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Ideal Trans-Syndesmotic Fixation Technique for Obtaining the Optimal Reduction Status Utilizing Bilateral CT Axial Scan in Ankle Fracture With Syndesmotic Injury

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Purpose: Anatomical restoration of distal tibiofibular syndesmosis is essential, but there is no global consensus yet on fixation material or method. Treatment commonly involves transfixation technique using screws or TightRope (Arthrex) from the fibula to the tibia. Making a reference line of the penetrating angle and evaluating the reduction status remain difficult. This study aimed to analyze the reduction status of a syndesmotic injury using radiographic parameters and to find the ideal fixation angle for the transfixation treatment of an unstable syndesmotic injury.

Methods: 26 patients with PER (pronation-external rotation) or PA (pronation-abduction) type ankle fractures due to syndesmotic injury who underwent preoperative and postoperative bilateral CT scan were enrolled in this study. A multicenter study was performed in 2 tertiary medical centers. All patients were treated with tibiofibular transfixation screw or TightRope fixation. The axial section of the bilateral CT scans was reviewed to measure fibular diastasis (FD) and surface area of syndesmosis (SAS) at 1.0 cm above the ankle joint. Reduction status ratio was measured by calculating the ratio of the postoperative and the intact sides using radiologic parameters. The transfixation angles between the perpendicular line of the incisura and the lower transfixation material were measured. Patients were subsequently classified into 3 groups based on the transfixation angle: 0-1° (A), 1-5° (B), and ≥5° (C), measured in absolute values.

Results: The mean value of the reduction status ratio was 1.13 in FD and 1.27 in SAS, and the absolute mean value of the transfixation angle was 4.11°. The study found that the transfixation angle and reduction status had a positive correlation in the FD (R = 0.522, P = 0.006) and the SAS ratio (R = 0.695, P = 0.000). The absolute mean value of the transfixation angle in groups A, B, and C was 0.56° (7 cases), 3.01° (12 cases), and 8.90° (7 cases), respectively. The mean value of the FD ratio in groups A, B, and C was 1.01, 1.03, and 1.42 in each. FD and SAS ratio had no difference between groups A and B but there was significant difference between groups A and C, as well as B and C (P<0.05).

Conclusion: An angle of about 5° from the perpendicular line of the incisura is considered as the ideal transfixation angle to maintain the reduction status.