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The relationship between the morphology of the incisura fibularis tibiae and the pattern of posterior malleolus fractures

Papa Kyei, MBChB, Dip HIV Man(SA), H Dip Orth (SA),
Johannesburg, SOUTH AFRICA

Collen Sandile Nkosi MBChB, MMed Orth (Wits), FC Orth (SA),
Johannesburg, Gauteng, SOUTH AFRICA

Abdirashid Aden MBBS, FCS (Orth), Johannesburg , SOUTH AFRICA

Richard Paterson MBBCH, FC Orth (SA), Johannessburg, SOUTH AFRICA



Faculty Disclosure Information

- No disclosures



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INTRODUCTION

↙ Is there a relationship? ↘

Type of posterior malleolus fracture

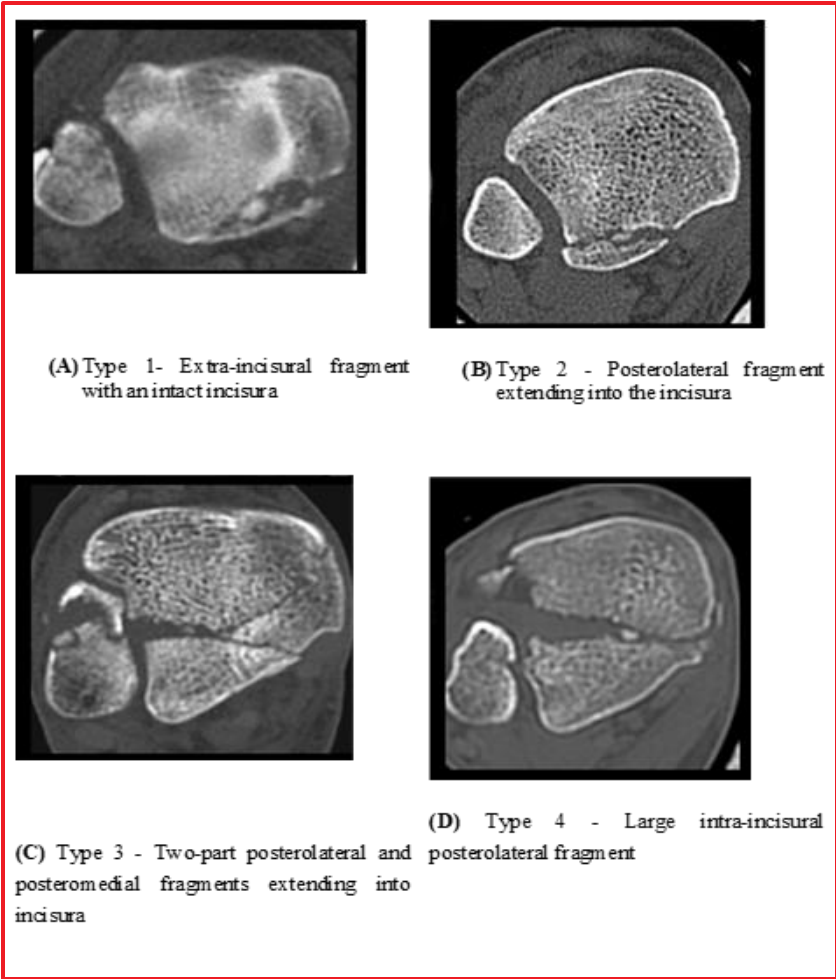
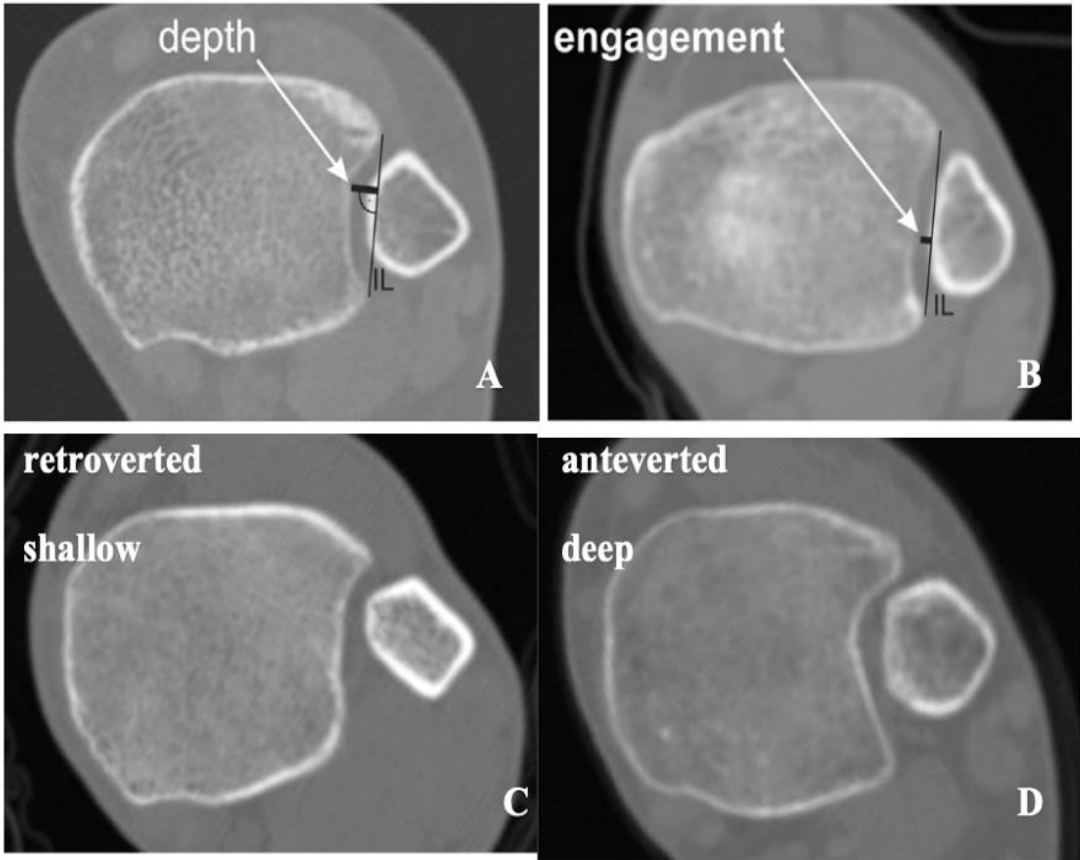


Figure from Bartonicek et al. – Classification of posterior malleolus fractures

Incisura morphology



Axial CT images from Boszczyk et al. : A – evaluating the depth of incisura, B – evaluating the level of fibula engagement, C – illustration of shallow, retroverted incisura and disengaged fibula, D – illustration of anteverted, deep incisura and engaged fibula.

A I M & O B J E C T I V E S

Aim:

- To evaluate the relationship between the anatomy of the tibia incisura and the pattern of posterior malleolus fractures

Objectives:

- To determine the demographics of patients who sustained posterior malleolar fractures and anatomy of the tibia incisura.
- To describe the pattern of the posterior malleolus fracture using the Bartonicek classification
- To evaluate the relationship between the anatomy of the incisura fibularis tibiae and the pattern of a posterior malleolus fracture



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Study Design

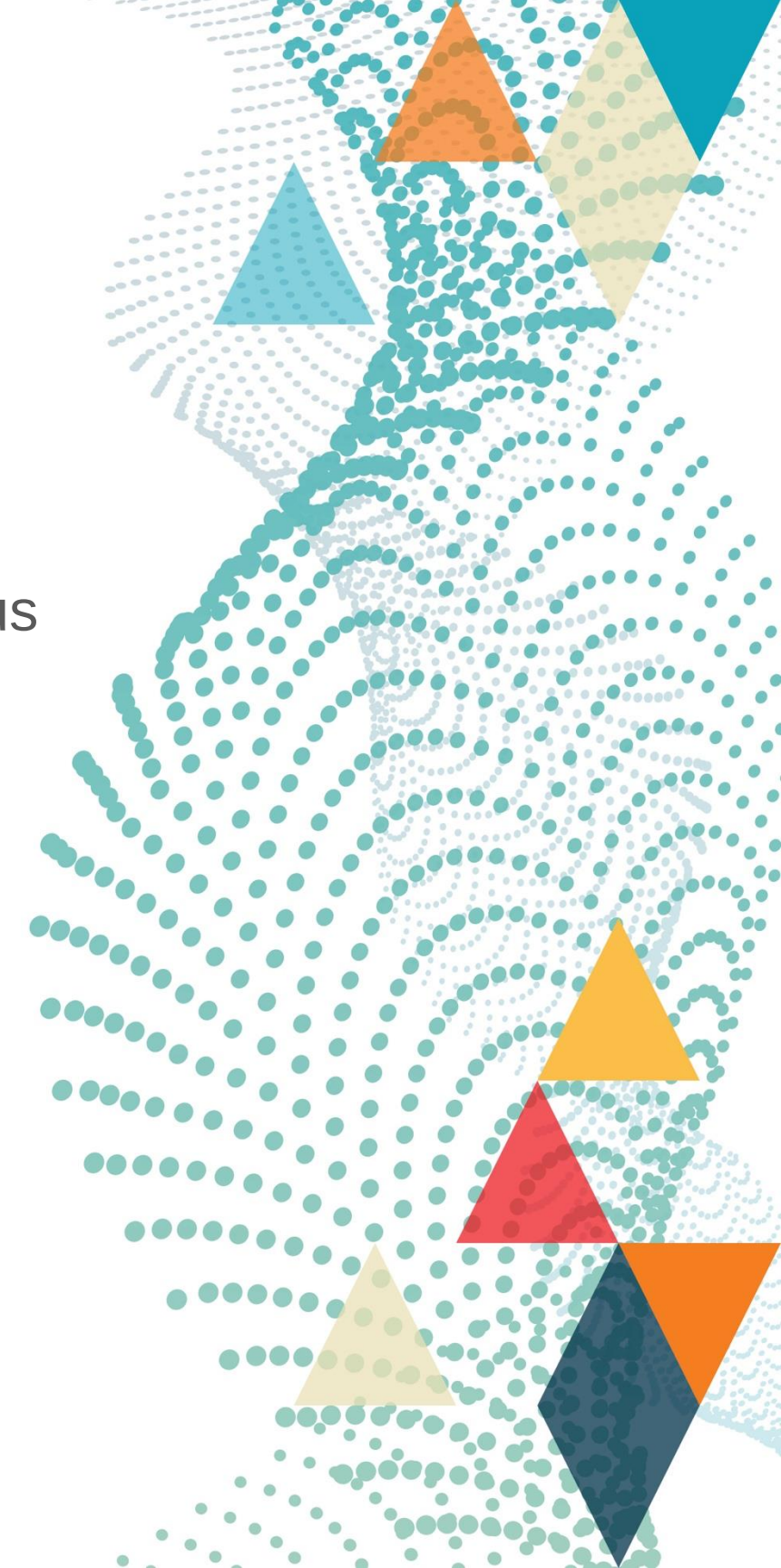
- A retrospective review of patients who sustained posterior malleolus fractures
- Charlotte Maxeke Johannesburg Academic Hospital (CMJAH)
- 01 January 2020 and 31 December 2022.



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Patient Selection Criteria

- Inclusion criteria:
 - Patients with posterior malleolus fractures
 - Patients ≥ 18 years old
 - Patients with ankle x-rays
 - Patients with pre-operative CT scans of lower limbs
- Exclusion criteria:
 - Patients who sustained Pilon fractures
 - Patients with bilateral ankle fractures
 - Patients whose CT scans do not involve both legs.
 - Patients with missing clinical records



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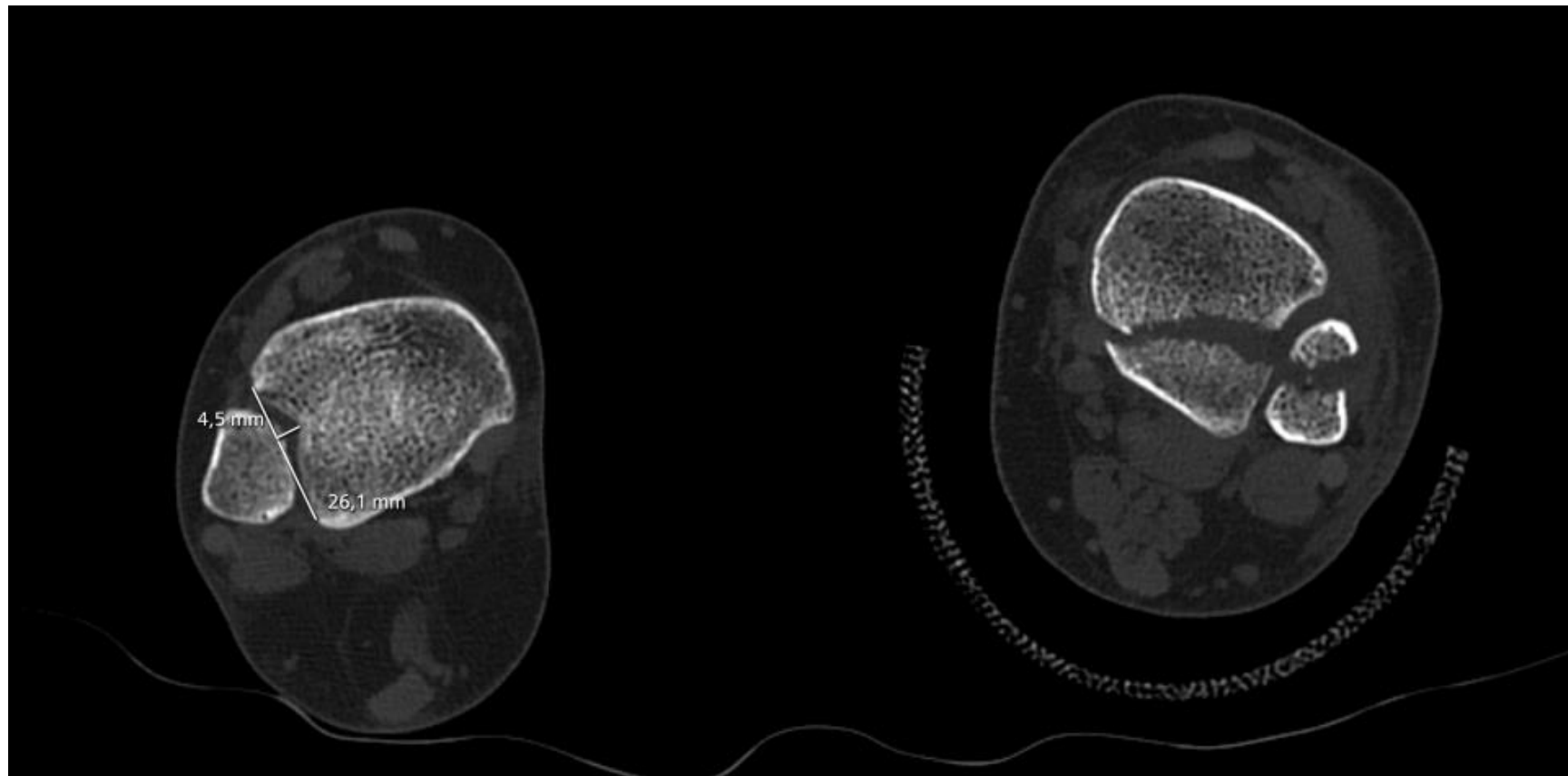


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CT scan evaluation

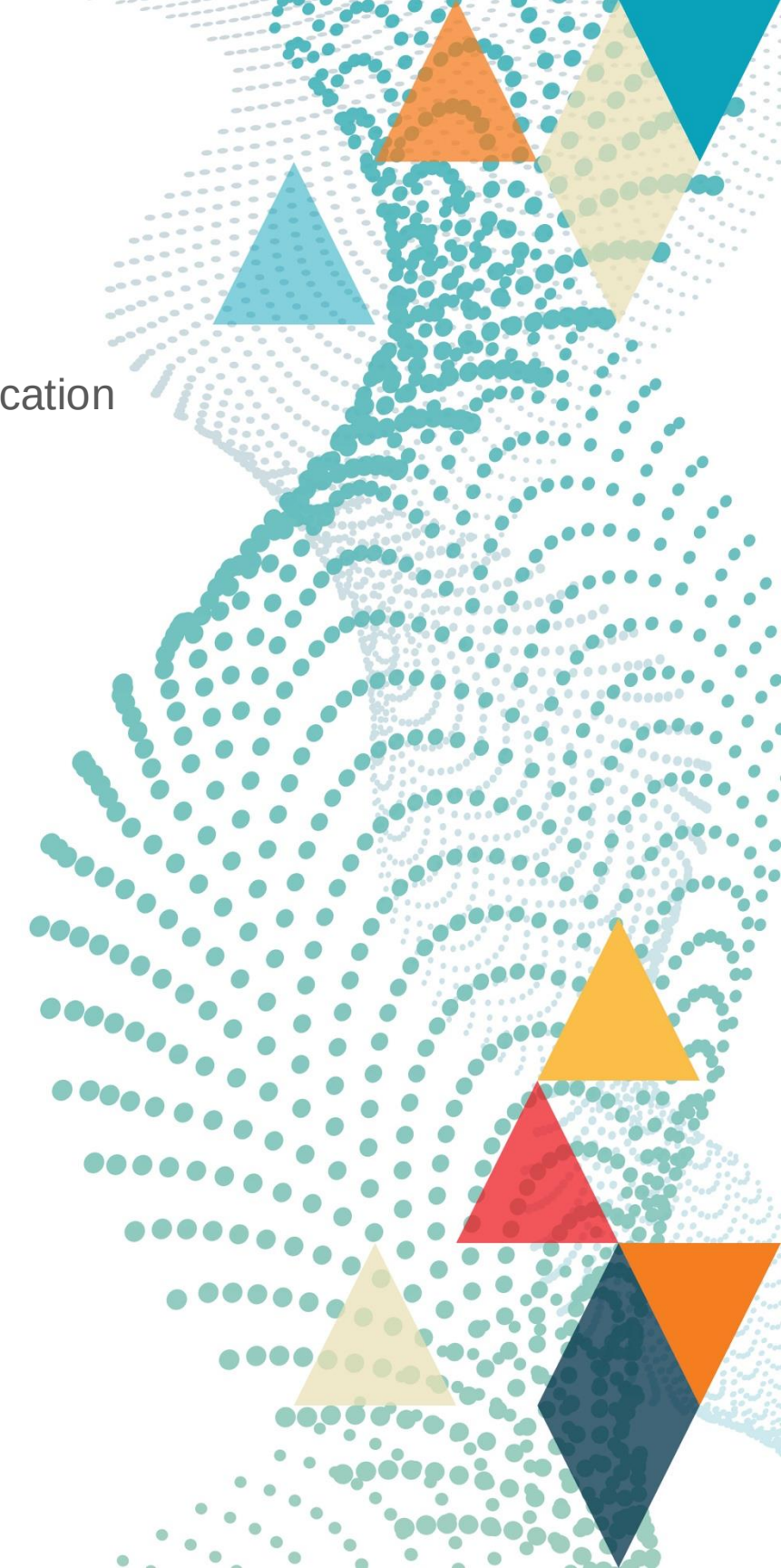
- Uninjured side - incisura morphology was evaluated - 5mm proximal to the tibia plafond
- Injured side - Bartonicek/Rammelt classification



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RESULTS – INCISURA VS BARTONICEK

Variable	Category	Total (%)	Bartonicek 1 (%)	Bartonicek 2 (%)	Bartonicek 3 (%)	Bartonicek 4 (%)	p-value
Incisura shape	Flat,	71(49)	10(45)	42(51)	13(59)	6(33)	0.773
	V-shaped	13(9)	2(10)	7(8)	2(9)	2(11)	
	C-shaped	61(42)	10(45)	34(41)	7(32)	10(56)	
Incisura Depth	Shallow	118(81)	19(86)	70(84)	18(82)	11(61)	0.161
	Deep	27(19)	3(14)	13(16)	4(18)	7(39)	
Incisura Version	Anteverted	75(52)	12(55)	45(54)	10(45)	8(44)	0.798
	Retroverted	70(48)	10(45)	38(46)	12(55)	10(56)	

RESULTS – INCISURA VS BARTONICEK

Variable	Category	Total (%)	Bartonicek 1 (%)	Bartonicek 2 (%)	Bartonicek 3 (%)	Bartonicek 4 (%)	p-value
Fibula shape	Triangle	110(76)	17(77)	64(77)	17(77)	12(67)	0.741
	Circle	22(15)	4(18)	10(12)	3(14)	5(28)	
	Trapezoidal	13(9)	1(5)	9(11)	2(9)	1(5)	
Fibula engagement	Engaged	128(88)	19(86)	75(90)	16(73)	18(100)	0.049
	Disengaged	17(12)	3(14)	8(10)	6(27)	0	

RESULTS – INCISURA VS BARTONICEK

Variable	Bartonicek 1	Bartonicek 2	Bartonicek 3	Bartonicek 4	p-value
Incisura Depth mm (median)	2.8	2.6	2.7	3.55	0.1796
Incisura width mm (median)	27.5	26.3	26	25.95	0.0131
Incisura version (degrees)	3.75	3.3	4.65	4.8	0.3779

COMPARED TO OTHER STUDIES

The Journal of Foot & Ankle Surgery 63 (2024) 18–21

Contents lists available at ScienceDirect

The Journal of Foot & Ankle Surgery

journal homepage: www.jfas.org



Morphology of Fibular Incisura is a Deciding Factor Between Posterior Malleolus Avulsion Fracture or Syndesmotic Ligament Injury in Ankle Fractures

Ali Yüce, MD, Nazım Erkurt, MD, Mustafa Yerli, MD, Mehmet Selçuk Saygılı, MD, Can Burak Özkan, MD

Department of Orthopedic and Traumatology, Prof. Dr. Cemil Taşcıoğlu City Hospital, Istanbul, Turkey



Similarly found wider incisura widths likely to cause Mason Malloy type 1 injuries

Journal of ISAKOS 10 (2025) 100361

Contents lists available at ScienceDirect

Journal of ISAKOS

journal homepage: www.elsevier.com/locate/jisakos



Systematic Review

Ligamentous ankle injuries in relation to the morphology of the incisura fibularis: A systematic review[☆]

Louise Wittouck^{a,1}, Ruben Vermeir^{b,1}, Matthias Peiffer^{c,d}, Wouter Huyse^e, Lauren Pringels^f, Nicolò Martinelli^g, Emmanuel Audenaert^h, Arne Burssens^{c,*}



Although not statistically significant in our study – above study found shallow incisura is associated with unstable fracture-associated syndesmotic injuries

Foot and Ankle Surgery 25 (2019) 51–58

Contents lists available at ScienceDirect

Foot and Ankle Surgery

journal homepage: www.elsevier.com/locate/fas



Anatomy of the tibial incisura as a risk factor for syndesmotic injury



Andrzej Boszczyk^{a,*}, Sławomir Kwapisz^a, Martin Krümmel^b, Rene Grass^c, Stefan Rammelt^c



Found shallow, retroverted incisura with disengaged fibulae – associated with syndesmotic injury



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CONCLUSION

A Relationship does exist between the Incisura fibularis tibiae and pattern of posterior malleolus fractures

- The narrower the incisura width the higher the Bartonicek classification.
- Patients with disengaged fibulae are more likely to sustain a Bartonicek type 2 or 3 injury.



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