

Comparison of adequacy of reduction of third malleolar fracture in prone vs. spine position in tri-malleolar ankle fracture a tertiary care experience

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Abstract:

INTRODUCTION:

Ankle fractures are one of the most common lower extremity injuries, particularly tri-malleolar fractures, provide substantial hurdles to orthopedic surgeons due to their complicated nature (Pflüger et al., 2021), occurring in around 179 out of 100,000 persons each year (Juto, Nilsson, & Morberg, 2018). However, posterior malleolus involvement may not be as uncommon as previously believed. According to the literature, the incidence of posterior malleolar fractures can reach 44%, necessitating additional strategic planning for the repair of displaced articular fracture patterns (Irwin, Lien, & Kadakia, 2013; Shi, Xiong, Chen, Wang, Qiu, Huang, Gui, Wen, & Wang, 2017).

Objectives: The unique fracture features, surgeon expertise, and patient considerations should all be taken into account while deciding between the two positions.

Methodology: This study is based on data collected from a tertiary care hospital that treated a cohort of patients with tri-malleolar ankle fractures. Patients were separated into two groups: those who had their reductions in the prone position and those who had them in the supine position. Radiographic studies, clinical examinations, and surgical problems were all used to determine the appropriateness of reduction.

Results and Discussion:

The comparison investigation demonstrated that both the prone and supine positions can effectively reduce third malleolar fractures in tri-malleolar ankle fractures. These results are in line with the results of Tosun, Selek, Gok, and Ceylan, (2018) which were reported as posterior malleolar fracture repair is strongly associated with favorable radiological and functional outcomes following trimalleolar fractures. The unique fracture features, surgeon expertise, and patient considerations should all be taken into account while deciding between the two positions. While the supine position may offer advantages in terms of anterior visibility and potential reduction in neurovascular problems, the prone position

remains a viable and time-tested technique for resolving posterior malleolar fractures.

Conclusion:

The choice between prone and supine postures in the reduction of third malleolar fractures in tri-malleolar ankle fractures is a difficult one that should be tailored to each patient. Our tertiary care center's experiences indicate that both positions can produce satisfactory results when used correctly. More research and larger studies are needed to develop more solid guidelines, taking into account the different aspects impacting the choice of location and subsequent reduction strategies in these complex ankle fractures.

Key Words: Ankle fractures, complicated, extremity injuries, posterior malleolar

Introduction:

Ankle fractures are one of the most common lower extremity injuries, particularly tri-malleolar fractures, provide substantial hurdles to orthopedic surgeons due to their complicated nature (Pflüger et al., 2021), occurring in around 179 out of 100,000 persons each year (Juto, Nilsson, & Morberg, 2018). As life

expectancy rises and adults continue to be physically active, ankle fracture incidence is expected to rise over the next few decades (Court-Brown, McBirnie, & Wilson, 1998) the distal fibula is the most usually injured section (67 percent) in ankle fractures, followed by bimalleolar ankle fractures (25 percent) and trimalleolar ankle fractures (7%) (Drijfhout van Hooff, Verhage, & Hoogendoorn, 2015; Juto, Nilsson, & Morberg, 2018). However, posterior malleolus involvement may not be as uncommon as previously believed. According to the literature, the incidence of posterior malleolar fractures can reach 44%, necessitating additional strategic planning for the repair of displaced articular fracture patterns (Irwin, Lien, & Kadakia, 2013; Shi, Xiong, Chen, Wang, Qiu, Huang, Gui, Wen, & Wang, 2017). One of the most important components of addressing these fractures is to achieve an appropriate reduction of the third malleolar fracture, which is critical for favorable outcomes. The placement of the patient throughout the reduction process is a hotly debated topic in the orthopedic world. This study dives into the comparative examination of the adequacy of reduction in third malleolar fractures, specifically comparing the results of reduction in prone and supine positions based on experiences from a tertiary care setting.

Tri-malleolar ankle fractures involve fractures of the medial and lateral malleoli, as well as the posterior side of the distal tibia (Kumar & Aloy, 2020). Proper reduction is critical for restoring joint congruity, reducing postoperative

problems, and allowing for maximal functional recovery. Traditionally, surgeons used the prone position to reduce the third malleolar fracture, but there is growing interest in investigating the advantages of the supine posture.

According to the literature review, a study compared the patient in the prone-supine position to the supine position for pilon fractures using a modified posteromedial approach paired with an anterolateral approach. The study discovered that both postures contributed similar quality of reduction, bone union time, functional outcomes, and comorbidities. However, the supine approach had a much lower operating time (Guo, Zhu, Li, Li, Yang, & Xu, 2023).

Methodology:

This study is based on data collected from a tertiary care hospital that treated a cohort of patients with tri-malleolar ankle fractures. Patients were separated into two groups: those who had their reductions in the prone position and those who had them in the supine position. Radiographic studies, clinical examinations, and surgical problems were all used to determine the appropriateness of reduction.

Inclusion Criteria

- Diagnosis of tri-malleolar
- Ankle fracture
- No previous ankle surgery

- Willing to participate

Exclusion Criteria

- Open fractures
- Contraindications to prone or supine positioning
- Previous ankle surgery

Prone Position:

The prone position has traditionally been used in orthopedic treatments because it allows direct access to the ankle joint's posterior facets. Surgeons often find it easier to manipulate fractures, particularly those of the posterior malleolus, while the patient is prone. However, there have been concerns expressed about the possibility of neurovascular problems and extended surgical timeframes.

Supine position:

Advocates of the supine position claim that it allows for greater sight of the ankle's anterior features, allowing for more accurate reduction of the medial and lateral malleoli. This position may also lower the risk of neurovascular problems that come with prone positioning. Critics argue that getting optimal reduction of posterior malleolar fractures in the supine position is difficult.

Results and Discussion:

The comparison investigation demonstrated that both the prone and supine positions can effectively reduce third malleolar fractures in tri-malleolar ankle fractures. These results are in line with the results of Tosun, Selek, Gok, and Ceylan, (2018) which were reported as posterior malleolar fracture repair is strongly associated with favorable radiological and functional outcomes following trimalleolar fractures. The unique fracture features, surgeon expertise, and patient considerations should all be taken into account while deciding between the two positions. While the supine position may offer advantages in terms of anterior visibility and potential reduction in neurovascular problems, the prone position remains a viable and time-tested technique for resolving posterior malleolar fractures.

Table 1: *Adequacy of Reduction in Prone Position Group (n=100)*

Criteria	Prone Position Group Results
Complications (e.g., Neurovascular)	2 (2%)
Adequate Reduction Achieved	82 (82%)
Inadequate Reduction	5 (5%)
Follow-up Complications	5 (5%)
Secondary Interventions	2 (2%)

Time Required for Reduction (minutes)	Mean: 31, Range: 20-45
Radiographic Evidence	Favorable
Patient Satisfaction	High

Table 2: *Adequacy of Reduction in Supine Position Group (n=100)*

Criteria	Supine Position Group Results
Complications (e.g., Neurovascular)	2 (2 %)
Adequate Reduction Achieved	89 (89 %)
Inadequate Reduction	4 (4%)
Follow-up Complications	3 (3 %)
Secondary Interventions	2 (2%)
Time Required for Reduction (minutes)	Mean: 29, Range: 19-45
Radiographic Evidence	Favorable
Patient Satisfaction	High

Conclusion:

The choice between prone and supine postures in the reduction of third malleolar fractures in tri-malleolar ankle fractures is a difficult one that should be tailored to each patient. Our tertiary care center's experiences indicate that both

positions can produce satisfactory results when used correctly. More research and larger studies are needed to develop more solid guidelines, taking into account the different aspects impacting the choice of location and subsequent reduction strategies in these complex ankle fractures.

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