July/ 2024

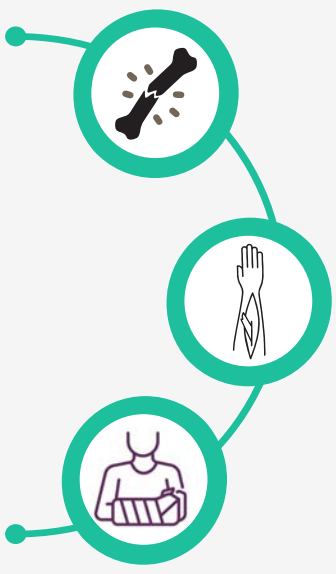
Department of Health Research
Ministry of Health and Family Welfare, Government of India

INDIAN COUNCIL OF MEDICAL RESEARCH
Serving the nation since 1911

Standard Treatment Workflow (STW)

OPEN FRACTURES

ICD-10-S82.891B



A fracture is considered open when there is communication between the fracture and/or the fracture hematoma and the external environment

CLINICAL EXAMINATION

Management of patient as per ATLS protocols
Systematic inspection of each limb is critical
Expose the entire extremity
- Size of skin wounds
- Muscle crush or loss
- Periosteal stripping or bone loss
- Contamination
- Clinical photography of wound is a must
- Neurovascular status assessment

GOALS OF TREATMENT

First Preserve life
↓
Preserve limb
↓
Preserve function
Prevention of infection
Fracture stabilization
Soft tissue coverage

MANAGEMENT

*ANTIBIOTIC - WHICH, WHEN AND FOR HOW LONG?

Single most important factor in reducing the infection rate - early administration of antibiotics - ideally within 1 hour of injury
- Cephalosporin (cefuroxime 1.5 gm) 3 doses 8 hours apart
- **Type III** - Add aminoglycoside (gentamycin 5mg/kg every 24 hours)
- **Duration** - 3 days after wound closure
- **Potential soil contamination** - Add metronidazole 500 mg IV every 8 hours

- Consider Aspirin in case of prolonged immobilisation
- Look for signs of DVT and embolism

REFERRAL

Ensure Splintage is done, Analgesic IV/IM Diclofenac single dose is given. Patient is kept NPO and IV fluid (RL) is started

At primary centre after initial management is done
- GA Type I to III A → Refer to secondary centre
- GA Type III B → Refer to tertiary centre

SURGICAL WOUND DECONTAMINATION

- Prior to formal debridement the wound should be handled only to remove gross contamination
- 'Mini-washouts' outside the operating theatre environment are not indicated
- Debride all devitalized structures – skin, muscle, bones ('When in doubt, take it out)
- Irrigation: Low to medium pressure; normal saline
- **Rule of 3 (Type 1 – 3L; Type 2 – 6L; Type 3 – 9L)**
- Send cultures
- Fracture stabilization with fresh instruments once debridement is complete
- **Grade I to IIIA** - Early internal fixation – With definitive skin cover
- **Grade IIIA and IIIB** - Provisional stabilization of fracture with wound management when definitive skin cover is not possible

GA TYPE III B/III C

Managed at tertiary centre
Multidisciplinary approach - **'Orthoplastic'**
III C injuries may require CT angiogram/doppler study

WOUND CLOSURE

- Recommendation is primary closure of Type I, Type II and a few selected Type IIIA fracture – but avoid tension at closure site
- Coverage of III A and III B - after proper debridement and cleaning. May require one or two or more formal debridements
- Definitive soft tissue closure or coverage should be aimed within 72 hours of injury if it cannot be performed at the time of debridement

INITIAL EMERGENCY TREATMENT

OBVIOUS BLEED → Apply local pressure
- Controlled → No obvious bleed
- Does not stop → Pack the wound

↓
Antibiotics* and Tetanus prophylaxis
↓
Remove gross contamination with gentle saline wash
↓
Cover with saline gauze
↓
Do not debride/suture in ED
↓
Assess Neurovascular status
↓
Reduction, realignment, splintage
↓
Reassess Neurovascular status

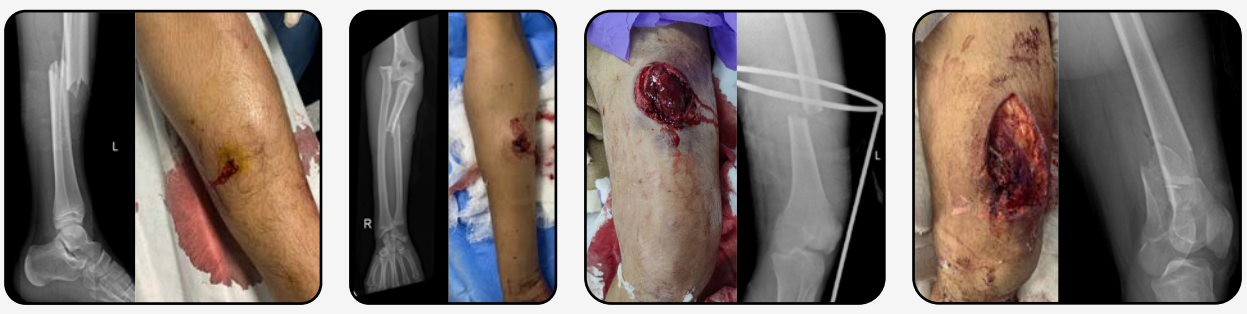
Look for Compartment syndrome
- Pain on passive stretching
- Pallor
- Paraesthesia
- Paralysis
- Pulselessness

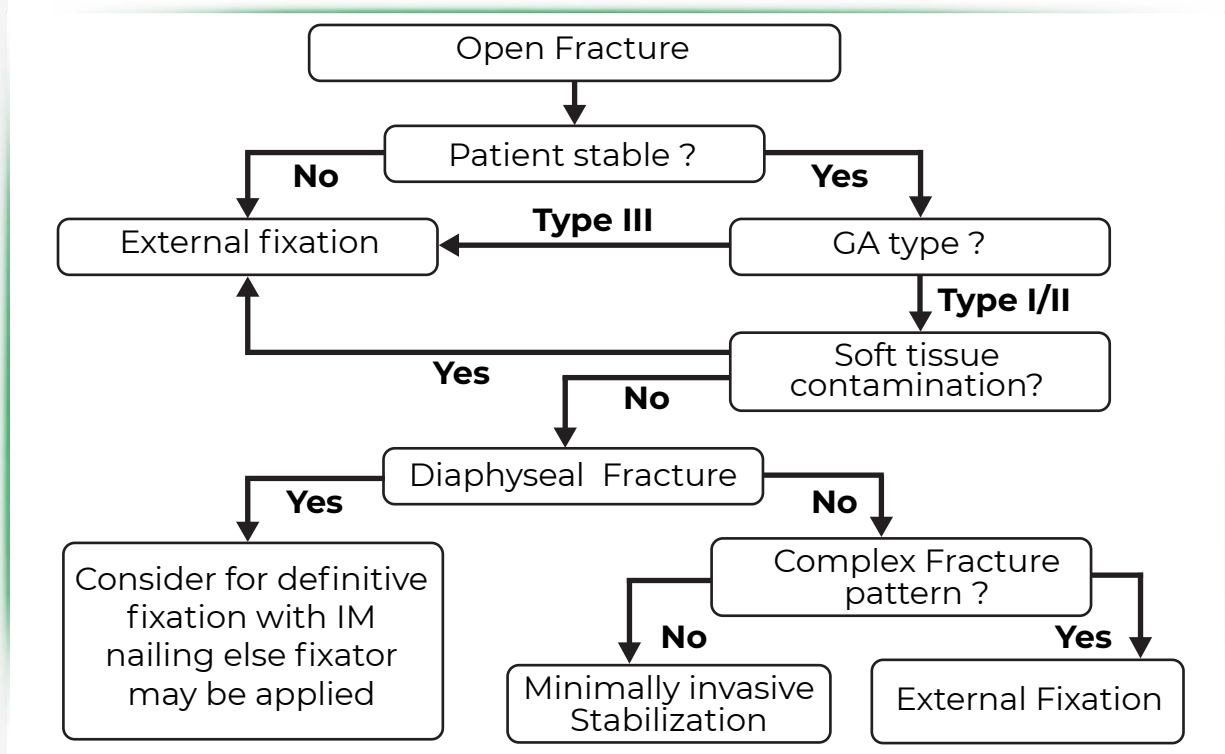
→ If suspected urgent referral to higher centre for immediate fasciotomy

GET X-RAY TO ASSESS UNDERLYING FRACTURE (IF POSSIBLE)

GUSTILO-ANDERSON CLASSIFICATION

	I	II	III-A	III-B	III-C
Energy of mechanism	Low	Moderate	High	High	High
Wound size	<1 cm	1 to 10 cm	>10 cm	>10 cm	>10 cm
Soft tissue injury	Low	Moderate	Extensive	Extensive	Extensive
Contamination	No	Low	Severe	Variable	Variable
Fracture pattern/ comminution	Simple /no	Simple/ Some	Complex /Severe	Complex /Severe	Complex /Severe
Soft tissue coverage	Yes	Yes	Yes	No	Variable
Vascular injury	No	No	No	No	Yes





ABBREVIATIONS

ATLS: Advanced Trauma Life Support
CT: Computed Tomography
ED: Emergency Department
GA: Gustilo Anderson
IM Nail: Intramedullary Nail
IV/IM: Intravenous/Intramuscular
NPO: Nil Per Oral
RL: Ringer's Lactate

REFERENCES

1. Sagi HC, Patzakis MJ. Evolution in the Acute Management of Open Fracture Treatment? Part 1. J Orthop Trauma. 2021 Sep 1;35(9):449-456. doi: 10.1097/BOT.0000000000002094. PMID: 34415869.
2. Sagi HC, Patzakis MJ. Evolution in the Acute Management of Open Fracture Treatment? Part 2. J Orthop Trauma. 2021 Sep 1;35(9):457-464. doi: 10.1097/BOT.0000000000002095. PMID: 34415870.
3. Berner JE, Ali SR, Will PA, Tejos R, Nanchahal J, Jain A. Standardising the management of open extremity fractures: a scoping review of national guidelines. Eur J Orthop Surg Traumatol. 2023 Jul;33(5):1463-1471. doi: 10.1007/s00590-022-03324-w. Epub 2022 Jul 10. PMID: 35819519; PMCID: PMC10276057.
4. Eccles, Simon & Handley, Bob & Khan, Umraz & Nanchahal, Jagdeep & Nayagam, Selvadurai & McFadyen, Iain. (2020). Standards for the Management of Open Fractures. 10.1093/med/9780198849360.001.0001.

☛ EARLY ADMINISTRATION OF ANTIBIOTICS AND REFERRAL AS PER RESOURCE SETTING