The Incidences and Locations of Osteochondral Lesions of the Talus in Ankle Fracture

In-Tak Chu, M.D., Yang-Soo Kim, M.D., Soung-Ho Yoo, M.D., and In-Sooh Oh, M.D.
Department of Orthopaedic Surgery, Kang-Nam St. Mary’s Hospital, The Catholic University of Korea, College of Medicine, Seoul, Korea

Purpose: An osteochondral lesion of the talus in ankle fracture needs appropriate treatment to prevent traumatic arthritis. Despite the high incidence of an osteochondral lesion in cases of ankle fracture, it is difficult to identify the location of the lesion during open fracture reduction due to limitation of the surgical approach. Therefore, we reviewed retrospectively the MRIs of ankle fractures to determine the incidences and locations of osteochondral lesions of the talus according to ankle fracture injury mechanism.

Materials and Methods: The MRIs of forty patients with ankle fractures were reviewed. Locations of osteochondral lesions were divided into nine areas; i.e., medial, central, lateral and anterior, central, posterior. Injury mechanisms were divided into supination and pronation groups.

Results: Twenty eight (70%) out of 40 patients with ankle fractures had an osteochondral lesion of the talus. Thirteen (46%) patients were allocated to the supination group and 15 (54%) to the pronation group. Lesion locations were; 7 cases of lateral, 1 central, 5 medial and 8 posterior, 3 central, and 2 anterior for supination injury. In cases of pronation injury, 13 were lateral, 1 each central and medial, and 9 posterior, 5 central, and 1 anterior. The incidences of osteochondral lesions were significantly different at the lateral and central areas, and also between the posterior and anterior areas in both the supination and pronation groups.

Conclusion: For osteochondral lesion in cases of ankle fracture, careful observation of the posterior and lateral areas of the talar dome should be performed and additional treatment should be added for the lesion if required.

Key Words: Ankle, Fracture, Osteochondral lesion, MRI
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Osteochondral lesions with ankle fractures, perhaps because it is difficult to identify lesions during open fracture reduction. Therefore, the purpose of this study was to analyze the incidence and location of osteochondral lesions of the talus in cases of ankle fracture by MRI.

**MATERIALS AND METHODS**

This study consisted of a retrospective review of MR images, operative reports, and the medical records of 40 patients who underwent open reduction for ankle fracture. All procedures were performed at the author's institution from June 1999 through December 2000. Each fracture was repaired using internal fixation according to a standard AO technique by one surgeon (Chu).

The recorded parameters included; patient age, type of injury mechanism (supination or pronation group), and presence or absence of osteochondral lesion and their locations. Forty fractures with MR imaging reports were available for analysis, which documented either the presence or absence of a lesion. A lesion was determined to be acute and traumatically induced, based on MR imaging, when it consisted of an increased signal within the subchondral bone that extended into the cancellous bone of the talar dome on T2-weighted sequences or STIR sequences, and an irregular cartilage border and fresh cartilage detachment. No attempt was made to stage the lesion. To characterize the locations of osteochondral lesions, the talar dome was divided into 9 areas, i.e., medial, central, lateral and anterior, central and posterior. Osteochondral lesion incidences were compared between groups. The Chi-square test was used to determine if there was a significant difference of incidences and locations of lesions according to the areas in the pronation or supination groups. P value less than 0.05 indicate a significant relationship.

**RESULTS**

Average age was 40 (range 16-68) years old and the male to female ratio was 1.8. Twenty three patients were in the supination group and 17 in the pronation group. Twenty eight cases (70%) of ankle fractures had an osteochondral lesion of talus. Thirteen (46%) cases were in the supination group and 15 (54%) in the pronation group. The locations were lateral in 7 cases, central in 1, medial in 5, and posterior in 8, central in 3, and anterior in 2 in the supination group (Fig. 1). In the pronation group, 13 cases were lateral, 1 at each of central and medial, and 9 posterior, 5 central, 1 anterior (Fig. 2).

Statistical analysis using Chi-square test revealed a significant difference between the incidences of osteochondral lesions in the lateral and central areas, and between the posterior and anterior areas in the supination and pronation groups. However, the incidences of an osteochondral lesion were not statistically different in the pronation and supination groups.

**DISCUSSION**

Ankle trauma has been described as an etiology of an osteochondral lesion of the talus. The correlation between osteochondral lesions and ankle

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**Fig. 1.** The numbers indicate the locations and incidences of osteochondral lesions in the supination group.

**Fig. 2.** The numbers indicate the locations and incidences of osteochondral lesions in the pronation group.
fractures has rarely been investigated. By arthroscopic examinations, Hintermann et al.7 noted a cartilageous lesion on the talus, distal tibia or fibula in 228 ankle fractures (72.9%) in 288 patients. Lesions were more often on the talus (69.4%) than on the distal tibia (45.8%) or fibula (45.1%). In the present study, we observed twenty eight cases (70%) of osteochondral lesion of the talus in 40 ankle fractures. This high incidence is attributed to the detectability of subchondral impaction without cartilaginous detachment by MRI which is not visible by arthroscopy. Other studies have mentioned a history of ankle fracture as a possible etiology, but none of these studies linked the acute presence of a lesion at the time of surgery2,5). This could be due to the difficulty of identifying a lesion during open fracture reduction through the standard approach.

MRI of 40 patients with ankle fracture revealed that most of the lesions were in the posterior and lateral areas of the talar dome. This area is more difficult to observe than the anteromedial or anterolateral areas of the talar dome using the standard approach to ankle fracture open reduction.

Roden and Tillegard13 were the first to propose two etiologies based on the presence or absence of trauma. Lateral osteochondral lesions were found to have a history of trauma and medial lesions no known traumatic episode. The work of Berndt and Hardy7 popularized a traumatic etiology for lateral osteochondral lesion, and provided a staged injury mechanism and a classification system. Using cadaveric specimens, they demonstrated that the lateral lesion is the result of inversion of the dorsiflexed ankle. A strong inversion force rotates the talus laterally in the ankle mortise, resulting impaction of the superolateral talar margin against the articular surface of the fibula.

The severity of the lesion increases with a progressive inversion force. Medial lesions conversely, were found to result from inversion of the plantarflexed ankle following contact between the inferior lip of the tibia and the superomedial ridge of the talus. The authors observed medial lesions in both the supination and pronation groups. The incidences and locations of osteochondral lesions showed no statistical difference between the pronation and supination groups. This may that indicate ankle fractures had developed by more complex and violent forces than ankle sprain, and that ankle fractures by pronation forces may involve supination forces in part.

Moreover, there is clear evidence that despite anatomic reduction, postoperative results of ankle fracture are not always free of complications.1,4,8,9,15). The authors believe that preoperative MR imaging is important for detecting osteochondral lesions in ankle fracture to prevent postoperative complications. Preoperative careful observation of the posterior and lateral areas of the talar dome by MRI should be considered for the detection of osteochondral lesions, and additional procedures should be added for osteochondral lesions if needed. Proper identification and early treatment of these lesions is likely to lead to improved long-term results and to reduce postoperative sequelae. Future study should include the clinical outcomes of osteochondral lesions in cases of ankle fracture.

CONCLUSION

We concluded that for osteochondral lesions in cases of ankle fracture, preoperative careful observation of the posterior and lateral areas of the talar dome should be performed by MRI, and additional treatment should be added if needed.

REFERENCES

목적: 족관절 골절에서 발생하는 거골의 골연골병변은 외상성 관절염을 속발할 수 있으므로 적절한 치료가 필요하다. 족관절 골절시 거골의 골연골병변의 반도가 높다고 알려져 있으나 골절의 관절적 정복시 사용하는 수술적 도달법으로는 거골의 골연골병변의 유무를 확인하기가 어려워 이에 대한 치료가 지연될 수 있다. 저자들은 족관절 골절시 발생하는 거골의 골연골병변의 반도와 위치를 알아보기 위하여 수술 전 검사한 자기공명영상의 후향적으로 분석하였다.

대상 및 방법: 족관절 골절 환자 40명의 자기공명영상들을 분석하였다. 골연골병변의 위치는 9구획으로 분류하였는데 거골 체부 관절면을 전후 그리고 내외측으로 3등분하여 내측, 중심부, 외측, 그리고 전방부, 중심부, 후방부로 나누어 각 부위의 발생 반도를 조사하였다. 수술기전은 회외기전, 회내기전으로 나누었다.

결과: 족관절 골절 40명의 환자 중 28명의 환자(70%)가 거골의 골연골병변이 있었고, 13명의 환자(46%)가 회외기전에 의해, 15명의 환자(54%)가 회내기전에 의해 발생하였다. 회외기전 손상군에서 7명은 외측부에, 1명은 중심부에, 5명은 내측부에 발생하였고, 8명은 후방부에, 3명은 중심부에, 2명은 전방부에 발생하였다. 회내기전 손상군에서는 13명은 외측부에, 1명은 중심부에, 1명은 내측부에 발생하였고, 9명은 후방부에 5명은 중심부에 1명은 전방부에 발생하였다. 외상 후 거골의 골연골병변의 반도는 동계적으로 회외, 회내기전 손상군에서 모두 외측과 후방에 능균한 발병률을 보였다.

결론: 족관절 골절에서 발생하는 거골의 골연골병변의 조기 진단을 위하여 족관절 골절 치료시 거골의 후방 혹은 외측부의 정밀한 관찰이 요구되며, 이에 대한 추가적인 치료가 필요하다.

색인 단어: 족관절, 골절, 골연골병변, 자기공명영상