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ORIGINAL ARTICLE

A STUDY OF FUNCTIONAL OUTCOME OF HEMIARTHROPLASTY OF HIP DONE BY MINI INCISION VERSES CONVENTIONAL METHOD

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ABSTRACT: INTRODUCTION: Mini incision surgical techniques have contributed to the development of newer tissue preserving surgical techniques and accelerated patient recovery and return to function. We have compared the results of hemiarthroplasty of hip joint performed by posterior mini-incision with those done by conventional posterior approach in relation to functional outcome. **MATERIALS AND METHODS:** This prospective randomized study was conducted in department of Orthopedics, SRMSIMS, Bareilly from January 2011 to October 2012. All adult patients with fracture of neck of femur who underwent hemiarthroplasty of hip and post-surgery who had adequate and stable fixation with no complications/limb length discrepancy were included in this study. In MIS technique a modified Moore's posterior approach was used in which a smaller incision was made and pyriformis was not cut, quadratus femoris was partially released and insertion gluteus maximus was left completely intact. These cases were compared with those operated using a conventional posterior approach. Surgical complications were noted. Functional assessment was done using Harris Hip Score and Gait analysis was done using Ultra Flex Gait Analyzer. **RESULTS:** A total of 23 patients were operated through MIS approach versus 26 cases with conventional approach. Average length of incision was 72+/-12mm in MIS group as compared to 163+/-24mm in the conventional group. Gait parameters like rate of full weight bearing, Vertical Ground Reaction Forces, gait cycle properties including stance time were favorable in the MIS group as compared to conventional group. Average Harris Hip score at the end of 9 months is almost similar in both the groups. **DISCUSSION AND CONCLUSION:** MIS approach gives a more normal gait cycle as compared to the conventional approach even though the difference is not demonstrable in the functional outcome as assessed by Harris Hip Score.

KEYWORDS: Hemiarthroplasty, Fracture Neck Femur, Miniincision**.**

INTRODUCTION: Intracapsular fracture neck of femur is a social, medical and economic challenge for both the orthopedic surgeon and the society. Hemi-arthroplasty is the standard treatment in geriatric patients. The main goal of treatment of fracture neck femur is restoration of pre-injury function with minimal surgery-associated morbidity. With aim of reducing surgical morbidity, minimally invasive techniques have been devised. Mini incision surgical techniques have contributed to the development of newer tissue preserving surgical techniques and accelerated patient recovery and return to function.[1,2]

The benefit of this surgical approach remains to be established. Besides clinical parameters which are always prone to bias, gait analysis can be used to objectively evaluate the results of hemiarthroplasty. In this prospective study, we have compared the results of hemiarthroplasty of hip joint performed by posterior mini-incision as well as those done by conventional posterior approach in relation to functional outcome by measuring Harris Hip Score and gait parameters evaluated using an Ultra Flex gait analyzer.

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METHODS AND MATERIALS: This prospective randomized study was conducted in department of Orthopedics, SRMSIMS, Bareilly from January 2011 to October 2012.

INCLUSION CRITERIA: All adult patients with fracture of neck of femur who underwent hemiarthroplasty of hip and post-surgery had adequate and stable fixation with no complications/limb length discrepancy were included in this study. Patients with co-existent disease/affections or other fractures of lower limb which would limit the post-operative rehabilitation programme were excluded from the study.

Choice of prosthesis depended upon whether calcar of femur was present or absent. Austin Moor Prosthesis was used when enough of calcar was present as it has collar which sits on it. In the absence of calcar Thompson type of prosthesis was chosen.

SURGICAL APPROACH: We used Moore's southern posterior approach in both groups. Besides the difference in size of incisions (roughly 15 cms in CM group and 6-8 cm in MIM group), there were other notable differences in the two groups: size of split in gluteus maximus muscle was much smaller in MIM group, pyriformis tendon was not cut, quadrates femoris was only partially released as required and the insertion of gluteus maximus was left completely intact[3-8]. Meticulous closure was done in both groups taking care to repair the posterior capsule and short rotators well.

POST-OPERATIVE MANAGEMENT: Patients were nursed in supine position with hip in slight abduction. The patient is also instructed to avoid any acute flexion, adduction and internal rotation of the operated hip but encouraged to do quadriceps drill and active toe movements. Patients were advised to use commode for latrine and were not allowed to sit in Indian latrine for 6 months. Post-operative mobilization was done on 3rd post-operative day (weight-bearing as tolerated)[5].

OUTCOME ASSESSMENT: Gait analysis was done at the intervals of 3 month, 6 month, 9 month after operation and still later if required. Following points were noted in the follow up:

1. Any complaints including surgical site healing
2. Limb length discrepancy
3. Functional status – Harris hip score.
4. Gait analysis with Ultra Flex gait analyzer.

Patients were asked specific questions in form of questionnaire which gave detailed information about functional utility of the prosthetic replacement. Modified Harris score, gait cycle properties, step-time parameters and VGRF variables were recorded.

RESULTS: Length of the incision in the minimal invasive group was 72+12 mm as compared to 163 +24 mm in conventional group. Duration of surgery was almost same in both the groups (73.4 & 74.4 minutes). Intra-operatively, only 4 patients required blood transfusion out of 23 in MIM and 19 patients required blood transfusion in conventional method out of 26 patients. Average Harris Hip score at the end of 9 months is almost similar in both the groups.

Rate of full-weight-bearing mobilization was around 92% in MIM, while it was 89% in conventional method at the end of two weeks[6]. Heel strike to mid stance (Stance Time) duration is

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increased in case of conventional method as compare to MIM. Increased stance time is around 0.941 seconds in MIM and in conventional method 0.542 seconds as compared to, but increase in stance time is nearer to normal in MIM. This study demonstrates that gait parameters are more towards normal in MIM. In this study Gait analysis was done after 3months, 6 months & 9 months; and results shows that greatest improvement has taken place in gait symmetry and both temporal & spatial gait parameters occur after minimal invasive hemiarthroplasty.

Our analysis also includes gait parameters such as Vertical Ground Reaction Forces and gait cycle properties. These parameters represents gait pattern of particular limb and also gives information regarding weight bearing duration of particular limb while walking.

Frequency denotes that the walking is absolutely reduced in both groups.

Gait cycle duration denotes the time elapsed in single gait cycle is increased in both groups, it also signifies that patient is doing greater postural adjustments while walking. This also results in reduction in frequency.

- SYMMETRY of left to right foot parameters is not maintained because both hip do not equally bear weight bear which is clearly obtained by assessing the step time parameter.
- STEP-TIME PARAMETER shows both weight bearing duration of particular limb as well as duration when the foot is of the ground. SINGLE SUPPORT TIME & STEP TIME is reduced on affected limb in both groups while SINGLE SWING TIME, DOUBLE SUPPORT TIME & STANCE TIME increase show that, patient avoid weight bearing on affected limb and most of the time he keep the limb off the ground.
- CYCLOGRAM & HISTOGRAM show that center of gravity is shifted to the affected side.

Mean Harris Hip score in mini-incision at 3rd month was77.15 at 6th month was 81.5 and at 9th month was 82.5. In conventional incision it was 70.15 at 3rd month 75.12 at 6th month and 76.58 at 9th month. This difference was found to be significant: p values respectively are .001, .004 & .020.

Stance time and MLR in both groups showed significant difference (respective p values are 0.00 and 0.00).

DISCUSSION: The study of minimal invasive and conventional method has been assessed by using functional outcome and gait analysis. This study was done to compare two methods one by conventional posterior approach & another by Minimally Invasive posterior approach for AMP fixation in intracapsular neck fracture in geriatrics age group. Out of 49 pt were operated, 26 were from conventional method & 23 were from Minimally Invasive Method.

Intra-operatively only 5 out of 23 patients of MIM group had blood loss greater than 200 ml whereas 19 patients out of 26 operated by conventional approach had blood loss more than 200 ml.

Mean length of incision was 72.4 mm in minimally invasive method, while it was 163 mm in Conventional method. Fibers of gluteus maximus were divided upto lesser length in minimally invasive method as compared to conventional method hence the strength of gluteus maximus is not decreased as it is in conventional approach.[4] This is also substantiated by gait cycle analysis.

When gluteus maximus is weak, Trunk lurches backwards (maximus lurch) at heel strike on weakened side to interrupt forward motion of trunk[5]. In a similar study by Kazuo et al[1] performed mini-invasive hemiarthroplasties through a mean 70-mm skin incision whereas the length of skin

incision in conventional method in their study was 151.8 mm. Wound healing at 15 days and 3 months was found to be comparable in both the groups.

Average Harris hip score at the end of nine months was almost similar in both groups. Earlier experiences by Digioia et al[7] with Mini incision THA showed higher Harris Hip Scores at 3 and 6 months whereas there was no significant difference in functional outcomes at 1 year follow up between the two groups.

Time of post op mobilization is a 92% in MIM while it is 89% in CM at the end of 2nd week. Berger et al and Goldstein et al in their studies[9, 10] comparing posterior mini incision THA with conventional lateral incision THA also reported early ambulation and decreased length of hospital stay in the posterior Mini incision group. Similar findings were noted by Wright et al in their study comparing THA done by Posterior mini incision versus conventional approach.[11] This is also reflected in other studies.[12, 13]

CONCLUSION: The current study shows that, in Minimally Invasive Method, there was less soft tissue dissection and reduced surgical trauma, less blood loss and faster mobilization, as compared to the conventional method. Gait analysis study showed that the functional outcome was better in MIM as compared to the conventional method and gait parameters were more towards normal in MIM.

Further long term studies would perhaps substantiate the results with more clarity. Mini incision surgery has contributed to the development of newer tissue preserving surgical techniques and accelerated the process of minimal hospital stay and earlier return to function. Minimal invasive approach though appealing, has a steep learning curve and care should be taken to avoid the potential risk of suboptimal component placement during surgery which can adversely affect the long term outcome.

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Figure 1 : Length of incision mini versus conventional approach

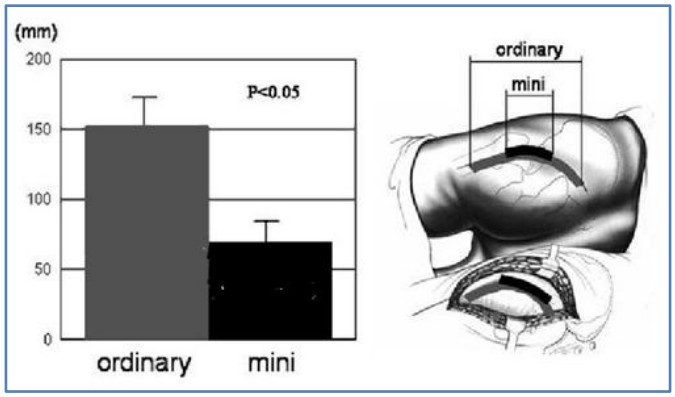

Figure 2 : Surface marking of mini versus conventional exposure

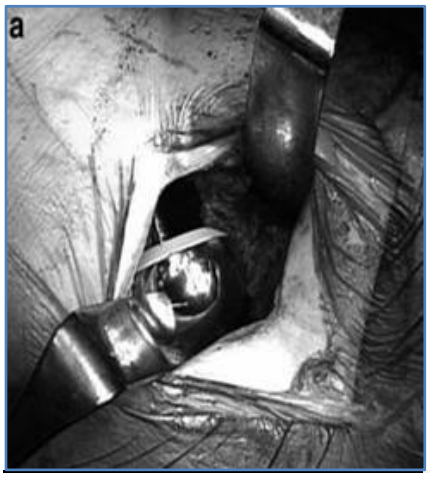

Figure 3a: Surgical exposure in mini incision

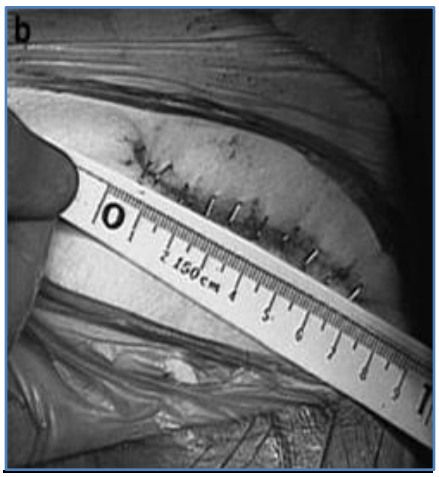

Figure 3b: Sutured surgical wound of mini incision technique

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Incision mark in Mini Incision Approach

Incision and exposure in Mini inicision

Head extraction in Mini incision Approach

Wound closer in Mini incision

Healed scar in Mini incision

Pre-op X-ray

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Post op 3 months

Post op 6 months

Conventional Incision

Wound closure in Conventional Incision

Healed scar in Conventional Incision

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Pre op X-ray

Post op 3 months

Post op 6 months

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