

Interlocking nailing. Is it a boon or a bane ?

(To the Patient and to the Orthopaedic Surgeon)

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The topic of my talk today is “Interlocking nailing. Is it a boon or a bane? (to the patient and to the orthopaedic surgeon)

Interlocking nailing is the commonest surgery being done by most of our colleagues in the present day. Internal fixation of every case is becoming the rule. The reason is not just the surgeon. It is the patient too, these days that wants and insists on correctly aligned bones on the X-ray. Thanks to the explosion of workshops and CMEs being conducted all over the country every surgeon is aware of interlocking technique and has learnt it. Even 10 years ago interlocking was not a common surgery while now it is quite common because I I T V is available more easily and moderately priced too.

Interlocking nailing has come to stay as one of the accepted methods of management of diaphyseal fractures of femur and tibia.

For so many years we have been treating diaphyseal fractures of femur by fixation with the clover leaf nail for femur usually by open method (1a & 1b) and that of the tibia by closed or open V nail fixation.(2) It may be wrong to state that, that technique is totally gone now. There must be surgeons still using the same method routinely even today. WHY?

The reasons are purely economical. The implant is costly and the requirement of C arm for the closed method and for the interlocking are the only reasons

I Quote Below 2 Recent Articles :

1. A. A. Olasinde : Open Kuntscher Nailing Of Closed Femoral Shaft Fractures: Revisited. The

Internet Journal of Third World Medicine. 2006. Volume 3 Number 2.

This was a three years prospective study from January 2002 to December 2004. Thirty seven patients were included in the study. All the 37 fractures healed on the average of 20 weeks. Two patients had superficial wound infection, 4 had limb shortening of 1-2 centimeters and range of motion at the knee from 100 to 135 degrees at minimum twelve months follow up.

It was concluded that open Kuntscher is still a relevant operation in the developing worlds with good functional and clinical results. He adds

“The closed intramedullary locked nails is now the ‘gold standard’ in the treatment of femoral shaft fracture as it offers good control of limb length and rotational alignments. However the cost of instrumentations and the nail has been a major factor militating against the wide spread use especially in third world country like ours”.

2. R. Botchu, H. Umanath, B.V.S. Reddy & S.D. Raju. Kurnool, India

Management of Fracture of Shaft of Femur

By Intramedullary Nailing In A Developing Country: A Clinical Study:

The Internet Journal of Orthopedic Surgery. 2006; Volume 3, Number 1.

Conclusions: The results were good in 73% and fair in 25% of patients.

They conclude as “Intramedullary nailing with Kuntscher nail or interlocking nail is an excellent

method of fixation of fracture of shaft of femur in a developing country set up”

Open K nailing of the femur is not dead yet.

It is an established fact that an intramedullary implant, being load sharing, is a better implant than the load bearing plate while using in diaphyseal fractures.

Another established fact is that closed fixation of a fracture, by preserving the fracture haematoma containing important healing factors, definitely gives better results than the soft tissue disrupting open fixation. Even then open nailing can give good results in femur because of the soft tissue envelope all around and the careful handling of soft tissues. (3) The same cannot be said about tibia.

The success in femoral fractures with K nail without locking has certain limitations. In fractures distal to the isthmus the main disadvantage is the rotational instability

In the fifties, Kuntscher had good results with his fixation without locking, because he used power reamers and put in a very thick nail. We in India had no power reamers and were using only hand reamers and could never put in a very thick nail. So we could never be sure when to make the patient bear weight and wait till callus was seen. All of us have seen complications like of nail bending, breaking (4 & 5) and backing out. (6) The reason was the rotational instability. In the articles coated above plaster boot or other forms of immobilizations have been used. Others have used a derotation plate (7) or derotation screws (8) along with K nail.

Regarding the tibia, it being a subcutaneous bone, closed nailing was possible and we used to do V nailing routinely. But the weight bearing was deferred at least for 6 weeks.(9) Or when the patient started bearing weight early with the V nail, it being not very strong used to give way, bend or break. (10)

Mid shaft fractures did very well but lower third fractures always created problem. Compare it to today's scenario.

Fracture shaft femur is fixed by closed method with a thick locked nail and the patient made

to bear weight early. Patients are back to their activities by 8 weeks fully functional. College student is able to start attending classes by 6 weeks. (11, 11a & 11b)

Cases of failed K nail femur can be managed by exchange interlocking nailing. Even **bilateral fractures** treated by closed interlocking are free by 10 weeks. (12, 12a, 13, 13a, 14, 14a, 15, 15a & 15b)

Fracture tibia is fixed with locked nailing and the patient made to bear weight immediately and the fracture unites in about 12 weeks. The patient is already independent by 4 weeks carrying out his normal activity unless he is a manual labourer. (16, 16a, 17, 17a & 17b)

Cases of failed V nail Tibia can be managed by removal of the broken nail and renailing by locked nailing

For **proximal tibial** fractures, we use a different nail (18) with a slightly different entry point. For very **distal tibial** fractures we use nails with locking hole at the very tip. (19)

Open fractures of the tibia have been the dreaded ones in the past to treat because of two reasons. One because the V nailing was never a stable fixation and the wounds being unstable took a really a long time to heal, often ultimately resulting in chronic osteomyelitis with discharging sinus. Sometimes the wound heals but we are left with a non union which needs management. Today when we do a locking nailing of the tibia and it gets infected the implant can be left in situ and the wound attended to. This is really a great advantage.

Today, up to grade III A open fractures can be debrided and stabilized with a locking nail. The fracture heals up along with the soft tissue which heals because the bone is stabilized. (20 & 20a)

Locked nailing has not remained restricted to diaphyseal fractures of the tibia and femur. We have Recon nail, (21a) Intramedullary supracondylar nail, (21) Distal tibia nail, Proximal femoral nail (21b) etc.

For a **fracture in the neck and shaft of femur** we have the Recon nail. This is like a routine ante

grade nail entering through the pyriformis fossa and has proximal locking holes through which bolts are passed into the neck fixing the neck fracture. (22 & 23)

Fractures of the lower femur are conventionally treated by dynamic compression plate, A O blade plate or a dynamic condylar screw. With these methods we may not be confident enough to make him walk immediately the way we would do if we fix with an IMSC.

These 2 cases of lower fourth femur fractures have been managed by closed IMSC nail and made to walk immediately. (24, 24a, 25 & 25a)

This patient with a long oblique supracondylar fracture of the femur was fixed with an I M S C nail. Despite the nail being a wee bit long at the entry site he became independent in 4 weeks. In fact he has no relatives and lives alone in a village looking after his farm. (26 & 26a)

This 70 year old lady with a brain tumour under treatment had undergone an AMP hemiarthroplasty for a transcervical fracture femur 6 months earlier. She sustained a fresh lower femur fracture. Here again the choice would have been a DCS or IMSC. She was managed by a closed IMSC, started mobilizing immediately and was living comfortably for a year later.

Osteoporotic bones do not stand usual plate fixation because the screws tend to pull out. This 65 year old lady with osteoporosis had sustained a lower third femur fracture a year earlier and had been fixed with locked nailing. She fell again and broke the other femur as well as forearm bones. Again she was fixed with locked nailing and closed nailing of the forearm bones. On the third post operative day she was so enthusiastic (from the earlier experience) that she asked me whether she could start walking!, that too with the forearm bones fixed. I did allow her to walk with a posterior slab in the forearm with a walker and she became independent in 8 weeks. (27 & 27a)

Diaphyseal fractures of the **humerus** are being treated still by plate fixation, though the trend is

leaning towards locked nailing. Only in a locked nailing can one get a callus, the evidence of bony union, in 8 weeks and an excellent function to make the patient go back to work. Examples are being shown. (29, 29a, 30, 30a & 30b)

This shattered osteoporotic humerus needs fixation. Open reduction with plating would entail extensive dissection with its own disadvantages of probable infection and huge surgical scar. Locked nailing in this case has enabled the patient to mobilize early. (31 & 31a) Plate osteosynthesis of humerus is good but leaves a long scar. (38 & 38a)

This is a patient with Fracture femur and Fracture humerus managed by closed locked nailing. Patient was allowed walking with a walker on the 8th postoperative day. (32, 32a & 32b)

Of course humerus locked nailing is the one fraught with maximum complications too.

For **segmental fractures** closed locked nailing has been really a boon. These segmental fractures would have meant really a very long incision for plate fixation. Examples of femur, (33 & 33a) tibia (34, 34a, 35, 35a, 36, & 36a) and humerus (37 & 37a) are seen here. Care should be taken if the middle fragment has to be reamed lest it spins and loses the soft tissue attachments

Failed plate osteosynthesis of humerus, (39, 39a & 39b) tibia or femur can be successfully managed with removal of the plate and screws and interlocking nailing

Coming to **trochanteric fractures** in the elderly, the golden rule is to fix it with a sliding hip screw. (40 & 40a) Stable fractures are fixed with SHS but unstable fractures do create problem. The recent PFN is a good answer though it is technically very demanding. The following examples will prove that PFN is a good implant for these fractures with shattered trochanter. (41, 41a & 41b) The surgical trauma is minimal; the scars are small and the patient independent in a very short time. (42, 42a, 44 & 44a)

This is a case with bilateral trochanteric fractures where the fractures have been treated differently. (44b)

There is a shorter version of PFN named trochanteric nail where one extra incision is avoided.

Arthrodesis of the knee for different indications is possible now by locked nailing using a custom made long nail from trochanter to lower tibia. (45 & 45a)

Lengthening on nail is a very useful method for treating unilateral shortening due to various aetiologies. The fixator time is shortened and the patient is more comfortable. (46, 46a, 47 & 47a)

So the secret is closed nailing to save the fracture haematoma, reaming to fit in thicker nails and locking to prevent rotational instability. This is why locked nailing is really a boon

After having said all this now I come to the important point. How locked nailing can be a curse to the patient. Inadequate instrumentation, incomplete inventory of implants, inferior quality of implants and finally inadequate experience giving rise to technical mistakes can make locked nailing a disaster.

The following has been my observations in the past fifteen years. Too long a nail, because the surgeon did not have a shorter nail, incorrect entry point for the particular nail, starting to do locking nailing after very minimal experience, using inferior quality implants for economic reasons have been the cause of failures of locked nailing.

Entry through the trochanter, (48) instead of the pyriformis fossa can cause varus at the fracture site. When the proximal fragment of the femur is very short care must be taken to pass the nail in line with the medullary canal.

One should not leave the nail too long at the trochanter (49 & 49a) because a shorter nail was not

available. In comminuted fractures after closed locked nailing, weight bearing should be deferred to avoid collapse at the fracture site or failure of the locking screw. Using a nail of inferior quality might jeopardize the result. (50, 50a & 50b)

In proximal fractures of the tibia, the entry point should be a little posterior and lateral than the usual entry and the nail must be in line with the medullary canal of the proximal fragment. (51) While nailing open fractures it must be locked correctly so that the fracture is stabilized.

In distal tibial fractures, if the nail is not long enough, if the nail is not in the center of the medulla, angulations may result. (52)

As mentioned earlier, locked nailing of the humerus can give maximum complications if not done correctly. Entry point in this humeral nailing is far too lateral. (55) Even a slightly protruding nail (54 & 54a) at the shoulder can result in permanent stiffness. An empty hole is a weak point. Distraction at the fracture site results in delayed and nonunion.

Proximal femoral nailing is demanding technically. Inadequate fixation causes the nails to walk out and cause nonunion. (56, 56a & 57) The nail can be damaged by inadvertent drilling. (58)

The extra long nail used for arthrodesis of knee is one which can break due to the long leverage. (59)

Locking nailing is really a boon as it has made the life of the patient more pleasant and the surgeon's life tension free. But one must have a proper working C arm, all the necessary implants, adequate knowledge and enough experience not only to do the surgery but also to overcome any adverse situation occurring during the surgery.

Photographs Contd. from next page.....



Fig. 1 : Fracture femur fixed by K nail femur and healed well.



Fig. 5 : K nail done for mid shaft fracture. Broken due to early weight bearing.



Fig. 2 : K nail. Union through the nail is too long.



Fig. 6 : Backout of the K nail.



Fig. 3 : Isthmus fracture successful with K nail.



Fig. 8 : K nail with interfragmentary screws.



Fig. 4 : K nail done for mid shaft fracture. Broken due to early weight bearing.



Fig. 7 : K nail + derotation plate not united at one year.

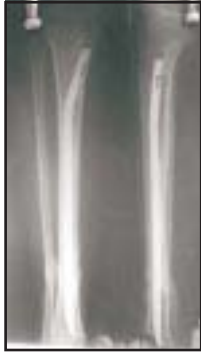


Fig. : Successful union with V nail tibia.



Fig. 10 : V nail broken due to early wt bearing.



Fig. : Successful union with V nail tibia.



Fig. 11 : Preop X ray.



Fig. : # Tiba fixec by Femoral nail.



Fig. 11a : Immediate postop.



Fig. 9 : X ray of Nailing at 6 weeks.
Weight bearing yes / No ?



Fig. 11b : 8 weeks postop.



Fig. : Treated by exchange locked nailing 4 months.



Fig. 17 : X ray at 4 weeks.



Fig. 12 and 12a : Bilateral # femur, locked nailing done both sides.



Fig. : Locking nailing. Weight bearing immediate. Picture at 14 weeks. Pt back to his work.



Fig. 13 and 13a : Plenty of callus at 10 wks postoperatively. Able to walk with support.



Fig. 18 : Proximal tibial nail, Herzog bend high.

Fig. 19 : Distal tibial nail. Locking holes at the very tip.



Fig. 16 and 16a : Comminuted # lower third tibia Locked nailing done.



Fig. : Locked nailing done. Implants stable wt bearing. Post opera infection with implants antibiotics.



Fig. : Basicervical + mid shaft.



Fig. 23 : Fixed with recon nail.



Fig. : Distal femur fixed with dynamic condylar screw, plate.



Fig. 24 : I M S C for distal fourth femur fracture, patient fully functional as housewife at 14 wks.



Fig. 24a : I M S C for distal fourth femur fracture, patient fully functional as housewife at 14 wks.



Fig. : Another example of a comminuted fracture.



Fig. : Another example of a comminuted fracture.



Fig. 26 and 26a : 70 yr old farmer. Locked IMSC done. Living all by himself at 5 weeks.



Fig. : Supracondylar # with AMP in situ.



Fig. : Humerus interlocking.



Fig. : Supracondylar # with AMP in situ.



Fig. : Humerus interlocking.



Fig. : Osteoporotic bone.



Fig. 30 : Same patient at 8 weeks, Good function. Miniscars, Good callus.



Fig. : Osteoporotic bone.



Fig. : Another example.



Fig. 31 :



Fig. 31 & 31a : Comminuted fracture in osteoporotic humerus. Locked nailing done.



Fig. 33 :



Fig. 33a : Segmental fracture femur. Locked nailing done.



Fig. 32 :



Fig. 32 & 32a : Patient with shaft femur and humerus fractures treated by locked nailing both 8th post operative day.



Fig. 34 :



Fig. 34a : Segmental fracture tibia. Closed interlocked nailing.



Fig. 37 :



Fig. : Plate osteosynthesis is also possible but ???.



Fig. 37 & 37a : Closed interlocked nailing for segmental fracture humerus.



Fig. : Plate osteosynthesis is also possible but ???.



Fig. : Back to household work at 2 months.



Fig. 39, 39a :



Fig. : Back to household work at 2 months.



Fig. 39, 39a & 39b : Failed plate osteosynthesis. Interlocked nailing done. Result at 6 months.



**Fig. 40 & 40a : Stable IT fracture.
Fixed with D H S.**



Fig. 42 & 42a : Another Trochanteric # fixed by P F nail.



Fig. 41 : 75 yr old female Shattered trochanter.



Fig. : Trochanteric nail.



Fig. 41a :



Fig. : Knee arthrodesis.



Fig. 41a & 41b : Fixed with Proximal femoral nail.



Fig. : Knee arthrodesis.



Fig. : Lengthening on nail.



Fig. : Incorrect technique.



Fig. : Lengthening on nail.



Fig. 49 : Incorrect inventory. Nails too long.



Fig. 48 : Wrong entry point (trochanter). Varus of the proximal fragment. Nail will fail.



Fig. : Incorrect technique Lucky surgeon.



Fig. : Incorrect technique.



Fig. : Incorrect technique Lucky surgeon.



Fig. : Inferior implant.



Fig. :



Fig. : Inferior implant.



Fig. : Reason for failure ? Implant quality, empty hole varus angulation.



Fig. : Inferior implant.



Fig. : Inferior implant.



Fig. :



Fig. : Such nailing is a curse.



Fig. : Inadequate fixation in the head.



Fig. : How could this happen.



Fig. : Inadequate fixation in the head.



Fig. : Arthrodesis of knee failed.



Fig. : Another failure but the patient is walking independantly.



Fig. : Is it correct, Justifiable.

* * *



Fig. : PFN broken.