Risk of Deep Peroneal Nerve Injury in Medial Opening-Wedge High Tibial Osteotomy -A Cadaveric Study Using Locking Plate-

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Medial opening-wedge high tibial osteotomy (MOWHTO)

- Early weight bearing
- No fibula osteotomy
  - Less peroneal nerve (PN) complication
- Nerve complication due to screw interfere
- Less study has examined the risk of peroneal nerve injury in MOWHTO

Purpose

To anatomically examine the risk of peroneal nerve injury in MOWHTO
Material And Methods

Ten cadaveric knees with normal anatomy (age: 67-105y, mean 84.1y)

Dissection Step

1. Identify the *common peroneal nerve (CPN)* in the posterior side
2. Remove the Tibialis anterior muscle
3. Expose the *deep peroneal nerve (DPN)* and *superficial peroneal nerve (SPN)* with the relation to the fibula intact
Material And Methods

MOWHTO and plate fixation

1. MOWHTO (10mm opening)
2. Temporarily fixation of Locking plate* with 2.4mm kirschner wires (K-wire)

Plate placement:
- Plate anterior
- Plate posterior (recommended position)

Measurement of the distance

- Tibial cortex to PN (on the K-wire) : Dt
- K-wire to PN : Dn

Statistics

Paired t-test, significance p ≤ .05

*TriS plate® (Olympus Termo Biomaterials, Tokyo, Japan)
Results Dn:
Distance from K-wire to PN

Plate anterior:
- Screws C and 2, 3, 4 are high risk

Plate posterior:
- Screws 1, 2, 3, 4 are high risk
Results Dt: Distance from tibial cortex to PN (on the K-wire)

- Screws A, B and C: PN are exist near the tibial cortex
- Safe distance for screws 1, 2, 3, 4 is under 7mm
Results
plate anterior vs posterior

plate anterior: Screw C is high risk
plate posterior: Screws 1, 2, 3, 4 are high risk
Discussion

PN injury

✓ Screw A, B, C potential risk
  (Madry H et. al. KSSTA. 2017) 4.

✓ Lag screw in hole 1
  (Shin YS et. al. 2017) 3.

Our study

✓ Screw 1.2.3.4 were directed toward the DPN
  (Both plate placements)

✓ Screw C was directed toward the CP (Especially Plate anterior)
Discussion

Extended insertion of distal screws
→ risk of neurovascular injury.
→ Screw #3, #4 mono-cortical recommend

Our study
Potential risk of DPN injury
at screw 2, 3, 4
(with any plate placement)

(Itou J. et al., 2019)
Our recommendation

Plate placement: posterior is better

Screws A, B, C:
Do not penetrate opposite cortex

Screws 1, 2, 3, 4:
Stop drilling just after penetrating the opposite cortex

Safe range (mm):
1: 1~13, 2: 1~12, 3: 1~8, 4: 1~7

Screws 3, 4:
Use Mono-cortical screw if the stability is ensured
Conclusion

✓ Screw directions were altered by the plate placement (no safe plate placement)
✓ Every screw has the potential risk of PN injury
✓ To avoid PN injury in OWHTO:

1. Do not penetrate the opposite cortex when drill the screws A, B, C
2. Stop within 7mm over the opposite cortex when drill the screws 1, 2, 3, 4