TECHNOLOGY UPDATE

Interlocking nails

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Kuntscher was the first to recognize that all femoral fractures are not suitable for conventional medullary nailing and designed the first interlocking nail in late 1960s. Klemm modified it in 1972. Grosse, in Strasbourg, modified Klemm's nail and published the first report in 1976 [1].

Interlocking medullary nail combines the advantages of closed medullary nailing with added fixation of inserted transfixion screws, introduced through pre-drilled holes at proximal or distal end of nail or both. When both the proximal and distal end of nail are locked, it is termed, "static" and when only proximal or distal end of nail is locked, it is termed, "dynamic". The static fixation may be converted to dynamic during later stages of healing. Interlocking nails provide a stable nail-bone construct during the healing process.

The advantages of interlocking nails are that they can be used for fractures which are unsuitable for standard medullary fixation, those with severe comminution, bone loss and those beyond the isthmus zone if transfixing interlocking screws are used [2]. Whittle and co-workers have reported the development and use of closed section interlocking intramedullary nails designed with smaller diameters and modified section modules to allow insertion with non reamed techniques in open fractures with low infection rates [3].

The new addition to the system is the *second generation nails or reconstruction nails*. Reconstruction nails were developed to address the unique anatomical and biomechanical demands of complex femoral fractures including subtrochanteric fractures and ipsilateral fractures neck and shaft fractures. All such nails are designed to permit the placement of one or two screws into femoral head and neck. Small diameter (delta) reconstruction nails have an increased wall thickness that enhances their bending strength. The proximal 8 cms of all commonly used reconstruction nails have an expanded diameter to provide additional strength for proximal lag screws [2]. New systems are also available in our country with distal locking pins (instead of bolts) and optional distal locking wings.

The use of cotter pins seems to have the advantage as the locking bolts are inherently weak at the junction of threaded part with the non-threaded part. Also it is easier to insert pins than bolts. The wings open up through holes in nails and engage themselves in the cancellous bone of distal femur or tibia. This option makes distal locking much simpler and also reduces radiation exposure. Studies have shown that the greatest dose radiation to the dominant hand of the surgeon occurs during nail insertion and distal targeting [4]. Usually there is no difficulty encountered during proximal locking due to availability of jigs and all manufacturers follow more or less the same pattern.

Interlocking nail system is expensive. It requires sophisticated equipment for insertion and extraction of nails. Certain systems require a separate inventory of nails for right and left sides. Image intensifier is necessary. Procedure is difficult and the learning curve is long. Interlocking pins/bolts at times break/bend and wings may get stuck inside medullary cavity leading to difficulty in extraction of nails. There may be fatigue failure of nails.

Interlocking nails are the preferred mode of treatment for fractures of long bones viz. femur, tibia and humerus. Presently, more than 95 per cent of femoral fractures and unstable tibial fractures can be treated with interlocking nails [2].

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