Incidence and clinical significance of bone bruises after supination injury of the ankle

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We used MRI to study a prospective series of 95 patients with inversion injuries of the ankle and no fracture on plain radiographs. We found an incidence of bone bruises of 27%, but these made no difference to the time of return to work, limitation of walking or physical activity, or the clinical outcome scores at three months.

We conclude that bone bruises have very little clinical significance after inversion injuries of the ankle.

Received 26 September 1997; Accepted after revision 22 December 1997

It has been estimated that regardless of treatment about 30% of patients with injuries of the ankle ligaments have residual symptoms such as pain and swelling or a sense of instability.1 The reasons for such an outcome are still not understood, although one possible factor is injury to the bones of the ankle. Anderson et al2 found that of 30 patients with residual symptoms 57% had an osteochondral fracture of the dome of the talus which was visible on MRI but not on conventional radiographs.

MRI can detect subtle injuries of cartilage and osteochondral bone.3-6 Damage to cartilage may lead to a lesion of subchondral bone seen as a bone bruise on MRI.7 The articular cartilage may appear to be intact8 and such lesions may represent elastic deformation of the cartilage with haemorrhage and disruption of the trabecular bone.9 Moreover, these subchondral microfractures may progress to osteochondral defects after several months.8

Our aim was to determine the incidence and clinical significance of bone bruises in supination injuries of the ankle.

Patients and Methods

Between May 1995 and December 1996, we asked patients with ankle sprains and no fracture visible on standard radiographs, or with no history of a sprain in either ankle to volunteer for our study. We set an age range of 15 to 60 years and excluded patients with alcoholism or rheumatoid arthritis. The participation rate among those with their first injury was 80%, but we found that most patients treated in our casualty department had had an earlier inversion injury which excluded them from our study. There were 95 consecutive volunteers, 48 men and 47 women, with a mean age of 28 years (SD 9; 15 to 56).

The mechanism of the ankle injury was a combination of inversion and plantar flexion. In 12 the injury had occurred at work, in 40 at sport and in 43 at other leisure activities. The left and right feet were equally involved. A subcutaneous haematoma was present in 59 of the patients (62%). There was no swelling in 11 (11%), lateral swelling in 74 (78%) and widespread swelling in 10 ankles. Twenty-six patients were unable to bear weight on the injured foot.

Imaging methods. Conventional radiographs were used to exclude fractures. For MRI we used a 0.23 T open-configurated device (Outlook; Picker-Nordstar Inc, Helsinki, Finland) and a circumferential surface coil. To avoid inadvertent movement, the leg was held in a vacuum cast. We used T1-weighted spin-echo (SE) images for the first 21 patients and T2-weighted images for the other 74. The anterior talofibular (ATF) and calcaneofibular (CF) ligaments were imaged on axial planes tilted parallel to the long axes of the ligaments. The repetition time (TR) was 1800 ms and the echo time (TE) 80 ms. The matrix was 256×256 and slice thickness and separation were both 5 mm. For the imaging of bone bruises we used sagittal and coronal short tau inversion recovery (STIR) sequences with a TR of 936 ms, a TE of 16 ms, an inversion time of 90 ms, and a matrix of 256×150 and 256×192 in the coronal and sagittal images, respectively. Slice thickness was 5 mm with an
interslice gap of 1 mm. Only the injured ankle was imaged. A radiologist analysed the images without any clinical data. Injuries to ATF and CF ligaments were classified as grade I to grade III based on the criteria of Kaikkonen, Kannus and Järvinen, and soft-tissue swelling and joint effusions were recorded. Signs of osteochondral lesions in the ankle were classified by a method modified from Mink and Deutsch: stage 0 was normal, stage I was a bone bruise and stage II was an osteochondral fracture. We combined the stage-I and stage-II osteochondral lesions to form a 0/1 variable for the classification of bone bruises. An ATF ligament injury of grade III was defined as a major ATF injury to form a 0/1 variable in the classification of ligament injuries.

Clinical evaluation and outcome variables. All patients were examined using a standard proforma, and re-examined by the first author (VA) at three months after the injury using the scoring systems described above.

All patients completed a questionnaire reporting the date when their walking had returned to normal, the date when they resumed work, and the date when they were able to participate in sport.

Statistical analysis. Statistical analysis included descriptive statistics as means and distributions using the chi-squared test, Fisher’s exact test, and the t-test for independent samples.

Results

The questionnaire was returned by 69 patients and 72 patients were evaluated at three months.

Incidence of bone bruises. There was a bone bruise in 26 patients, an incidence of 27%. There were 22 bruises and one subchondral fracture in the talus, with nine in the medial part (Fig. 1), four in the lateral part, two in the neck, four in the dome, and four with a combination. In the tibia there were four bruises and three subchondral fractures, five in the medial part, one in the central part (Fig. 2), and one in the anterolateral part.

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which showed incidences of 21% and 40%.

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**Discussion**

In our series the incidence of bone bruises was 27%, agreeing with two previous smaller retrospective studies which showed incidences of 21% and 40%.

Most of the bone bruises were in the talus, typically in the medial part, as reported by Nishimura et al.

The presence of a bone bruise has been described as an indirect sign of a ligament injury. We found a similar tendency, but no statistically significant association, since our study had insufficient statistical power to allow definitive conclusions.

We also found no statistical differences in the time to return to work, limitation in walking or physical activity and clinical outcome scores at three months in the two groups. The treatment of choice for a bone bruise is said to be immobilisation, but our findings agree with those of Zanetti et al who found that bone bruises of the ankle have a different course from those in the knee. At the ankle, they seem to be non-specific in association with sprains, and do not require treatment.

Our 95 patients form the largest reported prospective series which we could find, with a reasonable participation rate in that 72 of the 95 patients (76%) returned for the three-month follow-up.

We conclude that bone bruises in the ankle are common in uncomplicated injuries and have minor, if any, clinical significance.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

**References**