

# Nailfold capillaroscopic findings in a semi-professional volleyball player

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**Abstract.** Volleyball players are exposed to the possibility of several well recognized injuries, among which microvascular abnormalities are the less described and studied, although they could diminish their ability and performance. Capillaroscopy is a simple, non-invasive method to diagnose vascular abnormalities in athletes suffering for the consequences of repeated application of pressure by local trauma on the fingertips. The detected capillaroscopic picture will be the base for the follow-up and will indicate the possible need for further investigations aimed at excluding other occulted conditions. At our knowledge, this is the first report describing and documenting the related microvascular abnormalities in a volleyball player. This case emphasizes the fact that volleyball players among other athletes, whose hands are exposed to repeated fingertips trauma may suffer from microcirculation damage, for which reason they should be able to access an effective health surveillance program able to detect the first signs and offer the most appropriate clinical support.

**Keywords:** Volleyball, athletes, sport, capillaroscopy, hand, injury, microcirculation, translational medicine

## 1. Introduction

Elite athletes are exposed to the possibility of a variety of injuries and although musculoskeletal lesions are the most common cause of complain [1], some of the most devious and disabling could be vascular injuries [2, 3]. The causes of venous or arterial injuries in athletes could be high-speed collisions and repetitive motions. Symptoms could be striking, or on the contrary, blurred. In most cases athletes are healthy and young and vascular diseases could be overlooked [4].

Volleyball, that is estimated to have 500 million players all over the world [5], is a discipline with an high prevalence of ischemia related symptoms. In the Netherlands one third of male volleyball players reported pale and/or blue fingers and symptoms of cold. Most literature on the topic refer to vascular conditions that sometimes could have a rapid and sudden course with catastrophic consequences [6–8]. Volleyball produces the impact of a ball on fingertips, which is repeated many many times during training and competitions that became thousands of times throughout an entire sporting career and similar to Basque handball game could produce Raynaud syndrome and related microvascular abnormalities [9]. Local arterial injury and thrombosis is described in football and baseball players due to repeated application of pressure by local trauma to a digital artery [4].

Frequently volleyball players complain of discomfort in their hands attributable to microvascular abnormalities such as cold hands. This aspect is often overlooked and there are no significant data in this regard in the literature. Disturbances can occur in a single digit or affect all the fingers simultaneously, it can be bilateral or unilateral. Microvascular symptoms can be the consequences of several different conditions or causes, including connective tissue diseases such as systemic sclerosis, extrinsic

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vascular obstruction, certain chemicals/drugs, traumatic injuries, vibration exposure (hand-arm vibration syndrome), hyperviscosity states (paraproteinaemia) and anorexia nervosa [10–12].

## 2. Case report

We refer about a 17-year-old woman, volleyball player, visited for purple, swollen and sweating hands when playing that persists for a few hours after the end of the game, predominantly in the right hand. This happens in the last two years and it is worsening.

She had no history of diabetes mellitus, cardiovascular or neurologic disease, thyroid disease, arthritis, or connective tissue disease, no history of carpal tunnel syndrome or frostbite, no family history of primary Raynaud phenomenon or connective tissue disease. She was not taking any medications and she is right-hander.

She is doesn't smoke. She play volleyball an average of three hours a day four days a week, since she was twelve years old.

The physical examination was unrewarding. She had normal vital signs and no remarkable findings on cardiovascular, neurologic, and musculoskeletal examinations. In particular a careful clinical examination and laboratory investigations excluded known pathologies that could lead to nailfold microvascular abnormalities. She did not have symptoms or established diagnosis of connective tissue diseases, neither presented other known causes able to determine NVC abnormalities (no digital ulcers or skin manifestations suggesting a diagnosis of SLE or scleroderma, or suffering from muscle and joint pain). We performed nailfold videocapillaroscopy (NVC) to assess microcirculatory alteration in our young athlete [13, 14].

NVC was performed by using a x200 optical probe equipped videocapillaroscope connected to an image analyzer software (VideoCap software 3.0; DS Medica, Milan, Italy). After a 15 min. adaptation at room temperature of 23°C, a drop of immersion oil was applied to the nailfolds of the second, third, fourth and fifth fingers of both hands in order to increase transparency of the keratin layer, and all of them were examined in each patient.

We analyzed skin transparency, capillary density (normally between 9 to 14 homogeneously distributed hairpin-shaped capillaries in 1 mm), ramified capillaries and tortuosities (single or multiple crossovers) [15], microhaemorrhages [16] and disorganization of the vascular array. We also evaluated the presence of enlarged (irregular or homogeneous increase of capillary diameter >20 and <50 mm) and giant capillaries (homogeneously enlarged loop with a diameter >50 mm).

We found a lack of morphological homogeneity of capillaries, presence of ectasia of the efferent tract of the loops, apical ectasia, tortuosity, newly formed of capillaries with bushy, branching and “candelabrum” appearance (Fig. 1); a “non-specific abnormal NVC pattern” without findings suggestive of scleroderma.

At our knowledge, this is the first report describing and documenting the related microvascular abnormalities in a volleyball player.

This work was conducted after receiving the patient's informed consent to participate to the study and to publish this report, in compliance with the ethical standards in the field and the norms established by the Internal Review Board of our Institution.

## 3. Discussion

The volleyball player could suffer for the consequences of various injuries: the most frequent being musculoskeletal [1, 17]. Vascular complications are reported, influenced by exposition to high-speed collision and repetitive motion and appear that arterial and venous abnormalities are becoming an



Fig. 1. Nailfold videocapillaroscopy images in a case of volleyball player showing a “non-specific pattern”: a) ectasia of the efferent tract of the loops, b) apical ectasia, c) tortuosity and newly formed of capillaries with d1) bushy, d2) branching, d3) “candelabrum” appearance.

77 increasing problem in these athletes. Although severe vascular complication such as aneurysmal  
 78 degeneration, thrombosis and distal occlusion of the proximal posterior circumflex humeral artery  
 79 (PCHA) or Hypothenar or thenar hammer syndrome (HAVS) have been topic of previous studies  
 80 [8, 18, 19] and are well recognized in these patients, microvascular anomalies, are less described and  
 81 studied. Extremity pain, cold, blue and pale digits are signs associated to vascular disturbances that in  
 82 athletes necessitate a careful evaluation. A vascular disease left undiagnosed for a prolonged inter-  
 83 val, could have devastating consequences. After excluding more severe diseases the NVC allow in  
 84 a simple non-invasive way to evaluate cutaneous microcirculation and diagnose the digital vascular  
 85 abnormalities due to repeated fingertips trauma. NVC is a widely used test to diagnose digital vascular  
 86 abnormalities in hand-arm vibration syndrome (HAVS) and differentiate from a secondary form  
 87 depending by autoimmune/connective diseases such as scleroderma. Repeated traumas are a potential  
 88 risk for microcirculation with an increased tendency to vasospasm in the digital capillaries. Volley-  
 89 ball involves low-to-high-velocity collisions between the ball and a player, the volleyball behaviour is  
 90 unique for each different type and the interaction between the player and the ball depend on the ball  
 91 type and the incident velocity. In collision injuries, the varying combinations of kinetic energy lost  
 92 and peak impact force may be useful to understand the role of each of these variables [20]. In general,  
 93 little is known about how the collision in itself is harmful and the question becomes more complicated  
 94 about the athletes. Furthermore kinetic, force, intensity, duration, frequency of exposure and several

95 other cofactors regulate dangerousness and should be taken into account. Age, sex and smoking may  
96 also influence the risk of developing microvascular disturbances.

#### 97 4. Perspective

98 Currently NVC appear to be an accurate, reproducible, reliable and objective method to diagnose  
99 microvascular abnormalities, too often overlooked, in athletes and in volleyball players in particular.  
100 The capillaroscopic pattern will be the base for the follow up of the patient and will suggest if further  
101 investigations are needed to exclude other occulted pathologies such as connective tissue diseases. The  
102 detection of objective and documented vascular alterations, will help the athlete to achieve awareness  
103 of the condition, to reassure her/him while understanding the need for a follow-up and where possible  
104 for modifying some lifestyles and ways of playing. This to preserve health over time and to help control  
105 and, if possible, change factors that could affect the good athletic performance.

#### 106 Conflict of interest

107 No Authors has any conflict of interests

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