

Association between hip-trunk muscles and spinopelvic alignment in total hip arthroplasty patients

Ryohei Iino¹, Hyonmin Choe¹, Hiroyuki Ike¹, Daisuke Kawashima¹, Abe Kosei¹, Ryohei Yamazaki¹, Yutaka Inaba¹

¹Yokohama City University Hospital

e-mail: e203005f@yokohama-cu.ac.jp

Abstract:

[Introduction] Total hip arthroplasty (THA) provides the favorable clinical improvement in patients who suffer from hip disorders. However, THA patients with low muscle strength and postural imbalance are reported to have poor postoperative improvement in walking ability and hip function. The purpose of this study was to evaluate whether hip-trunk muscle strength are related to pre- and postoperative posture and walking ability in THA patients.

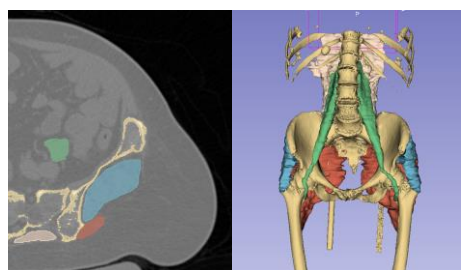
[Methods] Consecutive 53 female patients with bilateral Hip Osteoarthritis (HOA) and 74 female patients with unilateral HOA who underwent THA in our institution were enrolled in the study. All patients were conducted perioperative EOS imaging examination for the assessment of whole-body alignment of sagittal vertical axis (SVA), lumbar lordosis (LL), and pelvic alignment of sacral slope (SS). Preoperative CT images and 3D-Slicer software were used to measure the volume and mean CT density (house field unit: HU) value of gluteus maximus, gluteus medius, psoas major, and paraspinal muscles (Figure 1).

[Results] Preoperative SVA was not significantly different between bilateral and unilateral HOA patients, although preoperative SS and LL were significantly higher in bilateral HOA patients. SVA and SS showed a significantly negative correlation with psoas major muscle mass ($r=-0.39$ and -0.36 , $P<0.05$, respectively, Table 1), and LL showed a significantly negative correlation with paraspinal muscle mass ($r=-0.37$, $P<0.05$, Table 1). Unilateral HOA patients showed differences in muscle volume, CT density, and muscle mass value between affected side and contralateral side, whereas bilateral HOA patients had no significant difference in the muscle measurements. The muscle mass of the gluteus maximus, gluteus medius, and psoas major muscles in the bilateral HOA patients was significantly higher than that of the affected side in the unilateral HOA patients and lower than that of the contralateral side, while the muscle mass of the paraspinal muscles in bilateral HOA patients was significantly higher than that of either the affected or unaffected side in the unilateral HOA patients.

[Discussion] The study suggests that patients with bilateral HOA have more anterior pelvic tilt and lumbar kyphosis, likely due to flexion contracture of the hip affects posture in patients with bilateral HOA. Significant negative correlation between hip-trunk muscles and posture indexes suggests that rehabilitation targeting these hip-trunk muscles may be important to preserve the postures in both bilateral and unilateral OA patients.

[Significance] This study focused on the quantitative measurement of hip-trunk muscle and current result suggested that the rehabilitation on hip-trunk muscles, including psoas major muscles, may improve the postoperative outcome of THA.

[Images and Figures]



(Figure 1) 3D-Slicer software was used to measure the volume and mean house field unit

| Correlation between Posture Index and Hip-trunk muscles | | |
|---|----------------------------------|-------------------|
| Posture Index | Muscle Mass of Hip-trunk muscles | |
| | Psoas Major Muscles | Paraspinal Muscle |
| SVA | $r=-0.39$ | $r=-0.24$ |
| SS | $r=-0.36$ | $r=-0.03$ |
| LL | $r=0.05$ | $r=-0.37$ |

(Table 1) Correlation between Posture Index (SVA, SS, LL) and Hip-trunk muscles