

Skills Lab Faculty Guide

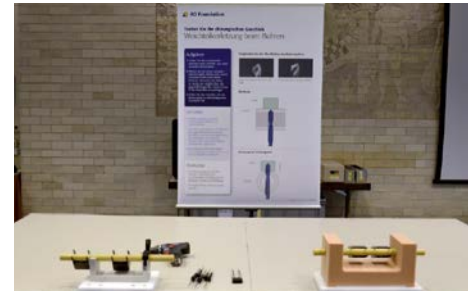
Soft-tissue penetration during drilling

At this station, you will help participants to develop a feel for drilling through the bone cortex without plunging and damaging the soft tissue. Through a hands-on exercise they will learn that the quality and nature of the drill bit/K-wire and the hold of a bone affect the depth of penetration.

Bone drilling is one of the basic surgical skills of orthopedic surgery. In order to achieve the best results, care should be taken to apply

a meticulous surgical technique. Drilling into bone must be kept under control so that it is safe for the surgeon and patient.

At this station, participants will exercise drilling using artificial bones. A box with plasticine is attached to the bone simulating the soft tissues. The depth of penetration into the soft tissue will be measured. Participants will use a K-wire or sharp and blunt drill bits.



Learning objectives

After completing this station, participants will be able to:

- Differentiate between sharp and blunt drill bits
- Develop a feel for penetrating the opposite bone cortex, and compare results using a K-wire or sharp and blunt drill bits
- Assess possible damage to soft tissues and neurovascular structures

Take-home message

- Use sharp drill bits to avoid uncontrolled penetration into muscles, nerves, and vessels
- Blunt drill bits must be replaced

Station sequences (your tasks)

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

- Familiarize yourself with the poster, which includes information about the station learning objectives and task.
- Check the set-up before participants arrive at this station.

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

- Explain the task to participants, identifying sharp and blunt drill bits, and plasticine.
- Show the participants how to distinguish between sharp and blunt drill bits by comparison of the tips of the drill bits in good light. The tips of blunt drill bits reflect light, the tips of sharp drill bits do not.
- Place the plasticine box (simulating soft tissue) on to the bone on the opposite side to where the drill hole will be made.
- Ask a participant to drill a hole. Drilling with one hand, tell the participant to use the other hand to hold the gray drill sleeve and ensure it is in contact with the near cortex.
- Tell the participant to focus on feeling the drill pass through the first cortex. As soon as the near cortex is penetrated, ask the participant to let go of the drill sleeve. When drilling through the second cortex, the drill bit should be kept under control and stopped after passing through the second cortex, minimizing plunging. Remove the drill bit but do not touch the drill sleeve.
- Now, the drill sleeve can be used as an indicator for penetration depth after drilling: Compare the length of the drill bit distal to the gray sleeve with the diameter of the bone.
- Alternatively, the depth of the hole created in the plasticine box (simulating the soft tissue) can be measured with the depth-gauge supplied. Smoothen the plasticine with your finger afterwards to fill up the hole in the box.

- Ask participants to drill another hole in the bone using the K-wire or a sharp or blunt drill bit. Measure the depth of penetration and compare it to the first try. Smoothen the hole in the plasticine with your finger.
- Let the participants drill again into different set-ups—bone fixed into vice or fixed into soft holder respectively.

Discussion points

- Summarize the take-home messages.
- Briefly restate the findings of the exercise:
 - Did all participants pay attention to what drill they were using?
 - Were they able to distinguish between sharp and blunt drill bits by observing the very tip of the drill bit? Could they then verify the findings when using the drill bits?
 - Are they aware of the potential damage they could cause when drilling too far into soft tissue?
 - Did they understand the importance of not touching the drill bit tip with their fingers in the OR but using their naked eye to distinguish between blunt and sharp drill bits?

While participants are changing tables:

- Ensure that all holes in the plasticine boxes are smoothed out.
- Disengage the drill bits from the power drill so that you are able to show the tips of the drill bits to the participants in your next presentation.
- If required, clean the drill bits from plasticine.

Before you leave the station after the Skills Lab module:

- Remove all drill bits from the power drill.
- Ensure the plasticine boxes are smoothed.
- Clean the drill bits, bone holders, and the power drill if necessary.

Frequently asked questions (FAQs)

What happens if I plunge?

It means you have penetrated the soft tissue and can damage soft-tissue structures, such as vessels or nerves.

How do I avoid penetrating soft tissue?

The most important step to reduce plunging is the use of sharp drill bits to reduce the amount of pressure you put on the power drill and thus the drill bit. In addition, it might be helpful to use shorter drill bits, if available, or letting the K-wire protrude less from the collar chuck. Discuss if placing yourself in a different position or holding the drill with one or two hands has any effect on plunging. If time permits, try the exercise again, modifying these factors.

How do drill bits become blunt?

Drill bits not only become blunt by drilling through bone; they also become blunt with friction against other tools as they go through the cleaning/sterilization process and/or when they are inappropriately stored. An everyday example is your tool box at home where drill bits are separated into compartments in order that they are not in contact with each other. This is not only for presentation purposes but also to keep them sharp by avoiding contact friction.

When perforating metaphyseal or osteoporotic bone do you feel the second cortex?

You may not feel when your drill bit passes through the second cortex, as metaphyseal and osteoporotic bone have very thin and delicate cortices. You should be particularly careful when drilling through these types of bone.

Why do the blunt drill bits reflect light?

Drill bits used in surgery fail first on the very tip and then, if at all, at the cutting edges. The worn off tip becomes round and the surface of this hemisphere reflects the light. Where the cutting edges can look perfect (do not reflect the light) the tip might already be blunt (reflects light).