Summary & Conclusion

Absolutely stable fixation used to be considered a prerequisite for immediate pain-free mobility. Precise adaptation and compression restores the overall mechanical integrity of bone but then mechanical induction of callus is minimal. Therefore, under conditions of absolute stability bone healing depends entirely on internal remodeling.

Direct healing follows stable fixation and compression, the bone heals without apparent callus. It skips the inter mediate steps of tissue differentiation and resorption of the bone surface and progresses to the final internal remodeling of the Haversian system.

Indirect healing consists of the sequential steps of tissue differentiation, resorption of the surfaces of the fracture and uniting of the fracture fragments by callus. Finally, the fracture undergoes long-lasting internal remodeling.

The goal of relative stability of fixation is to allow for pain-free mobility but simultaneously for induction of bone formation (callus). A precondition of relative stability of fixation is that it be elastic. Locked internal fixator technique enables the use of elastic flexible fixation.

The main biomechanical and resulting clinical benefits of these locked internal fixators are:

-The plate and screws form one stable system and the stability of the fracture depends on the stiffness of the construct. No compression of the plate on the bone is required; this suppresses the risk of primary loss of reduction and preserves the bone blood supply.

-Locking the screw into the plate to ensure angular as well as axial stability, eliminates the possibility for the screw to toggle, slide or be dislodged and thus strongly reduces the risk of postoperative loss of reduction.

-Improved biology for healing. Locked internal fixators do not compress the periosteal blood supply, thereby causing less interference of the fracture hematoma and fracture healing.

-Improved stability in multifragmentary, complex fractures with loss of medial/lateral buttress or bone loss.

-The locked screw/plate interface provides fixed angle stability, which avoids subsidence in the metaphyseal areas. It also allows medial or lateral fixation without reconstructing the medial or lateral buttress or without double plating, and without the use of primary bone graft.

-As the stability does not rely on compression between the plate and the bone, the plate does not need to be anatomically contoured. This is especially true for metaphyseal areas where the shape of the bone can be quite complex, which facilitates the surgical procedure. This point is important when using the MIPO technique.

-Better fixation in osteoporotic bone, especially near the joint: In osteoporotic bone, locking head screws have better resistance against bending and torsion forces with less pull out of the screw.

The main clinical benefits for using LCP are in the following situations:

-Epi/metaphaseal fractures (short articular block, little bone mass for purchase, angular stability).

-In situations where the MIPO technique is indicated or possible; because accurate contouring of the plate is not possible and also not necessary when using locking head screws; there is no loss of initial reduction. MIPO with indirect reduction and minimal invasive submuscular/subcutaneous plate insertion and fracture stabilization with locked internal fixator minimize the surgical devascularisation and the implant-related vascular insult to the bone and soft tissues.

-Fractures in osteoporotic bone.

-Fractures with severe soft-tissue injuries.

-Shaft fractures in children.

-No or less need of primary bone graft.

Although the LCP system offers a number of advantages in fracture management, its successful use requires careful preoperative planning, consideration of biomechanical principles, and the use of the appropriate plate and screws combined with good surgical technique. Failure to address these issues can lead to potential pitfalls in terms of implant loosening or breakage.

Potential problems can arise as a result of 2 features of the LCP: the locking of the screws into the plate hole that provides angular stability, and the fact that different types of screws can be used in the same plate hole, providing different means of fixing the plate to the bone. Both of these features offer several theoretical and practical advantages, but also increase the risk of new and unknown problems, inappropriate application, or both. Tightening a locked screw in the plate hole gives the surgeon a feeling of excellent stability, but the effective hold of the screw in the bone cannot be felt. This might lead the surgeon to overestimate the achieved stability and hence insert an insufficient number of screws. This can result in secondary loss of reduction due to early cut out of these too few screws.