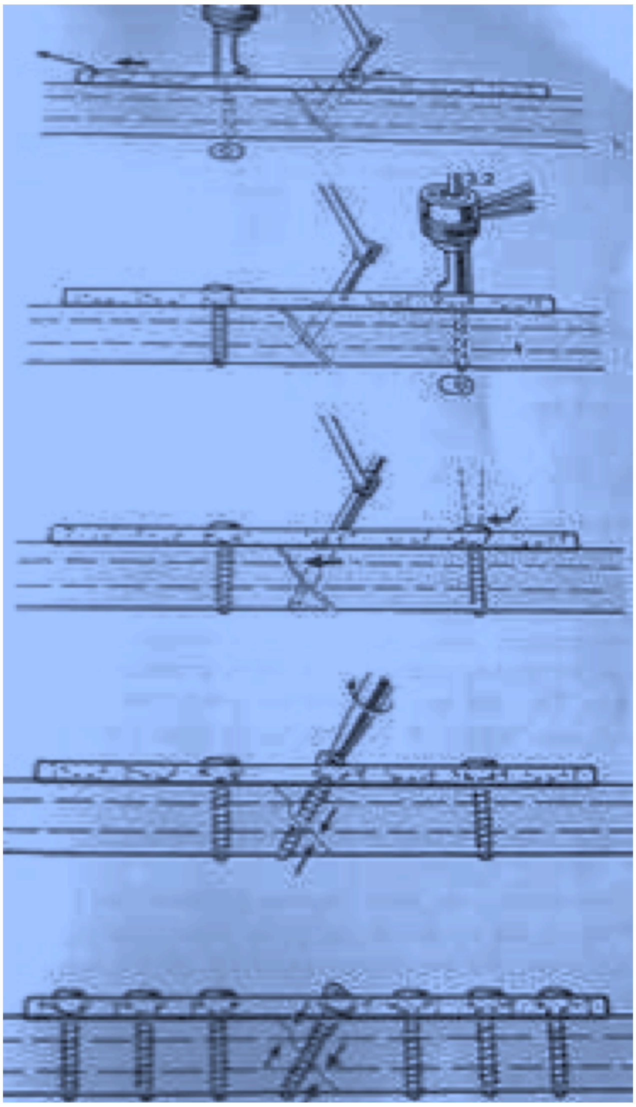
Types of Plates

1. New Dynamic Compression Plate:

Diaphyseal fracture: Radius, Ulna, Humerus, Rarely tibia

1. Undercut adjacent to the holes low contact: less stress shield
2. Undercut at the undersurface at the hole: permits screw to be placed 40° maximum [DCP 25°]
3. Cross section is trapezoid: Ridges formed are broad and less of stress riser
4. Using compressive eccentric: displacement is about 1 mm
5. Uniform spacing of screws: unlike Muller's plate with central free of screw
6. Universal plate drill guide:
   when not pressed ➔ eccentric mode
   When pressed ➔ neutral mode

Sequence of screw fixation

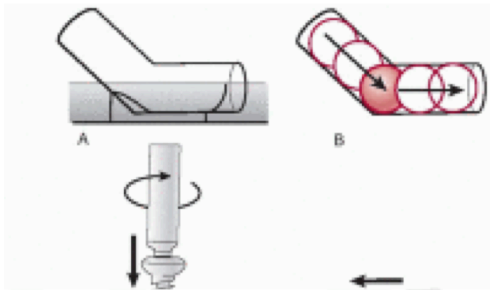


DCP

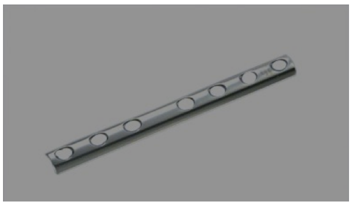
A. Dynamic compression principle: the holes of the DCP are shaped like an inclined and transverse cylinder.

B. The screw head slides down the inclined cylinder.

C,D. The plate is being moved horizontally relative to bone when the screw is driven home.



2. One third tubular Plates



Commonly used is 3.5 mm, from small fragment set
Usually for fixation of Lateral malleolus, ulna,
Metacarpal bones

Principle

These plates are designed in the shape of half tube;

They are only 1 mm thick and have low rigidity;

The plate is used only in areas where they are subject to tensile forces;

Oval plate holes allow some axial compression if screws are inserted eccentrically

2.7 mm drill bit is used for 3.5 mm cortical/cancellous screws

Semitubular plate: usually not used these days. 4.0 drill and 6.5 screws.

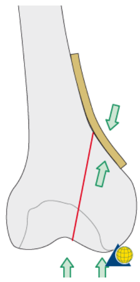
3. Reconstruction Plates

Used in : Clavicle, Pelvis, Acetabulum, calcaneus

Principle

1. These plates are used with 3.5 mm cortex screws;
2. Reconstruction plates have notches alongside the plate, which enables bending in three dimensions
3. Bending more than 15 degrees at any one site should be avoided
   If strong curvature is needed, consider a prebent plate;
4. Oval holes permit some self compression if the screw holes are placed eccentrically;
5. Holes accept 4.0 mm cancellous bone screws if the plate is placed over cancellous bone/3.5 cortical screw;
6. Screws can be inserted at an angle of 25° longitudinally and 7° sideways;
7. Thickness 2.8 mm and width 10 mm; hole spacing 12 mm

4. Buttress Plate



Fractures with a vertical fracture line, a buttress plate is necessary to counteract the vertical shear forces. The buttress plate prevents proximal displacement of the fragment. The buttress plate is added to enhance the stability and to counter axial load on the fracture, especially in osteoporotic bone.

Eg: Proximal tibia, malleolus, distal femur

5. Contoured plate

With the development and popularization of minimally invasive surgical methods and implants for fracture fixation, it is increasingly important that the available implants are precontoured to the specific anatomic location for which they are designed. Although the criteria plate fits of 43%-62% were achieved. This outcome is likely a result of bone morphology variations. Clinically, an anatomically well-fitting plate can greatly facilitate the process of reduction in terms of axial and rotational alignment of the main fragments. Such a plate may additionally protrude less and therefore minimize soft-tissue impingement.

6. Locking plates

Internal fixator principle

In an attempt to reduce or abolish the area of contact and friction between a plate and the bone surface, Tepic and Perren reported about a new principle of fracture fixation based on what they called the internal fixator. The first development was the point-contact fixator (PC-Fix), where every screw head was locked in the plate hole.

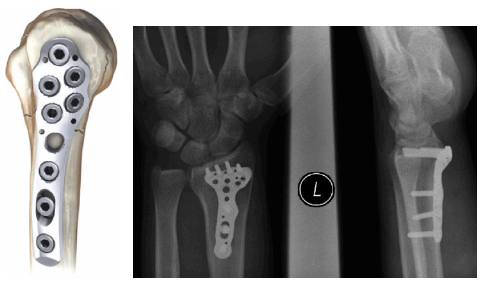
The stability of the fixation was therefore not based on compressing the plate onto the bone or on preload and friction, but depended on the stiffness of the plate screw construct. As the locked plate is not based on friction between the plate and the bone, there is no requirement for contact with the bone surface. Leaving a narrow free space between the implant and the bone preserves the periosteal blood flow and the underlying cortex remains vital, which appears to increase resistance against infection.

A further feature of the locking head screws is the angular stability of the construct, which prevents any secondary displacement or collapse of fixation. There is no need for a precise contouring of the plate to the shape of the bone with a pure locked plate construct, as plate is not pressed against bone as in conventional nonlocked plating.

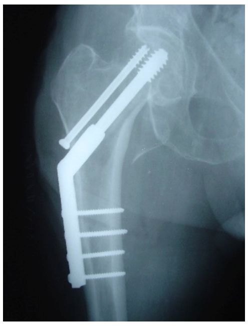
Last but not least, the locking head screws often have a larger core diameter (4.0- vs. 3.0-mm), which increases their strength, while the thread may be shallow as it adds very little to the resistance to pullout. Thanks to the entire screw-plate construct together and not one screw after the other as in conventional plating. This feature has proven most useful in poor quality or osteoporotic bone as well as in periprosthetic fractures, where often only monocortical screws can be inserted beside the shaft of a prosthesis.

The next development was the locked plate less invasive stabilization system (LISS) for the distal femur. It combines the fixed angle device with the possibility of a minimally invasive plate insertion technique using a special jig and monocortical and self-drilling and self-tapping screws that are introduced through short stab incisions.

Hybrid plating with a combination of conventional nonlocked screws (to use plate as template for reduction) and locked screws.



7. DHS



Commonly used for Trochanteric fracture,
undisplaced fracture neck of femur and
Subtrochanteric fracture

Principle

Femoral neck: causes large bending loads on fixation hardware.

The major force: Trochanteric fracture of the femoral neck is:

1. One parallel to the fracture line, causes sliding
2. Perpendicular to the fracture: cause impaction

The aim of fixation systems for this fracture is to use the perpendicular component to gain stability.

The actual stiffness provided by the sliding hip screw, the reconstruction nail, and the multiple pin constructs are quite similar, except that the reconstruction nail offers significantly greater torsional stiffness that the others, because of its tubular shape).

The higher angle compression hip screw provides less resistance to sliding, which allows the fracture fragments to be compressed.

Sliding in the barrel is better: [sliding in the barrel prevents penetration of the screw through the head which was common in older fixed plate screw system.

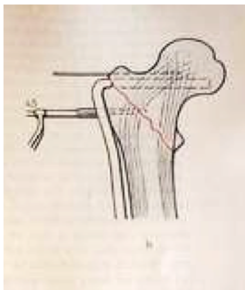
150 degrees than 135 degrees

Short than long barrel

The greater the length of the screw within the barrel, the lower the resistance to sliding

8. Angled Plates

Plates: 130° [increment in 10°] or 95°



Now is commonly used for distal and proximal Femur

- Problem: needs to be in the center of the neck
- needs to in the axis of distal femur
- Planning: Pre-op X-ray template
- Use of K wire

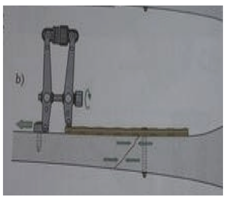
Done supine on a radiolucent table

Technique dependent

Technique: 95°:Tip of the blade in the lower half

Proximal screw to fix the calcar

- Lateral view: blade should be in the Centre of the head
- Screws used: 4.5 cortical and drill 3.2



9. **Muller's Plate**

used these days

Needs more exposure

Requires a compression device