

Quadriceps Muscle Geometry and Strength Throughout Maturation in National-Level Male Soccer Players: A Cross-Sectional Study [Letter]

Bruno Bordini 

Dipartimento di Cardiologia, Fondazione Don Carlo Gnocchi IRCCS, Istituto di Ricovero e Cura, S Maria Nascente, Milano, 20100, Italy

Correspondence: Bruno Bordini, Email bordonibruno@hotmail.com, bbordini@dongnocchi.it

Dear editor

I have read with interest the article by Ritsche et al, and I congratulate them for their publication.¹ The study used B-mode ultrasonography to examine quadriceps muscle morphology, fascicle length, muscle thickness and the pennation angle, and the strength expressed among young males of different ages (aged 14 to 21 years), in soccer players (96 players, national-level). In particular, the study evaluated the rectus femoris (RF) and vastus lateralis (VL) muscles. The aim of the research was to find a relationship between associations knee extension strength using isokinetic dynamometer, and morphology among different ages of players.

I would like to provide some information that has not been taken into consideration by the Authors. The quadriceps muscle, contrary to what is written (“four quadriceps heads”), is composed of 5 muscle bellies.² The tensor vastus intermedius (TVI) is the fifth muscle belly within the quadriceps femoris muscle; it is not an anatomical variant, but a structure with a high presence in the anterior and deep human thigh, positioned between the vastus lateralis (VL) and vastus intermedius (VI).³ TVI was first named in 2016 and described to be present in five variants, based on the feasibility of separating its aponeurosis from the neighbouring muscles.³ Its length varies according to studies, with an average of 10–14 centimeters, with almost no difference in average between the right and left thigh; female subjects have a slightly longer TVI, with an average of about one centimeter greater.^{3,4} The average width is about five centimeters, with a slight difference for the female sex, where the TVI is wider; similarly, the average thickness is about three centimeters, with a prevalence of slightly greater average thickness for females.³ This muscular strip originates between the intertrochanteric line and the greater trochanter; it has a flat and broad aponeurosis halfway along its course; this aponeurosis continues distally towards the patella, forming a tendinous structure with an oblique vector, to merge on the medial and cranial area of the patella.⁴ In its course it is hidden by the RF and at its patellar insertion it merges with the aponeurotic formations of the VL, RF and the vastus intermedius (VI).⁴

TVI is present in human embryonic development and can be recognized between the 55–56th day corresponding to 22–23 Carnegie stages.⁵ It is possible to affirm that this fifth element of the quadriceps is easily found in humans. Its specific functions are not completely known. Authors suggest that TVI is important in managing the force expressed by the medial muscle bellies and coordinating the movement of the patella, in particular, it would act as a force on the VI medially conveying the force on the patella.^{4,5}

The results of the study by Ritsche et al should be reviewed, as they do not consider the presence of this muscle in the evaluation, which could alter the conclusions. Furthermore, it is not easy to evaluate TVI with ultrasonography compared to cadaver examination.^{3,4}

Disclosure

The author reports no conflict of interest in this communication.

References

1. Ritsche P, Roth R, Bernhard T, et al. Quadriceps muscle geometry and strength throughout maturation in national-level male soccer players: a cross-sectional study. *Open Access J Sports Med.* 2024;15:159–170. doi:10.2147/OAJSM.S482796
2. Bordoni B, Varacallo M. *Anatomy, Bony Pelvis and Lower Limb: Thigh Quadriceps Muscle*. StatPearls Publishing; 2024. Bookshelf ID: NBK513334.
3. Piech P, Kuroska-Walczyńska G, Samczuk M, et al. Unveiling the Tensor Vastus Intermedius - A distinct anatomical phenomenon or a standard variation? A comparative analysis of comprehensive literature and original cadaveric studies. *Ann Agric Environ Med.* 2024;31(3):410–416. doi:10.26444/aaem/189164
4. Sahinis C, Kellis E. Anatomy, morphology and function of the tensor of vastus intermedius: a systematic review. *J Funct Morphol Kinesiol.* 2021;6(3):77. doi:10.3390/jfmk6030077
5. Utsunomiya N, Kodama R, Yamaguchi Y, Tsuge I, Yamada S. The development of the tensor vastus intermedius during the human embryonic period and its clinical implications. *J Anat.* 2021;239(3):583–588. doi:10.1111/joa.13453

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