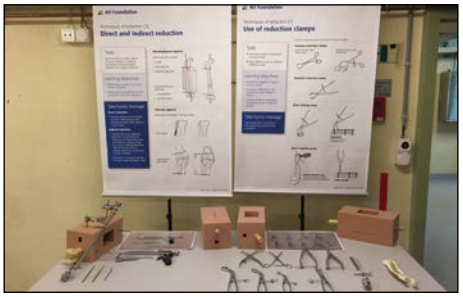
Skills Lab Faculty Guide
Techniques of reduction (1)

STATION E

At this station, you will introduce participants to different reduction techniques and tools, as well as to their applications and limitations.

Fracture reduction is probably the most difficult task in fracture surgery. Accomplishing successful reduction without compromising the blood supply to the bone and soft tissues is key for the success of the intervention.

This station provides a variety of reduction clamps, as well as a number of fractured artificial bones in foam blocks. After you have explained the differences between the clamps and tools on the table, the participants will try to reduce the fractures with the devices available.



Learning objectives

After completing this station, participants will be able to:

- Differentiate between direct and indirect reduction
- Relate both techniques to specific indications and bone segments
- Identify the degrees of freedom for each clamp
- Recognize difficulties in the application of the different devices
- Analyze biological advantages and shortcomings of different clamps

Take-home message

Direct reduction

- Fracture reduction is achieved by direct manipulation with instruments and under direct or C-arm vision

Indirect reduction

- Fracture site is not exposed, reduction is performed by applying corrective forces and moments at a distance from the fracture utilizing distraction with soft tissues such as capsule, ligaments, periosteum, muscles, tendons
- Reduction is checked clinically or using image intensifier, x-rays

Use of reduction clamps

- Use proper tools according to the anatomical and technical conditions

Station sequences (your tasks)

When you arrive at the station for the Skills Lab module:

- Familiarize yourself with the posters which include information about the station's learning outcomes and tasks
- Check the set-up before participants arrive at this station; ensure that all clamps are there.

During the group activity (to be repeated for each group):

Use of reduction clamps:

- Explain the different types and functions of reduction clamps. Point out that similar clamps can have different locking mechanisms.
- Encourage participants to inspect and feel each different clamp and practice reducing various fractures. The bone fractures set in foam boxes facilitate three different approaches:
  - Applying the clamps directly through the window (open approach)
  - Using the window as if it were a "permanent" C-arm, placing the clamp through a small incision on the side of the foam (minimally invasive approach)
  - Covering the window and letting participants work only through the side incisions by tactile perception.
- Explain how indirect reduction is accomplished using the push-pull technique which involves using a bone spreader and a screw placed outside of the plate for fracture distraction and a plate holding clamp for compression.

Direct and indirect reduction

- Explain the task to participants, encouraging them to test their skills with different bone models and bone-holding mechanisms; ideally, every participant tries at least one direct and one indirect reduction.

Discussion points

- Discuss different degrees of freedom and reduction capacity of the reduction tools: compression, distraction, rotation, and combinations thereof
- Summarize the take-home messages

While participants are changing tables:

- Remove all reduction tools from any bones
- Put the foam models and clamps back in order
- Check that none of the clamps are missing

Before you leave the station after the Skills Lab module:

- Check the station and make sure all clamps are still there

Frequently asked questions (FAQs)

STATION E

Why do we have different reduction techniques?
In order to understand reduction, one must also take into account what kind of fixation is required for the stability one wants to achieve. Different anatomical regions have different reduction requirements.

What is anatomical reduction and anatomical alignment?
Anatomical reduction is the result of a technique whereby fracture fragments are placed in their original anatomical positions to establish the original shape and form of the fractured bone. Anatomical reduction is required for articular fractures. Anatomical alignment refers to reestablishing the original axis of the bone and pertains to metaphyseal and diaphyseal fractures.

How is all this clinically relevant?
The surgical treatment of a fracture comprises three main steps that should be included in a complete preoperative plan: surgical approach, fracture reduction, and fracture fixation. Reducing the fracture is one of the steps in this surgical process and its difficulty is often underestimated. Since there are many reduction techniques and reduction-aiding devices, getting to know the names and functions of instruments is important if you want to successfully reduce any kind of fracture. Developing a defined surgical reduction technique that respects the biological principles of fracture fixation (open, closed, or minimally invasive) is a major step in becoming an accomplished surgeon.