

5th metatarsal fractures: changing concepts

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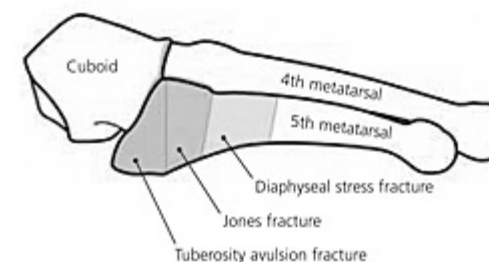
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- 1) 5th MT anatomical peculiarities
- 2) Not all lines across 5th MT base are fracture lines
- 3) What is the true Jones fracture ?
- 4) Why some fractures need surgery
- 5) Surgical treatment
- 6) Hindfoot Varus & Fractures of the 5th metatarsal
- 7) Stress Fractures of 5th MT
- 8) Treatment Algorithm

5th metatarsal fractures usually can be divided into one of three patterns:

- 1) Avulsion fractures of the base (Pseudo Jones Fractures)



II) Fractures at the junction of the metaphysis and diaphysis (Jones fractures)

III) Pure diaphysis fractures

Most of these fractures heal with nonoperative management and will not require surgery. Fractures of the metaphyseal diaphysis junction have a higher rate of non-union.

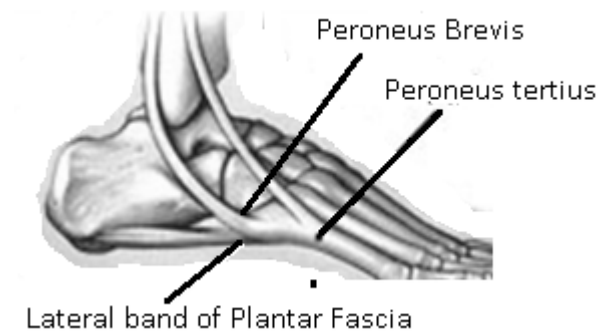
5th MT- anatomical peculiarities:

The 5th metatarsal forms the mobile lateral foot border.

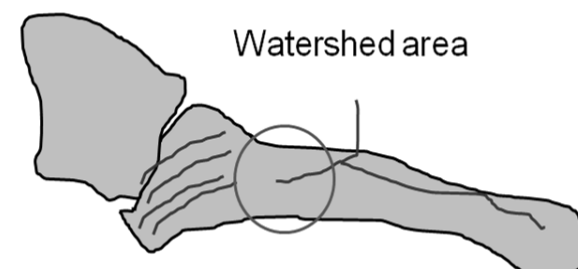
II) It has a broad base (metaphysis) which is expanded laterally to form the tuberosity, a narrow shaft (diaphysis) and a fairly small head.

III) Clinically important attachment to base are-

- a. Peroneus brevis tendon- at the dorsolateral tuberosity
- b. Peroneus tertius tendon- at the dorsal aspect of the metaphysis
- c. Lateral band of the plantar aponeurosis- connects the projecting part of the tuberosity with the lateral process of the tuberosity of the calcaneus



IV) Blood supply:



- a. Metaphyseal arteries gives supply to the base
- b. Nutrient artery enters at the proximal diaphysis and gives branches to supply diaphysis.

This creates so called watershed area at the metaphysis-diaphysis junction. This area is at high risk for poor healing of fractures due to avascularity.

Not all Fractures of base of 5th Metatarsals are **JONES** fractures:

- I. **Tuberosity fractures (Pseudo Jones fractures):** Avulsion fracture of the tuberosity with or without extension into the metatarsocuboid joint. Usually caused by forces that cause pull on the peroneus brevis tendon or lateral band of plantar fascia with foot inversion.
- II. **Jones fractures the classic Jones is -Fracture involving articulation between 4th and 5th Metatarsal.** Generally occurs within 1.5cm from the tuberosity. Caused by a large adduction force applied to the forefoot with the hindfoot in plantar flexion.
- III. **Stress fractures (Proximal diaphysis):** Occurs distal to the fourth and fifth metatarsal base articulation in diaphysis. Caused by overuse.

Not all lines across 5th MT base are fracture lines

The differential diagnosis:

1	Tuberosity fractures		Radiolucent line in a transverse plane. Piece of bone is sharply marginated and lacks cortication
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			at the fracture line
2	Apophysitis	Inflammation of apophysis	Fleck of bone oriented obliquely to the long axis of the metatarsal shaft
3	Os Vesalianum Pedis:	Accessory bone located proximal to the base of the 5th metatarsal	Piece of bone surrounded by bony cortex, and the margins are rounded
4	Os peroneum:	Accessory bone in the substance of peroneus longus	Small accessory bone located at the lateral plantar aspect of the cuboid



What is the **true Jones fracture** ?

I. **Jones fractures:** Occurs at metaphyseal-diaphyseal junction which is generally within 1.5cm from the tuberosity (water-shade area). Mechanism of injury is laterally directed force on the forefoot during plantar flexion of the ankle (eg. pivot-shifting in football or basketball with the heel off the ground). Fracture typically extends in the 4th/5th metatarsal articulation.

It is further classified into three types

- i. **Type I (acute fracture):** There is a sharp, well-delineated fracture line and minimal cortical hypertrophy with no intramedullary sclerosis.
- ii. **Type II (delayed unions):** There is widened fracture line with adjacent radiolucency related to bone resorption and evidence of intramedullary sclerosis
- iii. **Type III (nonunions):** There is wide fracture line with adjacent radiolucency and complete obliteration of the medullary canal at the fracture site by sclerotic bone.



Management:

	Non-athlete	Athlete
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	Minimally Displaced	Displaced	
Acute (<3months)	Short leg cast 6-8 weeks	Operative	Operative
Delayed-union	Short leg cast 8-12 weeks		
Non-union	Operative		

- In acute phase (less than 3 months old) i.e. type I fractures, the minimally displaced fracture is managed with short leg cast for 6 to 8 weeks and non weight bearing . Two thirds fractures will heels by this conservative treatment. However results of conservative treatment are poor in athletes. In displaced fractures and in active athletes the operative treatment is chosen.
- Type II fractures may also be treated with a nonweight-bearing cast, but a prolonged period may be required until union is achieved. In competitive athletes, these fractures are usually treated operatively.
- Type III fractures should be always treated operatively.

Why **some fractures** need **surgery**

- **Fracture in watershed area having high risk of nonunion**
- **Results of conservative treatment in high demand people e.g. athlete are poor**

Surgical treatment

Surgical fixation:

- placing intramedullary cancellus screw.
- size usually depends on width of the canal (4.5mm or 6.5mm cannulated, , 5.5mm solid).
- maximum diameter possible is used.
- threads must cross the fracture line.
- The length is usually between 40-55 mm
- the screw is countersunk to avoid prominence of the screw head.



Surgical tips:

- semilateral position
- longitudinal incision over distal metatarsal
- branches of sural nerve are protected
- peroneusbrevis isolated & retracted inferiorly.
- pass the guide wire as distal as possible.
 - Avoid directing the guide wire plantarwards, it should be parallel to shaft.

- Avoid putting the guidewire in the oblique view. The metatarsal shaft is narrower on the AP view, and it is possible for the pin to be centered on the oblique view where as on AP view the pin is eccentrically positioned.
 - 4.5 mm cannulated cancellus screw can be used in most cases in Indian population. Very occasionally in stout individuals 6.5mm screw may be used.
- For management of non union in addition intra-medullary curettage with bone grafting or bone marrow aspirate is used.

Potential complication:

- the common complication associated with surgery is nonunion. These are managed with re-fixation with larger diameter screw and bone grafting.
- other rare but serious complication is a re-fracture after fixation.

Association of Hindfoot Varus & Fractures of the 5th metatarsal

The majority of patients sustaining Jones fractures have evidence of varus hindfoot alignment. This may be a predisposing factor to developing the fracture or refracture after fixation. Postoperative varus unloading (lateral hindfoot and forefoot posting) orthotic insert is helpful in preventing reinjury or refracture of Jones fractures.

What is the Stress fracture

It occurs distal to the fourth and fifth metatarsal base articulation in diaphysis.

It is caused by repetitive trauma. Usually incomplete but can progress to complete fracture without proper treatment.



Management:

- short leg cast for prolonged duration (up to 20 weeks)
- non-union managed by fixation with screw or small plate and screws

Treatment Algorithm 5th Metatarsal Fractures:

		Non athlete		Athlete
		Minimally displaced	Displaced	
I.	Avulsion injury	Conservative	Conservative	Conservative Occasionally Operative fixation
II.	Jones fractures	Conservative	Operative fixation	Operative fixation
III.	Stress fractures	Conservative	Operative fixation	Operative fixation
IV.	Shaft fractures	Conservative	Operative fixation	Operative fixation
V.	Head fractures	Conservative	Operative fixation	Operative fixation

