoriatic arthritis.

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