Contemporary Open Fracture Classification Systems: The Good, The Bad and The Uncertain?

T Cloake, K Au-Yeung, W Flett, J Hardwicke, J Ward
University Hospitals Coventry and Warwickshire

Background

- Historical classifications are limited by heterogeneity in classes, poor inter-observer agreement and application after the first debridement.
- Contemporary systems such as the OTA Open Fracture Classification (OTA-OFC) and OTS Open Fracture Classification (OTS) have been developed to address some of the shortcomings but are yet to be adopted by the Orthoplastic community.
- This project aims to evaluate currently used open fracture classifications and assesses their ability to predict outcome.

Methods

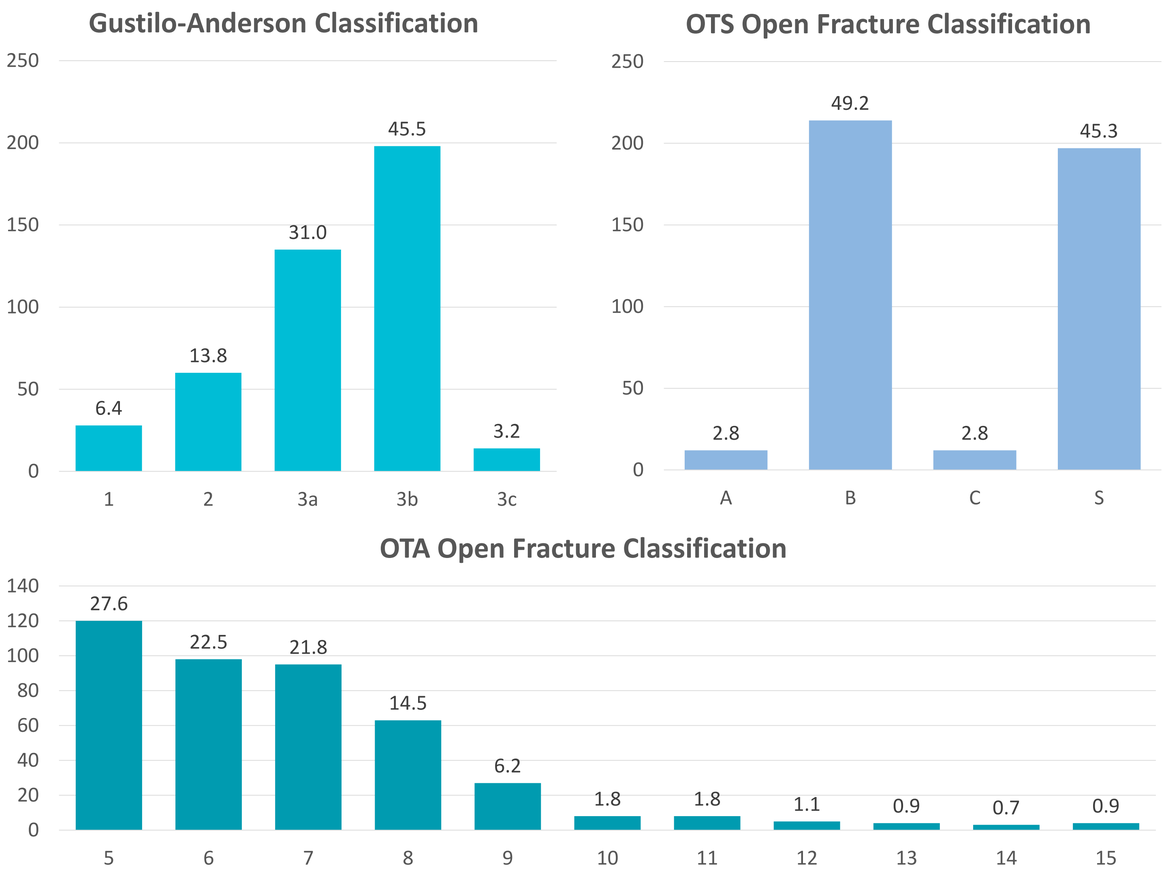
- Retrospective review of consecutive adult patients with an open lower limb fracture at a UK Major Trauma Centre over a 5-year period (2015 – 2020)
- Injuries classified according to the Gustilo-Anderson (GA), OTA-OFC and OTA systems by two independent observers
- Minimum follow-up for all patients was 12 months
- The primary outcome was the occurrence of a complication (requiring a return to theatre. Secondary outcomes were infection, non-union and limb salvage.

Results

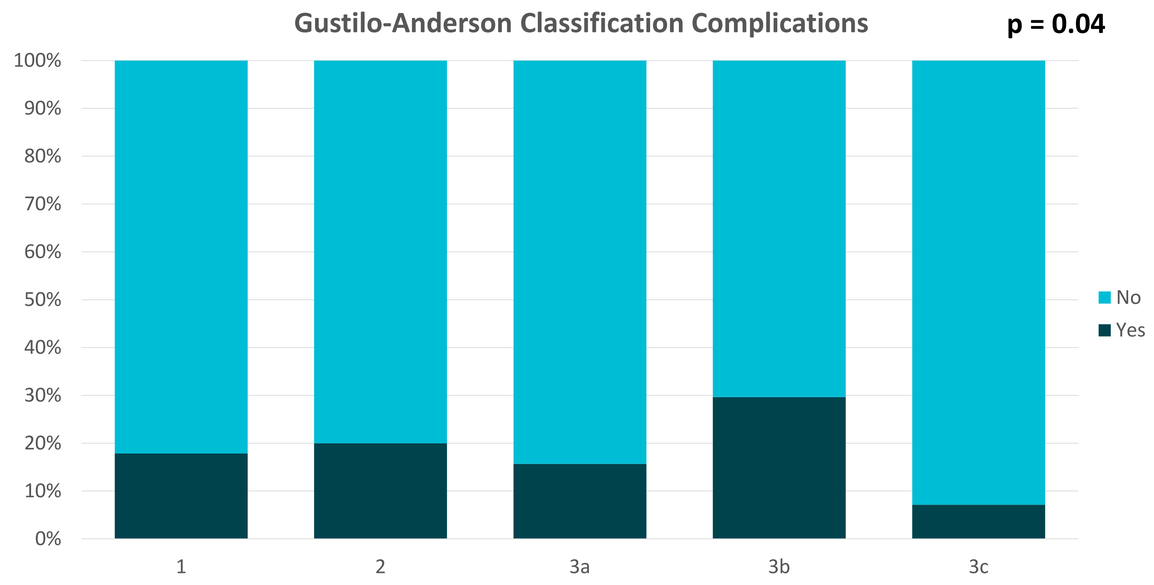
Gender	Number (%)
Male	153 (35.2)
Female	282 (64.8)
Mean Age (Range)	
48 years (16 – 99)	
Mean Follow-up (Range)	
43 months (12 – 83)	

Site	Number (%)
Femur	53 (12.2)
Knee	25 (5.7)
Tibia	206 (47.4)
Ankle	134 (30.8)
Foot	17 (3.9)
Mechanism	
Crush	26 (6.0)
Fall from height	52 (12.0)
RTC	201 (46.2)
Low energy	88 (20.2)
Other	68 (15.6)

Tables 1 and 2: Summary of the demographics, injury site, mechanism and follow-up of the included injuries



Total number (%) injuries per class according to each classification system.



Complication	GA	OTA-OFC	OTS
All	**0.04**	**0.001**	**0.028**
Infection	0.271	**0.048**	0.249
Non-union	0.362	**0.041**	0.19
Limb salvage	**<0.001**	**<0.001**	**<0.001**

Statistical significance of the predictive ability of each classification for the secondary outcomes.

OTA-OFC Subcategory	p-value
Muscle	**0.021**
Skin	0.132
Arterial	0.294
Contamination	0.162
Bone	**<0.001**

Statistical significance of the predictive ability of each OTA-OFC subcategory for the primary outcome (complications).

Incidence of complications per classification. Each bar represents all injuries within this class; the darker bars signify the percentage of complications within that group. Statistical significance of the differences between the number of complications between groups is displayed. The inter-observer agreement, calculated using the kappa statistic, is available beneath each chart.

Conclusions

- The OTA-OFC is a superior predictor of both primary and secondary outcomes. Subcategory analysis revealed that high 'muscle' and 'bone' scores were indicative of poor outcome.
- The OTS classification was the most simple to use and demonstrated excellent inter-observer variability. Although not designed to predict the clinical outcomes studied, a Complex B fracture showed the highest risk of future complication.
- There is a growing body of evidence advocating the use of modern open classification systems. This study further confirms that we should move away from the routine use of the GA Classification for assessment and management of open fractures

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