ORIGINAL RESEARCH PAPER
Volume-6 | Issue-12 | December-2017 | ISSN No 2277 - 8179 | IF : 4.176 | IC Value : 93.98
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

FUNCTIONAL OUTCOME OF FRACTURE NECK OF FEMUR TREATED BY CANCELLOUS SCREW FIXATION-A PROSPECTIVE OBSERVATIONAL STUDY.

Orthopaedics

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ABSTRACT

Background: The incidence of hip fractures is increasing throughout the world. As the number of hip fractures increases, it is important to identify the various treatment options for different age groups that provide optimal results and avoid re-operations. However the number of procedures available and practiced show that no one is universally applicable and surgeon has to select one which would be ideal in a given situation. The treatment varies with the age of the patient, the level of the fracture and displacement of fragments. It also depends upon the duration of the fracture.The purpose of this study is to evaluate the functional outcome of all fracture neck of femur, irrespective of the type of fracture, treated by cancellous screw fixation by using Harris Hip Score.

Materials & Methods: A sample of twenty patients with fracture neck of femur who were operated with cancellous screw fixation is followed for a minimum of 1 year, with the study period being from dec 2012 to dec 2014. The assessment is done using the Harris Hip Scoring System.

Result: All the patients were evaluated periodically at post op, 6 weeks, 3 months and 6 months .The standard protocol of Harris Hip scoring system was used for subjective evaluation of the results of the surgery during follow up. All cases gave good to excellent post-operative result.

Conclusion: Our result being encouraging in comparison to the literature, we recommend to fix the fracture with multiple cannulated hip screws as it is simple, less invasive and provides reasonable amount of stability. Moreover, the anatomy is not disturbed and the revision surgeries are not difficult.

KEYWORDS

Fracture neck of femur, cannulated hip screws

Introduction:

Fracture neck of femur is commonly seen in old people but in India quite a good number of patients are young adults below the age of 50.[1] Koval and Zuckerman noted the age-adjusted incidence of femoral neck fractures as 63.3 cases per 100,000 person-years for women and 27.7 cases per 100,000 person-years for men.

The number of these fractures has been estimated to be approximately 250,000 a year and the fractures are associated with 12 to 20 percent increase in morbidity and disability compared with the rate in a group of similar age and sex who have not sustained the fracture.[1]

Several studies have suggested that reduction and fixation of an intracapsular fracture of hip with multiple pins or screws is associated with lower rate of morbidity and mortality than treatment with prosthetic replacement.[1]

Arnold et al retrospectively reviewed the result of stabilization of an intracapsular fracture neck of femur with cannulated screws in 141 patients. He found fracture healing in 96% of patients.[1]

The treatment varies with the age of the patient, the level of the fracture and displacement of fragments. It also depends upon the duration of the fracture.

The functional outcome also depends upon the post operative rehabilitation policy that the patient follows.

We have found that the patients especially the elderly patients cannot consistently follow the toe touch/ partial weight bearing rehabilitation protocol following first few weeks after surgery and inaverdently tend to put more weight on operated then adviced which puts on more stress on the implant and can be a cause of failure of implant hence we came up with a modified protocol for fracture neck of femur treated with cancellous screws.

Asnis SE et al carried out the study in patients with median age of sixty-eight years (range, twenty-four to ninety-five years).4 Cancellous screw provided a reasonable good fixation and occupies less space in femoral neck.

A study by KBL Lee et al reviewed 90% cases of undisplaced (Garden 1 and 2) fractures and 10% cases of displaced (Garden 3 and 4) fractures treated with cancellous screw fixation. At 2 years' post-operation, 85% re turned to their premorbid level of ambulation and 90% reported good pain relief. The 1-year mortality rate was 7%.[5]

A retrospective evaluation and comparison by Lee Yih-Shiunn et al of eighty-four elderly patients (> 60 years) with undisplaced intracapsular femoral neck fractures which were treated with osteosynthesis with either dynamic hip screws (DHS) or multiple cannulated screws (MCS) revealed that the MCS group had significantly smaller wound incisions, less haemoglobin level drops, lower blood transfusion rates and shorter hospital stays than the DHS group.[6]

R. Blomfeldt et al found that the rate of hip complications was 30% in the internal fixation group and 23% in the hemiarthroplasty group; this was not significant at two years, 54% were totally dependent in ADL functions and 60% were bedridden or wheelchair-bound regardless of the surgical procedure.[7]

Van Dortmont LM et al found that hemiarthroplasty was associated with significantly more loss of blood and more wound complications.[8]

Mohit Bhandari, et al found that in comparison with internal fixation, arthroplasty had greater infection rates, blood loss, and operative time and possibly an increase in early mortality rates.[9]

Two clinical trials have reported that there is no co-relation between the time interval to surgery and development of AVN .[10]

Frede Frihagena et al showed that all scales were able to discriminate between the complications group and the non-complications group at 4 months, but only Harris Hip Score had independent explanatory ability in a logistic regression analysis.[11]

J William Fielding et al in their study kept the patients non weight

bearing for 4 weeks. Full weight bearing was permitted only after union was demonstrated on X-rays.[12]

RA Winquist et al allowed 6-12 weeks of non weight bearing or partial weight bearing with crutches. The delay of active mobilization did not affect the healing of fracture.[13]

Shwan Henari et al allowed limited weight bearing for 2 to 3 months with the aid of crutches and physiotherapy instruction.[14]

B Kenneth et al states that postoperative mobilization remains an area of controversy. Some authors have recommended restricted weight-bearing until the fracture has healed, while others have shown that unrestricted weight-bearing can be started immediately without detrimental effects.[15]

Craig Lareau et al states that weight bearing status after the surgical procedure is surgeon-dependent. Classically, patients are instructed touch-down weight bearing with a walker for approximately 8-12 weeks. Rehabilitation should focus on gait training and strengthening without needing any precautions.[16]

Arnold WD et al compared the effects of early weight bearing on the stability of femoral neck fractures following Knowles pin fixation with the data on similar group of patienats who were studied ten years previously, in which weight bearing had been delayed until radiographic evidence of fracture healing was apparent. The results concerning stability were essentially comparable, indicating that early weight bearing did not adversely affect the stability of a properly reduced and pinned displaced fracture of femoral neck.[17]

Hui-Kuang Huang et al postoperatively allowed all patients to toe-touch weight bear with a walker for 12 weeks, to advance to weight bearing thereafter.[1]

MATERIALAND METHOD:

Study setting: Bangalore Baptist Hospital, a 300-bedded tertiary teaching hospital..

Study Population: Cases operated for fracture neck of femur (by internal fixation with cancellous screws) between December 2012 and December 2014.

Inclusion Criteria:

- Age between 20 to 60 years.
- Closed fractures of Neck of femur (intracapsular).
- Patients presenting immediately presenting within 24 hours to 3 weeks after the injury.
- Patients without associated ipsilateral lower limb fractures.
- Patients treated with multiple cancellous screw fixation for fracture neck of femur.

Exclusion Criteria:

- Patients with head injury and polytraumatized patients.
- Patients with pre existing previous hip disorders.
- Patients with pathological fractures.
- Patients with stress fracture of fracture neck of femur.
- Patients presenting with fracture neck of femur with age more than 60 years.
- Patients presenting with fracture neck of femur more than 3 weeks.

Study design: Prospective Observational study

Sample Size: 20 cases

5. STUDY INSTRUMENT: Harris Hip Score (Table 1)

<70	Poor
70 - 79	Fair
80-89	Good
90 -100	Excellent

Methodology: Patients who satisfy the inclusion criteria have undergone/will undergo internal fixation with multiple cancellous screws for fracture neck of femur (Fig.1a and 1b). Post-operatively, functional assessment was performed using the Harris Hip Score at 12 weeks, 24 weeks and 52 weeks. Patient was also ambulated non-weight bearing (as per modified rehabilitation policy followed in BBH) for 6 weeks followed by toe touch weight bearing for 3 weeks and full weight bearing within 1 month after that.

Figure. 1 a and 1 b-Picture depicting position over operative table

Figure. 1 a and 1 b-Picture depicting position over operative table

Radiography should always be the initial imaging modality. Then, depending on the clinical concern, additional studies can be obtained. MRI or nuclear medicine scintigraphy may provide additional information if the presence of a fracture is equivocal on radiographs. CT scanning may be useful if more osseous details (e.g. degree of comminution and possible intra-articular bone fragments) are required.

In our study we have used radiography, & based on this have diagnosed & classified them accordingly using the Garden's Classification system.

X-Rays were done to all our patients initially following trauma i.e. at the time of admission, post-operatively, and during follow-up visits.

None of our patients underwent CT Scans, as the requirement did not arise. But two patients had to undergo MRI Scan of the affected hip which was suspected to have Avascular Necrosis of the femoral head on radiography.

Classification system used -

Garden's Classification of Fracture Neck of Femur

Operative technique

Closed Reduction & Internal Fixation with Cancellous Screws

Postoperative Regimen

The limb was kept elevated over a pillow; I.V antibiotics given for 2 . The wound inspected on the 2nd and 5th post operative day and the dressing changed, sutures were removed on the 11th post operative day.

Patients were put to static quadriceps, active ankle movements and pelvic lifting exercises from 1st post op day, made to sit from 2nd day with leg hanging from the bed.

They were allowed non weight bearing crutch walking from 2nd post op day. Patients were discharged from the hospital on the 3rd post op day. Patients were followed in OPD on 2nd, 4th, 6th week, 3 months, and 6 months and so on. In normal course, X-rays of concerned hip joint were taken at 6th week, 3 months and 6 months. They were assessed clinically and radio logically. Following a specific protocol we allowed patients to bear weight on the operated limb at the end of 6 weeks with the help of crutches as mentioned below.

Postoperative protocol instituted from the day of surgery with efforts to achieve discharge 3 days after surgery.

Day of Surgery:

- We begin with lower extremity isometric exercises and ankle pumps, encouraged the patient to perform these exercises every two hours while awake.
- Assisted bed-to-chair transfers using an assistive device to a chair of appropriate height.

Post-Operative Day 1:

- Continued lower extremity isometrics and ankle pumps.
- Initiated upper extremity and contralateral limb strengthening exercises along with pelvic lifting exercises.
- Post Operative Day 2:
- Reviewed lower extremity isometric and ankle pumping exercises.

- Began supine lower extremity active assisted range of motion exercises to the operative extremity. Motions are to the patient's tolerance and in cardinal planes.

Post Operative Day 3:
- Continued comprehensive exercise program with emphasis on increasing hip range of motion and general muscle strength in the operative extremity.
- Began sitting exercises.
- All patients required an assistive device for ambulation and follow-up physical therapy.
- Assisted ambulation on level surfaces using an assistive device was started.
- Weight bearing status was prolonged to 6 weeks post surgery.

Therapeutic Exercise:
- Passive, Active-Assisted, and active lower extremity range of motion
- Stationary cycling - No resistance to motion
- Iliotibial Band Stretches-Supine stretches
- Gait Training:
- Level Surface
- Forward Walking
- Sidestepping
- Uneven Surfaces

OBSERVATIONS AND RESULTS:
Twenty patients with fracture neck of femur were operated upon by doing a closed reduction and multiple cancellous screws application. They were later assessed functionally by using the Harris Hip Score.

The details of the patients are as follows....

General details:
- Out of the 20 patients, there were 4 females and 16 males.
- The patients' age ranged from 20yrs to 60yrs with the mean age being 41.6 years.
- The right hip was involved in 11 cases and 9 left hips were affected.
- The preferred anaesthesia was spinal.
- All cases were followed up for a minimum period of 1 year.
- Average time for surgery following trauma was 3 days ranging from 2 to 10 days.

The diagnosis was purely based on X- Rays. They were classified based on Garden's Classification of fracture neck of femur. Out of the 20 neck of femur fractures,5 were Type I; 3 were Type II; 6 were Type III and 6 were Type IV (figure 2)

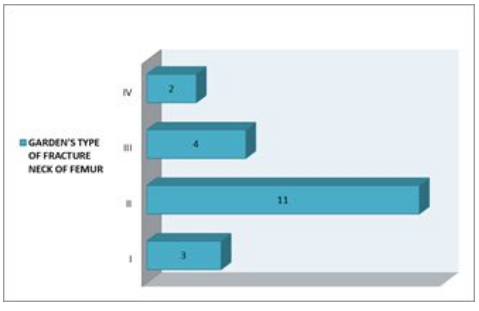

Fig. 2 – picture showing distribution of grades of femur neck fractures according to garden's classification

All the surgeries performed were uneventful and followed our post-operative protocol. Routine sterile techniques of surgery and dressings later on in the ward itself were followed.

Of all the 20 fracture neck of femurs, 2 had distal radius fracture. There was 1 patients who had diabetes mellitus , 2 with hypertension and 1 with bronchial asthama.

Out of 20 surgeries done, no major intra or immediate post-operative complications were encountered.

All patients had complete union at 1 year follow-up. Union was solely decided on serial X-Rays at follow-up visits which showed minimal callus formation and clinically on the patient's signs and symptoms like pain, instability & full weight bearing walking.

All the 20 patients showed signs of union on X – Rays during follow-ups were made to fully weight bear at 6 weeks post-surgery.

Based on each component of the Harris Hip Score the patients were analysed. Out of 20 patients who were regular for follow-up visits, 12 had no pain or just ignorable pain; 6 had slight, occasional or pain which did not compromise their activity level. 2 of them had moderate pain, tolerable but make concession to pain with some limitation or ordinary activity/work. They required occasional pain medications.

15 of our study group patients had a slight limp while walking and 5 had a moderate limp.

Majority of our patients i.e. 10 of them used a support like a cane most of the time for ambulation. 5 patients did not use any support at all, at 1 year follow-up. 2 patients used a cane for long walks only and 3 had to use a single crutch.

Patients who could walk unlimited were 9, 5 could walk only for about 6 blocks i.e. about 2kms in the Indian scenario and 5 patients could walk only indoors to carry out their routine daily activities .

Patients who were able to walk up & down stairs without using a railing were only 5 and those using the railing were 11. One of them was able to use the stairs somehow, using someone's support or with a walking aid. 3 of our patients were not able to use the stairs.

Daily routine activities like putting on shoes & socks, sitting on a chair & using public transportation were also evaluated. 14 of them could easily put on shoes & socks, 4 were able to do it with difficulty and 2 were unable to do it by themselves. Most of them i.e. 13 of them were able to sit comfortably in an ordinary chair for an hour, some for even longer duration, 7 of them on a high chair for about half an hour. Using public transportation like a bus or an auto rickshaw was possible for 14 of our patients, especially in the Indian scenario where auto rickshaw or a taxi is easier to get on to than a bus. The rest of our patients were either not able to use public transport or did not find the need to us it.

On examination, 9 out of the 20 patients had some or the other deformity. The other 11 had no or negligible deformity. But none of our patients had a limb length discrepancy more than 3cms. 14 out of the 20 had near normal range of movements, but rest of the 6 patients had all movements ranging from 30-60 degrees only. Abduction was the movement most affected.

The Functional Outcome as measured using the Harris Hip Score was analysed and out of the 20 hips operated with cancellous screw fixation, 13 patients had excellent results with no functional disability. 5 of them showed good results and 2 of them had fair results (figure 3). Apart from all the above included in the Harris Hip Score, our study also included two other categories based on the Indian scenario, which are sitting cross legged on the floor and squatting. 12 of our patients were able to sit cross legged comfortably, without any pain for a minimum of 20min. The other 7 were able to sit, but only for about 2-5min and 3 of them were not able to sit cross legged.

10 of our patients were able to squat, which is very important in our country to use the Indian type of toilet. 6 had to modify their lifestyle to using the western toilet as they were not able to squat and for 4 of them it did not make a difference, though they were not able to squat as they did not find the need to do so during their daily activities.Pre-operative, Post-operative and follow up clinical pictures and x-rays (Fig. 4)

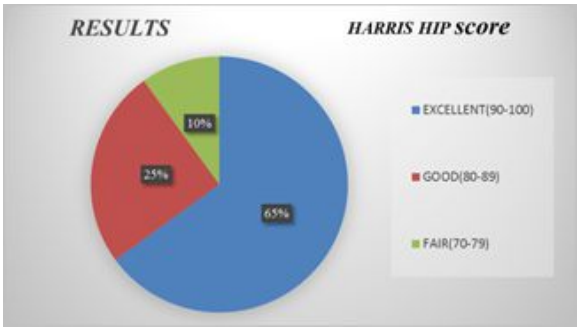

Fig. 3- picture showing results according to Harris Hip Score


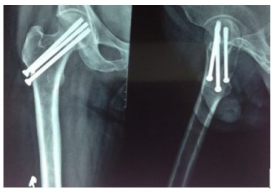

Fig. 4 pre operative X-ray Fig. 4 immediate post operative X-ray


Fig.4 3 months post operative X-ray Fig. 4 6 months post operative X-ray

Fig. 4 clinical pictures

DISCUSSION:

Irrespective of the age of the patients, intracapsular fracture of the neck of the femur of Garden I & II variety behaved nicely with Cancellous Screw fixation and resulted in union. In rest of the 6 patients of either Garden III or IV variety, our results were not very encouraging. If we consider our group to be of these 20 patients, then 2 patients had complications like bed sores and myositis ossificans. Therefore, the rate of complications is 10% respectively.

Our average time of surgery post trauma was 3 days ranging from 2 to 10 days. 2 patients who had gone for complications were of Garden III & IV. In all patients there was significant amount of posterior comminution and the reduction was quite difficult. So, the amount of trauma, delay in surgery, posterior comminution, difficult surgeries, early loss of reduction, convergent screw placement might be the risk factors for myositis ossificans.

In our series of 20 cases we had two non unions with AVN. So, we had a non union rate of 10%, union rate of 90%.

The patient who developed bed sore also recovered completely and did not have any restriction in daily activities with significant reduction in pain. For the other two patients who developed non-union with AVN, Total Hip Replacement was done (Fig 5). One patient who had myositis ossificans was managed conservatively with non steroidal anti-inflammatory medications and improved symptomatically.

Fig. 5– X-ray showing right total hip replacement following AVN of femoral head.

CONCLUSION:

Osteosynthesis in fractures of the neck of the femur in adults being a challenge to every orthopaedic surgeon, there are a number of implants and surgical techniques to address the problem.

Our result being encouraging in comparison to the literature, we recommend to fix the fracture with multiple cannulated hip screws as it is simple, less invasive and provides reasonable amount of stability. Moreover, the anatomy is not disturbed and the revision surgeries are not difficult.

However, a larger group and a longer follow-up are required to ascertain the outcome of hips fixed with cancellous screws, and also to determine the ideal method of fixation.

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