A comparative study between intramedullary nail and plate and screws fixation of closed fracture shaft femur

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الخلاصه:
كسور وتد عظم الفخذ هي من بين الكسور الاكثر شيوعآ التي نصادفها في ردهات جراحة العظام والمفاصل، ٢٧ مريضآ ممن لديهم كسر مغلق في وتد عظم الفخذ تمت معالجتهم جراحيآ بالتثبيت الداخلي، البعض بواسطة الشيش داخل القناة العظمية والاخرين بواسطة البليت والبراغي وقد تمت مقارنة الطريقتين من حيث زمن العملية، طول جرح العملية، كمية الدم المفقودة خلال العملية، والمشكلات والعقابيل الحاصلة خلال وبعد العملية، وكذلك سرعة التآم الكسر وعودة المريض الى العمل. وقد وجدنا ان عملية التثبيت بواسطة الشيش داخل القناة العظمية هي نوعآ ما آمنة بعقابيل اقل والتآم افضل للعظم وعودة اسرع للمريض الى العمل. لذا نوصي بالقيام بهذه العملية لتثبيت كسور وتد عظم الفخذ المغلقه متى ما امكن من حيث توفر المواد والكفائة الجراحية اللازمة من قبل الجراح.

Abstract:
Fractures of the shaft of femur (FSF) are among the most common fractures encountered in orthopedic practice, 27 patients with closed fracture shaft of femur treated by open reduction and internal fixation some by intramedullary nail and others by plate and screws and the two methods compared in relation to time of surgery, length of incision, amount of blood loss, intra and postoperative complications and postoperative rehabilitation and return to function. We found that nailing is relatively safer operation with less complication rate than plating operation, and fracture healing was better and patient return to function earlier, and we recommend using intramedullary nail for treating fracture shaft of femur if it is technically and surgically feasible and when adequate experience and surgical skills are available.

Aim of study:
This is to compare between open intramedullary nail (IMN) and plate and screws fixation of closed fracture shaft of femur in regard to time of operation, length of incision, amount of blood loss, intra and post operative complications and functional outcome.

Introduction:
Fractures of the shaft of the femur are among the most common fractures encountered in orthopedic practice. Since the femur is the largest bone of the body and one of the principle load bearing bones in the lower extremity, fractures can cause prolong morbidity and extensive disability unless treatment is appropriate. Fractures of the shaft of femur often are the result of high energy trauma and may be associated with multiple system injuries. Several techniques are now available for their treatment, the type and location of the fracture, the degree of comminution, the age of the patient, the patient social and economic demand and other factors may influence the methods of treatment.

Possible treatment methods for fractures of the femoral shaft include the followings:

1- Closed reduction and spica cast immobilization.
2- Skeletal traction.
3- Femoral cast bracing.
4- External fixation.
5- Internal fixations either in the form of intramedullary nail whether closed or open, or in the form of plate and screws fixation.(1)

Patients and methods:

From June 2006 to July 2007, 27 patients were operated for closed fracture shaft femur, 21 were male and 6 were female, their ages range from 10-39 years, average 24.5 years, all were approached through direct lateral incision with muscle reflection, periosteal stripping, reduction of fracture, reaming of the medullary canal for those selected for nailing and a nail 1 mm. less than the largest reamer used inserted through a retrograde way through the fracture site and for those selected for plating a heavy duty plate with at least 4-5 screws above and 4-5 screws bellow the fracture site. No drain left in the operative field in both groups, deep fascia closed with continuous non absorbable synthetic suture and skin closed with interrupted non absorbable synthetic suture.

Those with open fracture who were fixed with external fixation were excluded from the study. Two other cases with closed segmental fracture shaft of femur also were excluded from the study. All patients were put on i.v triple antibiotics for 5 days then oral antibiotics for another 5 days, stitches were removed after 2 weeks.

Results:

- 27 patients were operated for closed fracture shaft of femur. 21 were male 78%, and 6 were female 22%, and their ages range from 10-39 years, average 24.5 years.
- 16 patients were selected for plating, and 11 patients were selected for intramedullary nail fixation.

Table 1: age and sex distribution

	1-10 y	11-20 y	21-30 y	31-40 y	total	%
male	2	10	7	2	21	78%
female	2	4	0	0	6	22%
total	4	14	7	2	27	
%	15%	52%	26%	7%	100%	

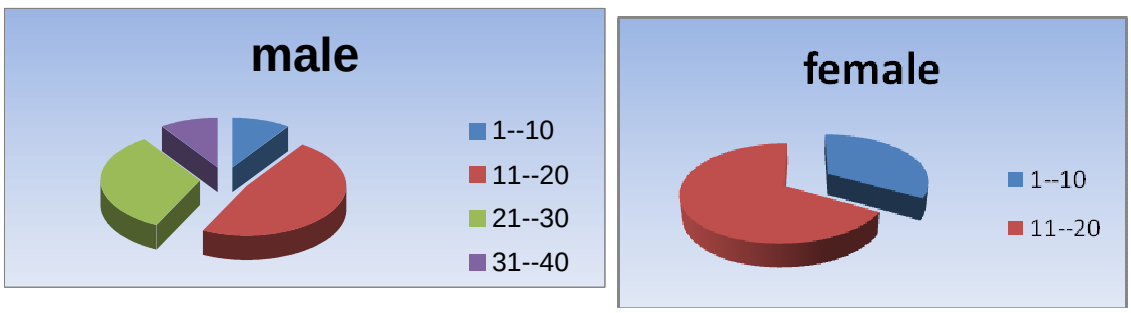


Chart 1: sex age distribution

- In all except one patient 96.3% the cause of the fracture was road traffic accident and the only one patient was fractured due to fall from a height.
- The time of operation for nailing group was from 40- 60 min. while for plating group was from 40-80 min. this also reflect the time of anesthesia the patient exposed to.
- The length of incision in nailing group was from 12-15 cm. average 13.5 cm. while for plating group was from 15-20 cm. average 17.5 cm. this also reflect the amount of soft tissue dissection, post operative muscle and skin scaring which is more in plating group.
- The amount of blood loss as reflected by measuring the deference in hemoglobin concentration before and 24 hours after the operation. This was in nailing group between 0-0.5 mg/dl. while in plating group was between 0.5-1 mg/dl.
- Intra and post operative complications in plating group were; in 1 patient 6% there is slight early post operative oozing, and in 2 patients 12% there is superficial wound infection and serous collection remain for 8 months and treated by dressing and antibiotics, and in 2 patient 12% there is delayed union for 8 months, and in one patient 6% there is implant failure after 2 months of operation, the implant was broken and was replaced by another one and in this patient union also delayed for 8 months after the second operation. In the nailing group the complications were; in 1 patient 9% there was faulty nail insertion and nail impaction which was removed with difficulty and replaced by smaller one in the same operation.
- The post operative rehabilitation and return to function: in nailing group the patient walk with 2 crutches in the 3rd post operative day with only partial weight bearing then after 1 months on one crutch and slightly increasing weight bearing and after 3 months with full weight bearing without aids, while in the plating group the patient remain for 1 month on 2 crutches without weight bearing then on 2 crutches with partial weight bearing for another 2 months then on one crutch with increasing weight bearing until the x-ray reflect good union and this take between 4-6 months except in 2 patients; one patient with delayed union remain for 8 months on one crutch and partial weight bearing, and the other patient with implant failure also remain on 2 crutches and partial weight bearing for 6 months after the second operation then on one crutch for another 6 months before the bone got good union.

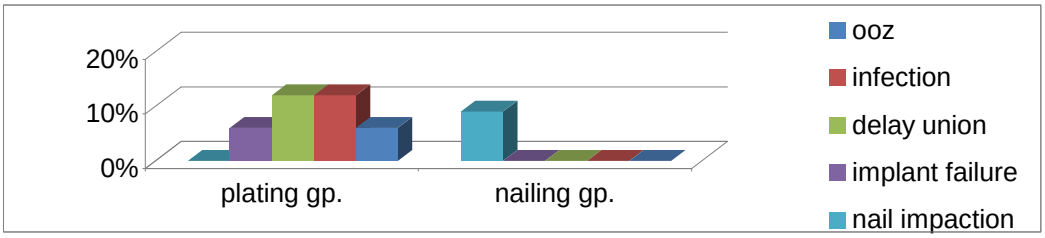
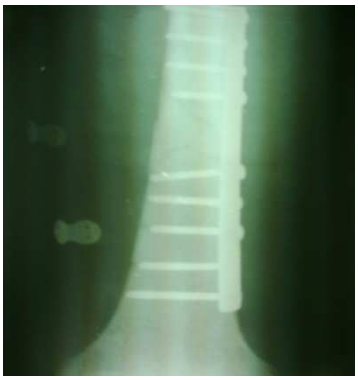


Chart 2: complication rate distribution

Proximal 1/3 #

distal 1/3 #



plating of distal 1/3 #

Plating 0f proximal 1/3 #

mid shaft # in immature bone

good callus of previous #

Previous # consolidated With florid callus.

site hardly seen with successful IMN

typical proximal insertion site.

Typical distal insertion site

early callus in 1 month

consolidated with rigid Callus.

Another # hardly seen fixed with IMN

example of the implant failure.

Discussion:

- In our study 78% of the patients were males and 22% were females this indicates that fracture shaft of femur occur more in males.
- The age of the majority of our patients range between 11-30 years about 78% of cases which mean that fracture shaft of femur(FSF) occur more in young age group and in 96% of cases caused by road traffic accident, it is also found that FSF is essentially of young adult and usually result from high energy trauma [(2)], another study showed that FSF has bimodal age distribution peak at 25 and 65 years and that motor vehicle accident is the most common cause followed by pedestrian versus automobile, fall from a height and gun shot injury[(3)].
- Time of operation; nailing operation take less operative time than plating operation this reflect less exposure to anesthesia and this is of benefit specially in risky patients as elderly and multiply injured patients. In one study showed that the advantages of retrograde nailing might include decreased operative time, decreased blood loss, and amenability to poly trauma situations. [(4)]
- Length of incision; nailing operation done through smaller incision less soft tissue dissection and damage and less periosteal stripping than plating

operation this is of benefit in decreasing operative time, decreasing post operative soft tissue adhesion and scaring and this will lead to less joint stiffness and early post operative rehabilitation and return to function. It is also found that nailing operation done through a limited lateral exposure but he found that this small exposure dose not affect the risk of complication or fracture healing[(2)]. Another study also shows that nailing operation done through a small exposure and limited soft tissue damage, and that compression plating has been met with much less enthusiasm than intramedullary nailing because of the extensive approach, periosteal stripping, potential blood loss, stress shielding (load sparing), less aesthetic scar, and higher rate of complications tend to favor other methods of treatment. [(4)]

- Blood loss; the amount of blood loss also less in nailing operation this is due to less soft tissue dissection and damage and shorter operative time. In one study showed that the advantages of retrograde nailing might include decreased operative time, decreased blood loss, and amenability to poly trauma situations. [(4)]
- Complications; complication rate occur more in plating operation 37% of cases than in nailing operation 9% of cases this is also found by Seligson who found that complication rate in plating operation was 30% while in nailing operation was 12%[(5)]. In plating operation; post operative oozing from the wound occur in 6% of cases, superficial wound infection and serous collection occur in 12% of cases, delay union occur in 12% of cases and post operative implant failure occur in 6% of cases. Ruedi and Luscher found that implant failure occur in 7%, and Ruedi found that infection rate was 9% using plate and screws[(6)], while in Magerl study implant failure occur in 10% of cases[(7)], and in 7% of cases in Thompson study[(8)]. Delay union occurred in 19% of cases in Sprenger study [(9)], and in 7% of cases in Riemer, Foglesong and Mirenda study [(10)]. In nailing operation there is only intra operative faulty nail insertion and nail impaction occurred in 4% of cases and no infection was reported in our study while in some series infection rate with open nailing of closed FSF. reached up to 10% [(1)], and in Chapman study the incidence of infection was reported in up to 1.7%of cases [(11)], while un Brumback study who reviewed 89 patients reported no infection rate [(12)].
- Rehabilitation and return to function; in nailing group the patient got early rehabilitation and return to function and good union rate, while those treated by plate and screws need longer time for union and return to function about 3-6 months where there is delayed union and implant failure that occur in some cases also lead to delayed rehabilitation and return to function and longer hospitalization and more cost on both the patients and the hospital. Campbell said that successful intra medullary nailing results in a short hospital stay, rapid return of motion in all joints, prompt return to walking, and a relatively short total disability [(1)], in Riemer, Foglesong and Miranda study the average time for union in plating operation was 18 weeks [(10)]. Generally if plate and screws are used for internal fixation of FSF. weight bearing and unprotected ambulation usually are not possible as soon as after intra medullary nailing [(1)]. Another study also showed that nailing operation is associated with easier nursing care, shorter hospital stays, and lower morbidity. [(4)]

Conclusions:

1- Nailing operation cause less post operative scaring and joint stiffness than plating operation.
2- Nailing operation cause less blood loss than in plating operation so it is better in multiply injured patient in whom blood loss is of concern.
3- Nailing operation done with a shorter operative time than plating operation so it is safer in elderly and in multiply injured patients.
4- Nailing operation cause less complications than plating operation so it is relatively safer operation.
5- In nailing operation patient return to function earlier than in plating operation.

Recommendations:

We recommend using IMN. for fixation of closed FSF. whenever technically and surgically feasible specially in elderly and multiply injured patients with whom the amount of blood loss and exposure to anesthesia is of concern.

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