General Usage Technique
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Notice to Surgeons
This guide describes the use of instrumentation and the features of the FIXIN system. It is highly recommended to question a surgeon that already implants the FIXIN system or to attend a FIXIN introductory course.
**Objectives**

- Show the Instrumentation for Fixin plate application
- Show the Fixin conical coupling mechanism
- Show different techniques for temporary plate application
- Show locking screw insertion
- Show Implant removal

**Instruments used for this exercise**

The 3.0-3.5 Instrumentation Set
- Drill Bit Ø 2.5 (for Ø 3.0 Screws);
- Drill Guide Ø 3.0 mm;
- Drill Bit Ø 2.9 (for Ø 3.5 Screws);
- Drill Guide Ø 3.5 mm;
- Depth Meter 3.0-3.5 Series;
- Screwdriver 3.0-3.5 Series (Hex Ø 2.5 mm);
- Bushing Extractor 3.0-3.5 Series;

The support of the large system will accept 3.0mm Fixin screws and 3.5mm Fixin screws.

To insert a 3.0mm screw, the 3.0mm golden drill guide is inserted into the bushing and a hole is created perpendicular to the plate using the golden 2.5mm drill bit.

To insert a 3.5mm screw, the silver 3.5mm drill guide is inserted into the bushing and a hole is created perpendicular to the plate using the 2.9mm drill bit.

Both screw sizes of the large system are inserted using the large system screw driver.

**Conical Coupling**

The Fixin system consists of a stainless steel support with trested holes and a titanium bushing that is screwed into the support to allow the insertion of a titanium Fixin screw. The Fixin screw has a conical head that matches the conical shape of the bushing, it has an hexagonal recess to accept the screw driver, a threaded part to engage the bone, and a self tapping tip to create the threads in the bone.
Temporary Fixation Devices

For Temporary Plate Fixation:
- bone holding forceps
- conventional bone screw (interference screw), 1.2mm K-Wire;
- Pin stopper large series used with the golden 3.0mm Drill Guide Ø;

Implant used for this exercise

The V3303 bone plate is used in the exercise with Fixin locking screws.

Temporary Fixation methods

The generic bone model is placed into the vice.

The golden 3.0mm drill guides are placed into the most proximal and most distal holes of the bone plate. They are used to manipulate and position the plate on the bone.
Before locking screw insertion, plate positioning is evaluated, and the plate is temporarily stabilized to the bone to counteract rotational forces. By doing so, the helicopter effect is counteracted during locking screw insertion.

For temporary plate fixation, different techniques can be used.

**Threaded Pin With Pin Stopper**

The 2.5mm partially threaded pin perfectly fits into the golden drill Guide for the 3.0mm screw. The screwdriver is used to unlock the pin stopper. The height of the pin stopper is adjusted so that the threaded part of the pin will securely engage the near cortex when inserted into the drill guide. The pin stopper is then secured again using the screwdriver.

The pin is placed into the drill and is then placed into the drill guide secured into the plate. When the pin is inserted, the pin stopper will press down on the top of the drill guide and the bone plate securing the implants in its position.

**Locking screw in the drill guide**

Threaded pin with a locking screw in the drill guide:

A 2.5mm partially threaded K-wire is inserted monocortically into the distal drill guide.

To secure the pin-plate bone construct, the screw in the drill guide is tightened using the large screwdriver.
Conventional Bone Screw

The plate with the two drill guides is positioned onto the bone.

Gold 3.0mm guide
Silver 3.5mm guide

A hole is created using the 2.9mm drill bit inserted into the Silver drill guide.

The drill guide is removed and a special self tapping temporary fixation screw is inserted using the screw driver.

When the screw is tightened, the plate is compressed onto the bone, stabilizing the implants.
**General Usage Technique**

**Small K-Wire**

Some of the Fixin bone plates have a small hole that accepts a 1.2mm K-wire for additional temporary fixation. When plate positioning has been evaluated, a 1.2mm K-wire is inserted into the dedicated hole in the plate. Although this technique does not compress the implants against the bone, it does secure plate position on the bone and provides rotational stability during locking screw insertion. In addition the K-wire does not interfere with the plate holes and screw insertion.

**Reduction Forceps**

Bone holding forceps are applied to secure the plate to the bone. This technique is mostly used for fracture reduction and fragment manipulation. However, this technique is more invasive and may damage the soft tissues surrounding the bone. At this point, temporary fixation is provided by the bone clamp on one side of the plate. On the opposite side, a 2.5mm k wire with a pin stopper is inserted. The stability of the temporary plate fixation is evaluated by manipulating the plate and the bone.
Locking screw insertion

The 3.5mm drill guide is inserted in an empty plate hole and secured in the plate by turning it in a clockwise direction.

A bicortical hole is created perpendicular to the plate using the 2.9mm drill bit.

The drill guide is removed in a clockwise direction and the depth of the hole is measured with a depth gauge.

The appropriate size and length screw is inserted and firmly tightened.

The same procedure is repeated on the opposite side of the bone model.
In some instances it may be difficult to place two drill guides in two plate holes next to each other. It is crucial for the locking mechanism that the drill guide is placed perpendicular to the plate hole.

To avoid interference of the drill guides, their flat surfaces should face each other.

Finally the temporary fixation devices are removed.

The last screw holes are filled with locking screws.
To place a 3.5mm locking screw, the golden 3.0mm drill guide is removed.

The Silver 3.5mm drill guide is inserted.

A 2.9mm hole is drilled bicortically to allow 3.5mm screw insertion.

The 3.5mm screw is tightened.

The plate is now fully secured to the bone without disturbing the blood supply.
Implant Removal

For implant removal, different instruments can be used.

Implant removal using screw Driver

The first attempt at screw removal is done using the dedicated screw driver. Care must be taken to accurately clean the recess of the screw head, to firmly engage the screw head with the screw driver and to maintain the screw driver in a perpendicular direction to the plate.

Now, two outcomes may happen.
First, the screw is disengaged from the bushing allowing screw removal while the bushing remains attached to the plate.

Or...

Second, in case the screw remains firmly engaged within the bushing, the bushing is unscrewed from the support. The screw and the bushing are extracted contemporaneously.
Bushing Extraction Device

In case the screw head is stripped, the bushing removal device can be used to disengage the bushing from the support.

The central stem of the bushing removal device is removed...

...and placed into the hole at the top of the instrument in order to create a t-handle.

This handle will provide a firm grip for direct extraction of the bushing.

The tip of the instrument is placed over the bushing, taking care that the two teeth of the device engage the bushing.

The instrument is pressed down on the bushing and maintained perpendicular to the support while it is turned counter-clockwise.

During bushing or screw removal the conical coupling may disengage due to the different thread pitch of the screw and the bushing.
Screw Extractor

In case the screw head is stripped, and the bushing removal device cannot be used due to damage to the bushing, a screw extractor can be used.

A left threaded screw extractor is connected to the T-handle and placed into the head of the screw.

The handle is turned in a counter-clockwise direction while being pressed into the screw head.

Once the removal device engages the head of the screw, further turning of the handle will disengage the coupling of the screw from the bushing or unscrew the bushing from the support.