

Anatomical predisposition of the ankle joint for lateral sprain or lateral malleolar fracture evaluated by radiographic measurements



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Introduction

- **Sophisticated structure of ankle presumes complexity in terms of biomechanics**
- **Several studies were dedicated on etiological factors and biomechanical aspects**
- **However, No clear understanding of anatomical aspect in **what circumstances the fracture occurs** and in **what circumstances does sprain****

The aim of study

- **To compare the radiographic indices representing anatomical structures of the ankle between the lateral malleolar fracture and lateral ankle sprain**

Materials and Methods

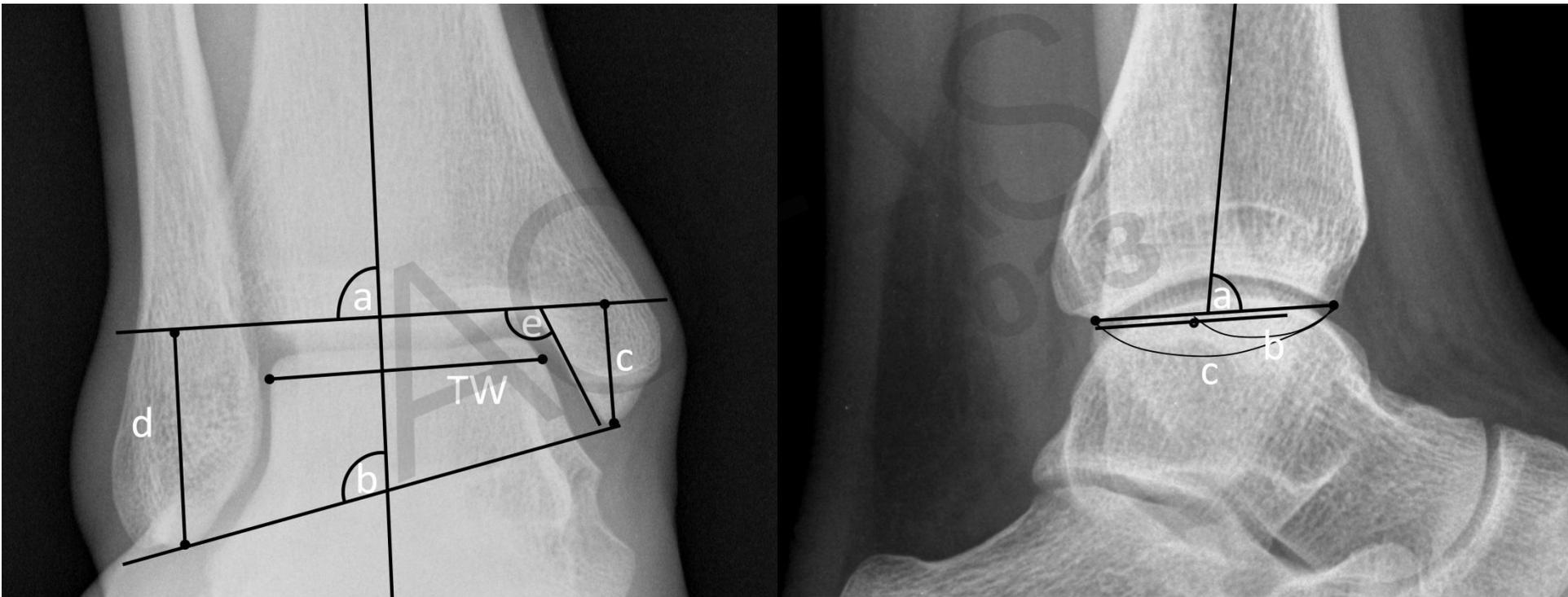
- **Retrospective study was approved by IRB**
- **May 2003 ~ December 2011**
 - **Lateral malleolar fracture and lateral ankle sprain**
 - **Anteroposterior, mortise, and lateral view of ankle radiographs**

Materials and Methods

- **Exclusion criteria**

- Previous lower extremity surgery, trauma, infection, tumor or any other conditions that could have changed the ankle anatomy
- Inadequate radiographs, such as, more than 3mm of superimposition of talar trochlear on lateral view
- Pronation-external rotation or pronation-abduction types of ankle fractures

Materials and Methods



Materials and Methods

- **Interobserver reliability of radiographic indices**
- **Intraclass correlation coefficients (ICCs) were used for reliability testing**
- **Comparison between fracture group and sprain group using t-test**
- **Linear regression analysis to correct the effect of age difference**

Results

Patient demographics for fracture and sprain groups

	Fracture group	Sprain group	p
No.	274	400	-
Mean age (years)	49.0 (SD 16.6)	38.4 (SD 14.5)	<0.001
M : F	138 : 136	207 : 193	0.754
Right : Left	150 : 124	237 : 163	0.266

Results

Interobserver reliability of radiographic measurement in ICCs(95% CI)

	Interobserver
DTAS angle	0.871 (0.784 to 0.925)
BT	0.822 (0.730 to 0.890)
MMRL	0.676 (0.488 to 0.812)
LMRL	0.724 (0.525 to 0.848)
MMSA	0.782 (0.659 to 0.873)
AI	0.639 (0.462 to 0.782)
FP	0.820 (0.687 to 0.909)

Results

Comparison of radiographic indices between fracture and sprain groups

	Fracture group	Sprain group	p
DTAS angle(°)	1.1 (2.8)	1.0 (2.6)	0.670
BT(°)	104.7 (3.3)	103.8 (2.9)	0.001
MMRL	0.51 (0.061)	0.51 (0.069)	0.462
LMRL	0.88 (0.085)	0.87 (0.081)	0.123
MMSA(°)	112.8 (7.4)	110.6 (7.2)	<0.001
AI(°)	81.0 (3.1)	82.0 (3.1)	0.023
FP	0.58 (0.098)	0.64 (0.088)	<0.001

Results

Linear regression analysis

Dependent variables	Groups	Age	Constant
DTAS angle(°)	0.004 (0.985)	0.009 (0.184)	90.7 (<0.001)
BT(°)	-0.714 (0.005)	0.014 (0.069)	104.7 (<0.001)
MMRL	0.328 (0.059)	0.010 (0.048)	15.3 (<0.001)
LMRL	-0.228 (0.334)	-0.002 (0.750)	28.4 (<0.001)
MMSA(°)	-2.2278 (<0.001)	-0.002 (0.913)	115.1 (<0.001)
AI(°)	0.369 (0.260)	-0.047 (<0.001)	83.0 (<0.001)
FP	0.074 (<0.001)	0.000 (0.700)	0.487 (<0.001)

Conclusions

- **Lateral malleolar fracture group** tended to show more bony constraint anterolaterally than that of the lateral ankle sprain group
- **Three dimensional assessment of the bony structure and subsequent biomechanical study** are needed to elucidate the mechanism of injury according to the various types of ankle fractures and ankle sprain