

# Hip fracture with lesser trochanter injury induces the decrease of iliopsoas muscle volume and the increase postoperative urinary retention

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## Hypothesis / aims of study

Hip fracture is a major problem for older patients, with a significant cause of postfracture disability, morbidity and mortality, and is often associated with postoperative urinary retention (POUR), which can lead to hydronephrosis, pyelonephritis and renal insufficiency, confusion, extended stay in hospital. However, the aetiology of POUR of hip fracture is unclear because the autonomic nervous system has no damage from the femoral fracture.

Iliopsoas muscle, which is placed between the lumbar vertebra and lesser trochanter of femoral bone, helps in stabilizing the spine and maintaining the posture. (Figure 1) Because urination with seating or standing position can use abdominal muscle pressure and gravity effectively for complete voiding when compared to urination with bed rest, iliopsoas muscle might have important role in voiding function. (Figure 2) In this study, we examined the relation between the residual urine volume and iliopsoas muscle function.

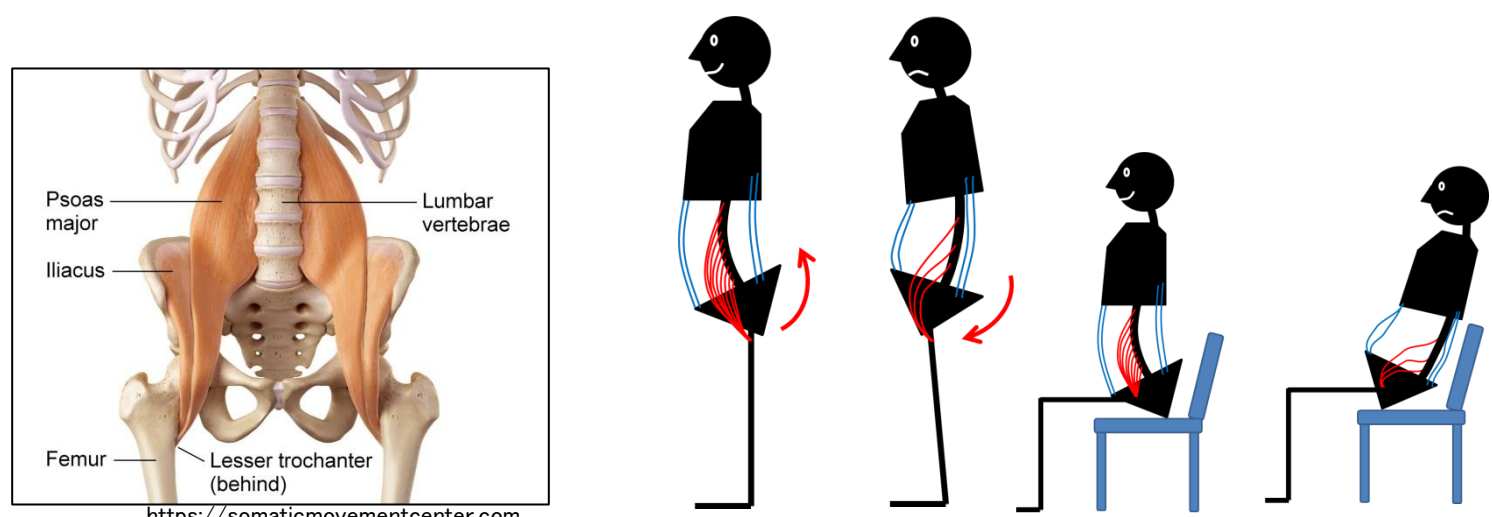


Figure 1. Iliopsoas muscle maintains posture.



Figure 2. Seating position can use abdominal pressure and gravity effectively for urination than bed rest.

## Materials and Methods

A total of 148 patients with hip fracture were studied.

Hip fracture was divided into 3 types of fracture;

- (1) femoral neck fracture (n=96),
- (2) trochanteric fracture with lesser trochanter injury (n=31),
- (3) trochanteric fracture without lesser trochanter injury (n=21).

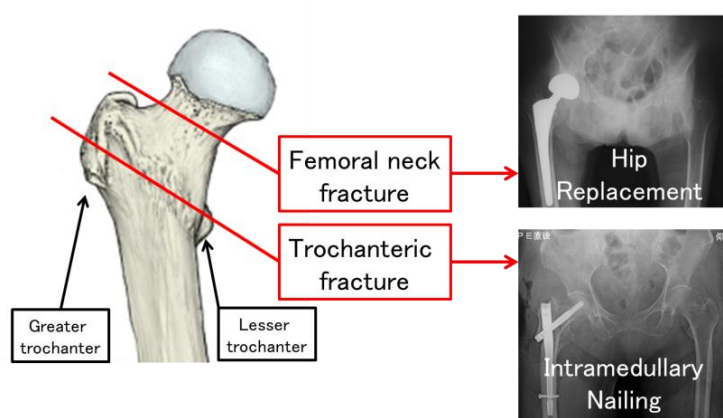


Figure 3. Surgical treatment

Hip replacement and intramedullary nailing were undertaken for treatment for femoral neck fracture and trochanteric fracture, respectively.

Urethral catheter was removed 2 or 3 days after hip surgery, and the postvoid residual urine volume was measured using ultrasonography for 24 hours. Intermittent catheterization (IC) was performed in patients with postvoid residual urine of over 200 ml.

### [Experiment 1] The comparison of ratio of drainage with intermittent catheterization (IC) for residual urine after surgery

The ratio of IC was compared between femoral fracture vs. trochanteric fracture, and trochanteric fracture with lesser trochanter injury vs. without injury.

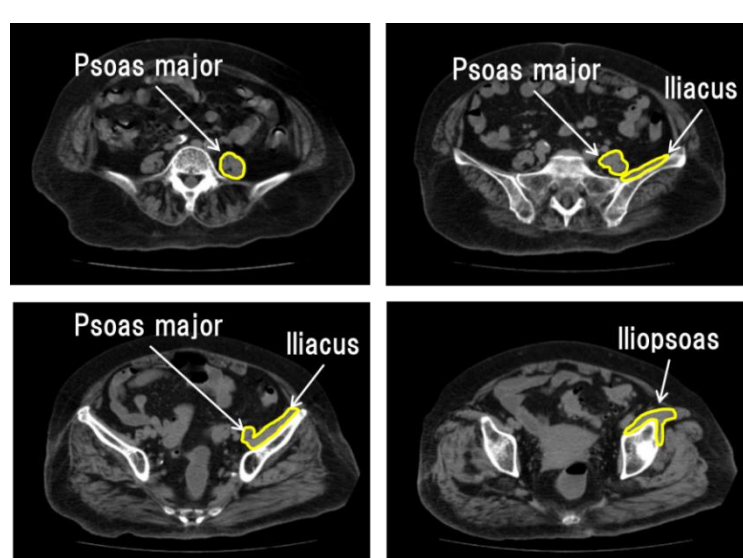


Figure 4.

### [Experiment 2] The comparison of iliopsoas muscle volume before and after surgery

Muscle volume of iliopsoas muscles were compared between before and after surgery using computerized tomography (n=8 in each group).

### [Experiment 3] The comparison in patients with trochanteric fracture with or without intermittent catheterization (IC)

In patients with trochanteric fracture with IC (n=6) or without IC (n=10), the fracture pattern of stable/unstable, postoperative pain, the ability of holding of seating position, and strength of iliopsoas muscles were assessed using Jensen classification, Numerical rating scale (NRS), Hoffer classification (JSSC version), and hand-held dynamometer, respectively.

## Results

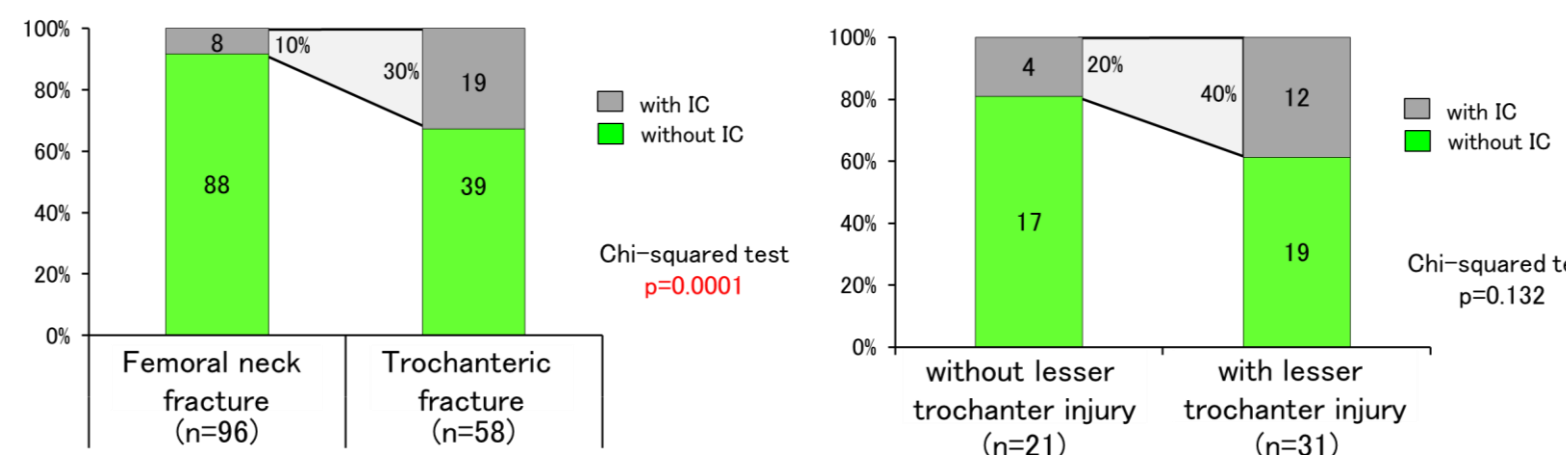


Figure 5. The ratio of drainage with intermittent catheterization (IC) for residual urine after surgery.

The ratio of drainage with IC for residual urine after surgery was significantly higher in trochanteric fracture (30%) compared with femoral fracture (10%), and has tendency of higher in trochanteric fracture with lesser trochanter injury (40%) than in patients without injury (20%).

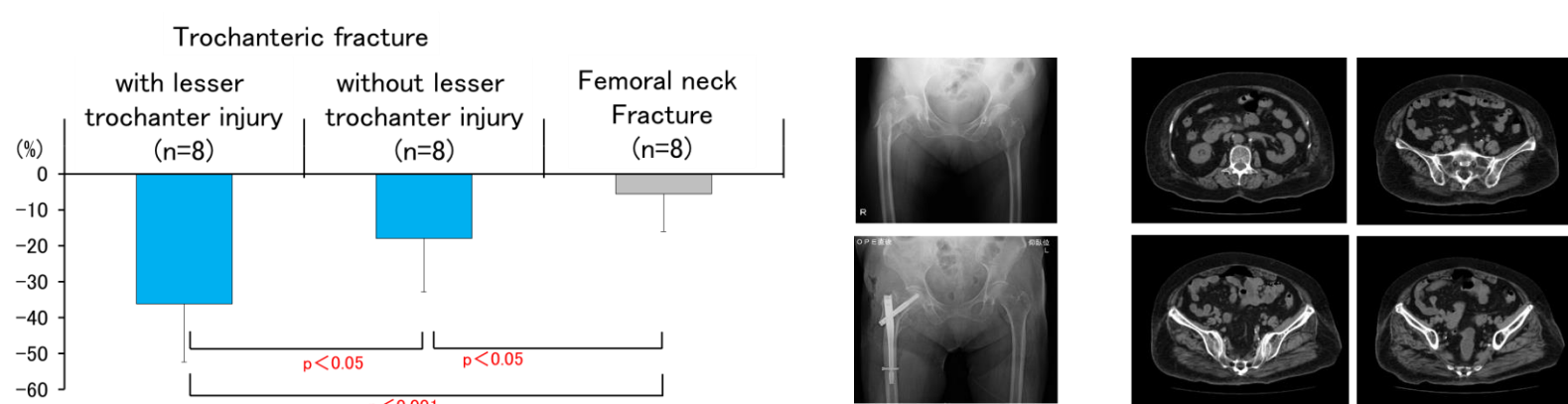


Figure 6. The volume of iliopsoas muscle.

The volume of iliopsoas muscle was significantly decreased in trochanteric fracture with lesser trochanter (-35%) compared with trochanteric fracture without lesser trochanter (-18%) and femoral fracture (-5%).

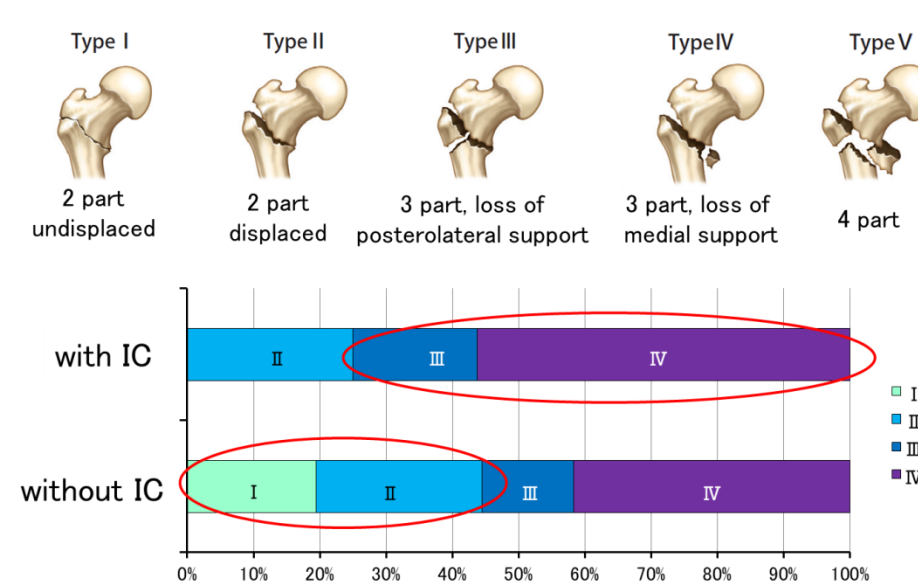


Figure 7. Jensen classification.

Jensen classification revealed that unstable fracture pattern (type 3, 4 and 5) is larger (75%) in patients with IC compared with patients without IC (55%).

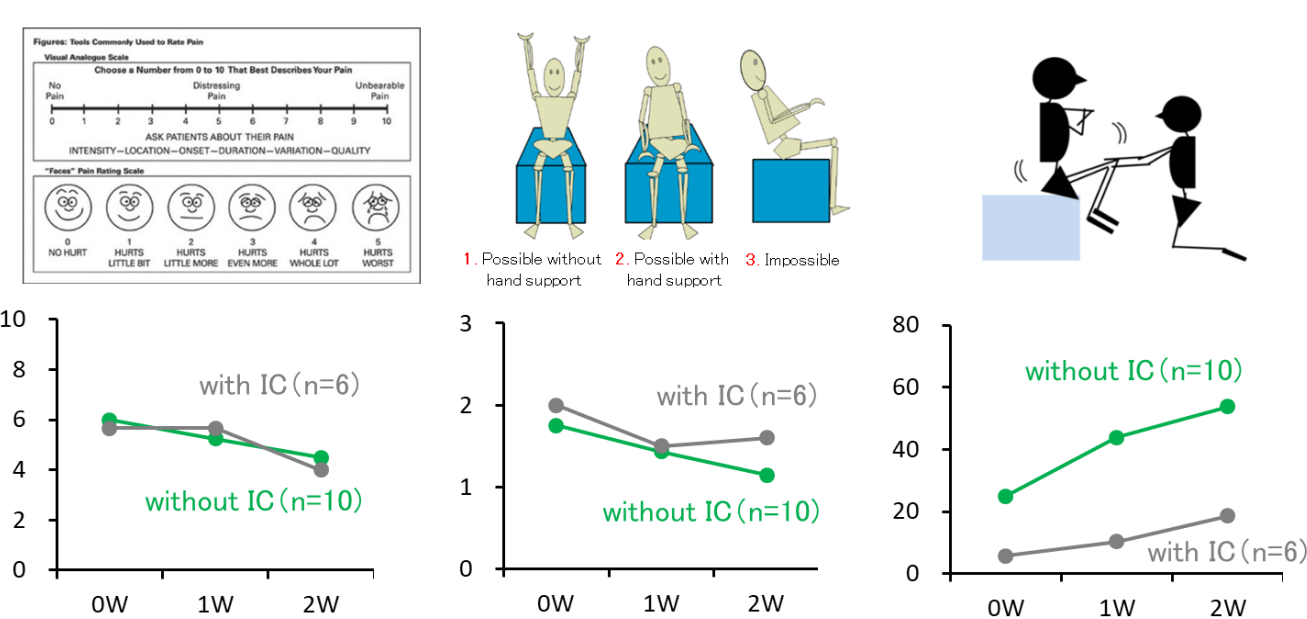


Figure 8. The comparison in patients with trochanteric fracture with or without intermittent catheterization (IC)

There is no difference in pain score between 2 groups. In patients with IC, the recovery of the ability of holding of seating position was slower than in patients without IC. The iliopsoas muscle strength was significantly weaker in patients with IC for postvoid residual urine than patients without IC.

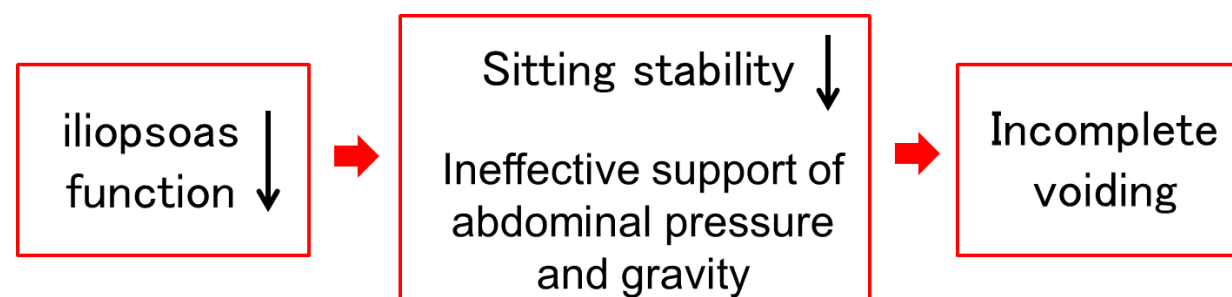
## Interpretation of results

This study suggests that

- (1) trochanteric fracture has relation with postvoid urine,
- (2) the volume of iliopsoas muscle was significantly decreased especially in patients with lesser trochanter injury when compared with femoral fracture, and
- (3) the stability of fracture and the strength of iliopsoas muscle was significantly weaker and the recovery of the ability of holding of seating position was slower in patients with residual urine than in patients without residual urine.

These results indicate that hip fracture with lesser trochanter injury induces the decrease of iliopsoas muscle function and increase postoperative urinary retention.

Because iliopsoas muscle is important for maintaining the posture, and seating or standing position during voiding is also needed to complete voiding when compared to bed rest, the weak strength of iliopsoas muscle might lead to the incomplete voiding.



## Concluding message

We need to attention on iliopsoas muscle and postoperative ability of maintaining posture, and rehabilitation that paid attention to iliopsoas muscle is more necessary to prevent urinary retention in elderly patients.