www.jmscr.igmpublication.org Impact Factor 3.79
ISSN (e)-2347-176x

IGM Publication Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Evaluation and Outcome of Management of Intracapsular Neck of Femur Fracture Treated With Cannulated Cancellous Screw Fixation

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ABSTRACT

Background: Fractures of neck of femur have always presented great challenges to the orthopeadic surgeons. In many ways today the unsolved fracture as far as treatment and results are concerned.Fractures of neck of femur are usually entirely intracapsular.Results depend upon the extent of injury and adequacy of reduction and fixation.Fixation with cannulated cancellous screws is usually adequate for femoral neck fractures.Lateral cortex plays a very important role in screw fixation

Materials And Methods: This study was conducted in Narayana Medical College and Hospital, Nellore, AP from Nov 2012 to Oct 2014.The patients with intracapsular fracture neck of femur are evaluated with pre-operative x-rays of the concerned hip joints both in arterio posterior and lateral views and their outcome post operatively after fixation with cancellousscrews.The outcome is evaluated in terms of pain relief,extent of ambulation achieved after surgery.The classifications we followed are Pauwells and Gardens classification of fracture neck of femur. The patient will be followedup to oneyear to assess the functional outcome.

Results: A good result was obtained in 65.38% of the patients, excellent in 23.07%, fair in 3.84% and poor result in 7.69% of the patients.Complications such as Nonunion & avascular necrosis in one case,Non-union and Extrusion of screws in one case, cut through of screws into articular surface leading to painful joint in one case.Most of the cases of intracapsular neck of femur were in the age group of 31 — 40 years.There was male preponderance as shown in this study (69%).

***Conclusion:** By the usage of multiple cannulatedcancellous lag screws, compression effect at the fracture site is achieved; it also avoids redisplacement and rotations. The implant occupies less volume in the small sized femoral necks of South Indian Patients allowing better osteosynthesis of intracapsular fracture neck of femur.Multiple cannulated cancellous screw fixations for intracapsularfracture neck of femur are an easy, safe & useful procedure with encouraging results.*

INTRODUCTION

Civilization has ushered in high injury rates with increased fracture pattern by virtue of high speed transportation accidents[1], industrial accidents, sports and recreational injuries. Fractures of the neck of the femur have a1way presented great challenges to orthopaedic surgeons and remain in many ways today the unsolved fracture as far as treatment and results are concerned. With life expectancy increasing each decade[2], our society is becoming more and more geriatric with significant increase in number of hospitalized and nursing home patients suffering from femoral neck fractures and their sequel.

Femoral neck fractures in young patients usually are caused by high energy trauma and often are associated with multiple injuries and high ratesof avascular necrosis and non-union. Even when undisplaced fracture neck of femur, there is no[3]assurance that a fracture will attain an excellent result. From 10% to 15% of these patients will develop complications over which the surgeon has little or no control.

The quotation"we came into the world under the brim[4] of pelvis and go out through the fracture neck of femur" reflects the defeatist attitude that has long been held by medical and lay personnel towardsfemoral neck fractures.

Though most of these fractures are due to trivial trauma the elderly age up in which they commonly occur, leads to catastrophic consequences unless early mobilization out of the bed is made possible.Moreover successful union with conservative management is uncommon.So operative intervention has become the routine for all types of femoral neck fractures. Early anatomical reduction compression of the fracture and rigid internal fixation are used to promote union. An attempt has been made in this dissertation to evaluate the role of multiple cancellous lag screws in intracapsular fracture of femur neck with internal fixation.Patients selected for this operation were between the age group of 21 to 60 years with intracapsular fracture neck of femur who were admitted and treated in Narayana Medical College and Hospital, Nellore, A.P, from November 2012 to October 2014.

AIMS AND OBJECTIVES

To study the effectiveness of cannulated cancellous screw fixation for treatment of fracture neck of femur in adults. On basis of

i. Rate of union (radiological and clinical)
ii. Study the incidence of complications
iii. Compare the results of my study with the works reported.

MATERIAL AND METHODS

The present work on "A Study of Internal Fixation of Intracapsular fracture neck of femur in adults by Multiple Cannulated Cancellous Lag Screws" is carried out in the Department of Orthopaedics, Narayana Medical College and Hospital during NOVEMBER 2012 to OCTOBER 2014. All the patients were pre-operatively assessed to grade the type of fracture by "GARDEN'S CLASSIFICATION" and prepared for surgery. All fractures were reduced by LEADBETTER (In flexion) method. A total of 26 cases of Intracapsular fracture neck of femur in adults were

treated after accurate reduction and rigid internal fixation under X ray control with 2 or 3 partially threaded 6.5 mm cannulated cancellous screws.

INCLUSION CRITERIA

1) Age 21-60 yrs
2) Intracapsular neck of femur fractures only
3) Indepently mobile patients without neuromuscular disorders

EXCLUSION CRITERIA

1) Age <20 yrs
2) Extra capsular neck of femur fractures excluded
3) Patient with polytrauma
4) Patient medically unfit for surgery

POST-OPERATIVE MANAGEMENT

•The patient is kept in the bed supine with a pillow under the knee. I.V.antibiotics for 5 days & oral antibiotics for 5 days and analgesics for a week were given.

•Post operatively on day 1 all patients were mobilized in the bed with Quadriceps exercises and ankle movements.

•On day 2, patients were made to sit with leg hanging down

•On day 3, non-weight bearing crutch walking

•On day 10 Sutures were removed and follow up in OPD.

Follow-Up

•3rd and 6th week and then Monthly check-up is done clinically and radiological until the union of fracture is seen.

•Full weight bearing is allowed after definite radiological evidence of union.

Surgical Technique

Internal Fixation of Intracapsular Fracture Neck of Femur Bymultiple Cancellous and Lag Screws Anaesthesia

Majority of cases were done under spinal anesthesia only, a few cases were done under general anesthesia.

Reduction

After anesthesia the patient was kept over the fracture table and fracture reduced by one of the methods previously described. Usually we follow the Lead better technique. The reduction was confirmed by both anteroposterior and lateral view of the hip.

Technique[5]

After satisfying with the reduction vertical incision given over the lateral surface of the greater trochanter and extended distally up to 10cm carried the dissection down through the skin and subcutaneous tissue and split the fascia lata. Femoral neck approached by detaching vastuslateralis and reflecting its. Then predrill the lateral cortex with 2mm drill bit. Guide pins placed across the fracture from the lateral aspect of the femoral shaft parallel to the neck usually at a 135° angle. Place one guide pin adjacent to the medial cortex at 135° angle. Two guide pins placed at the middle of the head, one anterior and one posterior, and drive them to within 5mm of subchondral bone. Check X rays taken both antero

posterior and lateral views; the guide pins should be measured to determine the correct screw length. After satisfying with the position of the guide wires in the neck, drilled and tapping should be done over the guide wires with cannulated drilled and cannulated tap respectively.Cannulatedcancellous lag screws inserted over the guide wires by using the cannulated screw driver, Confirmation of adequate fixation done by taking check X rays both anteroposterior and lateral view.

The screws should be within 5mm of subchondral bone. If necessary washers were used to prevent the screw head shrinking and get the uniform compression at the fracture site. After fixation of each screw, guide wire has to be removed to prevent loss of reduction drill tap and insert each screw before proceeding to the next. Haemostasis has to be secured. Wound closed in layers over the suction drain.

Neckfracture of femoral with internal fixation with a cannulated screw. A, B, Reduction is confirm, 3 parallel guide wires are placed using the guide and fluoroscopic control.C, The wire Length is measured. D, Screw are inserted over the guide wires to the preselected depth

ADVANTAGES:

1. Less trauma
2. Cheaper
3. Lesser chance of damage to blood supply.
4. Less chance of damage to blood supply.
5. Less blood loss.
6. Easy to insert.
7. Uniform compression at the fracture site.
8. Rigid fixation with lesser volume of implant and better suited to Indian small femoral head size.

DISADVANTAGES

1. Loosening of screws
2. No immediate weight bearing

POST-OPERATIVE MANAGEMENT

The patient is kept in the bed supine with a pillow under the knee. Antibiotics&analgesics were given for a week.

Post operatively all patients were mobilized in the bed with Quadriceps exercises.

Sutures were removed on the 10th day.

Non-weight crutch walking is advised after subsidence of the pain in the operated area.

Complications Of Intracapsular Fracture Neck Of Femur[6] , Avascular Necrosis[7, 8]

Death of bone as a result of deprivation of its circulation. The problem of avascular necrosis remains unsolved. After the fracture of the femoral neck the blood supply to the head of the femur is very precarious.

FACTORS INFLUENCING THE AVASCULAR NECROSIS

1. Sites: The higher the fractures the more complete is the interruption of the blood channels. Common with subcapital femoral neck fractures.
2. Effect of Fracture Trauma: Degree of displacement of fragments with torn

posterior capsule. High incidence in Grade III & IV femoral neck fractures.

3. The temponade pressure effect from bleeding intracapsularly.
4. Delays in reduction and internal fixation and trauma of reduction and fixation.
5. When the head is left in severe valgus deformity, the rate of avascular necrosis is high

REVASCULARISATION

After the vascular insult revascularization arises from three sources.

1. Sub foveal area supplied by the medial epiphyseal vessels.
2. Vascular in growth across the fracture site decreases the incidence of septic necrosis.
3. Vascular tissue growing in from that part of the femoral head not covered by articular cartilage.
4.

Radiological Diagnosis

As a general rule the earliest X-ray evidence .of aseptic necrosis appears at about 2 months and may not be revealed for as long as 36 months. Serial X rays should be taken.

Findings:

1. Increased density of head (avascular segment).

Causes:

a) Dead bone is relatively dense i.e., normal in contrast to the surrounding decalcified viable bone.

Type-II: is commonest, possible damage to the internal epiphyseal group prior to its division.

b) The dead fragment is compacted by crushing.

c) The dead tissue may be thickened by the deposition of new bone consequent upon vascular permeation of the space of the dead cancellous tissues.

2. Blotchy shadows of reduced density will appear just proximal to the fracture site, even after union has occurred by evidence of creeping invasion.

3. Thinning of subchondral bone when the vascular and cellular reparative tissue eventually reaches the cortical bone. Forms points of weekend resistance which yields to axial loading resulting in subchondral fracture of collapse.

4. The articular cartilage: Its nutrition from synovial fluid remains involved until a late date and “the joint line” is maintained.

5. In the later stages articular cartilage undergoes osteoarthritic changes causing narrowing of joint space.

Early Diagnostic Procedure:

i) Radio isotopic clearance using Na24.

ii) Radio phosphoruspick up using P32.

iii) Technetium isotope pick up using TC-99.

iv) Arteriography

v) Venography

vi) Tension measurements

vii) Tetracycline deposition

Consequences of Avascular Necrosis:

The main consequence of avascular necrosis is collapse of the bone structure leading to fragmentation.

A) Necrosis and collapse involving the fracture surface may lead to failure of union.

B) Collapse of articular surface leads to degenerative arthritis.

C) Total collapse resulting in disorganization of hip.

Thus avascular necrosis is closely related to the other two complications viz., Non-union and osteoarthritis.

NON-UNION[9, 10]

Incidence: Occurs in about 1/3 of all the cases of femoral neck of femur despite competent primary treatment.

Causes

1. Vascular insufficiency leading to avascular necrosis is most important factor.
2. Inaccurate reduction and incomplete immobilization and badly placed nail.
3. Flushing of fracture hematoma by synovial fluid.
4. Lack of periosteal layer over the femoral neck.
5. Angiogenic inhibiting factors in synovial fluid.

The golden period in fracture healing is the first six weeks. It can be delayed or prevented by motion at 11w fracture site.

Main Causes of Motion are:

1. Failure to provide adequate valgus reduction and good lateral reduction.
2. Failure to stabilize the reduction by impaction at surgery with the traction removed. If the comminuted fragments are not collapsed at the time of surgery, they loosen up later and start the viscous cycle of motion, decalcification shortening and more motion that may be piston like.
3. Failure to contain 1 & 2 by absolute fixation that allows continuous

ABSOLUTE FIXATION

A) Prevents damage to budding vessels

B) Lessens the fibrotic barrier to additional new vessels.

C) Decreases any tendency toward hyper dynamic decalcification in the distal fragment.

Radiological Appearances

1) Sclerotic borders at the fracture site.

2) Resorption of the fracture margins.

3) Distinct fracture line remains after reasonable time has passed.

Treatment of Complications

1) Abduction Osteotomy:

Indication: Delayed union with minimal absorption of neck and no evidence of avascular necrosis.

Aim: To return the shaft from adducted to the abducted position, so that shearing stress of weights bearing and muscle reaction becomes an impaction force.

Mechanics: The degree of correction must such that the long axis of the femur will pass directly through the fracture and the head of the femur.

A wedge of bone passed laterally is removed, the angle of wedge being precisely, calculated to correct the varies deformity of the femoral neck

Dickinson reported good results when this operation is performed for the delayed union

2) Fixation withAngle blade plate/DHS

McMURRAYS BIFURCATION OSTEOTOMY[11]

Indication: Delayed union or non-union in young and middle age groups.

The osteotomy is carried out with an osteotome immediately above the level of lesser trochanter and using the blade of osteotome as a lever the shaft of femur is displaced inwards so that it lies under the femoral head.

If the union is merely delayed and the blood supply of the head is normal, the operation has the same effects as a simple abduction osteotomy and the fracture unite. On the other hand if nonunion is established and the head has lost its blood supply, the osteotomy still succeeds because it has produced an excellent arthroplasty.

PROSTHETIC REPLACEMENT OF FEMORAL HEAD

It is the operation of choice in elderly patients with an un-united fracture or a painful avascular necrosis.

OBSERVATIONS AND RESULTS

AGE INCIDENCE: 20-30 yrs – 07; 31-40 yrs – 09; 41-50 yrs – 05; 51-60 yrs - 05

SEX INCIDENCE; Male – 18; Female - 08

SIDE INCIDENCE; RIGHT – 17; LEFT - 09

RELATION OF UNION WITH GARDEN'S GRADING OF FRACTURE:

Grade	No. of cases	Union	Non-union
I	09	09	Nil
II	08	08	Nil
III	06	06	-
IV	03	-	03
TOTAL	26	23	03

A good result was obtained in 65.38% of the patients, excellent in 23.07%, fair in 3.84% and poor result in 7.69% of the patients.

GRADING OF RESULTS as per a six point functional outcome scoring system for Asians after hip surgery[12]

Function	Score 0	Score 0.5	Score 1
Pain at hip	Moderate/severe	Mild	No pain
Walking	Significant limp with aid	Mild limp with aid	No aid/No limp
Independent mobility	Not possible	-	Possible
Sitting cross legged	Not possible	Incomplete	Complete
Squatting	Not possible	Incomplete	Complete
Climbing stairs	Not possible	Using hand rails/bar support	Without any support

Scoring analysis: Excellent Score- 5 or more; Good Score - 4-4.5; Fair Score - 2-3.5; PoorScore - <2

RESULT OF CASES TREATED AT NARAYANA MEDICAL COLLEGE &HOSPITAL, NELLOR, Scoring analysis: Excellent Score- 6 (23.07%); Good Score - 17(65.38%); Fair Score –(3.84%); PoorScore –2 (7.69%)

COMPLICATIONS

•1 cases of screw cut through into articular surface

•1 case of nonunion with AVN

•1 case of nonunion with loosening of screws

•Most of the cases of intracapsular neck of femur were in the age group of 31-40 years with right sided and male predominance

•Garden's type IV fractures showed poor results and rest (23) cases showed good union

DISCUSSION

•The main aim in the treatment of a femoral neck fracture is to facilitate a patient's return to his normal activities as soon as possible. Internal fixation of these fractures is more important than arthroplasties today,because the patient's native bone tissue is used and low costs are achieved[13-19]. While selecting a treatment method for these fractures, determination of the patient's physiological and chronological age is important along with determination of fracture type.Femoral neck fractures in the young population must be treated immediately and internal fixation must be performed after closed reduction[6-8]. To obtain stable osseous support of the femoral head on the femoral neck. The fixation is used to increase stability by compressing the fracture and then maintaining the reduction by neutralizing forces acting on the hip. The purposes of the fixation screws are to lock the fracture in a position in which the femoral neck gives bone-on-bone support to the femoral head-neck fragment, to prevent posterior andvarus migration of the femoral head, and to be parallel so as to maintain bone-on-bone support as the fracture settles in the healing period. Sufficient bone stock is needed for internal fixation,and functional status before fracture must be kept inmind to select a treatment method[13].There are several reasons for use of a cannulated screw system: (1) The smaller-diameter guide-pins can he used to determine the screw position and length accurately.(2) Cannulated screw systems improve the accuracy of screw placement by supplying jigs that can place guide pins very accurately; and with parallel screws, excellent compression can be produced a traumatically by the lag effect of the screws.It uses a minimal invasive technique, Protects vascular supply of head, Prevents additional soft tissue injury,The total numbers of cases of Intracapsular fracture neck of femur followed are 26. The cases were treated by multiple cannulatedcancellous screws and follow up from 6 months to 1 year. All patients were given regional anaesthesia

1) **AGE INCIDENCE:** In our study IC fracture neck of femur were common in the third decade with average age being 39.5 years (21-60).Our findings are

comparable to the study made by V.K. Gautam[20] 32 years (15-50), LARS REHNBERG[21] 82 years (). Bhava RJ Satish[12] 60 years (50-3)

2) **Sex distribution:** Our series had a male predominance with 69% (18) and 31% (8) female patients. Lars Rehnberg[21] in his study noted about 34% (15) male and 66% (29) female predominance. Bhava RJ Satish[12] in his study noted 47% (30) male and 53% (34) female predominance.

3) **Mode of Injure:** In the Present study 42% of cases were due to RTA and 58% of cases were due to fall. In study conducted by Tolga and Kaplan, 27% cases were due to RTA and 73% cases were due to fall.

4) **Type of fracture:** (Garden's Classification) In our series there were 34.6% cases of Garden's type I fracture, 30.7% Garden's type II, 23% Garden's type III and 11.5% Garden's type IV fractures.

5) **Comparison of outcome of present study with Bhava RJ Satish is as follows**: In study conducted by Bhava RJ Satish[12], 50 (7802%) cases had excellent outcome, while in our series 6(23.07%) cases had an excellent outcome. In present study 17 (65.38%)cases had good outcome while in Bhava RJ Satish[12] series 13(20.3%) cases had good outcome. There were no cases with fair outcome in Bhava RJ Satish[12] series while in the present study 1 (3.84%)case had a fair outcome. In the present study 2(7.69%) cases had a poor outcome while in Bhava RJ Satish[12] series 1(1.5%) case had a poor outcome.

6) Complications: In the present study, one case had nonunion; loosening of screws and AVN. Age of the patient was 60 years and had Garden's type IV fracture for which patient underwent Girdle stone arthroplasty. In one case, there was nonunion and extrusion of screws. Age of the patient was 55 years and had Garden's type IV fracture. Patient underwent revision surgery with hemiarthroplasty. In one case cut through of screws into articular surface which has not turned up for follow up.

To achieve good union, we followed

1. Good anatomical reduction
2. Rigid fixation
3. Partially threaded screws were used and threads crossed the fracture site
4. Valgus reduction was acceptable but varus reduction has high chances of failure
5. Strict postoperative physiotherapy
6. No early weight bearing

Pre operative:

Post-Operative:

Follow up :-

3 months

6months

1 Year

SUMMARY

- In this series, 26 cases were operated that were in the age grouped of 21-60 years.
- Cannulatedcancellous screws were used and got excellent results; fracture union was seen in 23 cases.
- There were 3 cases of poor results with one case of non-union and loosening of the screws, one case landed up in Girdle stone Excision arthroplasty and one case not turned up for further follow up.

The prerequisites for sound healing of intracapsular fracture neck of femur are

1. Anatomical Reduction
2. Rigid Fixation
3. Impaction
4. Strict post-operative physiotherapy.
5. No premature weight bearing.

CONCLUSIONS

- In our institute accurate reduction and rigid internal fixation of intracapsular fracture neck of femur was done with the help of C-Arm and the results were encouraging even up to the age of 60 years
- In early mobilization of the patients the complications of prolonged immobilization like thromboembolism, hypostatic pneumonia was avoided.
- By the usage of multiplecannulatedcancellous lag screws, compression effect at the fracture site is achieved;it also avoidsredisplacement and rotations. The implant occupies less volume in the small sized femoral necks of South Indian Patients allowing better osteosynthesis of intracapsular fracture neck of femur.
- Multiple cannulatedcancellous screw fixation for intracapsularfracture neck of femur is an easy, safe & useful procedure with encouraging results.

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