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Question:

Should Open Fractures Only Be Definitively Classified After Surgical Debridement Rather Than in the Emergency Room?

Participants:

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Background:

Open fracture classification is fundamental in orthopaedic trauma management. It guides antibiotic selection, surgical planning, prognosis, communication among treating teams, and research. The Gustilo-Anderson classification remains the most widely used system worldwide. Gustilo and Anderson originally emphasized that classification should be performed after operative wound assessment because contamination, periosteal stripping, muscle devitalization, and vascular injury may not be accurately appreciated during initial Emergency Room (ER) evaluation.^{1,2}

Despite this recommendation, definitive Gustilo grades are frequently assigned in the ER. Several studies have demonstrated poor interobserver reliability of preoperative classification and frequent upgrading following surgical debridement.^{3–6} Contemporary reviews and orthopaedic trauma guidelines continue to advocate provisional ER grading followed by definitive classification after operative assessment.^{6–10}

Data Extraction Table

Author, Year, Country	Study Design	Sample Size	Study Population	Groups Compared	Results/Comments
Gustilo & Anderson, 1976, USA	Prospective	1025	Open fractures	Initial vs operative assessment	Definitive grading intended after operative assessment.
Gustilo et al., 1984, USA	Prospective	673	Open fractures	Classification vs outcomes	Severity often underestimated initially.

Brumback & Jones, 1994, USA	Reliability study	245 surgeons	Open fracture cases	Interobserver agreement	Moderate agreement only.
Horn & Rettig, 1993, USA	Retrospective	—	Open tibial fractures	ER vs operative grading	Frequent upgrading after debridement.
Crowley et al., 2007, UK	Review	—	Open fractures	Timing of classification	Provisional ER grading recommended.
Halawi et al., 2015, USA	Review	—	Open fractures	Current management	Definitive classification after debridement.
Court-Brown & McQueen, 2015, UK	Review	—	Open fractures	Assessment methods	Grades frequently change after exploration.
OTA Core Curriculum	Guideline	—	Open fractures	Classification practice	Definitive grading after surgery.
BOAST Guidelines	Guideline	—	Open fractures	Assessment standards	Formal characterization after debridement.
BOA/BAPRAS Standards	Guideline	—	Severe open fractures	ER vs operative assessment	Soft tissue injury best assessed intraoperatively.
Durrant & Mackey, 2011, UK	Narrative review	—	Open fractures and lower limb trauma	Gustilo-Anderson vs alternative classification systems	Reported considerable interobserver variability in Gustilo classification and emphasized that key injury characteristics are often only fully appreciated at first debridement.

Byrd et al., 1985, USA	Classification study	—	Open fractures	Byrd-Spicer vs Gustilo-Anderson	Recognized shortcomings of Gustilo-Anderson and incorporated injury energy and tissue devitalization; some variables only reliably assessed during debridement.
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Results:

The literature consistently demonstrates limitations in assigning definitive open fracture classification in the ER. The original Gustilo publications recommended operative assessment before definitive classification.^{1,2} Reliability studies showed only moderate interobserver agreement, particularly among Type III injuries.³

Several observational studies reported frequent upgrading after debridement when occult contamination, muscle necrosis, periosteal stripping, and vascular injury became evident.^{4,5} Reviews by Crowley, Halawi, and Court-Brown consistently recommend provisional ER grading followed by definitive operative classification.^{5–7} National guidelines from OTA, BOAST, and BOA/BAPRAS support the same approach.^{8–10}

Recent studies have reported considerable interobserver variability in Gustilo classification and emphasized that key injury characteristics are often only fully appreciated at first debridement.^{11.}

Discussion:

The purpose of classification is to predict prognosis and guide treatment. For a classification system to be useful, it must be accurate, reproducible, and reflect the true extent of injury. Many determinants of Gustilo grade—including contamination, muscle viability, periosteal stripping, and vascular injury—cannot be reliably assessed through superficial ER inspection.^{1–4}

Small wounds may conceal extensive soft-tissue injury, while large wounds may have relatively preserved vascularity. Surgical exploration permits direct visualization of tissue viability and contamination and therefore improves classification accuracy.^{4–7}

One of the major criticisms of the Gustilo-Anderson classification remains its interobserver variability. Brumback and Jones demonstrated significant disagreement even among experienced orthopaedic surgeons.³ This disagreement is particularly pronounced when distinguishing Type IIIA from IIIB injuries, which may influence reconstructive planning and prognosis.

Modern orthoplastic principles emphasize repeated reassessment during debridement and

reconstruction. Consequently, definitive classification after operative exploration better reflects true injury severity and aligns with contemporary trauma practice.^{7–10}

Risk of Bias in Included Studies:

Most available evidence consists of reliability studies, retrospective observational cohorts, narrative reviews, and expert consensus statements. High-quality prospective comparative studies specifically evaluating ER versus post-debridement classification are limited. Overall risk of bias is therefore moderate.

Recommendation Proposed for Consensus:

Open fractures should be assigned a provisional classification in the Emergency Room for communication and initial management purposes. Definitive Gustilo-Anderson classification should only be assigned after surgical debridement and wound exploration, when the true extent of contamination, soft tissue injury, periosteal stripping, and vascular compromise can be accurately assessed.

Level of Evidence:

Predominantly Level III–V evidence. Despite the limited availability of high-level comparative studies, the consistency of findings across reliability studies, reviews, and guideline recommendations provides moderate support for definitive post-debridement classification.

References:

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