“Apples-to-Apples” – Moving to the New OTA Fracture Severity Classification in Extremity Trauma Research

The Major Extremity Trauma Research Consortium (METRC)

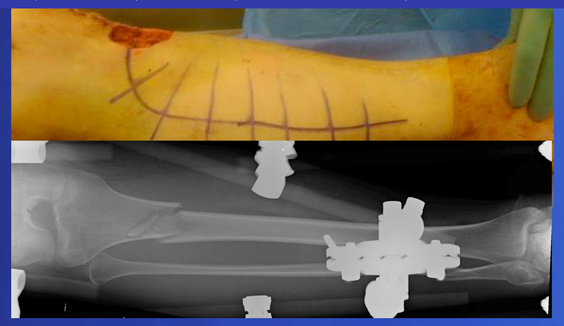
www.METRC.org

PURPOSE

The evaluation of treatment effect, limb survival, functional outcomes, performance outcomes and resource utilization in patients with severe extremity trauma requires that injury characteristics among individuals are comparable. At present, the Gustilo-Anderson classification[1] is the most commonly employed fracture grading system. All surgeons, however, recognize that a Type IIIB tibia fracture with no bone loss and only a 2x2 cm pre-tibial skin defect that is covered with a rotational flap (Case #1) is different from a Type IIIB fracture with severe contamination, a 5 cm bone defect and loss of the anterior compartment requiring a free tissue transfer and bone defect reconstruction (Case #2).

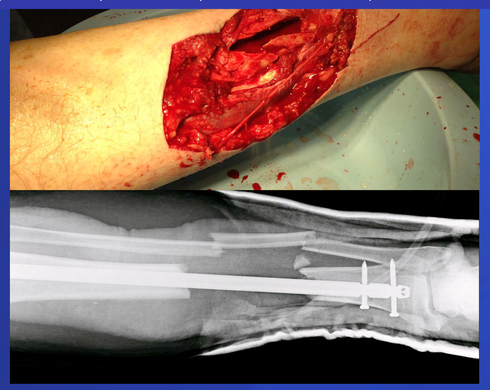
CASE #1

Skin: 2, Muscle: 1, Arterial: 1, Contamination: 1, Bone Loss: 1



CASE #2

Skin: 3, Muscle: 2, Arterial: 1, Contamination: 3, Bone Loss: 3



Recognizing the bias the Gustilo fracture grading system introduces into extremity trauma research, the OTA developed a new Open Fracture Classification (OTA-OFC)[2]. The OTA-OFC assigns the fracture an injury severity level in 5 domains: Bone Loss, Muscle Injury, Skin Injury, Arterial Injury and Contamination.

The purpose of this study is to delineate the various component injuries in open fractures being classified as Gustilo Type IIIB by using the new OTA-OFC.

METHODS

The Major Extremity Trauma Research Consortium (METRC) established a prospective extremity trauma registry of major operative fracture characteristics that included the OTA fracture classification and Gustilo open fracture type.

OTA-OFC Injury Domains and Severity Levels

Skin	Level 1: Can be approximated Level 2: Cannot be approximated Level 3: Extensive degloving
Muscle	Level 1: No muscle in area, no appreciable muscle necrosis, or some muscle injury with intact muscle function Level 2: Loss of muscle but the muscle remains functional, some localized necrosis in the zone of injury that requires excision, intact muscle-tendon unit. Level 3: Dead muscle, loss of muscle function, partial or complete compartment excision, complete disruption of a muscle-tendon unit, muscle defect does not approximate.
Arterial	Level 1: No arterial injury. Level 2: Artery injury without ischemia. Level 3: Artery injury with distal ischemia.
Contamination	Level 1: None or minimal contamination. Level 2: Surface contamination (easily removed not embedded in bone or deep soft tissues) Level 3: Imbedded in bone or deep soft tissues or high risk environmental conditions (barnyard, fecal, dirty water etc.).
Bone Loss	Level 1: None Level 2: Bone missing but still some contact between proximal and distal fragments Level 3: Segmental bone loss

A total of 22 of the 26 core METRC centers have implemented the registry and entered cases for greater than 90 days; 18 of these centers have entered cases for 365 consecutive days.

- The 22 METRC trauma centers have contributed a total of 15,043 fractures in 11,972 patients as of August 15, 2012
- 11,623 fractures (78%) were to the lower extremity
- 22% of the lower extremity fractures were open
- There were 960 open diaphyseal tibia fractures, of which 158 were Gustilo type IIIB fractures

RESULTS

The table below shows the percent distribution of each OTA-OFC component for all 960 open diaphyseal tibia fractures entered in the registry to date.

Percent Distribution of Each OTA-OFC Component
960 open diaphyseal tibia fractures
Source: METRC Registry (August 15, 2012)

	Bone	Muscle	Skin	Arterial	Contamination
Injury Level 1	51%	57%	78%	88%	57%
Injury Level 2	34%	34%	13%	8%	33%
Injury Level 3	7%	9%	9%	4%	10%

Of the 158 open diaphyseal tibia fractures in the registry that were classified as Gustilo Type IIIB injuries, 3 patients had no bone or muscle loss (Injury Level 1) while 23 patients had both severe bone loss (Injury Level 3) and severe muscle loss (Injury Level 3). A total of 20 patients had minimal muscle injury (Injury Level 1) while 43 had the most severe muscle injury (Injury Level 3).

OTA Classification of Bone Loss and Muscle Injury Levels
Type IIIB Diaphyseal Tibia Fractures Only
Source: METRC Registry (August 15, 2012)

		Muscle Injury Level (in 1 case, degree of muscle injury could not be assessed)		
Bone Loss Injury Level	**Total**	**Injury Level 1**	**Injury Level 2**	**Injury Level 3**
Total	157	20	94	43
Injury Level 1	24	3	16	5
Injury Level 2	69	8	46	15
Injury Level 3	64	9	32	23

CONCLUSIONS

As currently used, the Gustilo Type IIIB classification includes a wide variation in high-energy trauma. The spectrum of injury it represents is not amenable to appropriate comparisons for research purposes. Extremity trauma research should adopt the OTA-OFC to better stratify patients’ injuries and to enable comparison of treatments, outcomes and resource consumption.

REFERENCES

1. Gustilo RB, Mendoza RM, Williams DN. Problems in the management of type III (severe) open fractures: a new classification of type III open fractures. J Trauma.1984;24:742-6.
2. Orthopaedic Trauma Association Open Fracture Study Group. A new classification scheme for open fractures. J Orthop Trauma 2010;24:457–465.

ARE YOU INTERESTED IN PARTICIPATING IN METRC?

METRC is looking for centers that are interested in becoming involved as satellite centers. If you are interested in applying to become a satellite center, email admin@metrc.org or talk to Dr. Michael Bosse or Dr. Ellen MacKenzie.

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