Background

Syndesmotic lesions of the ankle have shown to be challenging injuries towards diagnosis and surgical treatment due to the limitations of 2D imaging. The aim of this study is therefore to develop a reproducible method to quantify the displacement of a syndesmotic lesion in all six degrees of freedom based on 3D imaging.

Methods

Sixteen patients were included having a unilateral syndesmotic lesion. N=11 sustained a high ankle sprain, a bilateral weightbearing conebeam CT was obtained because of positive clinical syndesmotic tests. N=5 presented with a fracture associated syndesmotic lesion and were imaged by a bilateral non weightbearing CT. The non-affected ankle was used as template after being mirrored and matched on the contralateral ankle containing a syndesmotic lesion (Fig 1, 2). The fibula was marked by computer calculation of the anterior, posterior and distal tip. The change of these points towards the unaffected fibular position was used to quantify the syndesmotic lesion. A control group of seven patients (N=7) was used to see if these changes differed from the normal variation in tibio-fibular congruency.

Results

The mean mediolateral diastasis of the syndesmotic lesion in the sprained group was 0.54 mm ± 1.55 and in the fracture group 1.67 mm ± 1.24 compared to the control group with a mean of -0.23 mm ± 0.41 (P < 0.05). The mean antero-posterior translation in the sprained group was 1.50 mm ± 0.92 and in the fracture group 2.65 mm ± 2.64 both towards posterior compared to the control group with a mean of 0.26 mm ± 1.53 towards posterior (P < 0.05). The mean supero-inferior translation in the sprained group was 0.94 mm ± 0.81 and in the fracture group 0.57 mm ± 0.70 compared to the control group with a mean of 0.45 mm ± 1.15 (P > 0.05). The mean external rotation in the sprained group was 4.12 degrees ± 2.82 and in the fracture group 3.27 degrees ± 4.18 compared to the control group with a mean of 0.23 degrees ± 1.72 (P < 0.05), as seen on Fig 3.

Conclusions

This study shows an effective method to quantify a unilateral syndesmotic lesion of the ankle. The pathological measurements differed from the normal distal tibio-fibular configuration in the syndesmotic complex. This information is of use for a pre-operative software based planning to know in advance how much correction needs to be achieved of the fibular diastasis, shortening, external rotation or other displacements. These findings will allow for a more anatomical reduction and point out mainly rotational lesions that will be missed when only using 2D radiographs.