

## **AIM OF THE WORK**

The aim of the work was to compare the early results of bipolar hemiarthroplasty done by minimal invasive posterior approach and conventional posterior approach.

## PATIENTS

This prospective and comparative study included 30 patients in two groups' fifteen patients done through MIS posterior approach and fifteen patients were done through conventional posterior approach. All cases were treated by cemented bipolar hemiarthroplasty at El Hdara university hospital and a private hospital.

The ethical committee accepted the performance of the study and informed consent was taken from all patients.

They were followed up clinically and radiologically for at least 3 Months postoperative.

### Demographic data

#### I- Age: (Table II)

- **Conventional group:** eight patients were between 60-70 years and seven patients were between 71-85 years with a mean age 71.87 year.
- **MIS group:** six patients were between 60-70years and nine patients were between 71-85 years With mean age 71.93 year.
- There was no significant difference between the two groups as regard their age [p. value 0464]

**Table (II): Comparison between the two studied groups according to age (years)**

| Age (years) | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | Test of sig.     | p     |
|-------------|----------------------|------|------------------|------|------------------|-------|
|             | N                    | %    | N                | %    |                  |       |
| 60 – 70     | 8                    | 53.3 | 6                | 40.0 | $\chi^2 = 0.536$ | 0.464 |
| 71 – 85     | 7                    | 46.7 | 9                | 60.0 |                  |       |
| Min. – Max. | 61.0 - 85.0          |      | 64.0 - 81.0      |      | t = 0.028        | 0.978 |
| Mean ± SD   | 71.87 ± 7.47         |      | 71.93 ± 5.38     |      |                  |       |
| Median      | 70.0                 |      | 71.0             |      |                  |       |

p: p value for comparing between the two studied groups

$\chi^2$ : Value for Chi square

t: Student t-test

**II- Sex: (Table III)**

- **Conventional group:** ten patients were male [66.7%] and five patients were female [33.3%].
- **MIS group:** eight patients male [53.3%] and seven patients female [46.7%].
- There was no significant difference between two groups as regard sex [p. value 0.456]

**Table (III): Comparison between the two studied groups according to sex**

| Sex    | Conventional<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | p     |
|--------|---------------------------|------|------------------|------|----------|-------|
|        | N                         | %    | n                | %    |          |       |
| Male   | 10                        | 66.7 | 8                | 53.3 | 0.556    | 0.456 |
| Female | 5                         | 33.3 | 7                | 46.7 |          |       |

$\chi^2$ : Value for Chi square

**III- Weight: (Table IV)**

- **Conventional group:** Weight of the patient ranged from 70-125 kg with mean age 101.6 kg.
- **MIS group:** Weight of patients ranged from 60-115 kg with mean age 84.4 kg.
- There was significant difference between two groups in weight with [p. value 0.012].

**Table (IV): Comparison between the two studied groups according to weight**

| Weight (kg) | Convent<br>( n = 15) | MIS<br>( n = 15) | t      | p      |
|-------------|----------------------|------------------|--------|--------|
| Min. – Max. | 70.0 - 125.0         | 60.0 - 115.0     |        |        |
| Mean ± SD   | 101.60 ± 16.55       | 84.40 ± 18.62    | 2.674* | 0.012* |
| Median      | 105.0                | 80.0             |        |        |

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$

**IV. Height: (Table V)**

- **Conventional group:** Height ranged from 159-181cm with mean 169.13cm.
- **MIS group:** Height ranged from 157-181cm with mean 167.2cm.
- There was no significant difference between two groups in height with [p. value 0.499].

**Table (V): Comparison between the two studied groups according to height**

| Height (cm) | Convent<br>( n = 15) | MIS<br>( n = 15) | t     | p     |
|-------------|----------------------|------------------|-------|-------|
| Min. – Max. | 159.0 - 181.0        | 157.0 - 181.0    |       |       |
| Mean ± SD   | 169.13 ± 7.22        | 167.20 ± 8.22    | 0.684 | 0.499 |
| Median      | 169.0                | 165.0            |       |       |

t: Student t-test

**V. Occupation: (Table VI)**

- **Conventional group:** Three patients unemployed and five patients house wife and two patients working office and five patients farmer.
- **MIS group:** Three patients unemployed and seven patients house wife and three patients work in office and two patients farmer.
- There was no significant difference between two groups in occupation. With [p. value→0.674].

**Table (VI): Comparison between the two studied groups according to occupation**

| Occupation | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | MC p  |
|------------|----------------------|------|------------------|------|----------|-------|
|            | n                    | %    | n                | %    |          |       |
| Unemployed | 3                    | 20.0 | 3                | 20.0 | 1.899    | 0.674 |
| House      | 5                    | 33.3 | 7                | 46.7 |          |       |
| Office     | 2                    | 13.3 | 3                | 20.0 |          |       |
| Farmer     | 5                    | 33.3 | 2                | 13.3 |          |       |

$\chi^2$ : Value for Chi square

MC: Monte Carlo test

**VI. Mode of trauma: (Table VII)**

- **Conventional group:** twelve patients fell while walking [80%] and three patients had road traffic accident [20%].
- **MIS group:** eleven patients fell while walking [73.3%] and four patients had road traffic [26.7%].
- There was no significant difference between two groups in mechanism of trauma with [p. value 1.00].

**Table (VII): Comparison between the two studied groups according to mode of trauma**

| Mechanism of trauma | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | FE p  |
|---------------------|----------------------|------|------------------|------|----------|-------|
|                     | n                    | %    | n                | %    |          |       |
| Fall while walking  | 12                   | 80.0 | 11               | 73.3 | 0.186    | 1.000 |
| RTA                 | 3                    | 20.0 | 4                | 26.7 |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test

**VII. Affected side: (Table VIII)**

- **Conventional group:** Ten patients right side affection [66.7%] and five patients left side affection [33.3%].
- **MIS group:** eight patients right side affection [53.3%] and seven patients left side affection [46.7%].
- There was no significant difference between two groups according to affected side [p. value 0.456].

**Table (VIII): Comparison between the two studied groups according to affected side**

| Affected side | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | p     |
|---------------|----------------------|------|------------------|------|----------|-------|
|               | n                    | %    | n                | %    |          |       |
| Right         | 10                   | 66.7 | 8                | 53.3 | 0.556    | 0.456 |
| Left          | 5                    | 33.3 | 7                | 46.7 |          |       |

$\chi^2$ : Value for Chi square test

**VIII. Medical history: (Table IX)**

**conventional group:** Two patients had no medical history and eight patients with HTN and two patients With D.M and one patient with asthma and two patients with ischemic heart disease.

**MIS group:** Four patients had no medical history and Five patients with hypertension and two patients With D.M and one patient with asthma and two patients with ischemic heart disease.

- There was no significant difference between two groups in medical history with [p. value 0.908].

**Table (IX): Comparison between the two studied groups according to medical history**

| Medical history         | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | MC p  |
|-------------------------|----------------------|------|------------------|------|----------|-------|
|                         | N                    | %    | n                | %    |          |       |
| No                      | 2                    | 13.3 | 4                | 26.7 | 2.359    | 0.908 |
| Hypertension            | 8                    | 53.3 | 5                | 33.3 |          |       |
| DM                      | 2                    | 13.3 | 2                | 13.3 |          |       |
| Asthma                  | 1                    | 6.7  | 1                | 6.7  |          |       |
| Stroke                  | 0                    | 0.0  | 0                | 0.0  |          |       |
| Ischemic heart diseases | 2                    | 13.3 | 2                | 13.3 |          |       |
| Renal problem           | 0                    | 0.0  | 1                | 6.7  |          |       |

$\chi^2$ : Chi square test  
MC: Monte Carlo test

**IX. ASA score: (Table X)**

According to the ASA score (American society of anesthesiologists).

- **Conventional group:** Five patients were healthy [score1], eight patients had mild systemic diseases [score two] and two patients had systemic diseases that limits activity [score3]. The mean ASA score was 1.80.
- **MIS group:** Four patients score1 and seven patients score two and four patients score3 With mean ASA [score2.0].
- There was no significant difference between two groups in ASA score [p. value 0.455].

**Table (X): Comparison between the two studied groups according to ASA**

| ASA         | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | Test of sig.     | p            |
|-------------|----------------------|------|------------------|------|------------------|--------------|
|             | N                    | %    | n                | %    |                  |              |
| 1           | 5                    | 33.3 | 4                | 26.7 | $\chi^2 = 0.893$ | MC p = 0.789 |
| 2           | 8                    | 53.3 | 7                | 46.7 |                  |              |
| 3           | 2                    | 13.3 | 4                | 26.7 |                  |              |
| Min. – Max. | 1.0 - 3.0            |      | 1.0 – 3.0        |      | Z = 0.746        | 0.455        |
| Mean ± SD   | 1.80 ± 0.68          |      | 2.0 ± 0.76       |      |                  |              |
| Median      | 2.0                  |      | 2.0              |      |                  |              |

p: p value for comparing between the two studied groups

$\chi^2$ : Value for Chi square

MC: Monte Carlo test

Z: Z for Mann Whitney test

## **METHODS**

This prospective, comparative study included 30 patients in two groups. Fifteen patients done through conventional posterior approach and Fifteen patients done through posterior MIS approach.

### **Preoperative assessment:**

#### **History: This included:**

- Personal data: name, age, sex, occupation
- Mechanism of trauma
- Medical history as DM, hypertension, bronchial asthma, stroke
- The ASA(American Society of Anesthesiologists Physical Status Classification) score of the patients was recorded:<sup>(156)</sup>

**Class 1:** A normally healthy patients

**Class 2:** A patient with mild systemic disease

**Class 3:** A patient with severe systemic disease that limits activity, but is not incapacitating

**Class 4:** A patient with an incapacitating systemic disease that is a constant threat to life

**Class 5:** A very ill patient that is not expected to survive 24 h with or without treatment

- Surgical history
- Pre fracture level of activity and ambulation

### **Physical examination:**

#### **General assessment:**

This was done to assess the general fitness to surgery, and to identify any potential source of infection.

#### **Local examination:**

- The skin and soft tissue condition around the hip joint including any previous scars or any bedsores.
- Leg length discrepancy
- Presence of deformity

#### **Radiographic evaluation:**

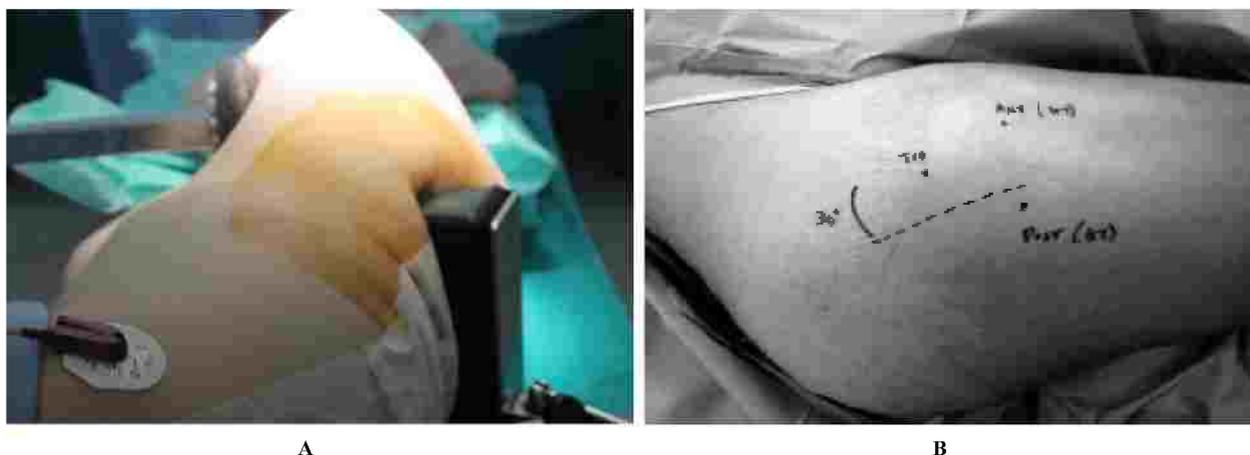
Anteroposterior radiographs of the pelvis and both hips were taken for all the patients, and lateral X-ray of the affected hip.

### Preoperative preparation:

- Routine investigation: This included complete blood picture, urea and creatinine, fasting blood sugar, prothrombin time and activity, Liver function tests Blood grouping and cross matching.
- ECG, chest X-ray.
- Proper analgesic.
- Optimization of any medical problem like diabetes and hypertension.

### Technique of Posterior mini-incision of hip arthroplasty:

- No specialized instruments were required.
- The patient was placed in the lateral decubitus position, the leg positioned in 45° of flexion at the hip and 90° of flexion at the knee (Fig. 50a).
- Landmarks for the skin incision are identified: the tip, anterior, and posterior borders of the greater trochanter forming an equilateral triangle.(Fig. 50b)



**Fig. (50):** (A) Positioning of the patient in posterior mini-incision hemiarthroplasty (B) landmark of skin insision

- About 10 cm incision is made, starting one finger's breadth anterior to the posterior corner of the triangle, extending cranially and posteriorly at an angle of 30° to the long axis of the femur, such that two thirds of the incision is distal to the tip of the greater trochanter and one third proximal.
- Sharp dissection is continued to gluteus maximus, which was split in the line of the incision, and fascia lata is split distally. The trochanteric bursa was excised if thickened and a fat is reflected posteriorly to reveal piriformis. A stay suture was taken in piriformis for later repair(Fig. 51). The piriformis,obturator internuswith the two gemelli were incised together with the posterior capsule close to the greater trochanter.Thiswas done using cutting dithermy. Another longitudinal cut was performed through the capsule,medially to the acetabulum. The quadratus femoris may be partially detached to visualize the inferior part of the neck two homanns retractors were used to visualize the femoral neck ,one proximal to the neck the other inferior at the level of lesser trochanter. (Fig. 52). The neck was cut using a pow saw, this helped to remove the femoral head using a cork-screw.
- The medullary canal of the femur was prepared and a cement plug was inserted.
- A trial steam was used before insertion of the stem.



**Fig. (51):** Capsule is incised using cutting diathermy along the inferior border of piriformis from the edge of the acetabulum



**Fig. (52):** Visualization of head and neck of femur

- The neck is osteomized (Fig. 53), femoral head is removed (Fig. 54), then the femur is prepared (Fig. 55 A & B).



**Fig. (53):** The neck is osteomized



**Fig. (54):** Femoral head is removed



**(A)**



**(B)**

**Fig. (55):** A, B The femur is prepared

- The definitive components was inserted (Fig. 56). Closure commences with repair of the posterior capsule. External rotators were re-attached to the greater trochanter. Gluteus maximas and iliotibial tract were repaired by interrupted sutures. Skin was closed using subcuticular non absorbable suture (Fig. 57A &B).



**Fig. (56):** The definitive components are inserted



**Fig. (57):** A,B,: closure with repair of the posterior capsule and the remaining tissues are closed in layers.

### **Postoperative management:**

#### **Transfer of the patient:**

The patient was directly transferred from the operating room to the bed with the limbs kept in abduction by a pillow inserted in between the legs.

#### **Medications:**

**Antibiotics:** all patients received intravenous third generation cephalosporins as ceftriaxone for 24 hours, no oral antibiotic were given. The first dose was given during induction of anesthesia.

**Analgesia:** postoperative pain was controlled in the first 48 hours using intravenous analgesic then mild analgesics belonging to NSAIDs were given as required for one week.

**Anticoagulants:** all patients received low molecular weight heparin for two weeks post-operative.<sup>(158)</sup>

### **Exercises:**

Quadriceps exercises and active ankle and foot movements were encouraged from first day post-operative.

### **No suction drain was used**

### **Care of the wound:**

New dressing was applied in the 2<sup>nd</sup> postoperative day. sutures were removed after two weeks.

### **Ambulation protocol:**

Walking was started on the first postoperative day. Patients were instructed to bear weight with a walking frame for six weeks. Then patients were allowed to bear weight as tolerated with the aid of one crutch.

### **Radiographic evaluation:**

Anteroposterior radiograph of both hips and lateral radiograph of the operated hip were performed and the following was assessed:

- Position of the bipolar head
- Position of the femoral stem (varus, valgus, or neutral)
- The bone cement

### **Follow up:**

#### **Clinical follow up:**

Harris Hip Score was used for clinical evaluation of patients at 3 months.<sup>(159)</sup>

**Table (XI): Harris Hip Score**

| DOMAIN   | SCORE |
|--|-------|
| <b>(I) Pain:</b>   |       |
| A. None or ignores it  | 44    |
| B. Slight, occasional, no compromise in activities   | 40    |
| C. Mild pain, no effect on average activities, rarely moderate pain with unusual activity, may take aspirin.   | 30    |
| D. Moderate pain, tolerable but makes concessions to pain. Some limitation of ordinary activity or work. May require occasional pain medicine stronger than aspirin. | 20    |
| E. Marked pain, serious limitations of activities  | 10    |
| F. Totally disabled, crippled, pain in bed, bedridden  | 0     |
| <b>(II) Function:</b>  |       |
| [A] Gait:  |       |
| (1) Limp:  |       |
| a. None  | 11    |
| b. Slight  | 8     |
| c. Moderate  | 5     |
| d. Severe  | 0     |
| (2) Support:   |       |
| a. None  | 11    |
| b. Cane for long walks   | 7     |
| c. Cane most of the time   | 5     |
| d. One crutch  | 3     |
| e. Two canes   | 2     |
| f. Two crutches  | 0     |
| g. Not able to walk  | 0     |
| [B] Activities:  |       |
| (1) Stairs:  |       |
| a. Normally without using any railing  | 4     |
| b. Normally using a railing  | 2     |
| c. In any manner   | 1     |
| d. Unable to use stairs  | 0     |
| (2) Shoes and socks:   |       |
| a. With ease   | 4     |
| b. With difficulty   | 2     |
| c. Unable  | 0     |
| (3) Sitting:   |       |
| a. Sitting comfortably in ordinary chair 1 h   | 5     |
| b. On a high chair for one-half hour   | 3     |
| c. Unable to sit comfortably in any chair  | 0     |
| (4) Distance:  |       |
| a. Unlimited   | 11    |
| b. Six blocks  | 8     |
| c. Two or three blocks   | 5     |
| d. Indoors only  | 2     |
| e. Bed and chair   | 0     |
| (5) Enter public transportation  |       |
| a. can   | 1     |
| b. cannot  | 0     |
| <b>(III) Absence of deformity points:</b>  |       |
| (4) are given if the patient demonstrates:   |       |
| a. Less than 30° fixed flexion contracture   |       |
| b. Less than 10° fixed adduction   |       |
| c. Less than 10° fixed internal rotation in extension  |       |
| d. Limb-length discrepancy less than 3.2 cm  |       |

**Cont.**

| DOMAIN                       | SCORE |
|------------------------------|-------|
| <b>(IV) ROM:</b>             |       |
| <b>Flexion: 140</b>          |       |
| <b>Abduction: 40</b>         |       |
| <b>Adduction: 40</b>         |       |
| <b>External rotation: 40</b> |       |
| <b>Internal rotation:40</b>  |       |
| 211-300                      | 5     |
| 161-210                      | 4     |
| 101-160                      | 3     |
| 61-100                       | 2     |
| 31-60                        | 1     |
| 0-31                         | 0     |

Total functional outcome was graded as following depending on the total Harris.

- Poor** : Harris hip score less than 70.
- Fair** : Harris hip score between 71-80.
- Good** : Harris hip score between 81-90.
- Excellent:** Harris hip score between 91-100

Excellent and good results were classified as satisfactory while fair and poor results were classified as unsatisfactory.

Also the clinical assessment included:

- 1- Trendelenberg test.
- 2- Straight leg raising test.
- 3- Pain on internal rotation of the hip.

**Radiological follow up:**

Standard radiographs were made for all patients at subsequent follow up. The radiographs were examined for:

**1) Femoral component:**

- 1- Position of the stem: neutral, valgus, or varus.
- 2- Subsidence of the stem: which is related to a fixed point as the tip of greater trochanter or the midpoint of lesser trochanter.
- 3- Stem condition: intact, bent or broken.
- 4- Prosthesis bone radiolucency: Lucent lines around the stem are assessed according to the Gruen zones. Fig(67)

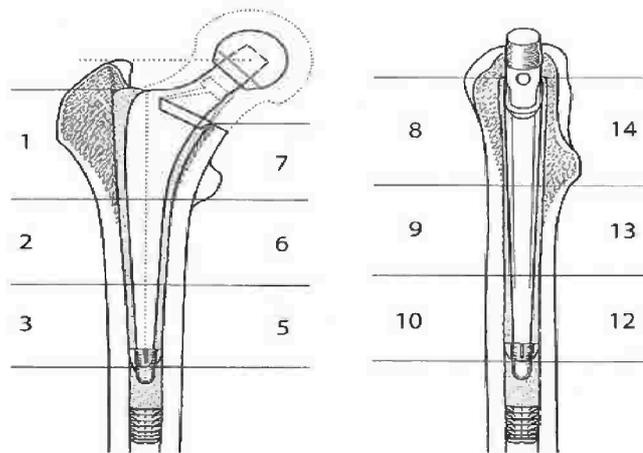


Fig (58): The Greun zones.<sup>(147)</sup>

5- Ectopic ossification using Brooker classification: Fig(68)

- Grade 1:** Islands of bone within the soft tissues about the hip.
- Grade 2:** Bony spurs from either the femur or the pelvis, with a gap of more than 1 cm between opposing bony ends.
- Grade 3:** The gaps between the spurs are less than 1 cm.
- Grade 4:** Apparent ankylosis of the hip due to the heterotopic ossification.

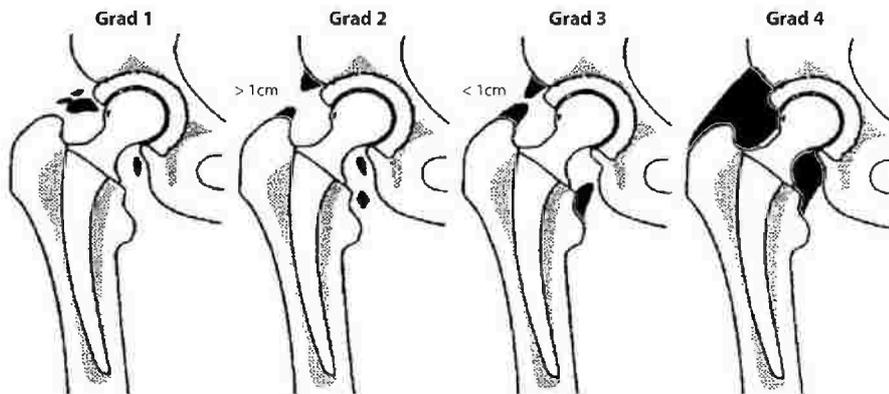


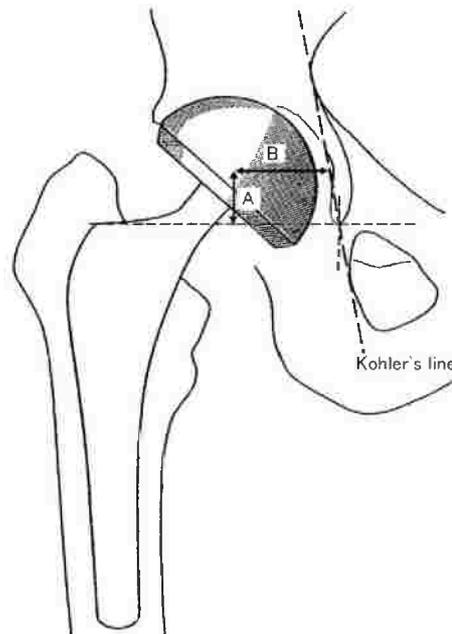
Fig (59): Brooker classification.<sup>(142)</sup>

6- Assessment of the cement mantle using Barrack classification:<sup>(160)</sup>

- Grade A:** Complete filling of the medullary cavity by cement, a so-called ‘white-out’ at the cement-bone Interface.
- Grade B:** Slight radiolucency of the cement-bone interface.
- Grade C:** Radiolucency involving 50% to 99% of the cement-bone interface or a defective or incomplete cement mantle.
- Grade D:** Radiolucency at the cement-bone interface of 100% in any projection, or a failure to fill the canal with cement such that the tip of the stem is uncovered.

**2) Bipolar cup component:**

- 1- Containment of the bipolar cup component whether contained or dislocated
- 2- Component position or migration and acetabular erosion: according to the method of Morzic and Mc-Collum in which superior migration is assessed by measuring the distance between the center of the outer head and the inferior margin of the ipsilateral tear drop. Medial migration is determined by measuring the distance from Kohler's line and the center of the outer head<sup>(161,162)</sup> Fig( 69)



**Fig (60):** Bipolar cup migration<sup>(162)</sup>

**Informed consent:**

Informed consent was taken from every patient as regards performance of the study.

**Statistical analysis of the data<sup>(163)</sup>**

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0<sup>(164)</sup>. Qualitative data were described using number and percent. Quantitative data were described using range (minimum and maximum), mean, standard deviation and median. Comparison between different groups regarding categorical variables was tested using Chi-square test. When more than 20% of the cells have expected count less than 5, correction for chi-square was conducted using Fisher's Exact test or Monte Carlo correction. The distributions of quantitative variables were tested for normality using Kolmogorov-Smirnov test, Shapiro-Wilk test and D'Agstino test, also Histogram and QQ plot were used for vision test. If it reveals normal data distribution, parametric tests was applied. If the data were abnormally distributed, non-parametric tests were used. For normally distributed data, comparison between the two studied groups were done using independent t-test while For abnormally distributed data, comparison between two independent population were done using Mann Whitney test. Significance of the obtained results was judged at the 5% level.

## RESULTS

This study included 30 patients in two groups fifteen patients were done through MIS posterior approach and fifteen through conventional posterior approach. All cases had displaced intra capsular femoral neck fracture, and were treated by cemented bipolar hemiarthroplasty.

### A- Operative data

#### 1- Incision length: (Table XII and Figure 61)

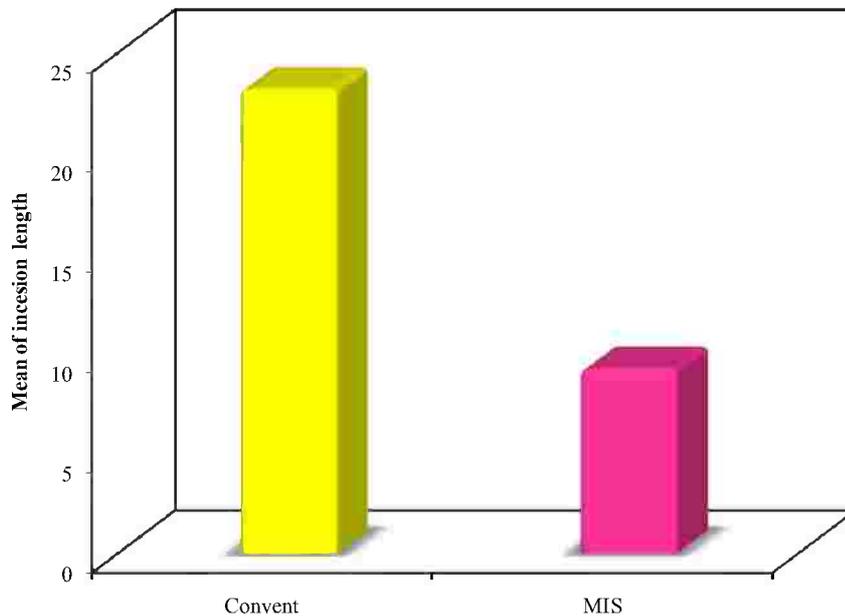
- **Conventional group:** Incision length ranged from 20-27cm with mean of  $23.2 \pm 2.27$ cm.
- **MIS group:** Incision length ranged from 6.5-12cm with mean of  $9.23 \pm 1.73$ cm.
- There were significant difference between two groups regarding the Incision length [p. value  $< 0.001$ ].

**Table (XII): Comparison between the two studied groups according to incision length**

| Incision length | Convent<br>(n = 15) | MIS<br>(n = 15) | t       | P          |
|-----------------|---------------------|-----------------|---------|------------|
| Min. – Max.     | 20.0 - 27.0         | 6.50 - 12.0     |         |            |
| Mean $\pm$ SD   | $23.20 \pm 2.27$    | $9.23 \pm 1.73$ | 18.928* | $<0.001^*$ |
| Median          | 24.0                | 8.50            |         |            |

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$



**Fig. (61): Comparison between the two studied groups according to incision length.**

**2- Operative time: (Table XIII and Figure 62)**

Operative time was calculated from skin incision to skin closure.

**Conventional group:** Operative time ranged from 100-120 min with mean [120 ± 18.61 min].

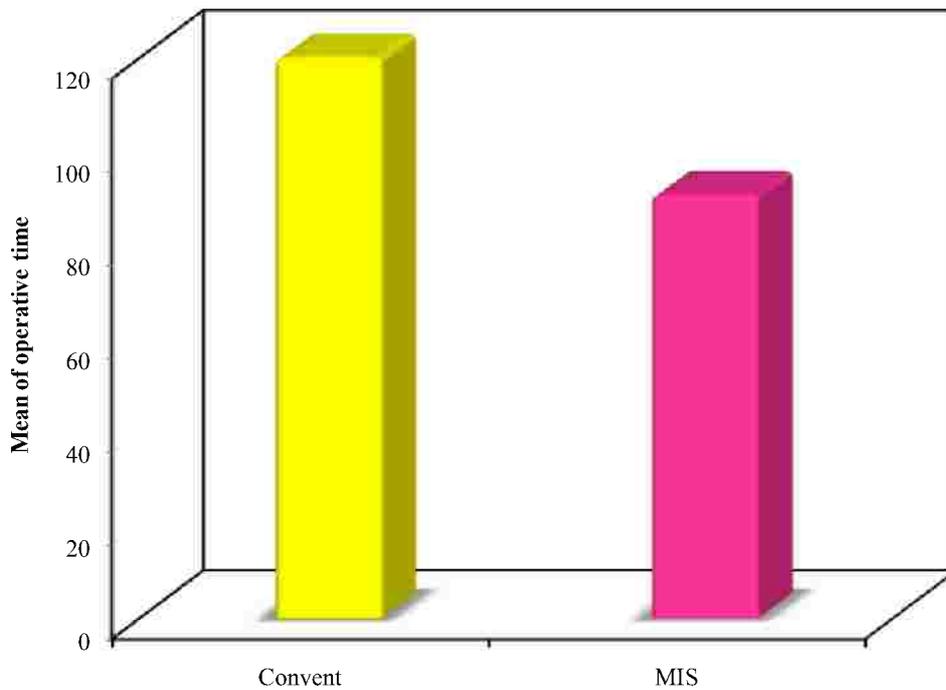
- **MIS group:** Operative time ranged from 45-60 min with mean [50.67 ± 10.34 min].
- There was significant difference between two groups as regard the operative time [p. value < 0.001].

**Table (XIII): Comparison between the two studied groups according to operative time**

| Operative time | Convent<br>(n = 15) | MIS<br>(n = 15) | t      | p       |
|----------------|---------------------|-----------------|--------|---------|
| Min. – Max.    | 100.0 - 180.0       | 70.0 - 120.0    |        |         |
| Mean ± SD      | 120.0 ± 18.61       | 90.67 ± 15.34   | 4.711* | <0.001* |
| Median         | 120.0               | 90.0            |        |         |

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$



**Fig. (62): Comparison between the two studied groups according to operative time**

### 3- Type of anesthesia: (Table XIV and Figure 63)

The type of anesthesia was chosen by anesthetist according to age and comorbidity of patients.

- **Conventional group:** Ten patients (66.7%) received spinal anesthesia and five patients (33.3%) received general anesthesia.
- **In MIS group:** Three patients received spinal anesthesia and twelve patients received combined epidural & general anesthesia.
- There was significant difference between two groups as regard type of anesthesia with [p. value < 0.001].

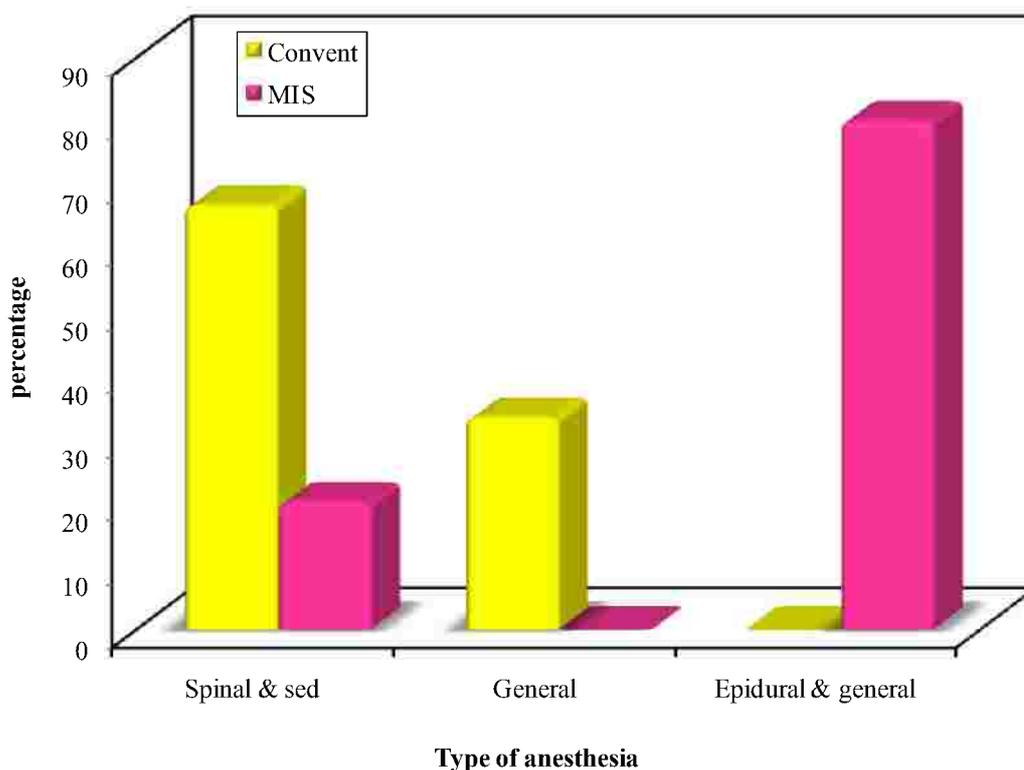
**Table (XIV): Comparison between the two studied groups according to type of anesthesia**

| Type of anesthesia | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | MC p    |
|--------------------|---------------------|------|-----------------|------|----------|---------|
|                    | No.                 | %    | No.             | %    |          |         |
| Spinal & sed       | 10                  | 66.7 | 3               | 20.0 | 22.246*  | <0.001* |
| General            | 5                   | 33.3 | 0               | 0.0  |          |         |
| Epidural & general | 0                   | 0.0  | 12              | 80.0 |          |         |

$\chi^2$ : Value for Chi square

MC: Monte Carlo test

\*: Statistically significant at p ≤ 0.05



**Fig. (63): Comparison between the two studied groups according to type of anesthesia**

**4- Blood transfusion: (Table XV Figure 64)**

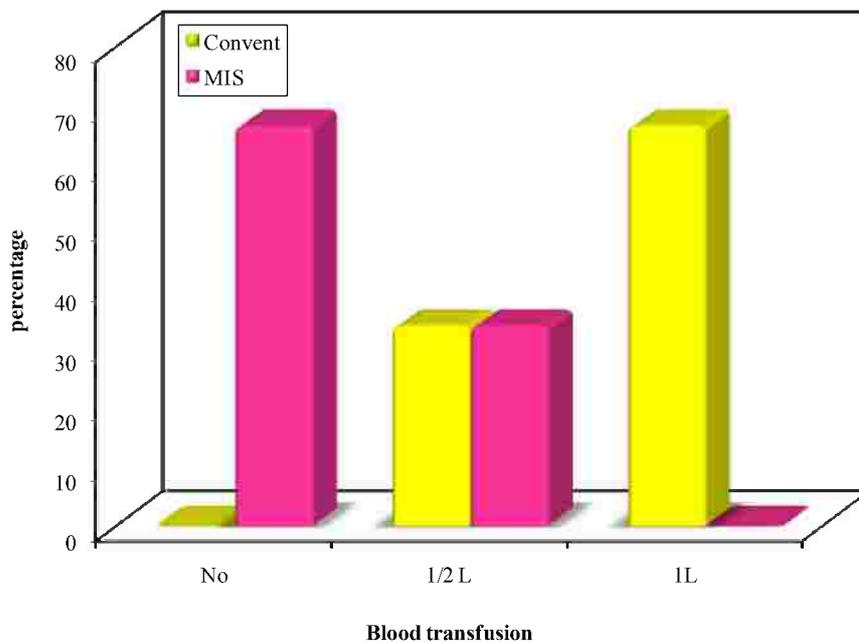
- **Conventional group:** Five patients [33.3%] received one unit of packed RBCS & ten patients [66.7%] received two unit of packed RBCS.
- **MIS group:** Ten patients did not received any blood & five patients received one unit of packed RBCS.
- There was significant difference between the two groups as regard blood transfusion [p. value < 0.001].

**Table (XV): Comparison between the two studied groups according to blood transfusion**

| Blood transfusion | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | p       |
|-------------------|---------------------|------|-----------------|------|----------|---------|
|                   | No.                 | %    | No.             | %    |          |         |
| No                | 0                   | 0.0  | 10              | 66.7 | 22.251*  | <0.001* |
| 1 unit            | 5                   | 33.3 | 5               | 33.3 |          |         |
| 2 unit            | 10                  | 66.7 | 0               | 0.0  |          |         |

$\chi^2$ : Value for Chi square test

\*: Statistically significant at  $p \leq 0.05$



**Fig. (64):** Comparison between the two studied groups according to the blood transfusion

**5- Hospital stay: (Table XVI and Figure 65)**

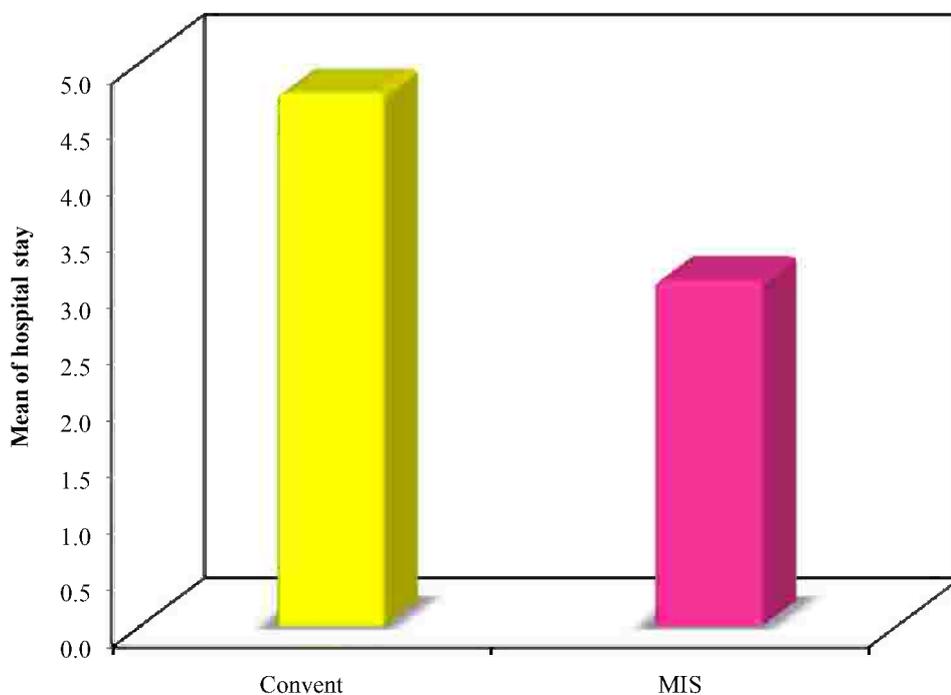
- **Conventional group:** The duration of hospital stay ranged from three to seven days [average four days].
- **MIS group:** The duration of hospital stay ranged from two to five days [average three days].
- There was significant difference between two groups [p. value 0.001].

**Table (XVI): Comparison between the two studied groups according to hospital stay**

| Hospital stay | Convent<br>( n = 15) | MIS<br>( n = 15) | t      | p      |
|---------------|----------------------|------------------|--------|--------|
| Min. – Max.   | 3.0 - 7.0            | 2.0 – 5.0        |        |        |
| Mean ± SD     | 4.73 ± 1.28          | 3.07 ± 1.10      | 3.825* | 0.001* |
| Median        | 4.0                  | 3.0              |        |        |

t: Student t-test

\*: Statistically significant at  $p \leq 0.05$



**Fig. (65): Comparison between the two studied groups according to hospital stay**

**B- The clinical results:**

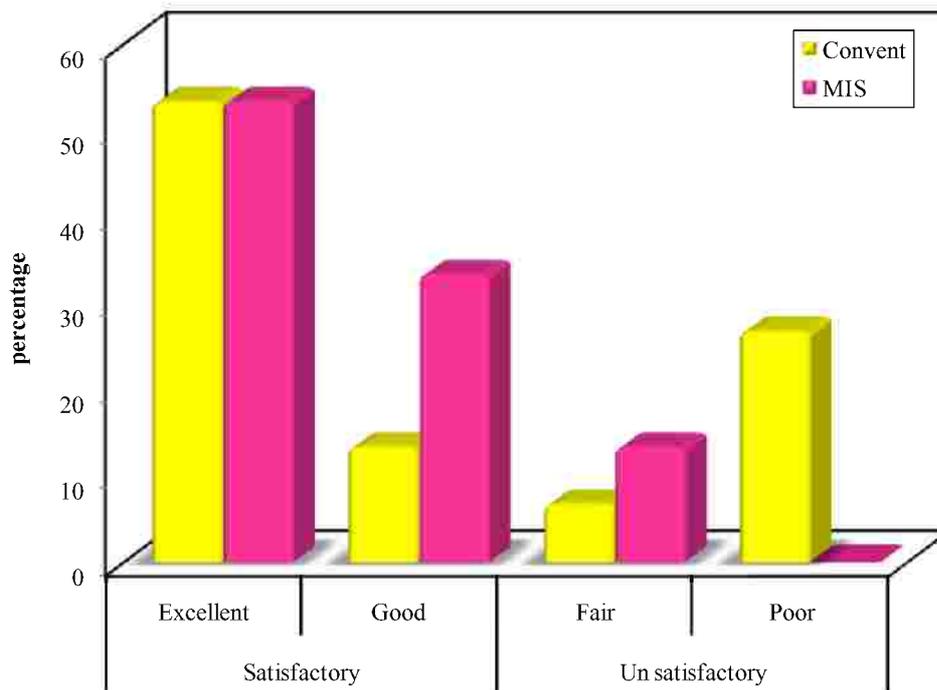
**Overall results: (Table XVII and Figure 66)**

- **Conventional group:** The final harris hip score was ranged from 38 to 100 with mean of 83.27. The number of patients with satisfactory results were ten[66.7%] & number of patients with unsatisfactory results were five[33.3%].
- **MIS group:** The final harris hip score ranged from 78 to 100 with mean 90.60. The number of patients with satisfactory results 13[86.7%] & patients with unsatisfactory results 2[13.3%].
- There was no significant difference between the two groups as regard harris hip score with (p value 0.390)

**Table (XVII): Comparison between the two studied groups according to harris hip score**

| Harris hip score       | Convent<br>(n = 15) |             | MIS<br>(n = 15) |             |
|------------------------|---------------------|-------------|-----------------|-------------|
|                        | No.                 | %           | No.             | %           |
| <b>Satisfactory</b>    | <b>10</b>           | <b>66.7</b> | <b>13</b>       | <b>86.7</b> |
| Excellent              | 8                   | 53.3        | 8               | 53.3        |
| Good                   | 2                   | 13.3        | 5               | 33.3        |
| <b>Un satisfactory</b> | <b>5</b>            | <b>33.3</b> | <b>2</b>        | <b>13.3</b> |
| Fair                   | 1                   | 6.7         | 2               | 13.3        |
| Poor                   | 4                   | 26.7        | 0               | 0.0         |
| $\chi^2$ (FE p)        | 1.677 (0.390)       |             |                 |             |

$\chi^2$ : Chi square test  
FE: Fisher Exact test



**Fig. (66): Comparison between the two studied groups according to harris hip score**

**Analysis of results:**

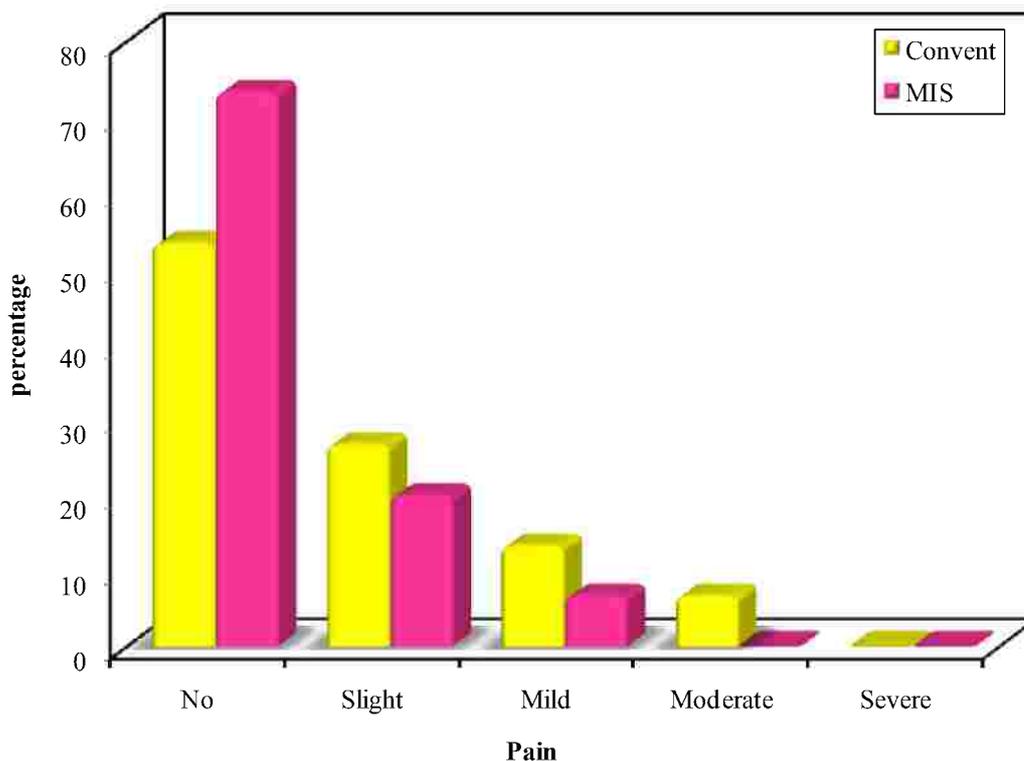
**Pain: (Table XVIII and Figure 67)**

- **Conventional group:** At the end of follow up eight patients [53.3%] had no pain, four patients [26.7%] had slight pain that did not compromise their activity, 2 patients [13.3%] had mild pain not affect their average activities, one patient [6.7%] had moderate pain that caused some limitation of activity. No patients complained from severe pain or was totally disabled.
- **In MIS group:** At end of follow up 11 patients [73.3%] had no pain, three patients [20%] had slight pain did not compromise their activity, one patient [6.7%] had mild pain not affecting their average activities no patients complain from moderate or sever pain.

**Table (XVIII): Comparison between the two studied groups according to pain**

| Pain     | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | Z     | p     |
|----------|---------------------|------|-----------------|------|-------|-------|
|          | No.                 | %    | No.             | %    |       |       |
| No       | 8                   | 53.3 | 11              | 73.3 | 1.235 | 0.217 |
| Slight   | 4                   | 26.7 | 3               | 20.0 |       |       |
| Mild     | 2                   | 13.3 | 1               | 6.7  |       |       |
| Moderate | 1                   | 6.7  | 0               | 0.0  |       |       |
| Severe   | 0                   | 0.0  | 0               | 0.0  |       |       |

Z: Z for Mann Whitney test



**Fig. (67): Comparison between the two studied groups according to pain**

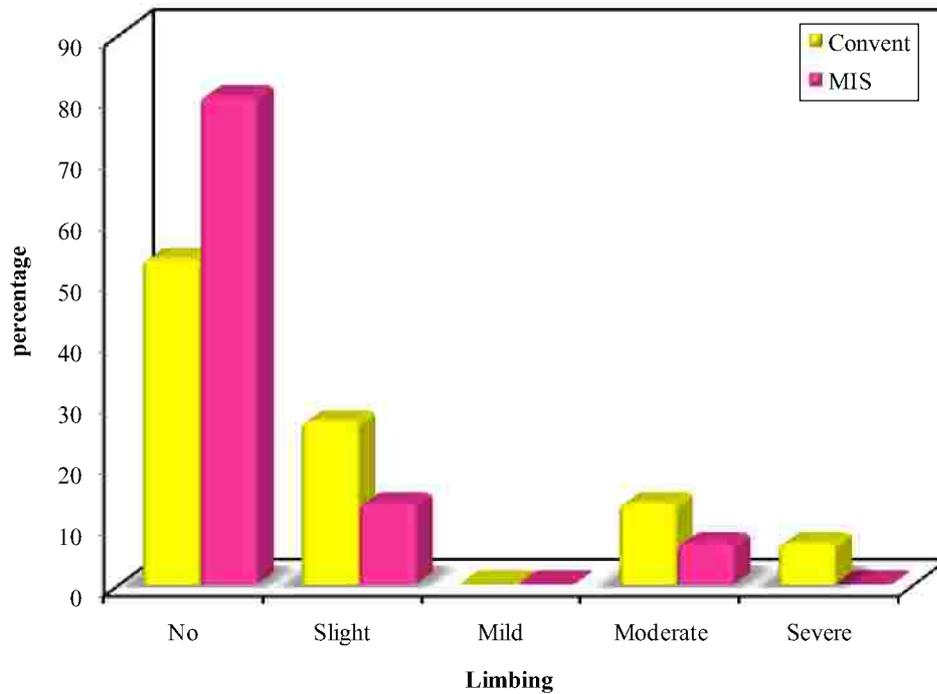
**Limping: (Table XIX and Figure 68)**

- **Conventional group:** At the end of follow up eight patients [53.3%] had no limping, nine patients [26.7%] had slight limping, two patients [13.35%] had Moderate limping & one patient [6.7%] had sever limping.
- **MIS group:** At the end of follow up 12 patients [80%] had no limping, two patients [13.3%] had slight limping & one Patient [6.7%] had moderate limping.

**Table (XIX): Comparison between the two studied groups according to limbing**

| Limping  | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | Z     | p     |
|----------|---------------------|------|-----------------|------|-------|-------|
|          | No.                 | %    | No.             | %    |       |       |
| No       | 8                   | 53.3 | 12              | 80.0 | 1.567 | 0.117 |
| Slight   | 4                   | 26.7 | 2               | 13.3 |       |       |
| Mild     | 0                   | 0.0  | 0               | 0.0  |       |       |
| Moderate | 2                   | 13.3 | 1               | 6.7  |       |       |
| Severe   | 1                   | 6.7  | 0               | 0.0  |       |       |

Z: Z for Mann Whitney test



**Fig. (68): Comparison between the two studied groups according to limbing**

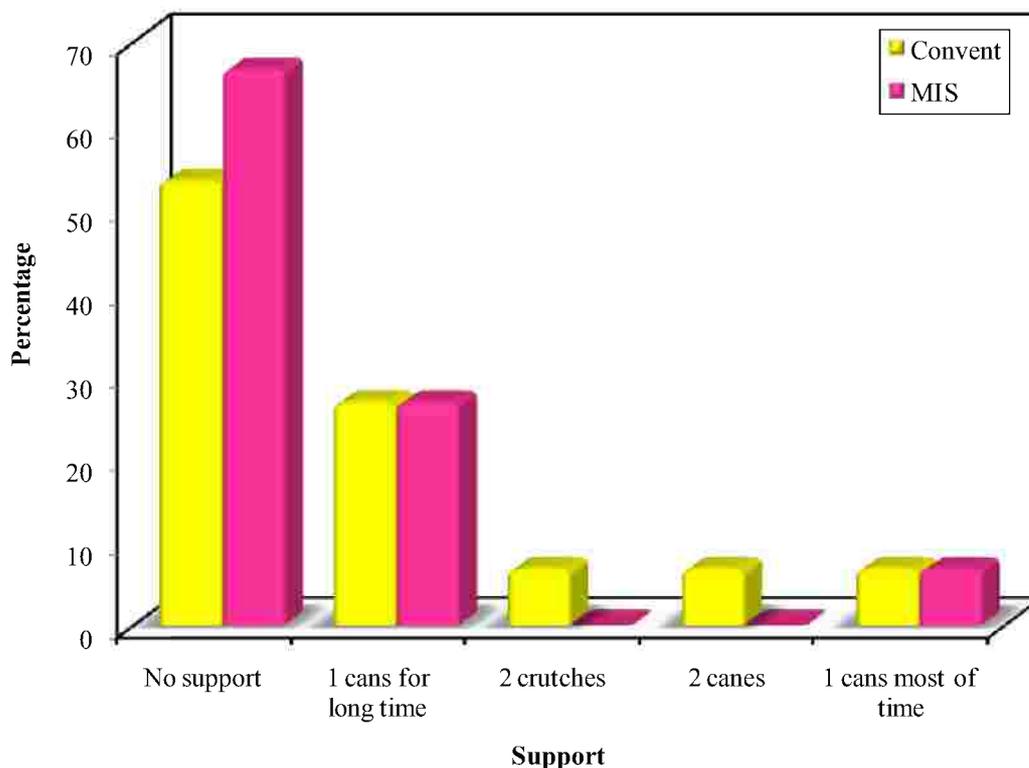
**Support: (Table XX and Figure 69)**

- **Conventional group:** eight patients [53.3%] could walk without support, four patients [26.7%] Used one cane for long time, one patients [6.7] used cane most of time & one patient [6.7%] used two cane& one patients [6.7] used two crutches.
- **MIS group:** ten patients [66.7%] could walk without support, four patients [26.7%] used one cane for long time and one patients [6.7%] used one cane most of time.

**Table (XX): Comparison between the two studied groups according to support**

| Support              | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | MC p  |
|----------------------|---------------------|------|-----------------|------|----------|-------|
|                      | No.                 | %    | No.             | %    |          |       |
| No support           | 8                   | 53.3 | 10              | 66.7 | 2.395    | 0.913 |
| 1 cans for long time | 4                   | 26.7 | 4               | 26.7 |          |       |
| 1 cans most of time  | 1                   | 6.7  | 1               | 6.7  |          |       |
| 2 canes              | 1                   | 6.7  | 0               | 0.0  |          |       |
| 2 crutches           | 1                   | 6.7  | 0               | 0.0  |          |       |

$\chi^2$ : Value for Chi square  
MC: Monte Carlo test



**Fig. (69): Comparison between the two studied groups according to support**

**Walking distance: (Table XXI and Figure 70)**

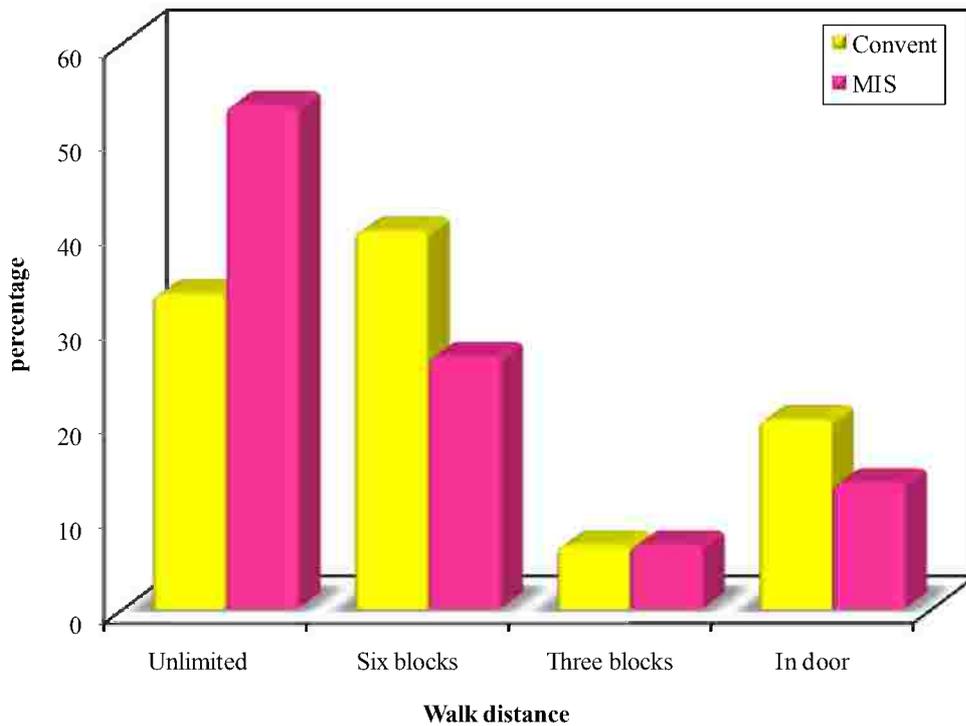
**Conventional group:** Five patients [33.3%] could walk unlimited distance, six patients [6.7%] could walk up to six blocks, one patient (6.7%) could walk up to three blocks and three patients [20%] could walk indoors only and no one bed ridden.

- **MIS group:** Eight patients [53.3%] could walk unlimited distance, four patients [26.7%] could walk up to six blocks, one patient [6.7%] could walk up to three blocks, and two patients 13.3% could walk indoors only and no one bed ridden.

**Table (XXI): Comparison between the two studied groups according to walk distance**

| Walk distance | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | Test of sig.     | p            |
|---------------|---------------------|------|-----------------|------|------------------|--------------|
|               | No.                 | %    | No.             | %    |                  |              |
| Unlimited     | 5                   | 33.3 | 8               | 53.3 | $\chi^2 = 1.590$ | MC p = 0.797 |
| Six blocks    | 6                   | 40.0 | 4               | 26.7 |                  |              |
| Three blocks  | 1                   | 6.7  | 1               | 6.7  |                  |              |
| In door       | 3                   | 20.0 | 2               | 13.3 |                  |              |

p: p value for comparing between the two studied groups  
 $\chi^2$ : Value for Chi square  
 MC: Monte Carlo test



**Fig. (70): Comparison between the two studied groups according to walk distance**

## Results

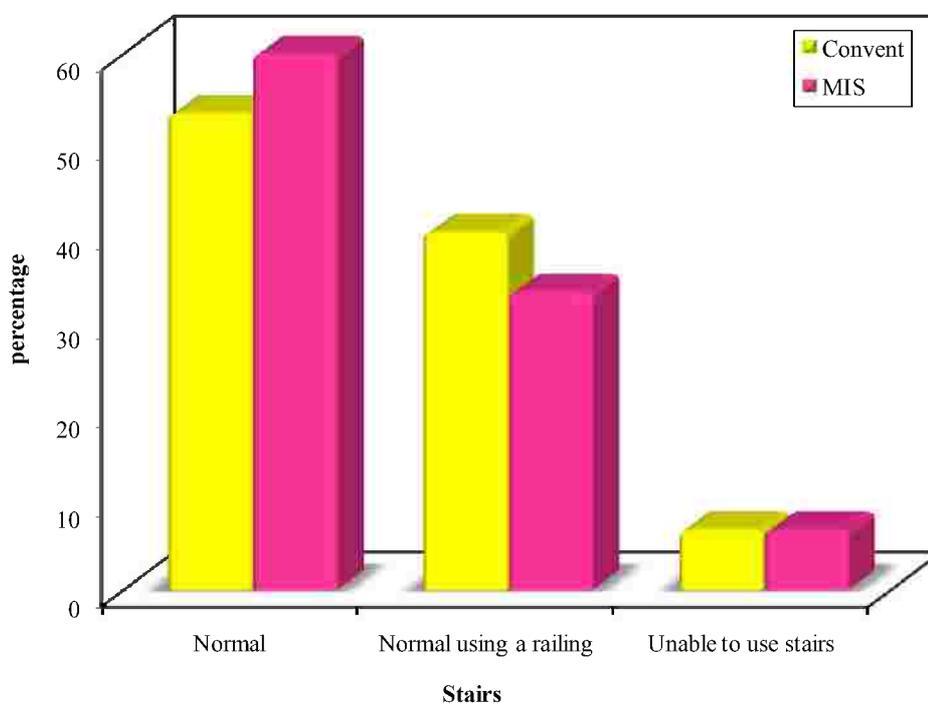
### Stairs: (Table XXII and Figure 71)

- **Conventional group:** Eight patients [53.3] could climb stairs normally, six patients [40%] used railing and one patient [6.7%] unable to climb stairs.
- **MIS group:** Nine patients [60%] could climb stairs normally, five patients [33.3%] used railing and one patient [6.7%] unable to climb stairs.

**Table (XXII): Comparison between the two studied groups according to stairs**

| Stairs                 | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | FE p  |
|------------------------|---------------------|------|-----------------|------|----------|-------|
|                        | No.                 | %    | No.             | %    |          |       |
| Normal                 | 8                   | 53.3 | 9               | 60.0 | 0.438    | 1.000 |
| Normal using a railing | 6                   | 40.0 | 5               | 33.3 |          |       |
| Unable to use stairs   | 1                   | 6.7  | 1               | 6.7  |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test



**Fig. (71): Comparison between the two studied groups according to stairs**

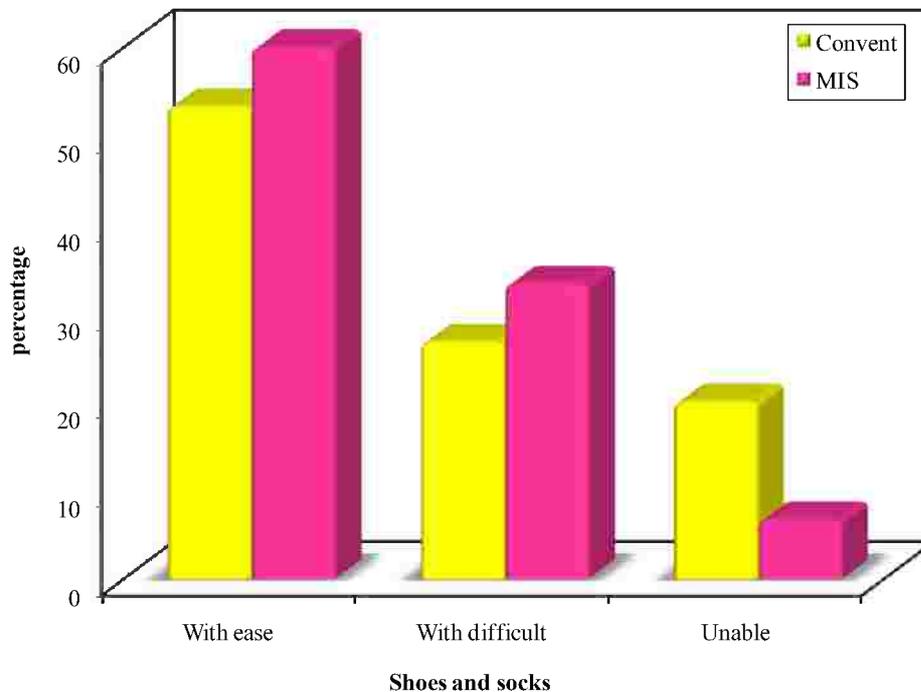
**Shoes & socks : (Table XXIII and Figure 72)**

- **Conventional group:** Eight patients [53.3%] could tie shoes with ease, four patients [26.7%] with difficulty and three patients [20%] were unable to tie shoes & socks.
- **MIS Group:** Nine patients [60%] could tie shoes with ease, five patient [33.3%] with difficulty and one patient (6.7) unable to tie shoes & socks.

**Table (XXIII): Comparison between the two studied groups according to shoes and socks**

| Shoes and socks | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | FE p  |
|-----------------|----------------------|------|------------------|------|----------|-------|
|                 | No.                  | %    | No.              | %    |          |       |
| With ease       | 8                    | 53.3 | 9                | 60.0 | 1.158    | 0.764 |
| With difficult  | 4                    | 26.7 | 5                | 33.3 |          |       |
| Unable          | 3                    | 20.0 | 1                | 6.7  |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test



**Fig. (72): Comparison between the two studied groups according to shoes and socks**

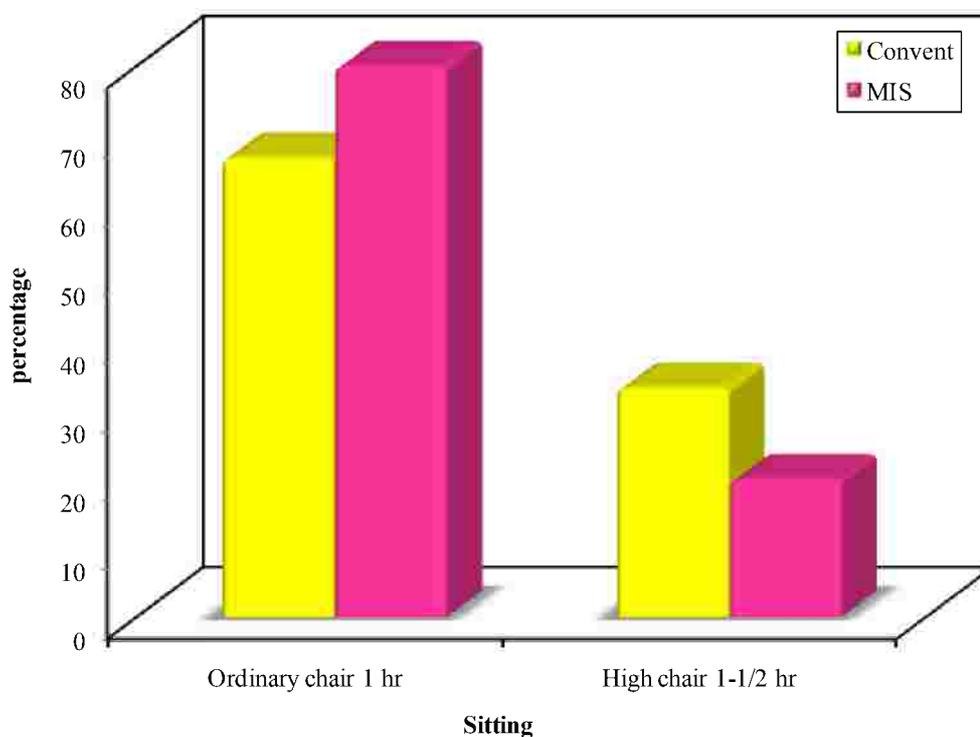
**Sitting on chair : (Table XXIV and Figure 73)**

- **Conventional group:** Ten patients were able to sit comfortably on a chair for one hour or more and five patients [33.3%] were able to sit on high chair for less than one hour.
- **MIS group:** Twelve patient [80%] were able to sit comfortably on chair for one hour or more and three patient [20%] were able to sit on high chair for less than one hour.

**Table (XXIV): Comparison between the two studied groups according to sitting on chair**

| Sitting             | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | FE p  |
|---------------------|----------------------|------|------------------|------|----------|-------|
|                     | No.                  | %    | No.              | %    |          |       |
| Ordinary chair 1 hr | 10                   | 66.7 | 12               | 80.0 | 0.682    | 0.682 |
| High chair 1-1/2 hr | 5                    | 33.3 | 3                | 20.0 |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test



**Fig. (73): Comparison between the two studied groups according to sitting**

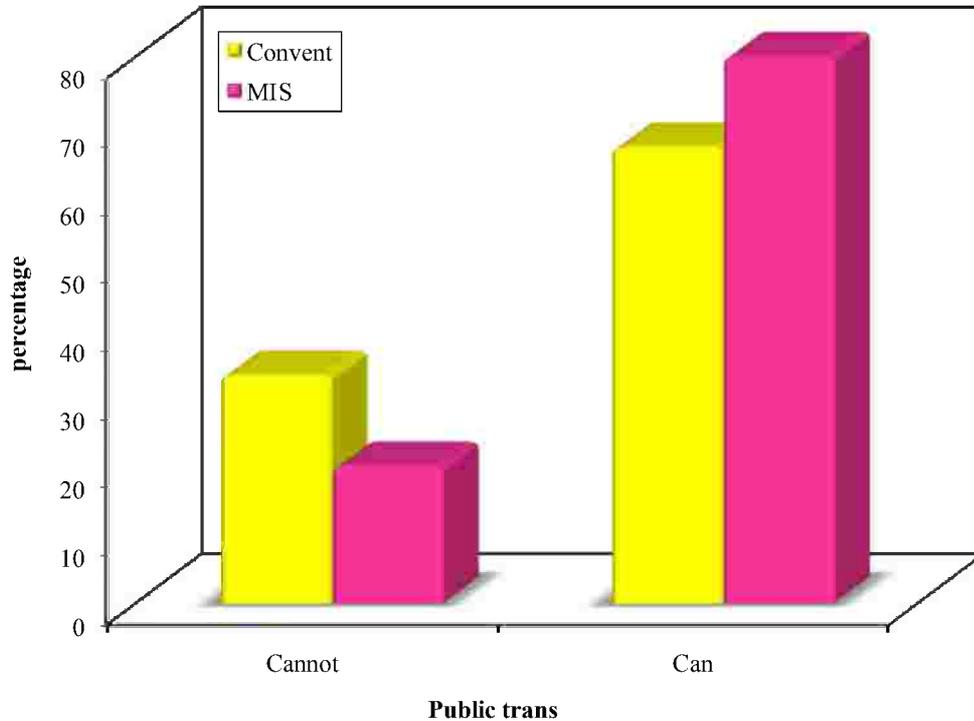
**Public transportation: (Table XXV and Figure 74)**

- **Conventional group:** Ten patients [66.7%] were able to use Public transportation and five patients [33.3%] unable to use public transportation.
- **MIS group:** Twelve patients [80%] were able to use Public transportation and three patients [20%] Unable to use public transportation.

**Table (XXV): Comparison between the two studied groups according to public transportation**

| Public trans | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | FE p  |
|--------------|---------------------|------|-----------------|------|----------|-------|
|              | No.                 | %    | No.             | %    |          |       |
| Can          | 10                  | 66.7 | 12              | 80.0 | 0.682    | 0.682 |
| Cannot       | 5                   | 33.3 | 3               | 20.0 |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test



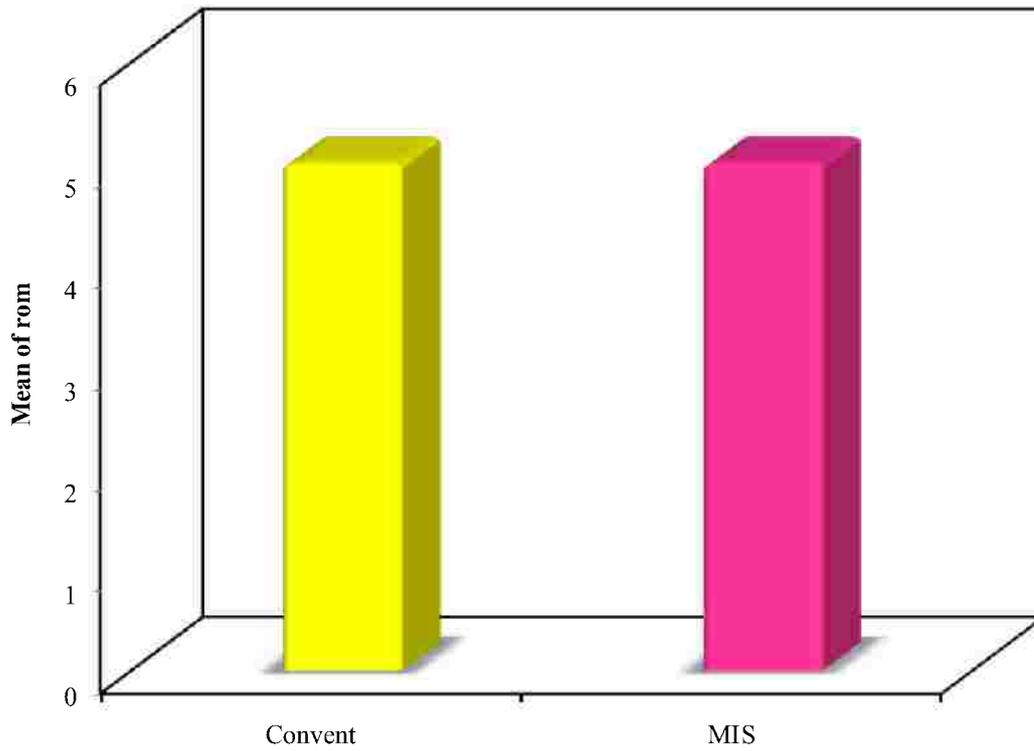
**Fig. (74):** Comparison between the two studied groups according to public transportation

**Deformity:**

No patients presented with any deformity in both groups.

**Range of Motion: (Figure 75)**

All patients in two groups attained range of motion score of 5 [flexion + abduction + adduction + external rotation + internal rotation=211-300].



**Fig. (75):** Comparison between the two studied groups according to Range of Motion

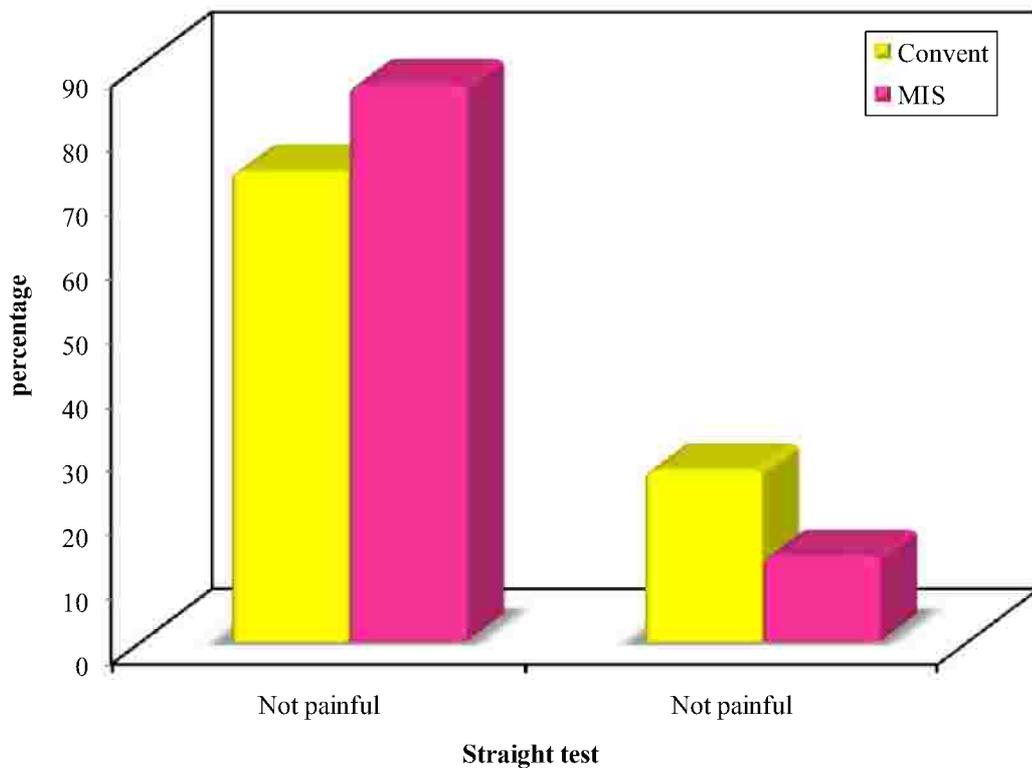
**Straight leg raising test: (Table XXVI and Figure 76)**

- **Conventional group:** Straight leg raising was not painful in eleven patients [73.3%] & painful in four patients [26.7%].
- **MIS group:** Straight leg raising was not painful in 13 patients [86.7%] & painful in two patients [13.3%].

**Table (XXVI): Comparison between the two studied groups according to straight test**

| Straight test | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | FE p  |
|---------------|----------------------|------|------------------|------|----------|-------|
|               | No.                  | %    | No.              | %    |          |       |
| Not painful   | 11                   | 73.3 | 13               | 86.7 | 0.833    | 0.651 |
| Painful       | 4                    | 26.7 | 2                | 13.3 |          |       |

$\chi^2$ : Value for Chi square  
FE: Fisher Exact test



**Fig. (76): Comparison between the two studied groups according to straight test**

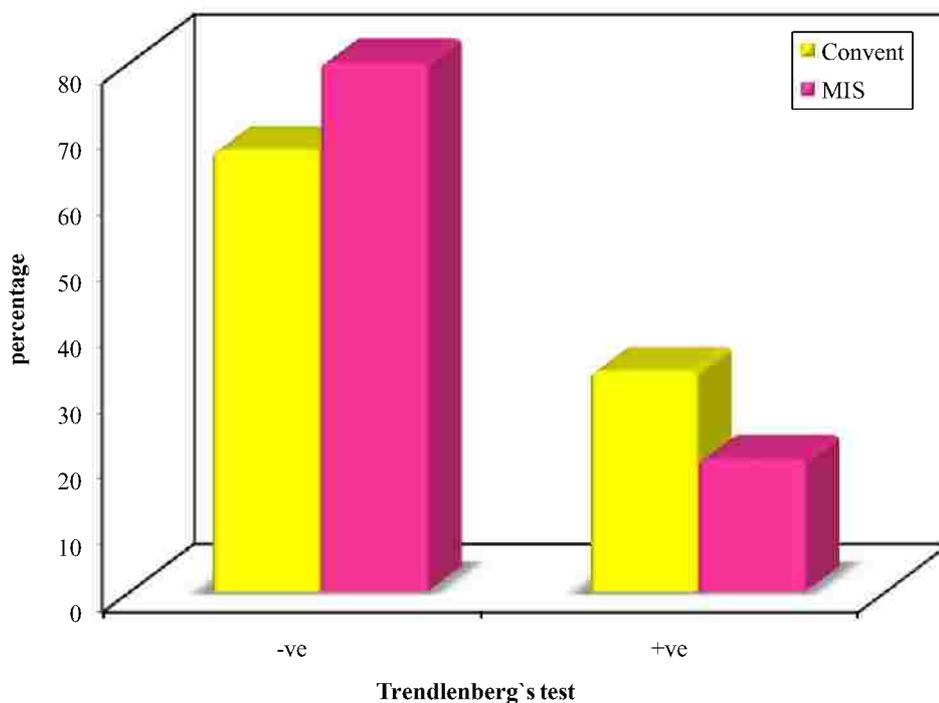
**Trendlenberg`s test: (Table XXVII and Figure 77)**

- **Conventional group:** Ten patients [66.7%] had no trendlenberg gait & trendlenberg test was negative the remaining five patients [33.3%] had positive trendlenberg test.
- **MIS group:** Twelve patients [80%] had no trendlenberg gait & trendlenberg test was negative the remaining three patients 20% had positive trendlenberg test.

**Table (XXVII): Comparison between the two studied groups according to trendlenberg`s test**

| Trendlenberg`s test | Convent<br>( n = 15) |      | MIS<br>( n = 15) |      | $\chi^2$ | FE p  |
|---------------------|----------------------|------|------------------|------|----------|-------|
|                     | No.                  | %    | No.              | %    |          |       |
| -ve                 | 10                   | 66.7 | 12               | 80.0 | 0.682    | 0.682 |
| +ve                 | 5                    | 33.3 | 3                | 20.0 |          |       |

$\chi^2$ : Chi square test  
FE: Fisher Exact test



**Fig. (77):** Comparison between the two studied groups according to trendlenberg`s test

## **C- Radiological results:**

### **1- Dislocation:**

- Conventional group : only one case had sustained one attack of dislocation. It was posterior dislocation.
- MIS group: No patient had dislocation.

### **2- Acetabular erosion:**

- No acetabular erosion in two groups.

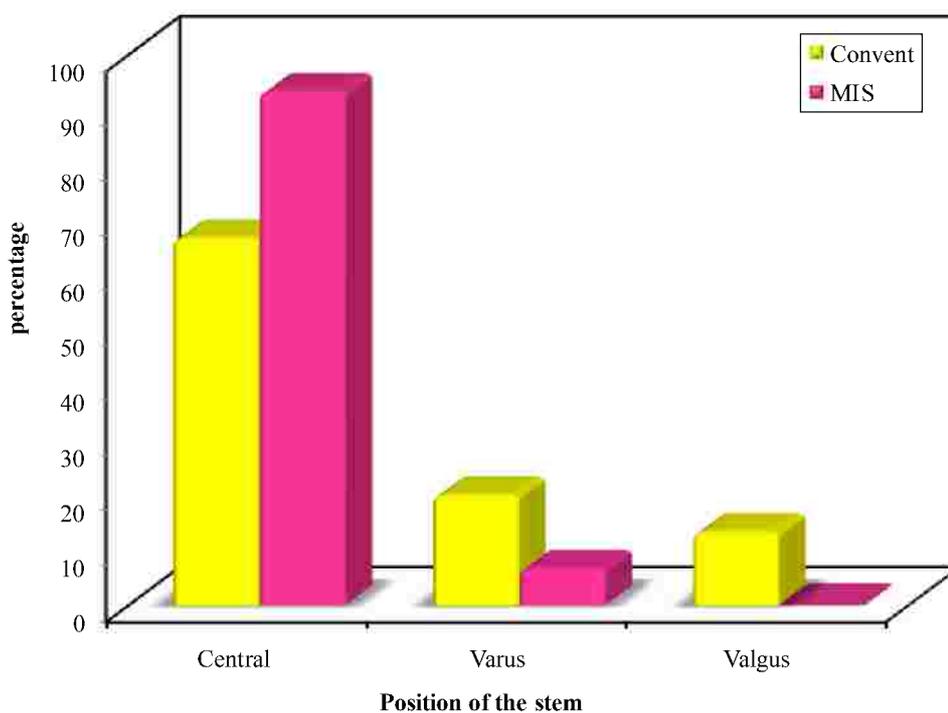
### **3- Position of stem: (Table XXVIII and Figure 78)**

- **Conventional group:** The femoral stem was central in ten patient [66.7%], in varus alignment in three patients [20%] and in Valgus alignment in two patient [13.3%].
- **MIS group:** The femoral stem was central in 14 patients [93.3%] & in varus alignment in only one patient [6.7%].

**Table (XXVIII): Comparison between the two studied groups according to position of the stem**

| Position of the stem | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | MC <sub>p</sub> |
|----------------------|---------------------|------|-----------------|------|----------|-----------------|
|                      | No.                 | %    | No.             | %    |          |                 |
| Central              | 10                  | 66.7 | 14              | 93.3 | 3.667    | 0.200           |
| Varus                | 3                   | 20.0 | 1               | 6.7  |          |                 |
| Valgus               | 2                   | 13.3 | 0               | 0.0  |          |                 |

$\chi^2$ : Chi square test  
MC: Monte Carlo test



**Fig. (78):** Comparison between the two studied groups according to position of the stem

**4- Cement mantle assessment: (Table XXIX and Figure 79)**

- **Conventional group:** Five patients [33.3%] had grade A with complete filling of medullary cavity by cement, eight patients [53.3%] had grade B with slight radiolucency of the cement-bone inter face, one patient [6.7%] had grade C with radiolucency involving 50% to 99% of cement-bone inter face, and one patient [6.7%] had grade D with radiolucency at the cement interface of 100% in any projection.
- **MIS group:** 13 patients had graded A & one patient grade B & one patient grade C & no patient grade D.

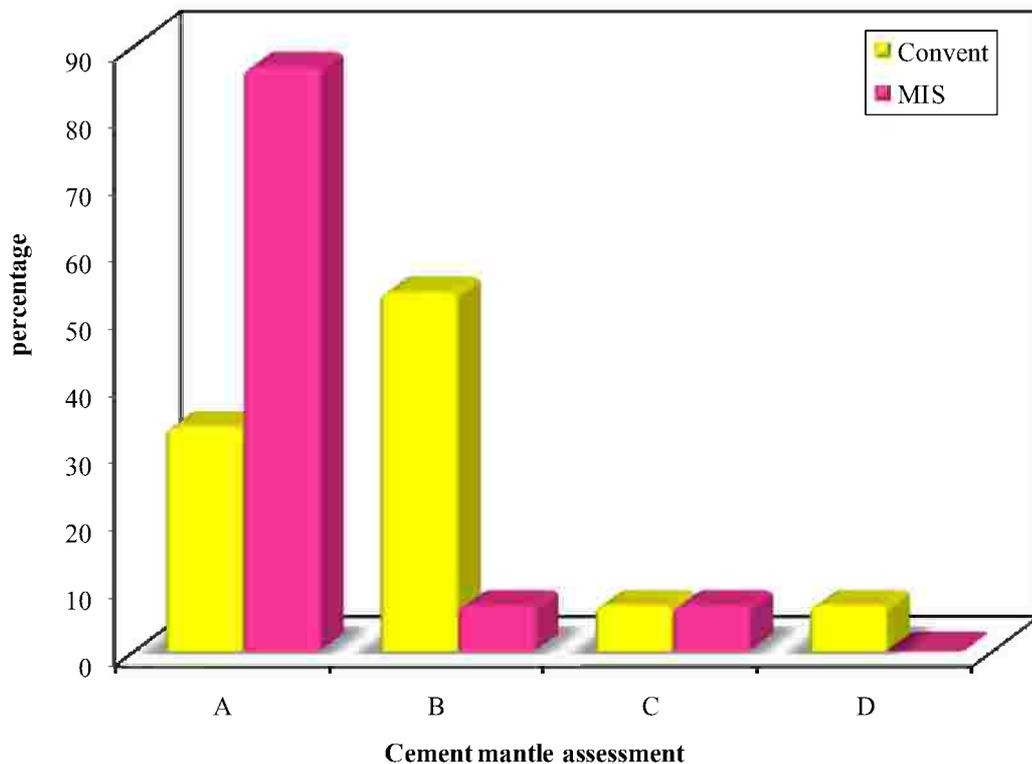
**Table (XXIX): Comparison between the two studied groups according to cement mantle assessment**

| Cement mantle assessment | Convent<br>(n = 15) |      | MIS<br>(n = 15) |      | $\chi^2$ | MC p   |
|--------------------------|---------------------|------|-----------------|------|----------|--------|
|                          | No.                 | %    | No.             | %    |          |        |
| A                        | 5                   | 33.3 | 13              | 86.7 | 10.000*  | 0.005* |
| B                        | 8                   | 53.3 | 1               | 6.7  |          |        |
| C                        | 1                   | 6.7  | 1               | 6.7  |          |        |
| D                        | 1                   | 6.7  | 0               | 0.0  |          |        |

$\chi^2$ : Chi square test

MC: Monte Carlo test

\*: Statistically significant at  $p \leq 0.05$



**Fig. (79):** Comparison between the two studied groups according to cement mantle assessment

**Postoperative complication:**

- **In conventional group:** Four patients [26.7%] had complication such:
  - One patient had sciatic nerve palsy was recovered after six month.
  - One patient had early infection after 3 weeks of operative which was diagnosed by pain in groin with erythema, and dehiscence of wound margins and seropurulent discharge. This patient was treated by debridement & component retention because the prosthesis was fixed & the culture showed infection with staphylococcus aureus which sensitive to augmentin antibiotic and subsided.
  - One patient sustained one attack of posterior dislocation after 2 weeks of the operative which results from slippage of the patient while walking. This dislocation treated by closed reduction & skin traction for 3 weeks. The prosthesis was stable & patient returned to usual daily activities.
  - One patient had post operative DVT affecting the calf veins which was diagnosed by Doppler u/s. The patient was treated by anticoagulation & limb elevation & condition was controlled.
  
- **In MIS group:** Two patients [13.3%] had complication such as:
  - One patient had sciatic nerve palsy was recovered after 5 month
  - One patient had post operative DVT affecting the calf vein which was diagnosed by Doppler u/s. The patient treated by anticoagulation & condition was controlled.

## **Case presentation**

### **A- In conventional group**

#### **case1:**

Female patient aged 72 years old, housewife, complain from fracture neck of femur of the right side confirmed by x-ray, her weight 90 kg, height 170cm she was controlled diabetic and hypertension planed for conventional posterior approach of bipolar hemiarthroplasty.

#### **Operative date**

Incision length was 22 cm, operative time 120 min, type of anesthesia was spinal, she recived two unit of packed RBCS.

Hospital Stay was five days.

Postoperative harris hip score was 90. There were no complication



**(a)Pre-operative**



**(b): Post-operative**



**(c): Post-operative skin incision**

**Figure (80): Conventional group case no. 1 (a): Pre-operative x-ray (b): Post-operative x-ray (c): Post-operative skin incision**

**Case 2**

Male patient aged 67 years old, farmer, complain from fracture neck of femur of left side. his weight 95kg and his height 178cm with no medical history.

**Operative date**

Incision lengthh was 20 cm, time of oprative was 100 min spinal anathesia his received one unit packed RBCS intraopratively

Hospital stay was 4 days

Postoprative harris hip score was 92

There were no compication

with good satisfaction



**(a): Pre-operative**



**(b): Post-operative AP view**



**(c): post operative latral view**

**Figure (81): Conventional group case no. 2 (a): Pre-operative x-ray (b): Post-operative x-ray Ap view (c): Post-operative latral view**

**B- MIS group**

**Case 1**

Female patient 70 years old housewife fall while walking by xray she had fracture neck of femur of left side her weight was 82 , hight was 173 cm with controlled hypertension

**Operative date**

Incision length was 9 cm time of operation was 50 min general and epidural anesthesia not received any packed RBCS

Hospital stay 3 day

Pos operative harris hip score was 100

There were no complication and with excellent satisfactory



**(a): Pre-operative**



**(b): Post-operative AP view**



**(c): post operative latral view**



**(d): Post-operative skin incision**

**Figure (82): MIS group case no. 1 (a): Pre-operative x-ray (b): Post-operative x-ray AP view (c): Post-operative lateral view (d): Post-operative skin incision**

## **Results**

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### **Case 2**

Male patient aged 72 years old, work in office,complain from fracture neck of femur of left side confirmed by x-ray .his weight 90kg, height 182cm with controlled diabetic.

### **Oprative date**

Incision length was 10 cm, time of oprative was 45 min general and epidural anasthesia her not received any packed RBCS interaopratively

Hospital stay was 3 days

Postoprative harris hip score was 95

There were no compication

with good satisfaction



**(a): Pre-operative**



**(b): Post-operative AP view**



**(c): post operative latral view**

**Figure (83): MIS group case no. 1 (a): Pre-operative x-ray (b): Post-operative x-ray AP view (c): Post-operative latral view**