

A Solution to Torsion Deformities in Children: The Torsional External Fixator

Dainen Parry

University of Utah, Dept. of Biomedical Engineering

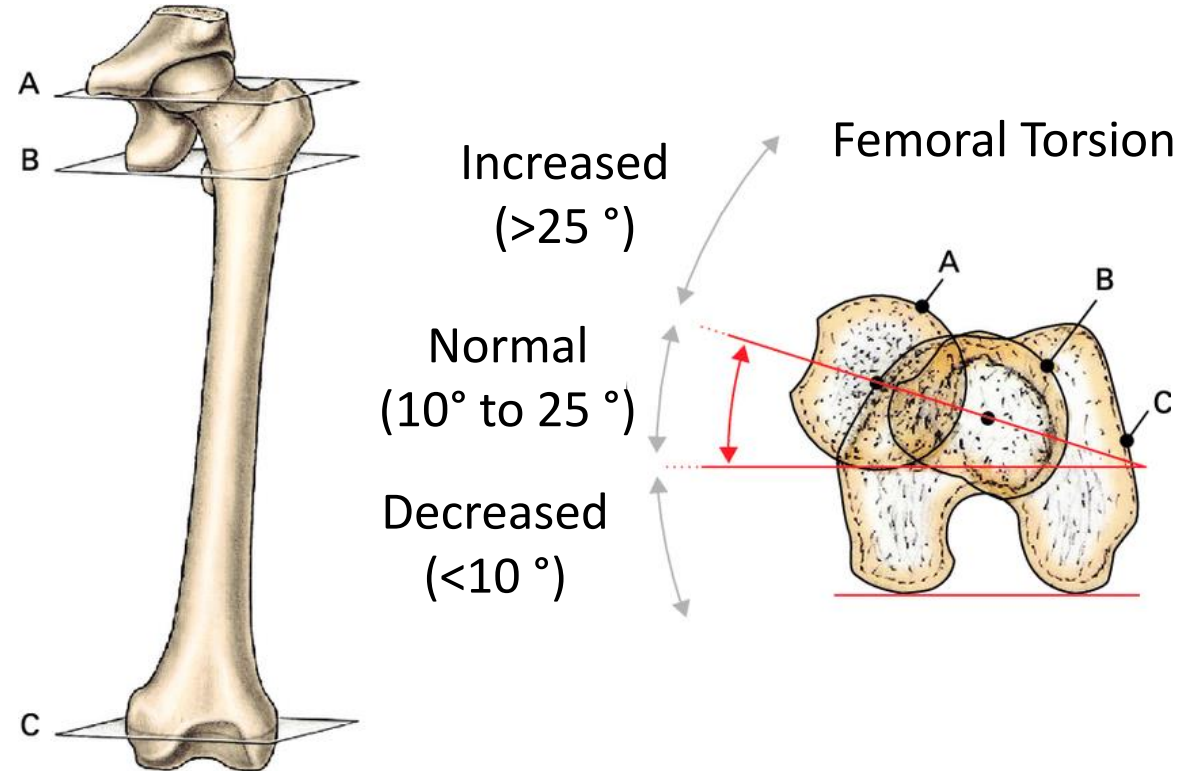
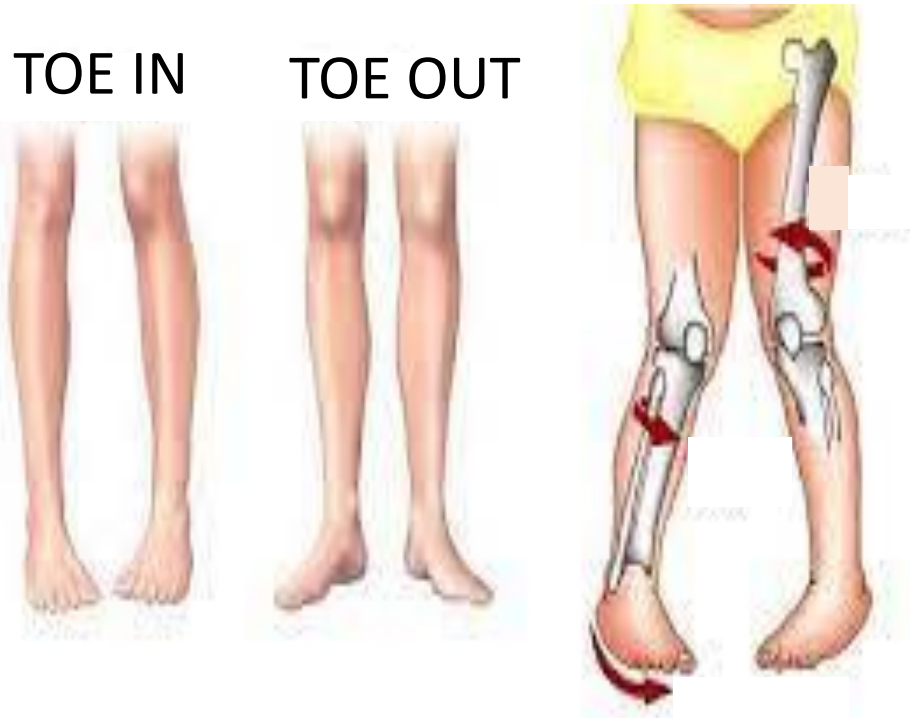
PI: Wade Fallin, MS

LS Peery Orthopaedic Innovation Center

March 3, 2022



Torsional Deformities Are a Twisting of the Bone



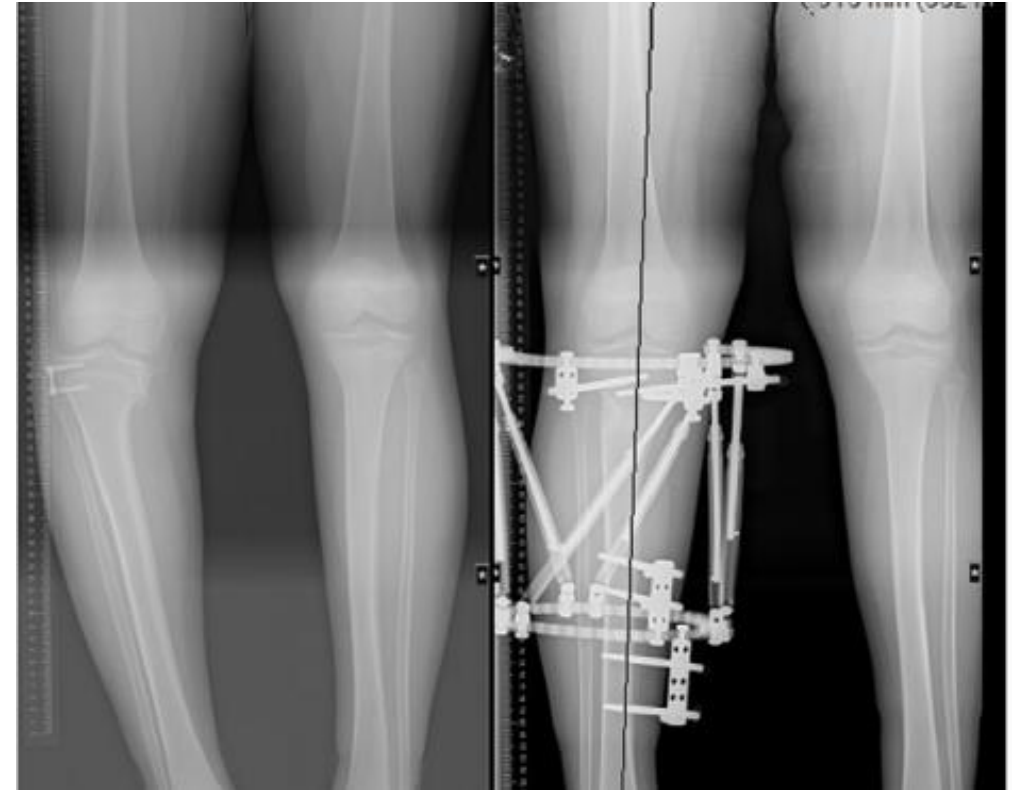
- These deformities cause pain and difficulty in movement

- Surgery is usually not performed unless the deformity is greater than 20°

Current Treatments of Torsional Deformities Are Invasive

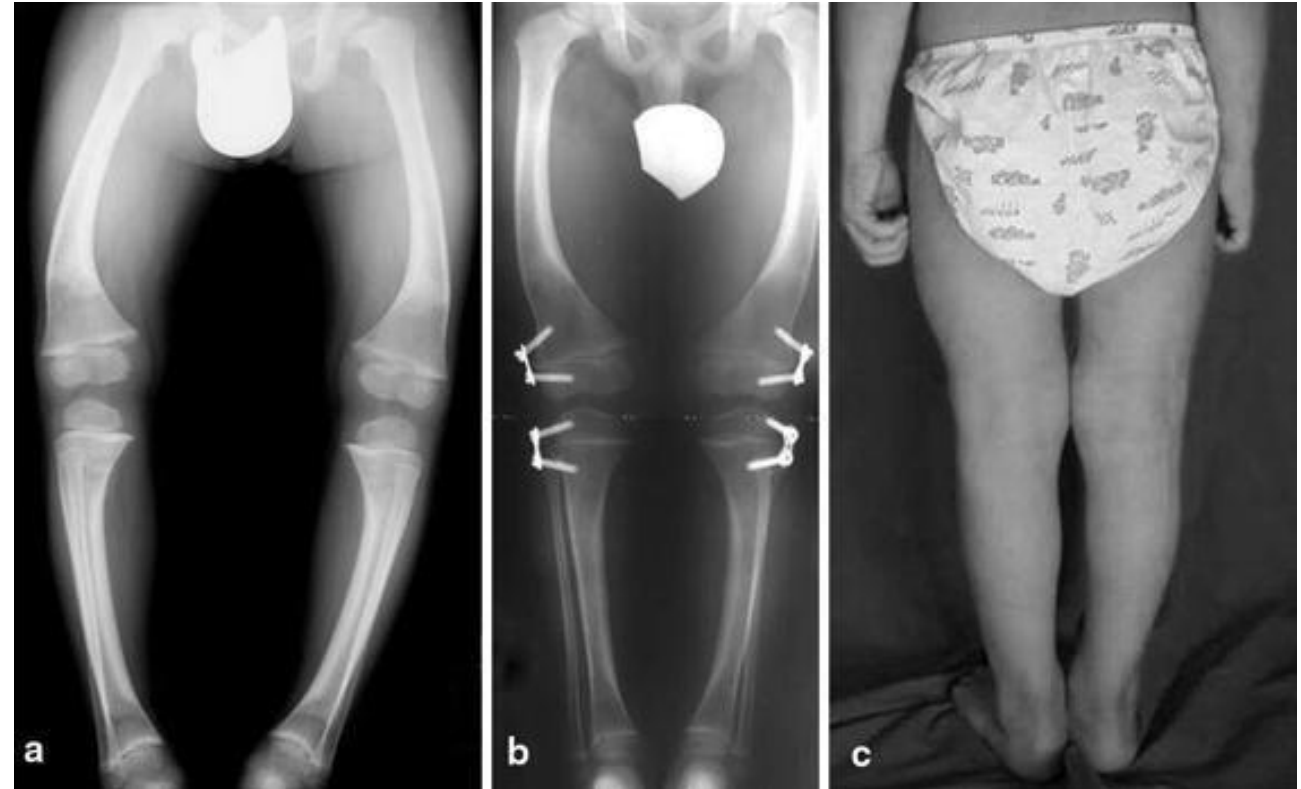
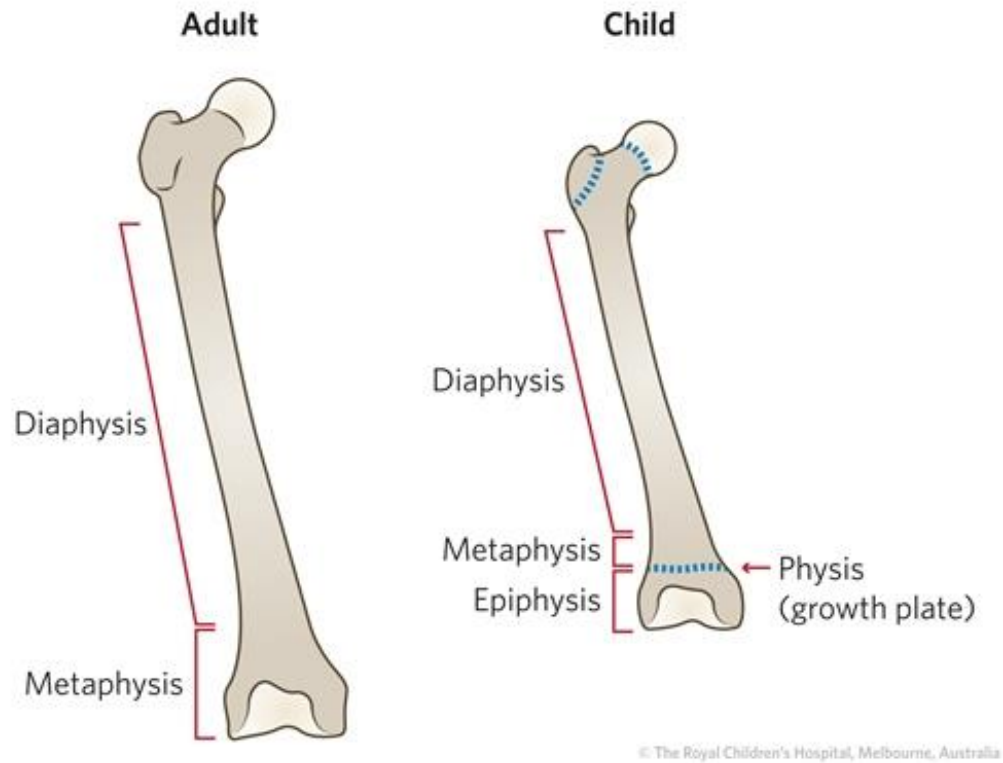


- Plates support the fracture and allow for greater joint mobility



- External Fixators Support the fracture and allow for earlier movement

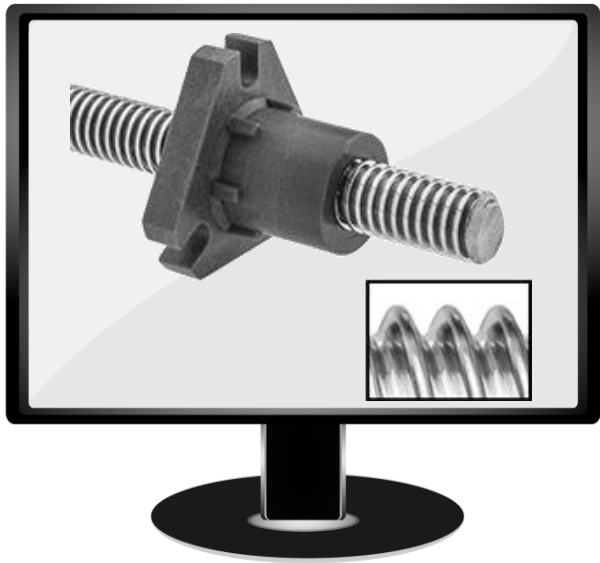
Guided Growth Can Be Used to Fix Deformities Without An Osteotomy



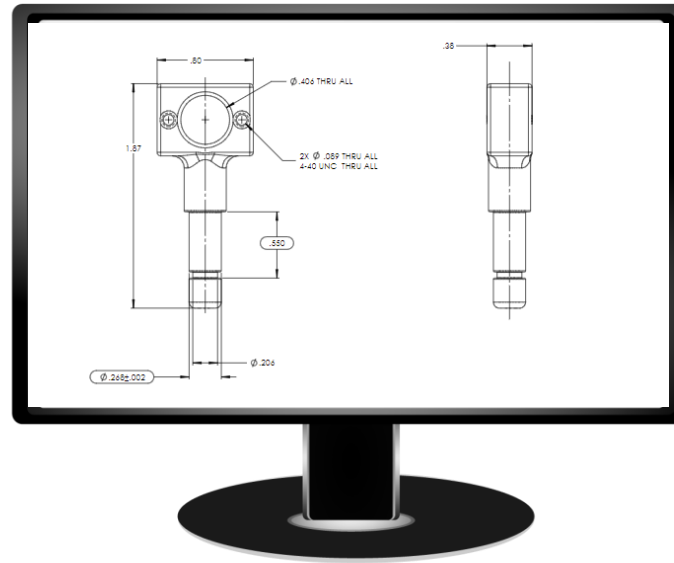
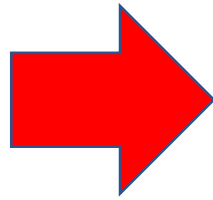
- Main Difference is the presence of a growth plate

- Guided Growth has been used to correct angular deformities.

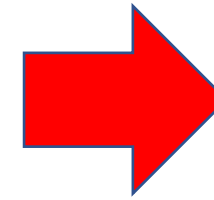
Creating the Torsional External Fixator



Researching



Designing/Locating Parts



Testing

The Motor and Battery Were Difficult to Locate

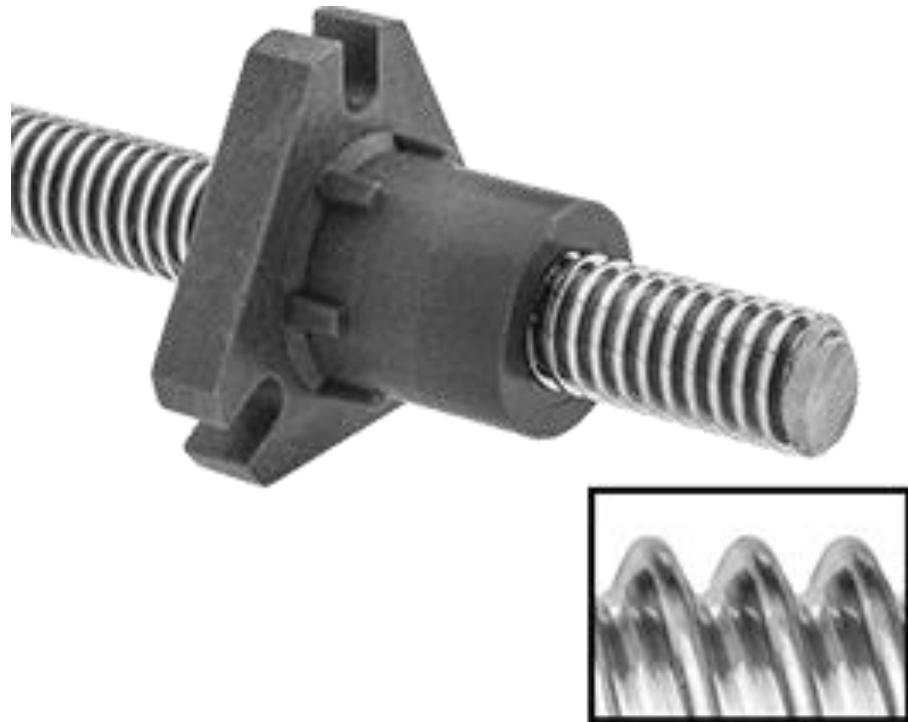


- Enough Power to last a week
- Weigh Less than 1 lb



- 51,200 steps/Revolution
- Slowest speed of 1 step/second

The Screw and Coupling Function as a Gearbox



- The screw has very fine threads
- Moves the nut at less than 1 mm per rotation

Google Search mcmaster.com (Lead Screw)

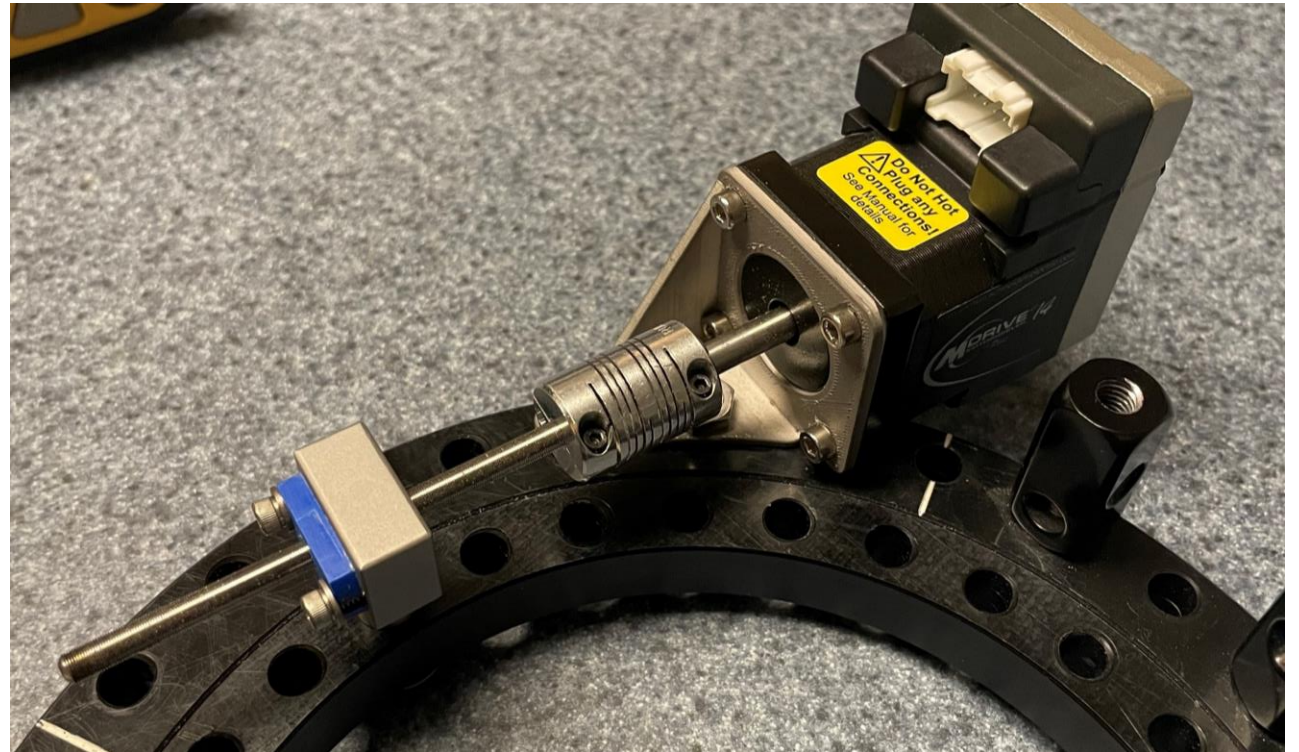
- The Spiral cut allows the coupling to flex as the ring rotates

Google Search mcmaster.com (Spiral Coupling)

The Motor Frame Had to Be Light and Strong



This Fixture Needed to Convert Rotational Movement into Linear Movement

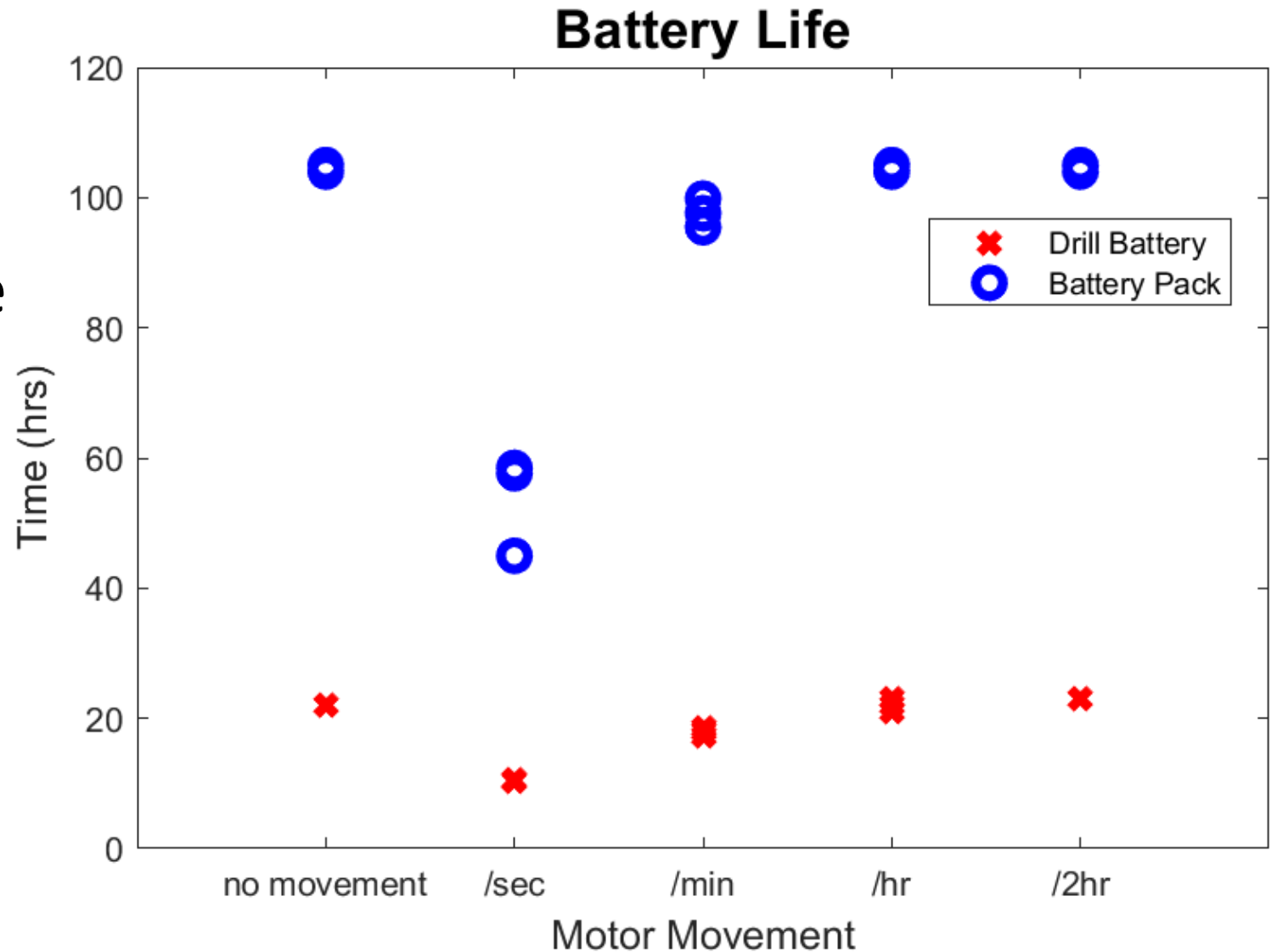


The Motor Rotates the Screw Which Moves the Ring



Maximum Battery Life Was 104 Hours

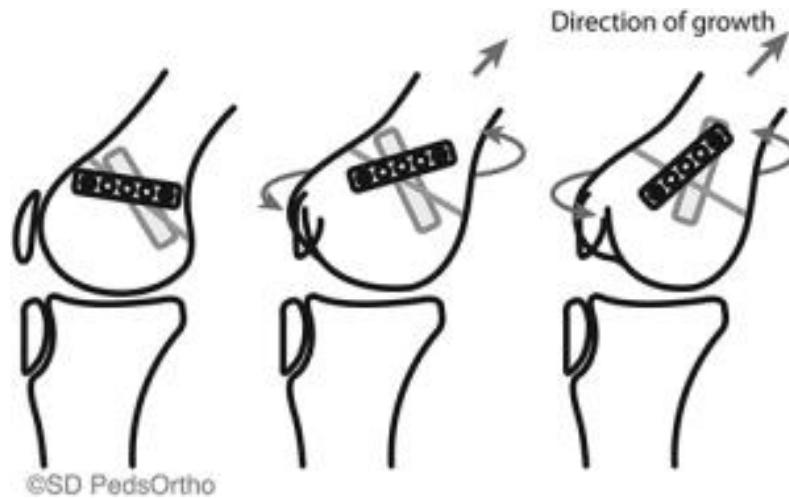
- Battery life at movement every 2 hours is the same as at no movement
- The optimal movement speed for battery life was movement every minute



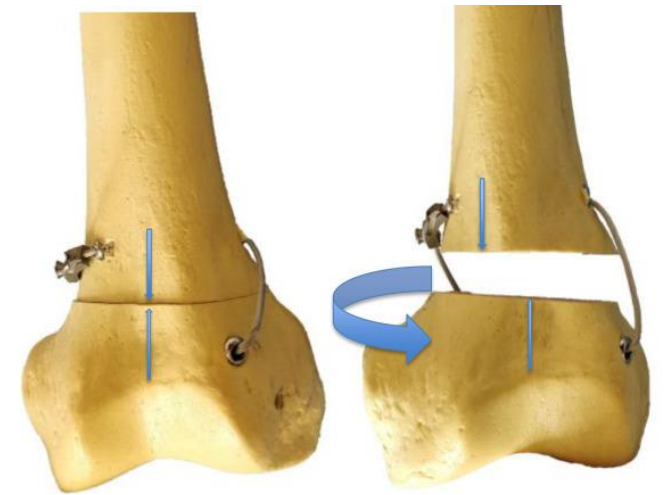
The Device Is Different from Its Predecessors



- Non automated



- Arrested Growth



- Caused Knee Stiffness

The TEF Can Fix Torsional Deformities without the Use of an Osteotomy



The Torsional External Fixator provides a torsional force to the bone using an automated motorized system

The TEF will help Children avoid the Pain of Osteotomies

