

Number: 4330 Program: 230

Choices of Screws in Medial Malleolar Fractures

Yenwen Cheng¹, Yu-ping Su², Chi-kuang Feng², Fan-yao Chiu^{2,3}

1. Institute of Orthopaedics, University College London, UK
2. Department of Orthopaedics and Traumatology, Veterans' General Hospital Taipei, Taiwan
3. Department of Rehabilitation and Technical Aid Center, Veterans' General Hospital Taipei, Taiwan

【Introduction】

Medial malleolar fracture is one of the most common fractures which require internal fixation after adequate reduction of fracture fragments (Rockwood & Green's Fractures in Adults, 2006 #1). There are various types of implants for internal fixation. Traditionally, medial malleolar fractures will be treated with partial threaded screws. Tension-band wire or mixed use of screws and Kirschner's pins are reported. Plates are indicated in limited circumstance (Dumigan, 2006 #2). Regarding to partial threaded screws, it is still debated if there is appropriate number of screws for fixation. For this purpose, we retrospectively reviewed clinical outcome of our patients who had medial malleolar fracture and received open reduction and internal fixation with screws.

【Materials and Methods】

There were 158 patients with medial malleolar fractures enrolled in our database from 2002-2010. Patients who suffered from medial malleolar fracture underwent internal fixation with screws and followed up at least for 12 months post-operatively were included. Internal fixation only was performed after adequate fracture reduction by a team of trauma orthopedic surgeons. Patient who refused surgery or loss of follow up were excluded. One patient with bilateral medial malleolar fractures would be regarded as two cases. Since fixation with screws is the preferred surgical method of our trauma surgeons, all patients underwent internal fixation with screws. Selection of implants and number of screws were recorded. Concomitant injury usually reflects severity of trauma and its mechanism, therefore we considered associated injury as well. In our study, associated injury was defined as concurrent ipsilateral tibial or lateral malleolar fracture which were indicated for surgical treatment. Post-operation x-ray were taken right after surgery, three months, and one year later. Healing of fractures were evaluated in anterior-posterior and lateral view roentgenography. Statistics were processed with Medcalc® and Chi-square test was used.

【Results】

There were one hundred and sixty-one operations, of which ninety-six cases were fixed with one screw and sixty-five cases were fixed with two screws. Cancellous,

[在此鍵入]

[在此鍵入]

cannulated or malleolar screws have been used. There were eighty-four cases fixed with malleolar screws, forty-seven cases with cancellous screws, and thirty cases with cannulated screw. Forty-eight patients had associated injury, such as lateral malleolar fracture or syndesmotic injury (Table 1). Three patients had loss of reduction and underwent revision surgery right after operations. There were twenty patients had distinguishable fracture gap on Xray in three months (Figure 1). In our study, number of screws was the significant factor of post-operational union. Two-screw group had few numbers with significant nonunion in four-month after surgery (Table 2). Screw type and associated injury have no significant differences (Table 3,4).

【Discussion】

Medial malleolar fractures are common seen in trauma patients. However, no one certain fixation methods would be regarded as standard treatment, unlike lateral malleolar fractures. Fixation with screws seem to be favored by most surgeons, but how many screws would be appropriate or which screw provides better clinical results are not yet answered. Two screws were suggested in a review of American College of Foot and Ankle Surgeons (Jennings, 2008 #3). About numbers of screws, two-screw technique method is preferred in AO technique (AO Principles of Fracture Management, #4). In our research, two-screw method has less incidence of persistent fracture gap, no matter what kind of screw were used. And rotational stability may answer why two-screw method provides better fixation. Back to trauma energy and mechanism, we analyzed associated injury as an indicator of different mechanism, but no significant differences could be found between associated-injury group and non-associated injury group. We think this is due to that we seldom face the extremely high energy force trauma which could lead to massive comminuted medial malleolar fractures. Interestingly, our investigation revealed that fixation with cannulated screws has the trend of persistent gap, though not significantly different from other two groups. We proposed that cannulated screw are usually the second-line choices of implants due to medical cost and availability. Cannulated screws are used once the fracture fragment is too small or comminuted to provide screw insertion. Therefore, the timing of using cannulated screws requires further investigation.

【Limitation】

This research is a retrospective study. Size of bone fragment is the biggest issue we want to investigate in the future with development of image technology. We'd tried to analyze bone fragment according to X-ray only however results could not represent real size of bone fragment. Bone quality is also to be taken into consideration. Biomechanical study could be another part of our research. Besides, medial malleolar fracture could be categorized by Hersovici classification. We also want to investigate the relationship between of fracture classification and number of screws.

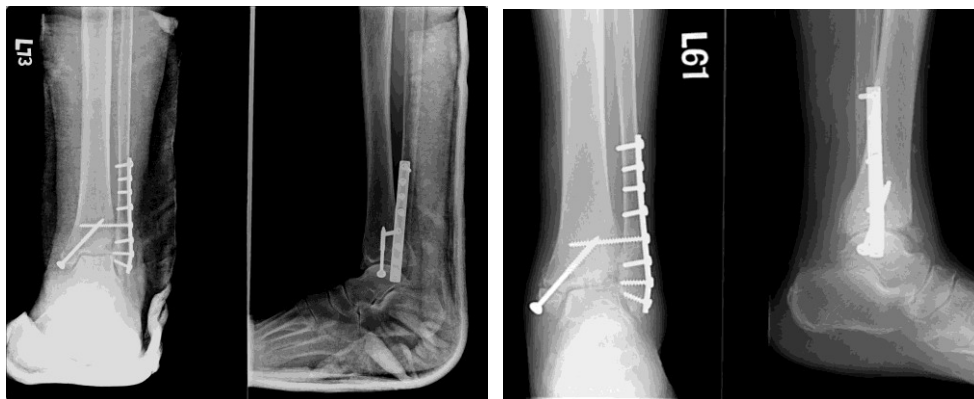
[在此鍵入]

[在此鍵入]

【Conclusion】

Displaced medial malleolar fractures are indicated for operations, which are proved to be beneficial to patients with open reduction and internal fixation. With proper open reduction, internal fixation with two screws provides stronger and more stable fixation than with only one screw. Fixation with two screws has significant fracture union rate.

Figure 1



a. Post-op xray

b. Three months later, gap still could be observed

Table 1 Demographic data

Category	Sub-category	Case Numbers
Type of Screws	Malleolar	84
	Cannulated	30
	Cancellous	47
Associated Injury	With	48
	Without	113

Table 2 Number of Screws

Table 2	Numbers	Persistent gap
One-Screw group	96	22
Two-Screw group	65	2
p value = 0.0032, Odds ratio: 9.3649		

Table 3 Comparison of screw type

Screw Type	Numbers	Persistent gap
Malleolar	84	13

[在此鍵入]

[在此鍵入]

Cannulated	30	6
Cancellous	47	5
p value= 0.493, not significant		

Table 4 Comparison of associated injury

Associated Injury	Numbers	Persistent gap
With	48	10
Without	113	14
p value=0.17, not significant. Odds ratio 1.86		

Bibilography

1. Rober W. Bucholz et al *Rockwood & Green's Fractures in Adults, 6th Edition*. Vol. I. 2006: Lippincott Williams & Wilkins.
2. Dumigan, R.M., D.G. Bronson, and J.S. Early, *Analysis of fixation methods for vertical shear fractures of the medial malleolus*. *J Orthop Trauma*, 2006. **20**: p. 687-91.
3. Jennings, M.M. and J.M. Schuberth, *Fixation of the medial malleolar fracture: a simplified technique*. *J Foot Ankle Surg*, 2008. **47**(4): p. 368-71.
4. Ruedi, T., *AO Principles of Fracture Management*. 2 ed. 2007.