THE GENDER DIFFERENCE OF THE ISOKINETIC ANKLE JOINT MOMENT IN THE ELDERLY

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Introduction

It is reported that the age-related muscle power decrease is more pronounced in females than males, even when the values are normalized for body mass [1]. However, the effect of the movement directions (i.e. concentric and eccentric contractions) on the gender difference of muscle performance is not clear. In this study, we investigated ankle joint moment of the elderly and the young in concentric, isometric and eccentric movement. The male-to-female gender ratio of the ankle moment per body weight was greater with the elderly than with the young, at the eccentric contraction. This result suggests that the decreased muscle force per body weight, especially at the eccentric contraction, may be one reason for the more frequent falling of the elderly female than the elderly male.

Subjects and Methods

Table 1 shows subjects in this experiment. A group of 20 healthy young adults and a group of 26 healthy elderly adults are participated in this experiment.

Table 1 Subjects information

	Elderly		Young	
	male(n=12)	female(n=14)	male(n=9)	female(n=11)
Age	76.2±4.4	72.3±3.5	23.7±2.1	22.6±0.9
Weight[kg]	56.3±9.2	54.3±6.1	66.7±6.4	52.9±5.0
body fat[%]	22.7±3.7	35.0±2.5	15.4±5.8	25.0±2.7

Maximum values of both the dorsiflexion and plantarflexion moment at ankle joint were investigated at pre-specified five different angular velocities including concentric (60deg/sec, 120deg/sec), isometric and eccentric (-45deg/sec, -20 deg/sec) directions by using Biodex system. Both ankle joints of the dominant and the non-dominant legs were tested. The maximum moments were normalized by body mass because the ability of postural balance control to prevent the falling is relative ability of the muscle acting against the body weight. Then, male-to-female gender ratios of the normalized maximum moment in both the young and the elderly group were calculated.

Results and Discussion

Figure 1 shows maximum moment per body weight of dorsiflexion and plantarflexion moments at five different angular velocities in all subjects. The young male was the greatest, followed by the young female, the elderly male and the elderly female. In overall, there was difference of maximum moment among the group. Especially, there was significant difference at the eccentric contractions.

Figure 2 shows gender ratio of dorsiflexion and plantarflexion moments at five different angular velocities in all subjects. Independent t-test was used for the evaluation of the statistical significance. In overall, the gender ratio of the elderly was greater than that of the young in eccentric contractions. That is, the ankle joint control performance of the female compared to that of the male is much more deteriorated in the elderly female than in the young female, especially at the eccentric contraction. This suggests that the higher rate of falls in women may be due to the muscle power

decrease mainly in the eccentric contraction, which plays role in the initial resistance to the disturbed body balance.

Figure 1 Maximum ankle moment per body weight in the young and the elderly.

Figure 2 Male-to-female gender ratio of the maximum ankle moment per body weight in the young and the elderly.
(*:p<0.05, **:p<0.01, ***:p<0.001)

Conclusions

In this study, we investigated ankle joint moment of the elderly and the young. The results suggested that the ankle joint control performance of the female as compared to the male is deteriorated with age.

References

- [1] Caserotti, P, et al: Contraction-specific differences in maximal muscle power during stretch shortening cycle movements in elderly males and females, J Appl Physiol, Europe, vol. 84, pp. 206-212, 2001