The psoas major muscle is one of the major hip flexor muscles, and regarded as important not only in sports but also in daily-life movement such as walking. However, much fewer studies have been conducted on this muscle as compared with its antagonist, hip extensor muscles. The major reason for this is probably its inaccessibility. The psoas major muscle is placed in deep trunk, so that invasive methods are usually required for studying its activities. Therefore developing a non-invasive method is highly beneficial for studying its function. Ultrasonography is one of the possible methodologies, although most studies with this technique have so far been conducted on muscles near the body surface.

PURPOSE: We aimed to estimate the activity of psoas major muscle with ultrasonography. For this purpose, we measured the elongation of the central tendon (aponeurosis) during stepping exercise, and examine its validity.

METHODS: Two male subjects performed stepping exercise in the laboratory. They lifted their thighs repeatedly to a varied height following a constant rhythm generated by a metronome (60/min). During exercise, a longitudinal image of the right psoas major muscle was obtained with an ultrasound apparatus (B-mode). Scanned muscle images were collected at 30Hz, and the displacement of the central tendon within the muscle was measured with a digitizing software. We also recorded kinematic data for the right leg with a motion analysis system. Because the displacement of the central tendon reflects both length change in whole muscle-tendon unit and generated tension (elongation of the tendon), we separated these two factors with reference to an additional experiment using an isokinetic dynamometer: the tendon displacement solely due to the length change in muscle-tendon unit was estimated with passive hip flexion and extension, whereas the elongation of the tendon due to active tension generation was estimated with isometric contractions at varied activation level.

RESULTS: The elongation of the central tendon occurred in hip-flexion phase, indicating that tension generated by the psoas major muscle plays an important role in stepping movement. In addition, the peak elongation appeared at the initial phase of hip flexion movement, in agreement with previous studies with EMG analysis.

CONCLUSION: Ultrasonography successfully detected the tendon elongation of psoas major muscle, from which tension generated by the muscle could be estimated during stepping exercise. This method will be useful for studying the function of psoas major muscle in a variety of movements.

Keywords: Tendomuscular Mechanics -session, Biomechanics, Methodology