

Quantitative evaluation of the plantar pressure in soccer players with 5th metatarsal stress fracture (Jones fracture)

Kuzuyama M, Yamaura I*, Tsuchiya A*, Kanisawa I*,
Takahashi K*, Sakai H*, Kusaki Y, Okada T



Department of Rehabilitation, Funabashi Orthopedic Hospital

*Funabashi Orthopedic Hospital Sports Medicine Center

Background

- Jones fracture is a common problem in many athletes , especially high activity athletes in running and jumping sports. However, little is known about the mechanism of this fracture



Purpose

- To investigate the plantar pressure patterns of soccer players with 5th metatarsal stress fracture (Jones fracture)

Subjects

51 male soccer players

- professional soccer players : 31
- high school soccer players : 20

Height 175.4 ± 5.9 cm Weight 68.8 ± 5.8 kg Age 21.1 ± 4.7 yrs



➤ Jones fracture group: 7

- Op. tx. : 4
- Conservative tx. : 3
- All patients were available for clinical healing and return to soccer



➤ Control group: 44

- without fracture

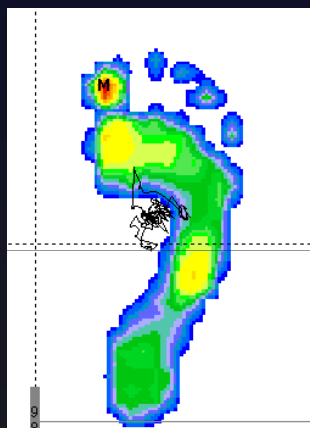
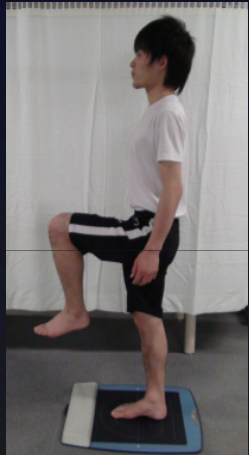
Measurement

Win-pod



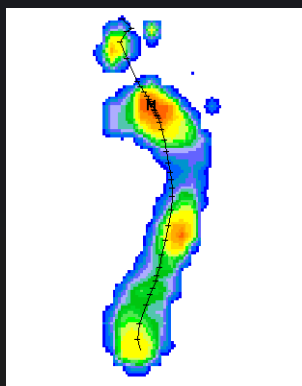
- Measuring device: Win-pod (MEDICAPTEURS)
- Task: single leg standing and walking

➤ Single-leg standing



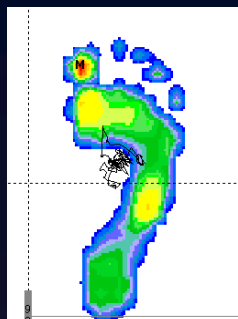
- Track length of Center of pressure: (COP)
- Foot was placed pointing straight forward
- Maintain this position 25 seconds
- Black line shows track

➤ Walking

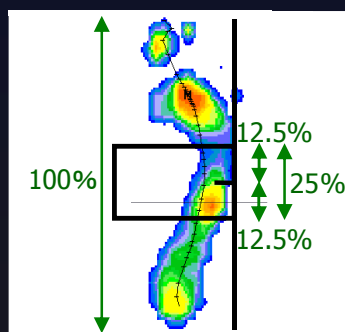


- Fifth metatarsal pressure
- Fifth metatarsal angle
- Dotted-line is indicated as track of the COP

Data analysis

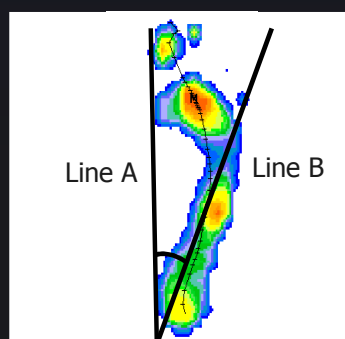


- Track length of COP



- Fifth metatarsal pressure

Calculated Maximum pressure and average pressure in center area of the fifth metatarsal



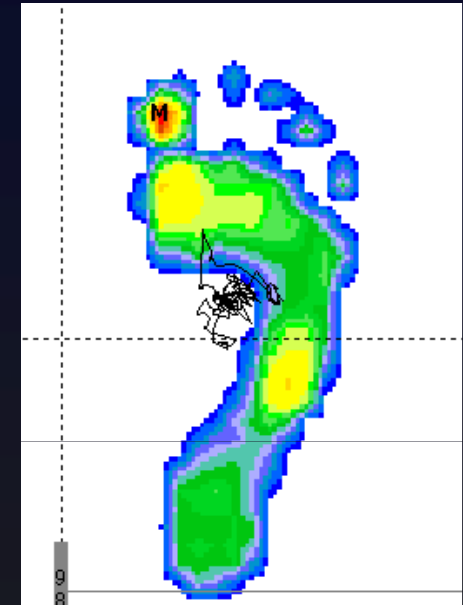
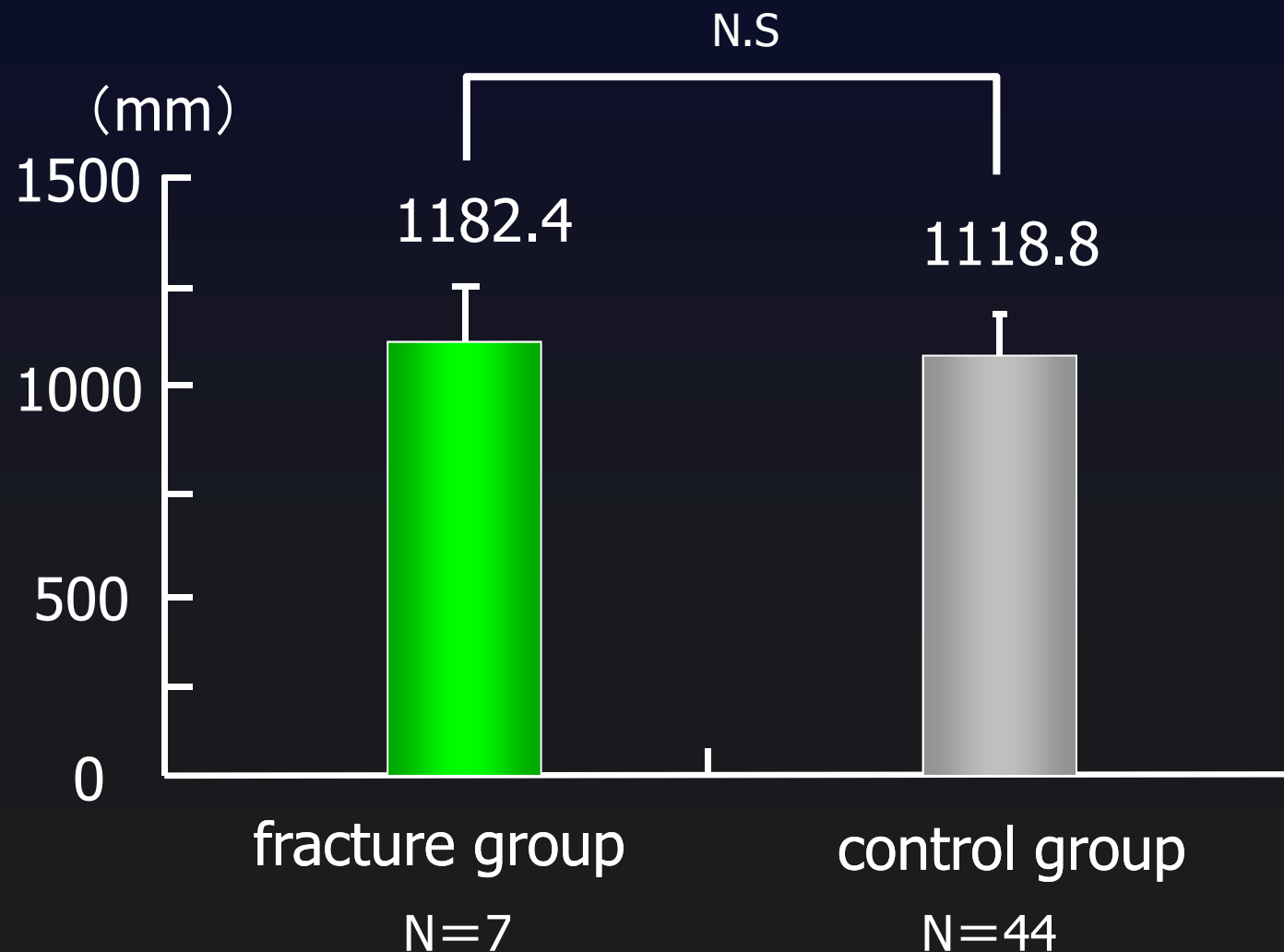
- Fifth metatarsal angle (between A and B)

Line A: medial line of foot

Line B: medial heel to most lateral point of the dotted-line (COP)

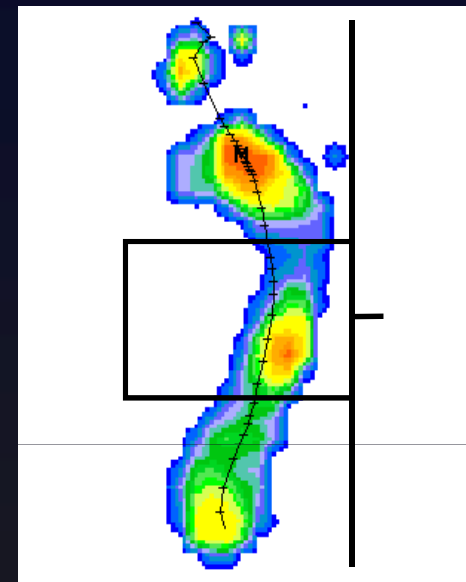
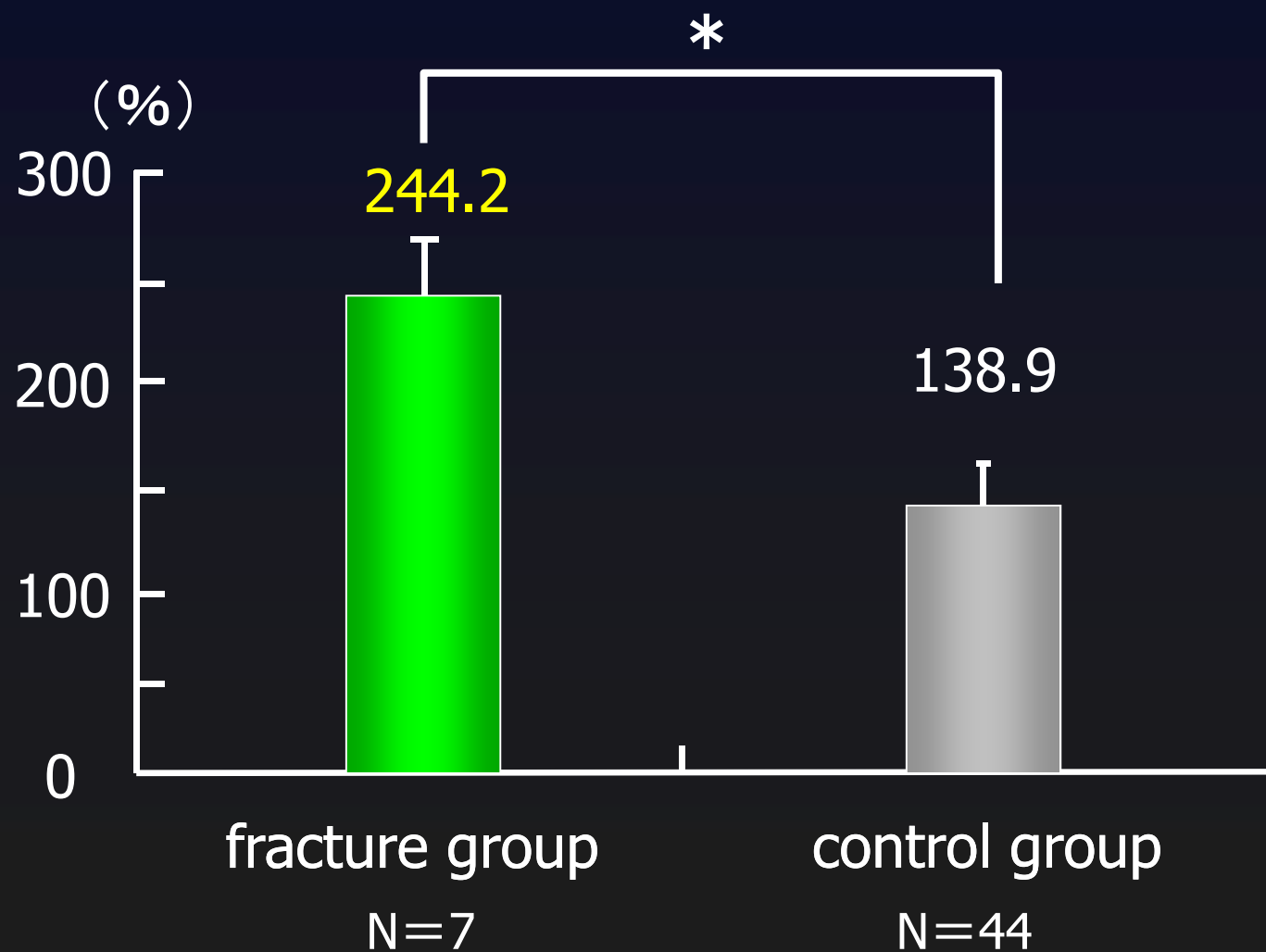
- Statistical analysis : Mann-Whitney test
- Compare these data between Jones fracture group and control group

Result : Track length of COP



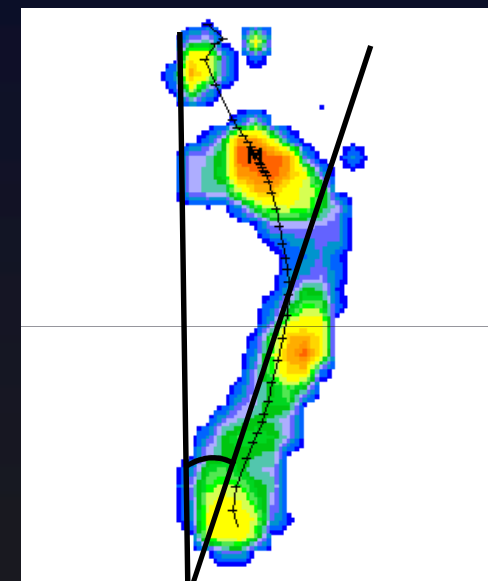
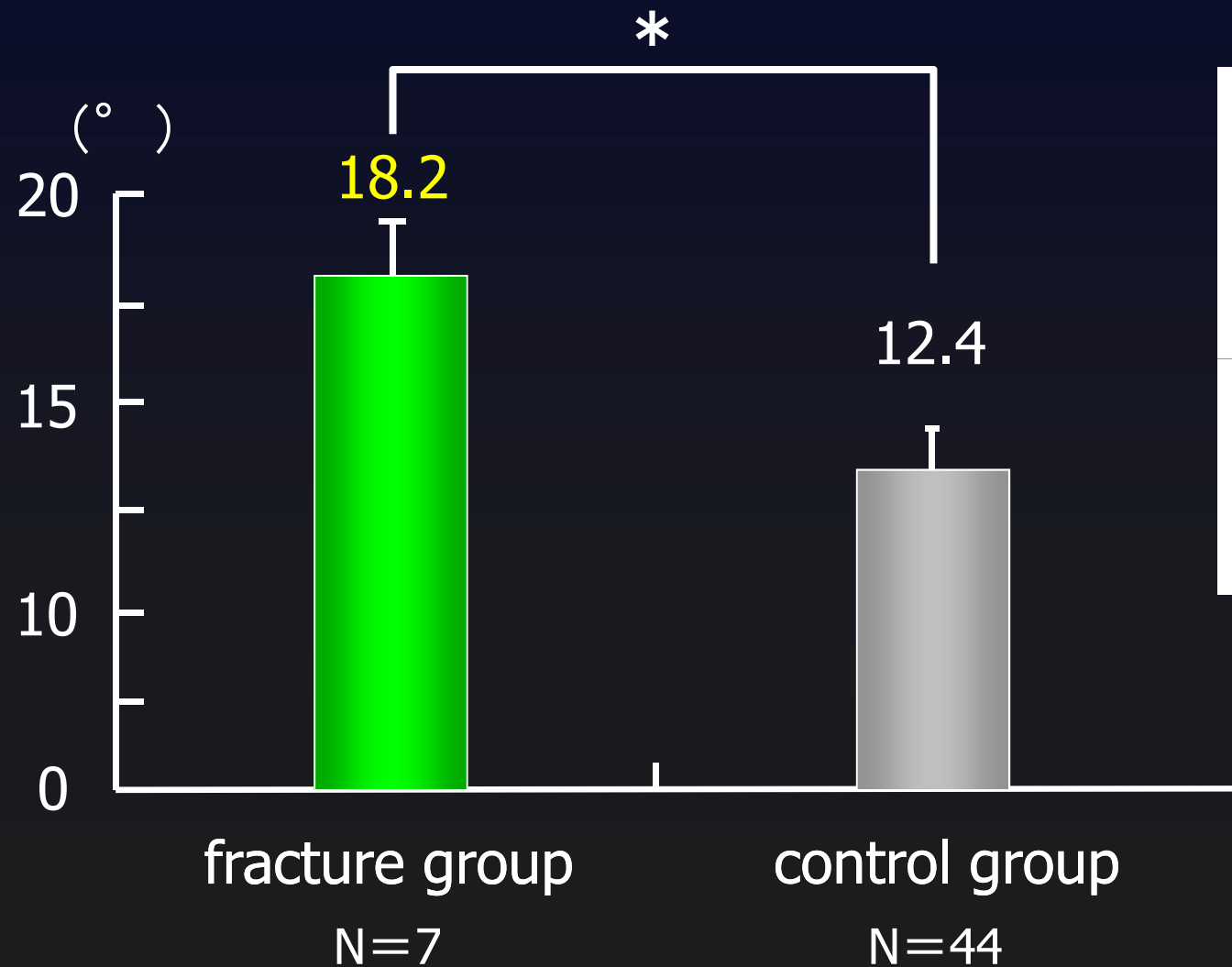
N.S: Not Significant

Result : Fifth metatarsal pressure



* P<0.05

Result : Fifth metatarsal angle



* P < 0.05

Discussion

- Lateral metatarsal pressure is high in Kick motions
Weist R, Am J Sports Med, 2004
- Plantar loading on the lateral portion increased fifth metatarsal stress fractures
Sims E L, Br J Sports Med, 2008

Our study :

- Fifth metatarsal pressure and fifth metatarsal angle are significantly higher in fracture group
- Extreme loading of the lateral aspect of foot in soccer players who had suffered Jones fracture



Evaluation of the plantar pressure may contribute to prevention of Jones fracture

Conclusions

- We examined the plantar pressures patterns of soccer players with 5th metatarsal stress fracture
- Fifth metatarsal pressure and fifth metatarsal angle are significantly higher in fracture group than control group
- The results of this study showed characteristic loading patterns of the foot in soccer players with fifth metatarsal stress fracture

References

- 1.) Weist R et al. The influence of muscle fatigue on electromyogram and plantar pressure patterns as an explanation for the incidence of metatarsal stress fractures. *Am J Sports Med.* 2004; 32: 1893-1898.
- 2.) E L Sims et al. Gender differences in plantar loading during three soccer-specific tasks. *Br J Sports Med.* 2008; 42: 272-277.