The Effectiveness of Computed Tomography in Lateral Hinge Fracture in Medial Opening Wedge High Tibial Osteotomy

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Introduction

- Medial opening wedge high tibial osteotomy (OWHTO) is a well-established treatment for medial compartment osteoarthritis of the knee, and the Lateral hinge fracture(LHF) is one of the complications after OWHTO.

- The risk of correction loss and delayed union has been reported in the Takeuchi classification Type II and III, but the LHF is often not clear on simple x-ray and it's revealed on CT.

- This study compared the detection rates of LHF after OWHTO on X-ray and CT.

Materials and Methods

Subject

2016.7-2021.9
OWHTO due to Osteoarthritis or Osteonecrosis
46 patients (female 22, male 24)
Average age 59.1 y/o (33-74)
Planed mechanical axis: 60%

LHF were evaluated by X-ray and CT taken after surgery according to the Takeuchi classification.

Rehabilitation

ROM exercise from 1 day postoperatively
Partial weight-bearing from 1 week postoperatively

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Radiographic Evaluation

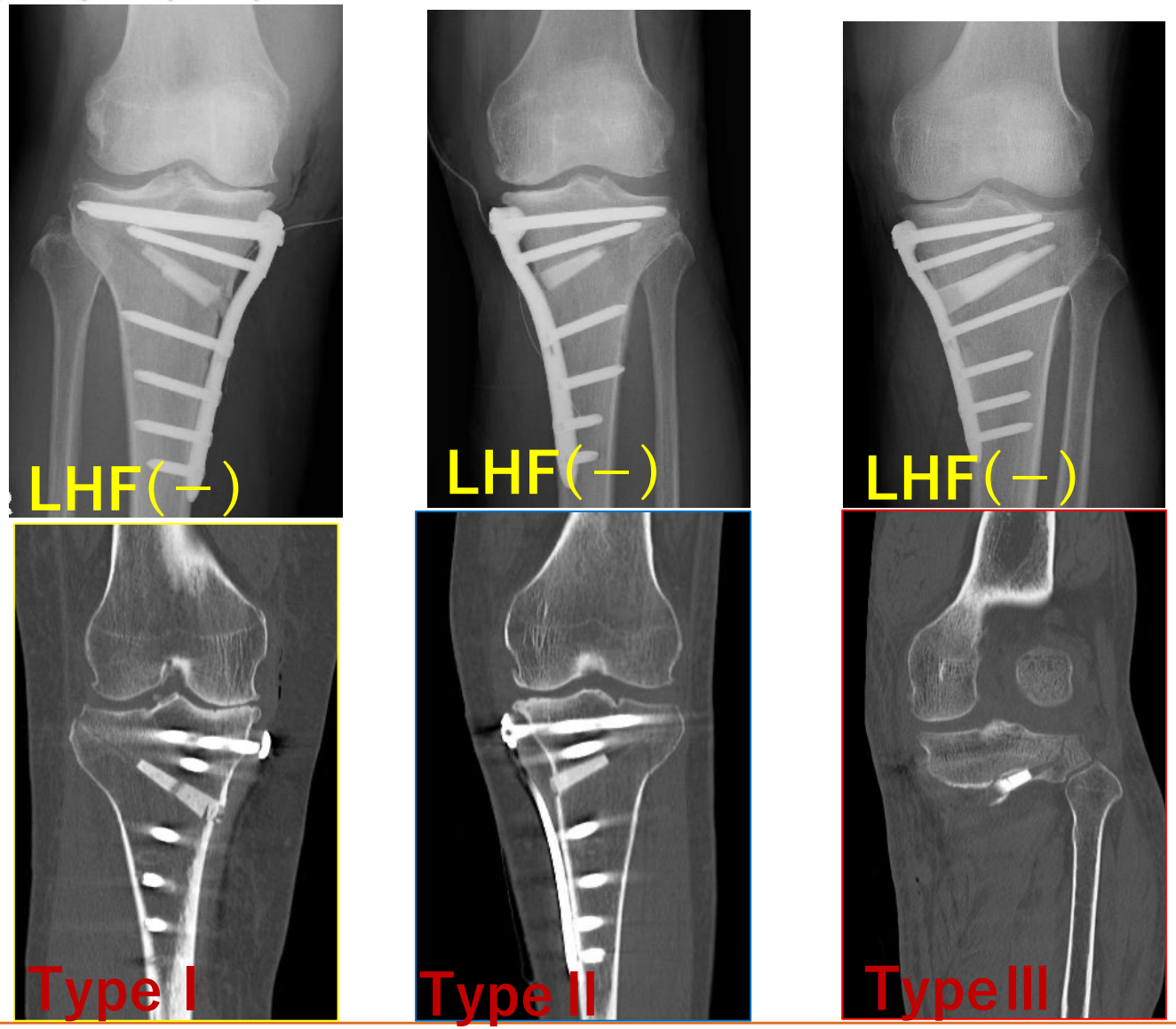
- Mean opening gap width
- Comparison of
  - X-ray and CT in Takeuchi classification
  - Correction loss of MPTA with X-ray
  - Changes in posterior tibial slope (PTS) with X-ray immediately after surgery and 6 months after surgery

Result

Mean opening gap：9.5mm±2.1mm

	LHF(−)	LHF(+)
X-ray	40 (87%)	**6 (13%)**
CT	22 (47.8%)	**24 (52.2%)**

Takeuchi classification	Type I	Type II	TypeIII
X-ray	4	1	1
CT	18	2	4


LHF(−)
LHF(−)
LHF(−)
Type I
Type II
TypeIII

	LHF(－) (n=22)	LHF(－) (n=24)	P-value
Opening gap(mm)	8.6±1.8	10.4±1.9	P=0.003
Correction loss of MPTA	0.7° ±1.3°	0.4° ±0.7°	P=0.303
Change in PTS	0.7° ±1.1°	0.9° ±1.5°	P=0.535

	Type Ⅰ (n=18)	Type Ⅱ (n=2)	Type Ⅲ (n=4)
Opening gap(mm)	10.6±2.0	8.5±2.1	10.3±1.3
Correction loss of MPTA	0.3° ±0.8°	0	0.7° ±0.8°
Change in PTS	0.9° ±1.4°	0	1.7° ±1.9°

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Discussion

Detection rates

・The detection rates of LHF is **14-35% on X-ray and 50-60% on CT.** Nakamura et al:Bone Joint J ,2015
Lee et al:The Journal of Arthroscopic and Related Surgery,2018

・the detection rates of LHF was **21.2% in X-ray and 7.6% in CT** taken **at 2 weeks postoperatively** due to slice thickness and crimping at the hinge area by the load (especially Type Ⅰ). Kobayashi et al:The Knee 2017

This study

Comparison X-ray taken immediately after surgery and CT taken the day after surgery

X-ray 6knee（13%） CT 24knee（52.2%）

Early postoperative CT is necessary to diagnose LHF

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Discussion

Osteotomy gap height and LHF

・The risk of LHF increases with greater opening gap due to limited cortical bone plasticity. Nelissen et al;Int Orthop, 2010

・Mean opening gap greater than 11.7mm increases the risk of LHF.

Lee et al:The Journal of Arthroscopic and Related Surgery,2018

・Considering the radiation exposure,CT might be the preferred method when the osteotomy gap height is greater than 13mm because the mean osteotomy gap height in knees with LHF was 13.5mm. Han et al;The Journal of Arthroplasty,2019

This study

LHF(+)→mean opening gap 10.4mm (P=0.003)

The osteotomy technique should be performed more carefully.

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Conclusion

The LHF after OWHTO was evaluated using CT and compared and discussed with X-ray evaluation.

Early postoperative CT is useful due to the high incidence ofLHF(52.2%)

The greater the opening gap,the greater the risk of LHF, so the surgical technique should be performed more carefully.

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