Complications associated with Medial Opening-Wedge HTO Using a Locking Plate: A Multi-Center Study

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Disclosure Statement

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High Tibial Osteotomy (HTO)

- A well-established option for varus alignment with associated medial compartment OA.

  - Naudie D, et al. KSSTA. 2013

- Medial opening wedge HTO (OWHTO)

  : Satisfactory objective & subjective outcomes reported following medial OWHTO

  - Floerkemeier S et al. KSSTA. 2013
  - Duivenvoorden T et al. JBJS Am. 2014
  - Bonnin MP et al. AJSM. 2014
  - Miller BS et al. JKS. 2007
  - Schallberger A. et al. KSSTA 2011
Complications after OWHTO

- Recently, several reports regarding Cx. following OWHTO
  - Niemeyer P et al. Arthroscopy, 2010
  - Martin R et al. AJSM. 2014
  - Valkering KP et al. JKS. 2009

- General incidence of Complications: 1.9 ~ 55 %
  - Asik M et al. KSSTA. 2006
  - Kolb W et al. JBJS Am. 2009
  - Niemeyer P et al. Arthroscopy 2010

- However, these studies involved small numbers or lacked evaluation on clinical influences

- Limited studies for OWHTO using Locking plates
  - Seo S, et al. KSRR 2016
Purpose of this Study

• To investigate Complications following medial OWHTO using a Locking Plate by means of a multi-center study.

• To compare postoperative outcomes between Complicated group and Uncomplicated group.
Patients & Methods

• Patients who underwent **medial OWHTO using locking plates** (2010 to 2015): 3 medical centers

• Minimal 2 years f/u after index Op.

**Inclusion Criteria**
- Patients who underwent OWHTO for medial compart arthrosis (OA or ON) with varus alignment of the knee.
- OWHTO using locking plate
- Patients with minimal 2 years f/u after index operation

**Exclusion Criteria**
- Patients who underwent OWHTO for alternative reasons (e.g. 2nd OA…)
- Other fixatives (e.g. Puddu plate)
- Patients who underwent additional surgeries such as lig. reconstruction at index operation.
Patients & Methods

• Medical records & Radiologic data retrospectively reviewed.
• Clinical outcomes assessed using the WOMAC score.
• Complications (up to postop. 2 years) categorized into Major and Minor Complications.

- **Major complication**: Additional Surgical Treatment or Long-term Conservative Treatment needed
  - Deep wound infection
  - Hardware failure with severe pain or correction loss
  - Non-union
  - Neurovascular injury
  - CRPS type II
  - Displaced lateral tibial plateau Fx.
  - Displaced lateral hinge Fx.
  - Intra-articular screw penetration
  - Compartment syndrome
  - Early conversion to TKR within 2 years d/t any reason

- **Minor complication**: Close observation without surgical treatment
  - Undisplaced lateral hinge Fx.
  - Hematoma around osteotomy site
  - Delayed wound healing
  - Undisplaced lateral tibial plateau Fx.
  - Post-op. stiffness
  - DVT
  - CRPS type I
  - Cellulitis
  - Superficial wound infection
  - Increased tibial slope (more than 10°)
  - Delayed union
  - Tendinitis
  - Limited HW failure (w/o correction loss)
  - Neuropathy
  - Hardware irritation
Results: **Demographics**

- Total **209** patients: male 29 / female 180 enrolled.
- Mean age: **56.4 ± 5.9** years.
- Mean pre-op. varus: **7.1 ± 3.6°**
- Mean pre-op. WOMAC: **51.1 ± 12.4**
Results: **Complication rate**

- **Overall** Complication rate: **29.7%**
- **Major** Complication: **8.6 %**
- **Minor** Complications: **21.1%**

- **M/C Cx.: Undisplaced lateral hinge Fx. (< 2 mm):** 12.0%
  - **Opening width (> 11 mm):** Significant risk factor (OR=2.844) for Lateral Hinge Fx.
Results: Each time period

<table>
<thead>
<tr>
<th>Complication Occurrence According to the Period After Medial Opening-Wedge High Tibial Osteotomy.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intraoperation</td>
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<tr>
<td>----------------</td>
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<tr>
<td>Complications (n)</td>
</tr>
<tr>
<td>• Undisplaced (&lt;2 mm) lateral hinge fracture (14)</td>
</tr>
<tr>
<td>• Undisplaced (&lt;2 mm) lateral tibial plateau fracture (2)</td>
</tr>
<tr>
<td>• Displaced (&gt;2 mm) lateral hinge fracture (3)</td>
</tr>
<tr>
<td>• Deep wound infection (2)</td>
</tr>
<tr>
<td>• Cellulitis (2)</td>
</tr>
<tr>
<td>• Spontaneous osteonecrosis of the knee (1)</td>
</tr>
</tbody>
</table>

| Total no. of cases (rate) | 19 (30.6%) | 25 (40.3%) | 5 (8.1%) | 6 (9.7%) | 7 (11.3%) |

CRPS, complex regional pain syndrome.
Results: **WOMAC score**

### WOMAC score: overall patients

- **Pre-op**: 51.1 ± 12.4
- **POD 6m**: 22.9 ± 11.5
- **POD 1y**: 15.7 ± 10.0
- **POD 2y**: 11.4 ± 7.9

*P < 0.001*

### WOMAC score: Group comparison

- **Uncomplicated Group**
  - **Pre-op**: n.s.
  - **POD 6m**: n.s.
  - **POD 1y**: n.s.
  - **POD 2y**: P = 0.005

- **Minor Complication Group**
  - **Pre-op**: n.s.
  - **POD 6m**: n.s.
  - **POD 1y**: n.s.
  - **POD 2y**: P = 0.002

- **Major Complication Group**
  - **Pre-op**: n.s.
  - **POD 6m**: n.s.
  - **POD 1y**: n.s.
  - **POD 2y**: P < 0.001
Conclusion

- Overall Cx. rate after OWHTO using a Locking plate: 29.7%.
- Most Cx. were minor complications.
- Most common Cx.: undisplaced (< 2 mm) lateral hinge fracture. (12.0%).
- Major Cx. occurred in 8.6% of all patients.
- Major Complication group showed significantly worse clinical outcome at 1 & 2 yr.
Thank you for your kind attention!

- References