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A cutting guide positioner robot to improve bone-cutting precision in knee osteotomy

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BRIGIT Surgical Robot

BRIGIT (Bone Resection Instrument Guidance by Intelligent Telemanipulator), is a **surgical robot** used for **optimal positioning of a guide** providing mechanical support for a saw or a drill. BRIGIT is a compact 6 degree-of-freedom robot mounted onto a wheeled trolley, together with its control software.

Adequate position of the guide is derived from three-dimensional calculations performed from desired surgical planning parameters and spatial position of anatomical landmarks. Pinpoint collection of anatomical landmarks is carried out with BRIGIT surgical robot and its pointing end effector device.

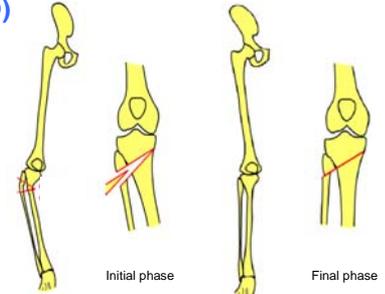
The study presented is carried out with **dry bones** and a **prototype** version of BRIGIT.



High Tibial Osteotomy (HTO)

HTO is a corrective surgical procedure in which the upper part of the tibia is resected with a precise angle so that the lower limb can be realigned, in order to change the biomechanics of the joint.

One of the **major difficulties** with HTO lies in the risks of **over- or undercorrection** leading to esthetic and functional complications.



Steps of the BRIGIT HTO technique



The first step consists in **locating a series of anatomical landmarks** to determine the anatomical axis of the tibia and the level of the upper resection. In order to achieve this, **BRIGIT** robot is used in a « **cooperative mode** » with its pointing device.

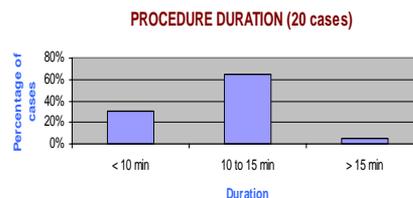
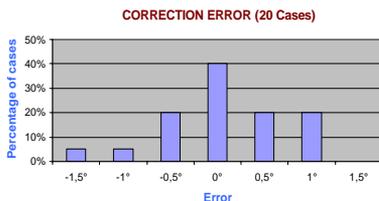
Then, the surgeon can input the **desired correction angle** thanks to a **user-friendly graphic interface**.

The **cutting guide** now replaces the pointing device. **BRIGIT** surgical robot **precisely positions** this cutting guide where the upper resection should be done.

Once the saw cutting is completed, **BRIGIT** now moves the cutting guide to the position where the **second resection** should be done.

The bone wedge is removed, measured and **compared** with the **desired correction** input to the system.

Results



Results of the study are very encouraging with an **average precision better than 0.7°**

Advantages of BRIGIT assisted High Tibial Osteotomy

- Optimal precision in angle of correction
- No plane-oblique effect
- No per-op X-ray irradiation due to cut positioning
- Short and predictable procedure duration
- Easy and intuitive technique without navigation required