

# Femoral Fracture Orthosis with Pelvic band and Hip joint: A post-op Orthotic Rehabilitation Measure

Lukeshkumar R. Bhuyar<sup>1</sup> (Demonstrator P&O), Jyoti Vora<sup>2</sup> (II-MPO)

Department of Prosthetics Orthotics, AIIPMR, Mumbai

## Abstract

*The given case reported after surgery for the fixation of fractured femur with external fixator. We have fitted him with the customized Hip orthosis with pelvic belt after removal of external fixator to provide stability and support to the fracture d healing site.*

*Key Words: Femoral Fracture, Orthosis, Rehabilitation, Surgery, External Fixator*

## Introduction

External fixation is a process for fracture fixation by which pins or wires are inserted into bone percutaneously and held together via an external scaffold. Initially described by Malgaigne in 1853, external fixation was proposed as an alternative to immobilization in plaster cast, traction, or internal fixation.

Physicians have been using external fixation to treat fractures for more than 2000 years after being first described by Hippocrates as a way to immobilize the fracture while preserving soft tissue integrity. The fixator design and biomechanics have changed dramatically over the years, but the principles remain the same. The primary goal of external fixation is to maintain the length, alignment, and rotation of the fracture.

### Frame Components:

**Pins:** Including half-pins, centrally threaded transfixation pins, and thin wire.

**Pin Clamps:** Serve to connect pins/wires to a rod or ring.

**Rings:** For use with Ilizarov and hybrid fixators.

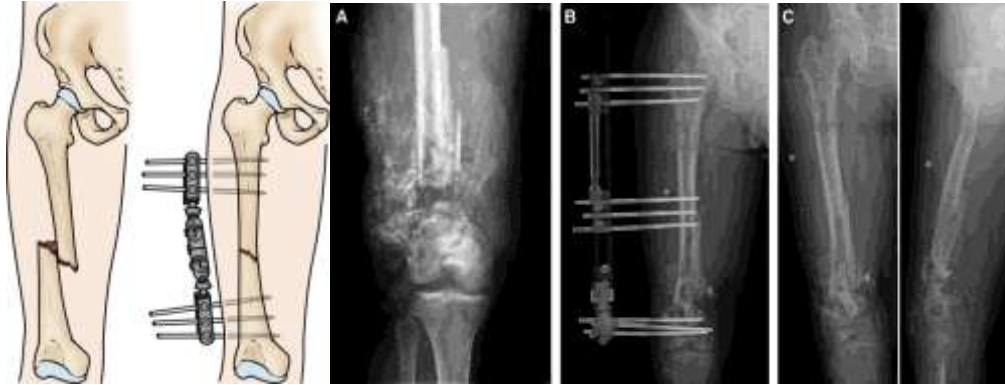
**Connecting Rods:** Most are carbon fiber, 15% stiffer than stainless steel tubes with less deformation at 50% maximum loads.

### Actions:

The design of the fixator can be varied to provide compressive or distractive forces and to neutralize bending and rotational moments.

### Biomechanics:

- Maximizing pin size, pin number, pin separation, pin proximity to the fracture, bone to clamp/bar proximity, and the diameter of the pins/connecting rod optimizes frame stability.
- The ideal position for pin placement is a near-far construct with a pin placed close to the fracture site on both sides and a pin placed as far away as possible on each side of the fracture. Stiffness is also increased by double stacking the connecting rods.



External fixation may be indicated for a variety of traumatic and reconstructive conditions involving the femur. Regardless of underlying pathology and type of external fixator used, fixator placement requires a clear understanding of the unique skeletal and soft-tissue anatomy of the femur.

External fixation is performed by an orthopedic surgeon and is usually done under a general anesthetic. The procedure itself typically follows the following steps:

1. Holes are drilled into the undamaged areas of bones around the fracture.
2. Special bolts are screwed into the holes.
3. Outside of the body, rods with ball-and-socket joints are joined with the bolts.
4. Adjustments can be made to the ball-and-socket joint to ensure the bone is aligned properly with as little, if any, shortening of a bone.

The main advantage of external fixation is that it is quickly and easily applied. The risk of infection at the site of the fracture is minimal, although there is a chance of infection where the rods have been inserted through the skin.

The external fixation also ensures the ideal compression, extension, or neutralization of bone placement while allowing for movement of the nearby joints. This not only aids in setting the bones correctly, but it can also help minimize muscle atrophy and edema (the buildup of excess fluid) caused by the total immobilization of a limb.

### Methodology:

Role of orthosis after removing external fixation:-

1. Immobilization: Orthosis helps to immobilize the fractured site
2. Supportive: Orthosis supports the fractured site which helps in reducing pain and healing the fracture
3. Maintain alignment: Orthosis provides the circumferential pressure to keep the fractured bone in normal alignment

Here in this research, we fitted an orthotic femoral fracture brace with pelvic belt and Hip joint to a subject who had fracture at proximal 1/3<sup>rd</sup> femur. The subject was fitted with External Fixator for six months and after radiological examination was advised to remove external fixator and use orthotic support.

### Design of femur Brace

It is an anterior opening design with Velcro strap closure. The femur brace design uses hip joint with pelvic band which maintain alignment of femur bone.

### Materials

Polypropylene sheet

Velcro straps  
Aluminum upright with PB and Hip joint

### **Femur brace components**

Thigh piece  
Hip joint  
Pelvic band

### **Biomechanics of Orthosis**

The Fracture site is unloaded by bearing the weight of trunk on the pelvic belt which is then transmitted from orthotic hip joint to the lower thigh shell.

### **Fabrication procedure**

First of all take measurement. In measurement there are two types of measurement.

1. Length
  - ASIS to Hip joint
  - Maximum thigh to minimum thigh
2. Circumferential
  - Pelvic
  - Max thigh
  - Min thigh

According to the measurement make a thigh piece and attach pelvic band with hip joint. Then check the alignment of the hip joint and pelvic band. Make sure that donning and doffing will be easily.



### **References**

1. <https://www.sciencedirect.com/topics/medicine-and-dentistry/external-fixation>
2. <https://www.ncbi.nlm.nih.gov/books/NBK547694>