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Same Directionality of Foot Straight Line and Forward Movement

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Abbreviations: *anterior transverse arch (ATA), deep Transverse metatarsal ligaments (DTML), medial longitudinal arch (MLA), lateral longitudinal arch (LLA)*

COMMENTARY

Authors have continued working for Masters' Athletics for long. In the light of sports medicine, we have given lectures of theory and practice in the various situations. Especially, we have showed the safer and faster method of running for the middle and senior athletes from 30 to 85 years old. Furthermore, our advices include how to stretch neck, shoulder and joints with pole exercise through many workshops using our multiple textbooks [1].

Among them, the recognition of "triangle of the foot" in the sole would be important in particular. By target conscious of the triangle in the sole, it is possible to grasp the ground flat without tension [2]. Then, various running injuries can be minimized. Regarding this triangle, the detail explanation about three vertexes will be shown in the following.

The first and second vertices are situated in the former portion of the foot. There is an anterior transverse arch (ATA) as one of the important three arches in the foot. ATA is composed of five metatarsal heads [3]. The position of the thumb is one vertex, and the position of the little finger corresponds to the second vertex. ATA plays an important clinical role in the sole function so far [4, 5]. When ATA is subjected to a heavy load or acute impact, it receives and reduces the load [5]. Furthermore, when an athlete is running, it acts as a spring on the sole of the foot [4]. Therefore, some impairment of ATA can be observed in the case of overuse. There are many cases that complain of pain in the forefoot at various medical and sports situations. Some cases may be involved in ATA dysfunction [6]. As a result, the forefoot issues concerning ATA and DTML will be expected to be investigated further in the future.

Furthermore, there are deep transverse metatarsal ligaments (DTML) in the deep part of ATA as an assistant role [7]. It has four strong ligaments connecting the five femoral heads [8]. Both ADA and DTML are playing the role of spring in relieving strong impact and loading during exercise. DTML and the collateral ligaments have together attach to the medial and lateral borders of the plantar plate [9].

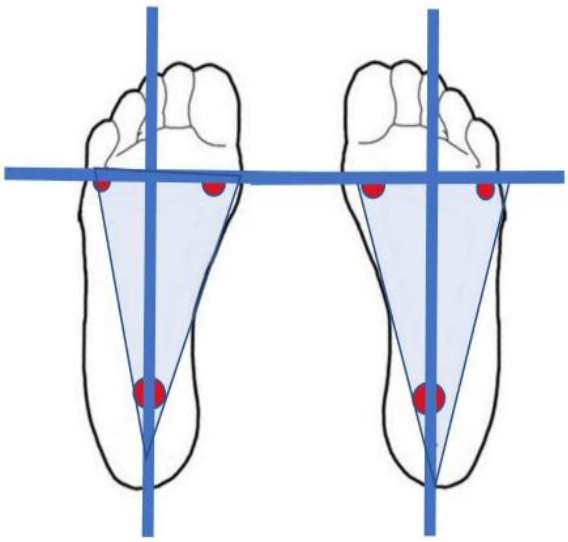

Figure1. *Directionality of foot straight line and also forward movement*

The third vertex is approximately situated at the calcaneus bulge [8]. The inner and outer sides of the triangle correspond to medial longitudinal arch (MLA) and lateral longitudinal arch (LLA), respectively (Figure 1).

When an athlete is conscious of this triangle, the function of the sole would become more effective in the sports field. For example, short distance dash can be compared. In the past, the standard way was to kick with front half of the foot. With this method, however, lots of athletes including masters are liable to get injured. On the other hand, the current method is a pushing in the latter half of the foot [10]. Be conscious to make the triangle of the sole and land in flat way. Then, he can run faster, safer and smoothly without tension or wasteful power.

Regarding the triangle, the directionality of the axis of the ATA including both ends of the MP joint is important [11]. When the direction is perpendicular to the forward direction, the maximum force is transmitted smoothly. This seems to be consistent theoretically. When the athlete actually runs, it is better to turn the direction of the leg for the straight line passing through the heel and the third finger. In this case, he can run naturally without twisting the pelvis, and there seems to be little trouble of the ankle and knee. If the athlete moves in the 2nd finger direction, the MP joint is displaced for the direction of proceeding. Then, some brake would be generated for the ball of the thumb. When the athlete walks on the line from heel to 3rd finger, he can proceed straight freely with natural movement of the center of gravity.

Furthermore, when the knee head is bent in the third finger direction, the direction of the knee head and the direction of the foot will coincide with the least load of twisting on the knee joint. Many athlete runners have complained of knee pain so far. Its characteristic is the mismatch between the direction of the ground foot and the direction of the knee [12]. In many cases, the knees are directed forward and the toes are directed to the outside. In response to the situation, to bend knee in the 3rd finger direction would be advised. Consequently, the pain can be relieved and run as soon as possible in many cases. Since such knee deviation has been a physical habit for long, it is important to be awareness to ground in the correct direction. This will require a period of time for the athletes.

In conclusion, we can summarize the way how to run safely and efficiently without injury or dysfunction. The recommended methods are

i) To be conscious of "triangle of feet" in the aspect of grounding.

ii) Grounding flat and soft with whole sole using three arches.

iii) Bending the MP joint at the moment of leaving.

iv) Not kicking the foot but pushing the foot, and

v) Going with the same direction of straight line through heel and 3rd finger.

Consequently, the movement of the center of gravity becomes smooth, leading to successful performance. Furthermore, some impairments would be reduced such as knee arthrosis, Achilles tendonitis, plantar fasciitis and various running disorders.

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