ISSN: 0976-3031

Available Online at http://www.recentscientific.com

International Journal of Recent Scientific Research
Vol. 6, Issue, 7, pp.5339-5341, July, 2015

International Journal of Recent Scientific Research

RESEARCH ARTICLE

GUIDE WIRE SOUNDING: A USEFUL TECHNIQUE TO AID ACCURATE PLACEMENT OF DISTAL LOCKING SCREWS IN INTERMEDULLARY NAILING OF LONG BONE FRACTURES IN A LOW RESOURCE CENTRE

Olakulehin OA, Amuwa C.O.F, Yakub S and Itie J C

Department Of Surgery Lautech Teaching Hospital, Ogbomoso, Oyo State Nigeria

ARTICLE INFO

Article History:

Received 14th, June, 2015
Received in revised form 23th, June, 2015
Accepted 13th, July, 2015
Published online 28th, July, 2015

Key words:

Intramedullary nail, guide wire, sounding and distal locking screws

ABSTRACT

Intramedullary nailing has evolved overtime to become the gold standard in the management of the long bone fractures.
Locked nail is now the preferred method of fixing femoral, and tibia shaft fractures.
Distal locking of the intra medullary nail however is still a challenge in orthopedic practice despite numerous innovations. Intra operative guide wire sounding of the hollow I.M nailing improved the accuracy of distal locking screws placement in this study and also has the potential of reducing radiation exposure to both the surgeons and the patient with no additional cost to the patients.

INTRODUCTION

Locked intramedullary nailing of the long bone fractures especially of the femur and the tibia has become a standard practice of care (Bhandari M S *et al*., 2001), with proven superiority over other treatment modalities such as traction, cast bracing and external fixation (Webblx *et al* l., 1998, Court-brown 1991).

Intramedullary nailing of long bones has decreased incidence of non-union, allowed shorter hospitalization time and earlier weight bearing for the patients compared to plaster cast or external fixation (Court brown 1991).

Over the years, intramedullary nail design has improved, however distal locking still remains a major challenge (Whatling GM *et al*., 2006).

Deformation of the IM nail in both sagittal and coronal planes and possible torsion by the bone is responsible for this difficulty.

The technical difficulty of distal locking can increase radiation exposure for the surgeon and the patient as much as 2.6 times as well as the surgical time (Levin PE *et al*., 1987, Miller ME *et al*., 1983, Sander *et al*, 1993, Suhm N *et al*., 2004).

Numerous innovations have been introduced to resolve the problem of distal locking which include; hands held targeting device (Knudeen CJ *et al*., 1991), radio lucent drill guides (Hashemi Nejad A *et al*., 1994), computer assisted systems (Suhm N *et al*., 2004, Krettee K C *et al*., 1997). Proximally mounted devices (Krette KC *et al* 1997). Devices fixed to the image intensifier (Good all JD 1991), (Kelleyss *et al* 1995, Tyropouloss, *et al* 2001) navigator assisted distal locking devices (Suhm N *et al* 2004) and magnetic targeting device (David C Szakelyhidi Jr Ph D Thesis).

Despite these numerous innovations, freehand techniques still has the most familiarity among surgeons (Whatling GM *et al*.,2006, Krette C *et al*., 1997, Pardiwala D *et al*.,2001).

In low resource centers where image intensifier is either not readily available nor in a functional status, open intramedullary nailing is often resulted to. It is however noted that distal locking screw placement is still a major challenge despite the use of various distal scew locking aiming devises. This is more so in delayed presentation of long bone fractures to the orthopaedic surgeon as in our area of practice.

An oversight of not withdrawing the guide wire prior to the drilling of the distal femur in preparation for the insertion of the distal locking screw drew our attention to the possibility of sounding the intramedullary nail with a guide wire to confirm

Corresponding author:* **Olakulehin OA
Department Of Surgery Lautech Teaching Hospital, Ogbomoso, Oyo State Nigeria

accurate position of the drill bit, depth gauge and ultimately the locking screws intraoperatively.

MATERIALS AND METHODS

We retrieved all the X-ray films of all the intramedullary nailing of the femur and the tibia that were done five years prior to the introduction of the I.M. Nailing sounding. All the immediate post-operative x-rays were reexamined by two investigations independently and the locking scews that actually engaged the near cortex, the slot within the nail and the far cortex were recorded as accurate and in accurate where the screw missed the slot within the nail.

We also prospectively analyzed the immediate post-operative x-rays of all I.M. nailing done after routine sounding was introduced. These were also done by the two set of investigators independently and their findings with respect to the accurate placement of the locking screws were recorded ie radiologically proven locking screws and likewise the distal locking screws that missed the slot within the nail.

The bio data, nature of the injury, stature of the long bone fractures vis a vis old [presentatation after two weeks of injury] or fresh [presentation within two weeks of injury], and the duration of the surgery were all recorded.

We follow the standard protocol of open I.M. nailing in all cases, in the latter group however after the insertion of I.M. Nail, we prepare the hole for the most distal locking slot by drilling with the aid of distal locking device pre attached to the nail, we then reintroduce the guide wire into the hollow cavity I.M nail until it engages the drill bit. If the drill bit transverses the near cortex and the slot in the nail, the guide wire within the cavity of the IM nail makes contact with the drill bit. This contact of metals can be heard and also felt by the surgeon hence the term “sounding.” The same process is repeated for the depth gauge meter and ultimately the locking screw. We lock starting from the most distal locking slot to the proximal.Whenever the guide wire sounding did not confirm the accurate placement of the drill bit or depth gauge meter or the locking screw, necessary adjustments are made to the distal locking devise until the desired objective is achieved.

RESULTS

Post-operative x-ray films of 51 cases of intramedullary nailing of the femur and the tibia done over five years period prior to march 2011 were successfully retrieved.

Male patients were 36 (70.6%) and female patients were 15 (29.4%) in number.

Age range of all the patients was 15-55 years with means of 28years. Average operating time was 70 minutes. Fresh fractures that were managed with I.M. nails were 39 (76.5%) while mal-union and non-union were 12 (23.5%). Post-operative check x-ray analysis revealed 86% success rate for distal locking screws placement for the old fractures and 94% successful placement of the distal locking screws for the fresh fractures.

A total of 48 consecutive patients that had intra medullary nailing after the introduction of guide wire sounding were analyzed prospectively.

Males patients were 30 (62.5%) and females was 18 (37.5%). Age range was 20–60years, with the mean of 30 years. Average operating time was 75 minutes. Femoral shaft fractures accounted for 75.5% (36) of all the cases while tibia fractures were 25.0% (12). Fresh fractures were 35 (73.0%) while non-union, mal-union and delayed union were 13 (27.0%).

After careful analysis of the x-ray films, success rate for the distal locking screw placement for the old fractures was 92.3% (12 out of 13) and 100% (35) for the fresh fractures. Concerning the 13th case of the old fractures, the intramedullary nailing of the malunited segmental fracture of the femur was abandoned due to our inability to ream through the intercalary segment. A 12 holes broad dynamic compression plate was eventually used in this particular case.

DISCUSSION

Long bone fracture are a major source of disability following trauma. Locking IM nailing has also become the gold standard in managing long bone fractures especially of the femur and the tibia. Getting the distal locking screws right remains a challenge in orthopaedic practice despite numerous innovations. The deformation of the nail in the coronal and Sagittal planes is the main reason proximally mounted targeting devices fail to identify the location of the distal holes (Krettek C *et al.,* 1997). It is even a bigger challenge in low resource communities where C-arm is not often available. With the introduction of guide wire sounding, the success rate of correct placement of the distal locking screws has increased significantly, with attainment of 100% in fresh fractures of the long bones management in our practice.

The introduction of guide wire intraoperatively has not significantly affected the operating time in this study rather it has helped to reduce the revision surgery to zero percent for long bone fractures managed with intramedullary nailing and has also improved the confidence of the surgeon intraoperatively.

This technique is capable of reducing exposure to x-ray even in centers where c-arm or image intensifier is available. Distal locking of the IM nailing increases radiation exposure for both the surgeon and the patient [Miller ME *et al*., 1983].

Guide wire sounding attracts no extra cost to the surgery because guide wire is already a part of any standard intramedullary nailing instrumentation. This technique technically speaking is compatible with all devices aimed at improving the accurate placement of distal locking screws which has remained an unresolved challenges in orthopaedic practice (Whatling GM *et al*., 2006) except where solid nails are being used.

For this technique to be useful, the most distal locking screw has to be fixed first, then the more proximal.

Guide wire sounding is also compatible with both open nailing and closed nailing.

Acknowledgment

All the surgical residents that have passed through the orthopaedic unit and all other operating room staffs.

CONCLUSION

In a low resource centers where c-arm is either not available or nonfunctioning, intra -operative sounding of the hollow nails improved accuracy and on table confirmation of the correct placement of the interlocking screws, obviating the need for a repeat surgery and all the attendant possible complications and cost to the patient.

The technique also has the potential of limiting radiation exposures to the surgeon and the patient even in centers where c-arm is available.

References

1. Bhandari M. Guyatt GH, Swiontkowski MF.2001. surgeons' preferences for the operative treatment of fractures of the tibial staff. An international survey. I bone joint surgery (AM) ; 83-1746-52.
2. Court-Brown. 1991. An atlas of closed nailing of the Tibia and femur. Springer-Verlag, New York.
3. Duan X, Al-Qwbani M, Zeng Y, Zhang W, Xiang Z.2012. Intra medullary nailing for tibia shaft fractures in adults. Cochrane database syst. Rev. 2012 1" CD 008241
4. Goodall JD. 1991. An image intensifier laser guidance system. For the distal locking for an intramedullary nail. Injury; 22:339
5. Hashemi Nejad A, Garlick N, Goddard NJ.1994. A Simple Jig to ease the insertion of distal screws in intramedullary locking nails. Injury; 25:407-408.
6. Kelley SS, Bonar S, Hussamy OD, Morrison JA.1995. A simple technique of insertion of distal screws into interlocking nails. J Orthop Trauma; 9:227-230.
7. Knudsen CJ, Grobler GP, Close RE.1991. Inserting the distal screws in a locked femoral nail. J Bone Joint Surg Br; 73: 660-661.
8. Krette C, Mann SS J, Konemann B, Miclau T, Schandelmaier P, Tscherne H.1997. the deformation of small diameter solid tibial nails with undreamed intramedull;ary insertion J. Biomech; 30:391-394.
9. Krette C, Konemann B, Miclau T, Schandel maier P, Blanth as, Tscherne H.1997. in vitro and in vivo radiomorphometric analysis of distal screw hole position of the solid tibial aid following insertion. Clin Biomech (Bristol, Avon); 12;198-200.
10. Krettekc, Konemann B, Miclau T, Schandel maler P, Tscherne H.A.1997. New technique for the distal locking of solid A O unreamed tibial nails. J Orthoptruma; 11:446-451.
11. Levin PE, Scheon RW Jr, Browner BD.1987. Radiation exposure to the surgeon during closed interlocking intramedullary nailing. J Bone Joint Surt Am; 69:761-766.
12. Lucas BL, Change ACM, Buhr BR, Jones TL, Wooley PH.2011. Biomechanical Comparision of distal locking screws for distal tibia fractures intramedullary nailing. J Biomedical science and Engineering; 4:234\5-241.
13. Macmillan U, Gross RH. A.1988. simplified technique of distal femoral screw insertion for the Grosse-Kempt Interlocking nail. Clin Orthop Relat Rers; 226-252-259.
14. Miller ME, Davis ML, Macclean CR, Davis JG, Smith BL, Humphries JR.1983. radiation exposure and associated risks to operating room personnel during use of fluoroscopic guidance for selected orthopaedic surgical procedures. J Bone Joint surg. Am;65:1-4.
15. Pardwala D, Prabhu, Dudhniwola G, Katre R.2001. The AO distal locking aiming device, an evaluation of efficacy and learning curve. Injury;32:713
16. Pennig D, Oppenheim W, Faccioli G, Rossi S.1997. Intramedullary locked nailing of femur and tibia; insertion of distal locking screws without image intensifier. Injury; 28:323-326.
17. Pfister U.2010. (Reamed Intra medullary nailing) orthopade; 39(2): 171-81
18. Rahman MM, Taha WS, Shaheen MN.1998. A simple technique for distal locking of tibia nail Sa Injury; 29:789-796
19. Sanders R, Koval KJ, D; Pasquale T, sch melling G, Stenzler S, Ross E.1993. Exposure of the orthopaedic surgeon to radiation. J Bone Joint Surg Am; 75:326-330.
20. Suhm N, Messner P, Zuna 1, Jacob LA, Regazzoni P.2014. Floroscopic guidance versus surgical navigation for distal locking of intramedullary implants; a prospective, controlled clinical study. Injury; 35:567-574.
21. Tyropoulous S, Garnavos C.A.2001. new distal targeting device for closed interlocking nailing injury; 32: 732-735.
22. Webb LX, Gristina AG, Fowler HL.1998. Unstable femoral staff fractures: a comparism of interlocking nailing versus traction and casting methods. J Orthop Trauma; 2:10-12.
23. Whatling GM, Nokes LD.2006. Literature review of current techniques for the insertion of distal screws into intremedullary locking nails. Injury; 37:109-119.

****