RESULTS

The clinical results in this study were evaluated according to the Harris hip score. Evaluation of radiological results includes assessment of both the femoral and acetabular components.

I-Clinical results:

Harris hip score:

Harris hip score is a comprehensive, widely accepted scoring system that was used for clinical evaluation of patients, pre and postoperatively at 6 weeks, 6 and 12 months, and yearly there after till the last follow up. The score is considered ***excellent*** if it is ***between 90-100***, ***good if between 80-90***, ***fair if between 70-80***, while ***scores below 70 are considered poor. (Harris, 1969)***

The preoperative Harris hip score (HHS) ranged from ***25 to 48*** with a mean of ***37.6,*** The postoperative HHS in the last follow up ranged from ***72 to 95*** with a mean of ***91.8***

Pre-op HHS		last follow up HHS		p-value
Mean	SD	Mean	SD	
37. 6	10.47	91.8	14.5	0.001*

Table (XX) Comparison between pre and post operative HHS in the last follow up:

There was highly significant difference between preoperative HHS and postoperative HHS in the last follow up (p-value =0.001, t=-22.7). It was found also that there was statistically significant difference between preoperative HHS and postoperative HHS after 6 weeks (p-value =0.0001, t=-15.6), between HHS at 6 weeks and HHS at 6 months (p-value =0.0001, t=-16.1). However there was no statistically significant difference between the postoperative HHS at 12 months and the last postoperative HHS (p-value =0.7, t=-0.3).

	Pre-op	6weeks	6weeks	6 months	12 months	Last Follow up
	37. 6	76.2	76.2	87.4	89.8	91.8
p-value	0.0001*		0.0001*		0.7	

*Significant

Table (XXI) HHS score before the operation and during the follow up

Results of HHS in the last follow up:

Excellent results (HHS≥ 90) were obtained in ***11 out of 20 patients*** representing ***55%*** of the studied group, and ***good results*** (HHS 80- 90) were reported in ***6 patients representing 30%***, ***fair results*** (HHS 70-79) encountered in ***3 patients*** representing ***15 %***, while no patients with poor results (HHS < 70) were reported in the studied population. (Fig 111A) So, ***satisfactory results*** (excellent and good results) were obtained in ***17*** patients representing ***85%*** of the studied group. (Fig 111B)

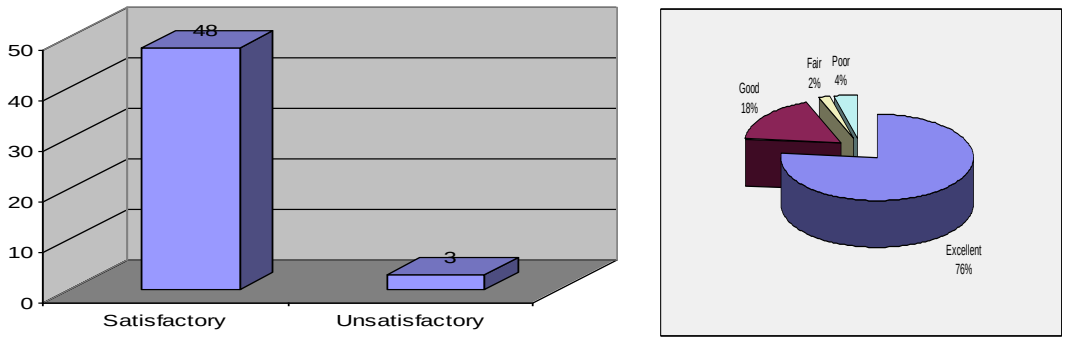


Fig 111 HHS in the last follow up

Individual items in HHS.

I-Limping

By 3 months postoperatively, 9 patients (45 %) could walk without limping, the 11 patients (55 %) with limping varied in degree ranged from mild limping at the start of walking and on prolonged walking, to severe limping that is continuous, at the start and during walking even for a short distance. 5 patients (25 %) with limping were operated through the posterior approach; while the 6 remaining patients were operated through the modified lateral approach.

Table (XXXVII) Limping before the operation and during the follow up

Limping	Preoperative		3 months		Last follow up	
	no	%	no	%	no	%
No limping	-	0 %	9	45%	16	80%
Slight	8	40%	4	20%	2	10%
Moderate	5	25%	4	20%	2	10%
Severe	7	35%	3	15%	0	0%
Total	20	100%	20	100%	20	100%

Limping in cases operated through the posterior approach was due to LLD in 2 cases , in 3 cases limping was due to pain .while Limping in cases operated through the modified lateral approach was due to cutting through the abductor mass. At 1 year follow only one patient in this group was still limping. At the end of the follow up 16 patients (80%) could walk without a limp, 2 patients (10 %) with mild limp and 2 patients (10 %) with moderate limp. (Table XXXVII)

It was found also that there was statistically significant difference between preoperative limping score and postoperative limping score after 6 weeks (p =0.0001, t=7.3), between the score at 6 weeks and at 6 months (p-value =0.0001, t=5.4). also, there was statistically significant difference between the postoperative limping score at 6 months and at 12 months (p =0.3, t=1.0), but there was no statistically between the limp score at 12 months and at the last follow up (p-value =1.0, t=0.0001). (Table XXXVIII and Fig117)

Table (XXXVIII) Limping score before the operation and during the follow up

Mean pre-op. limping score	Pre-op	6 wks	6wks	6 months	12 months	Last Follow up
	3.25	6.0	6.0	8.8	9.4	9.8
p-value	0.0001*		0.0001*		1.0	
		0.0001*		0.3		

*Significant

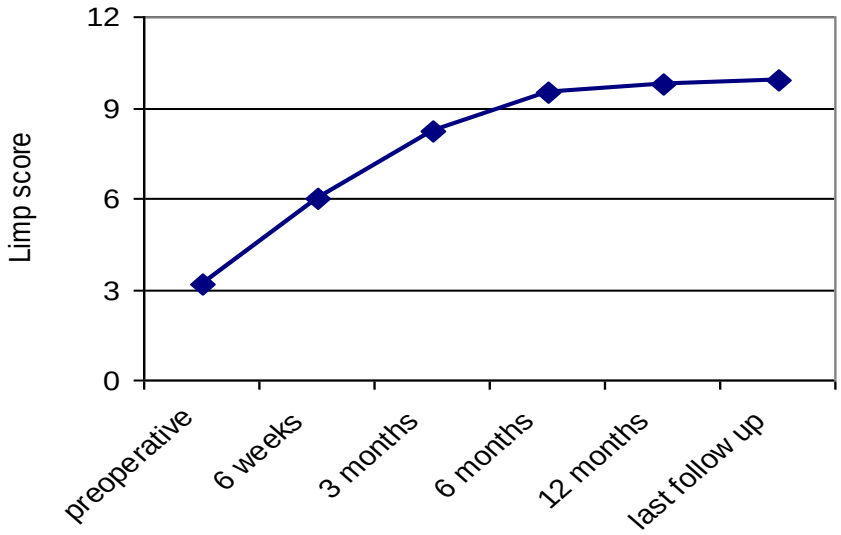


Fig 117 the mean score for limping increased significantly after the operation

II-Walking aids:

All patients with cementless stems were instructed to use walking aids (Two crutches) During the first 6 weeks postoperatively. By 3 months 19 patients (95%) were able to walk unsupported, 1 patient (5%) used a cane only for long walks, at the end of the follow up 20 patients (100%) could walk unsupported. (Table XXXIX)

Table (XXXIX) Walking aids used before the operation and during the follow up

Walking aids	Preoperative		3 months		Last follow up	
	no	%	no	%	n	%
None	15	75 %	19	80 %	20	100%
Cane for long walks	2	10 %	1	5 %	0	0%
Cane most of the time	3	15 %	0	0 %	0	0%
Two crutches	0	0 %	0	0%	0	0%
Total	20	100%	20	100%	20	100%

It was found also that there was statistically significant difference between the mean preoperative walking aids score and the mean postoperative score after 3 months (p =0.0001, t=6.2), the same between 3 and 6 months (p-value =0.0001, t=4.1). However there was no statistically significant difference between the mean postoperative walking aids score at 6 months and at 12 months (p =0.07, t=1.8), and between the mean walking aids score at 12 months and at the last follow up (p-value =0.6, t=0.5). (Table XXXX and Fig 118)

Table (XXXX) Walking aids score before the operation and during the follow up

	Pre-op	3 months	6 months	12 months	Last follow up
	6.2	8.1	9.4	9.8	9.8
p-value	0.0001*		0.07		
		0.0001*		0.6	

*Significant

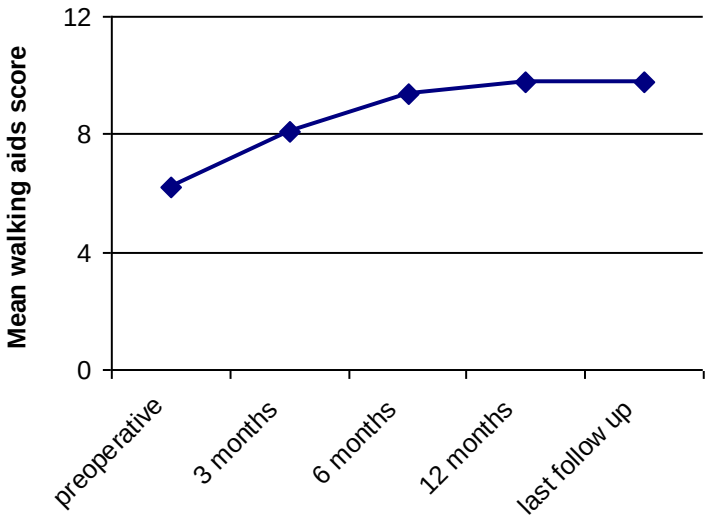


Fig 118 the mean walking aids score before the operation and during the follow up

IV-Stairs

By three months 14 patients (70%) were able to climb stairs normally, 3 patients (15%) used railing, 3 patients (15%) used walking aids,. At the end of the follow up 17 patients (85 %) were able to climb stairs normally while 3 patients (15%) used railing.. (Table XXXXIII)

Table (XXXXIII) the ability to climb stairs preoperatively and during the follow up

Climbing stairs	Preoperative		3 months		Last follow up	
	no	%	no	%	n	%
Normally	-	0 %	14	70%	17	85%
Using railing	7	35%	3	15%	3	15%
Any method	8	40%	3	15%	0	0%
Unable	5	25%	0	0%	0	0%
Total	20	100%	20	100%	20	100%

V-Wearing shoes

Before surgery no patient was able to reach his feet to wear shoes or socks, three months postoperatively 6 patients (30%) were able to do so with ease, 12 patients (60%) with difficulty, while 2 patients (10 %) was unable to reach their feet.

At the end of the follow up 16 patients (80%) were able to wear shoes with ease, 3 patients (15%) with difficulty. While 1 patient (5%) was not able to do so. (Table XXXXV)

Table (XXXXV) ability of the patients to reach their feet preoperatively and during the follow up

Wearing shoes and socks	Preoperative		3 months		Last follow up	
	no	%	no	%	n	%
With ease	-	0 %	6	23.4%	16	80%
With difficulty	5	25%	12	74.5%	3	15%
Not able	15	75%	2	2.1%	1	5%
Total	20	100%	20	100%	20	100%

It was found also that there was statistically significant difference between preoperative wearing shoes score and postoperative score after 3 months (p =0.0001, t=5.2), also there was statistically significant difference between the postoperative wearing shoes score at 3 months and at the last follow up (p-value =0.4, t=2.0). (Table XXXXVI and Fig 121)

VI-Ability to sit

By six months postoperatively, 12 patients (60%) were able to sit on ordinary chair, 8 patients (40%) were able to sit on high chair .At the end of the follow up 18 patients (90%) could sit on any chair, 2 patients (10%) could sit on a high chair (Table XXXXVII)

Table (XXXXVII) ability to sit preoperatively and during the follow up

Ability to sit	Preoperative		6 months		Last follow up	
	no	%	no	%	n	%
Comfortable in ordinary chair	8	40 %	12	60%	18	90 %
High chair	8	40 %	8	40%	2	10 %
Uncomfortable on any chair	4	20 %	0	0%	0	0%
Total	20	100%	20	100%	20	100%

It was found also that there was statistically significant difference between number of patients and ability to sit preoperative and postoperative at 6 months (p =0.007, t=3.3), There was also a statistically significant difference between the postoperative sitting ability score at 6 months and at the last follow up. (Table XXXXVIII and Fig 122)

Range of motion

Range of motion (ROM) accounts for 5 points of HHS.

The preoperative scoring for ROM ranged from 1 to 3.5 with a mean of 3.08 the postoperative scoring for ROM in the last follow up ranged from 3 to 5 with a mean of 4.8. There was statistically significant increase in the range of motion at 6 weeks if compared to the preoperative score (p=0.0001, t=7.9), the difference remain significant between 6 weeks and 6 months postoperatively (p=0.0001, t=4.9),

This difference became insignificant at 6 months if compared to the ROM score at the end of the follow up (p=0.2, t=1.3). (Table XXXXXI and Fig 123)

Table (XXXXXI) Comparison between the mean pre and post operative ROM score:

	Pre-op	6 wks	6 wks	6 months	6 months	Last Follow up
	3.08	4.1	4.1	4.6	4.6	4.8
p-value	0.0001*		0.001*		0.2	
		0.0001*		0.7		

*Significant

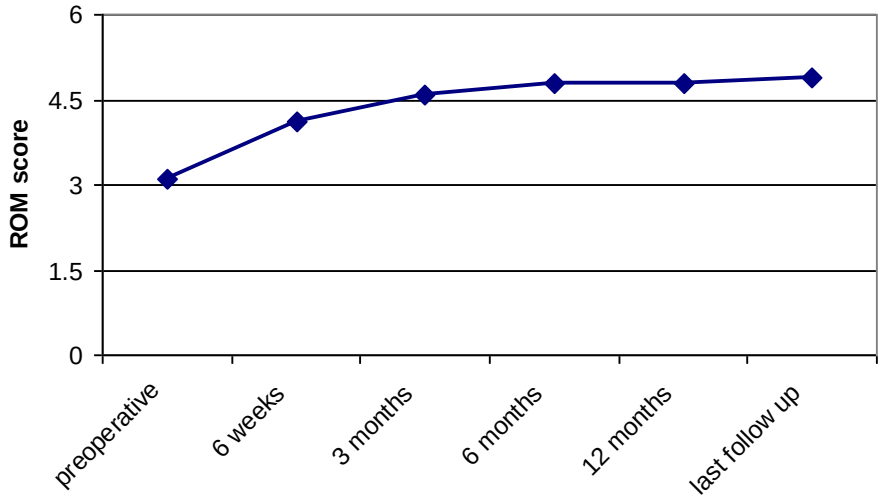


Fig 123 the mean ROM score before surgery and during the follow up. Most of the improvement occurred during the first 6 months after surgery

The maximum, the minimum and the mean postoperative range of motion in the last follow up regarding flexion, abduction, adduction, internal and external rotation are shown in Table XXXXXII.

Table (XXXXXII) the postoperative range of motion in the last follow up

	Minimum ROM	Maximum ROM	Mean ROM
Flexion	35^0	125^0	$93.8^0 \pm 11.7$
Abduction	20^0	60^0	$45.5^0 \pm 6.4$
Adduction	10^0	30^0	$23.7^0 \pm 4.0$
Internal rotation	20^0	40^0	$32.8^0 \pm 4.1$
External rotation	25^0	45^0	$49.1^0 \pm 4.0$

At the end of the follow up, the mean range of flexion was 93.8^0 while preoperatively was 37.9^0, this difference was statistically significant (P=0.0001, t=27.8). The range of abduction increased significantly from 22.35^0preoperatively to 45.5^0 postoperatively (P=0.0001, t=17.8). Also the range of adduction increased significantly from a mean of 11.49^0preoperatively to 23.7^0 postoperatively at the end of the follow up (P=0.0001, t=16.2).

regarding the internal and external rotation movements, both increased significantly postoperatively at the end of the follow up as compared to the preoperative movements; the mean range of internal rotation increased from 8.1^0preoperatively to 32.8^0 postoperatively (P=0.0001, t=26.2), while the mean range of external rotation increased from 20.31^0preoperatively to 49.1^0 postoperatively at the end of the follow up (p=0.0001, t=19.3). (Table XXXXXIII and Fig 124)

Table (XXXXXIII) comparison between the mean ROM preoperatively and at the last follows up

	Flexion		Abduction		Adduction		External rotation		Internal rotation	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre	37.9^0	13.5	22.35^0	11.7	11.49^0	5.7	20.31^0	9.1	8.1^0	6.7
Post	93.8^0	11.7	45.5^0	6.4	23.7^0	4.0	49.1^0	4.0	32.8^0	4.1
p-value	0.0001*		0.0001*		0.0001*		0.0001*		0.0001*	

*Significant

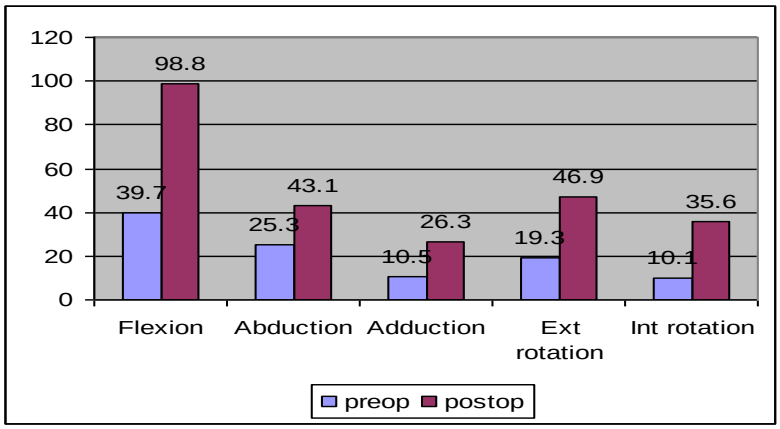


Fig 124 Comparison between the preoperative and the postoperative ROM at the end of the follow up

Limb length discrepancy

Limb length discrepancy was measured in all patients pre and postoperatively and is expressed in cm. Preoperative LLD ranged from 0 to 3 cm with a mean of 1.7 cm. Postoperative LLD ranged from 0 to 1.5 cm with a mean of 0.5 cm. It was found that there was statistically highly significant difference between pre and postoperative LLD (p=0.0001, t=4.5). Table (XXXXXIV)

Table (XXXXXIV) Comparison between pre and post operative LLD:

Pre-op LLD		Post-op LLD		p-value
Mean	SD	Mean	SD	
1.7	1.16	0.5	0.6	0.0001*

Factors affecting the results

I-Age

In the young age group < 30 years, excellent results were obtained in the 2 patients (100 %), In the second group with age between 30 and 50 years , excellent results were obtained in 9 patients (60%) , good results in 5 patients (33.3%) fair results in 1 patient (6.7%). While in the group of patients older than 50 years, good results in1patient (33.3%), fair results in 2 patients (66.6%) (Table XXII)

Table (XXII) Relation between the age of the patient and the end result

Age groups	End results				Total (patient)
	Satisfactory		Unsatisfactory		
	Excellent	good	Fair	Poor	
<30 yrs n %	2 100%	0 0%	0 0%	0 0%	2 10%
30-50 yrs n %	9 60%	5 33.3%	1 6.7%	0 0%	15 75%
>50yrs n %	0 0%	1 33.3%	2 66.6%	0 0%	3 15%
Total n %	11 55%	6 30%	3 15%	0 0%	20 100%
X^2=2.7 , P=0.8					

It was found that there was statistically ------- difference between different age groups regarding the mean postoperative HHS (p-value =0.61, F= 0.49). (Table XXIII and Fig 112) this could be explained by many factors;

younger age groups are much more motivated, much more active ,have adequate muscle power, and also shorter period of disability and adaptive changes to the pathological conditions that caused there hip disease .

Table (XXIII) Comparison between different age groups as regards pre and post operative mean HHS in the last follow up:

	Group I (<30 yrs)		Group II (30-50 yrs)		Group III (>50 yrs)	
	Mean	SD	Mean	SD	Mean	SD
Pre						
Post						
	F=0.49 , P= 0.61					

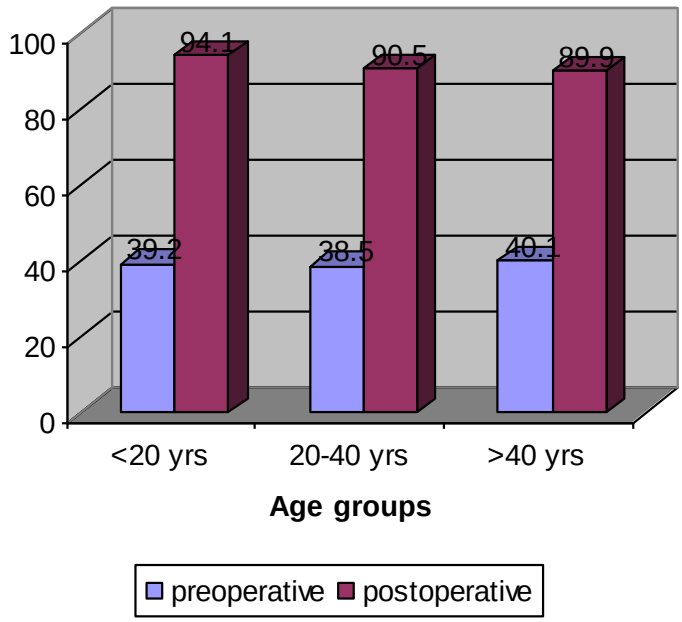


Fig 112 Comparison between different age groups as regards the mean pre and post operative HHS in the last follow up

II-Gender

In the 16 male patients (out of 20 patients); excellent results were obtained in 10 patients (62.5%), good results in 4 patients (25%), fair results in 2 patients (12.5%).

In the female group, there were 4 patients, 3 of them had excellent results (75%), 1 was good (25%), 0 fair (0%). (Table XXIV)

Table (XXIV) Relation between the gender of the patient and the end result

Gender		End results				Total (patients)
		Satisfactory		Unsatisfactory		
		Excellent	Good	Fair	Poor	
Male	n	8	5	3	0	16
	%	50%	31.25%	18.75%	0%	80%
Female	n	3	1	0	0	4
	%	75%	25%	0%	0%	20%
Total	n	11	6	3	0	20
	%	55%	30%	15%	0%	100%
X^2=8.8 , P=0.3						

It was found that there was statistically --------difference between male and female patients regarding the mean postoperative HHS (p-value =0.58 , t=0.54). (Fig 114) So the gender had no impact on the final clinical outcome. (Table XXV)

Table (XXV) Comparison between males and females as regards pre and postoperative HHS in the last follow up:

	Males		Females	
	Mean	SD	Mean	SD
Pre				
Post				
	t=0.54 , p=0.58			

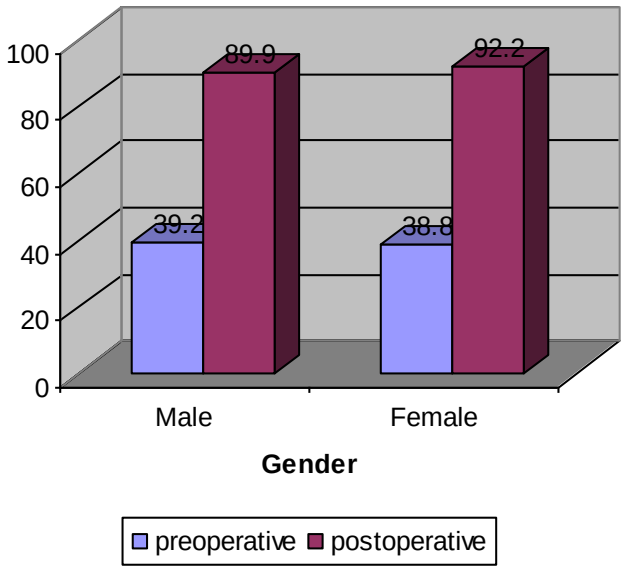


Fig 114 comparison between males and females as regards pre and postoperative HHS in the last follow up:

V-Occupation

In the first group (6 employees) excellent results were obtained in 4 patients (66.6%), good results in 2 patients (33.3%).
The second group (3 students) excellent results were achieved in the 3 patients (100%).
In the third group (1 housewife), the result was good.
While in the last group (10 manual workers) excellent results were achieved in 4 patients of this group (40%). good results in 3 hips (30%), 3 patients fair(30%). (Table XXVII)

Table (XXVII) Relation between the occupation of the patients and the end result

Occupation	End results				Total (patients)
	Satisfactory		Unsatisfactory		
	Excellent	Good	Fair	Poor	
Employee n %	4 66.6%	2 33.3%	0 0%	0 0%	6 30%
Students n %	1 100%	0 0%	0 0%	0 0%	1 5%
Housewives n %	2 0%	1 100%	0 0%	0 0%	3 15%
workers n %	4 40%	3 30%	3 30%	0 0%	10 50%
Total n %	11 76.4%	6 17.6%	3 2%	0 0%	20 100%
	X^2= 7.9 , P=0.54				

It was reported that there was no statistically significant difference between the occupation and the preoperative as well as the final post operative clinical outcome (P=0.85, F=0.25). (Table XXVIII)

Table (XXVIII) Comparison between the different occupations as regards pre and postoperative HHS in the last follow up:

	Employee		Students		housewives		Workers	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pre	38.2	10.9	40.5	11.6	37.3	9.5	38.3	12.2
Post	91.2	14.6	88.3	19.9	91.8	4.7	94.7	0.9
	F=0.25 , P= 0.85							

VI-Preoperative diagnosis

N0 any one of the patients in this study had 1ry OA. All patients had 2ry OA as a sequel of other diseases affecting the hip joints, when correlating the post-operative results to the pre-operative diagnosis, the results are as follows:

In patients suffering from avascular necrosis (10 patients); excellent results were achieved in 7 patients (70%), good results in 2 patient (20%), fair in 1patient (10%).
In the patient who suffered from OA as a sequel of old SCFE (1patient), the result was good
In the group of patients who suffered from OA as a sequel of septic arthritis of the hip (2 patients), excellent results were obtained in 1 patient (50%) while fair result in the second patient (50%).

In the group of patients with posttraumatic OA (5 patients), excellent results were achieved in 1 patients (20%), good results in 3 patient (60%), fair in 1patient (20%),
In the patient with inflammatory arthritis (ankylosing spondylitis & SLE) 2 patients (10%) the results were excellent in the two patients.
It was found that there was no statistically significant difference between the previously mentioned groups and the mean preoperative as well as the mean final postoperative clinical outcome (P=0.8, F= 0.43). (Table XXIX)

Table (XXX) Relation between the preoperative diagnosis of the patients and the end result

Preoperative diagnosis	End results				Total
	Satisfactory		Unsatisfactory		
	Excellent	Good	Fair	Poor	
Secondary OA due toAVN n %	7 70%	2 20%	1 10%	0 0%	10 50%
Secondary OA due to Septic hip n %	1 50%	0 0%	1 50%	0 0%	2 10%

Secondary OA due to SCFE n %	0 0%	1 100%	0 0%	0 0%	1 5%
Post-traumatic OA n%	1 20%	3 60%	1 20%	0 0%	5 30%
Secondary OA due to SLE	1 100%	0 0%	0 0%	0 0%	1 5%
Secondary OA due to Ankylosing spondylitis n %	1 100%	0 0%	0 0%	0 0%	1 5%
Total n %	11 55%	6 30%	3 15%	0 0%	20 100%
	X^2=26.7 , P=0.31				

It was found that there was no statistically significant difference between the previously mentioned groups and the mean preoperative as well as the mean final postoperative clinical outcome (P=0.8, F= 0.43). (Table XXIX)

Table (XXIX) Comparison between the different etiologies of hip arthritis as regards pre and postoperative HHS in the last follow up:

	AVN		inflamatory		Post traumatic OA		Post infection		SCFE	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD		
Pre	38.8	11.3	37.2	6.2	31.4	13.6	36.1	13.1		
Post	91.9	4.3	86.9	22.4	84.1	24.7	92.6	8.4		

VII-Previous surgery on the affected hip

in patients who had no history of previous hip surgery ,Excellent results were obtained in 8 patients (66.6%) , good results in 3 patients (25%) and fair in 1 patient (8.4%), while the results were excellent in 2 hips (33.3%) and good in 3 hips (50%) and fair in 1 patient(17.7%) following core decompression. Regarding the patients with previous history of drainage for septic arthritis of the hip, the results were excellent in 1 hips (50%) and fair in the other patient (50%). (Table XXXI)

Table (XXXI) Relation between previous hip surgery and the end result

	End results				Total
	Satisfactory		Unsatisfactory		
	Excellent	Good	Fair	Poor	
No history n %	8 66,6%	3 25%	1 8.4%	0 0%	12 60%
Core Decomp-ression n %	2 33.3%	3 50%	1 17.7	0 %	6 30%
Drainage n %	1 50%	0 0%	1 50	0 0%	2 10%
Total n %	11 55%	6 30%	3 15%	0 0%	20 100%
	X^2= 24.9 , P= 0.15				

There was statistically ----------difference between the preoperative as well as the postoperative final clinical outcome in patients with or without history of previous hip surgery (P=0.4, t=0.9), however relatively better results were obtained in the patients who had their first hip surgery at the time of the hip replacement. (Tables XXXII and XXXIII)

There was no statistically significant difference between the preoperative as well as the postoperative final clinical outcome in patients with or without history of previous hip surgery (P=0.4, t=0.9), however relatively better results were obtained in the patients who had their first hip surgery at the time of the hip replacement. (Tables XXXII and XXXIII)

Table (XXXII) Comparison between the patients with and without history of previous hip surgery as regards the mean preoperative and the mean postoperative HHS in the last follow up:

	No history		History of previous hip surgery	
	Mean	SD	Mean	SD
Pre	41.4	8.4	34.4	12.5
Post	92.2	12.3	88.5	17.2
	t= 0.9 , P=0.4			

VIII-Surgical approach

15 hips in 14 patients (70%) in the studied group were operated upon through the standard posterior-lateral approach; while 6 hips in 6 patients (30%) were operated

upon through the lateral approach and its modifications. (Table XXXXXVII and Fig 125)

Table (XXXXXVII) surgical approaches used in this study

	Number of hips	Percentage
posterior-lateral approach	15	71.4%
Rady's approach	6	28.6%
Total	21	100%

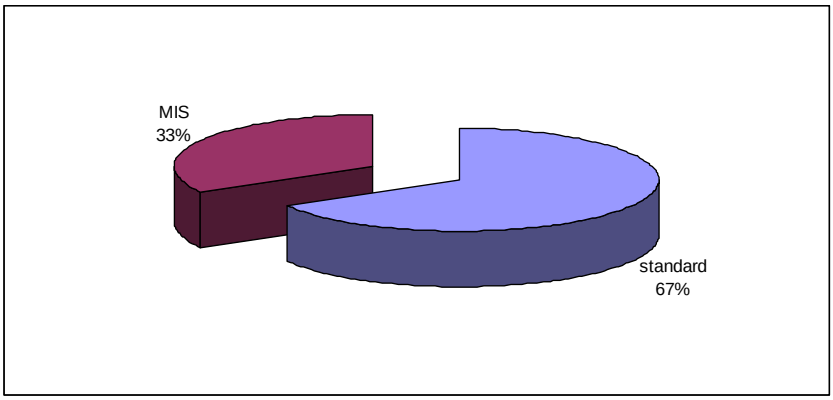


Fig 125 distribution of the patients according to the surgical approach

Regarding the approach used, the following was found:

The operative time was shorter in cases done through the postero-lateral approach due to wider exposure, better orientation.

No difference between the two approaches regarding the intraoperative bleeding or need of blood transfusion.

No difference between the two approaches regarding the cup inclination angle and stem alignment.

The surgical skills and training are much more important than the approach selected.

Radiological results

Standard radiographs were made for all patients immediately postoperatively and at subsequent follow up assessments.

Immediate postoperative X-ray:

1- **Acetabular component inclination :**

Acetabular inclination was determined in relation to the inter-teardrop line. ***(Berger et al., 1997)*** (Fig 129) Acetabular inclination in all patients ranged from **40^{o}-80^{o}** with a mean of **47.8^{o}** .

There was insignificant correlation between the degree of acetabular inclination and the clinical outcome; this is may be due to the large size of the femoral head that allows greater arc of motion without impingement.

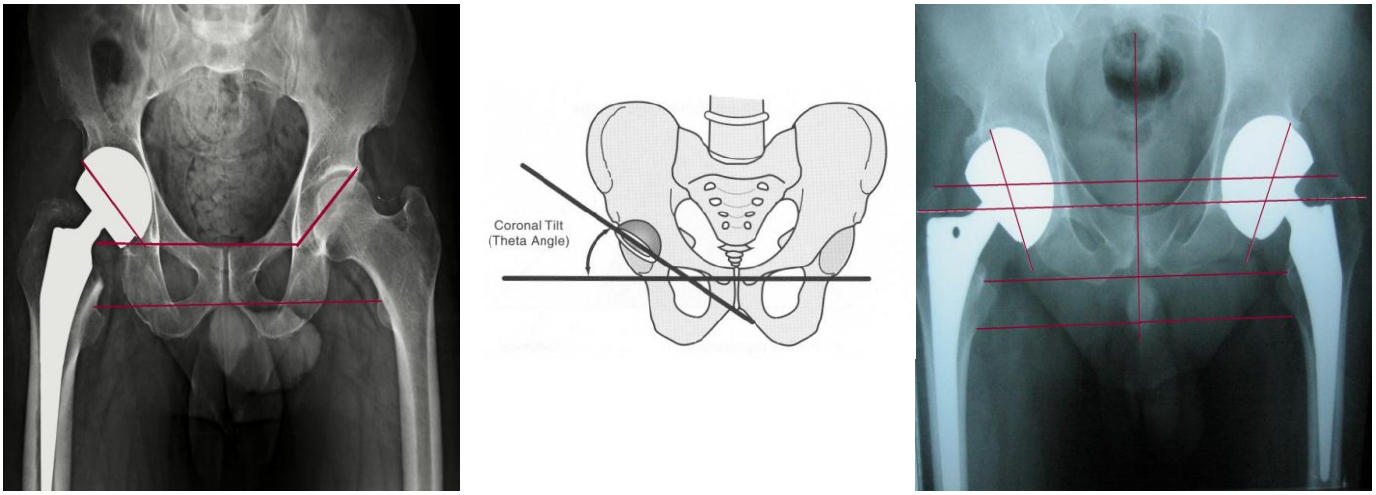
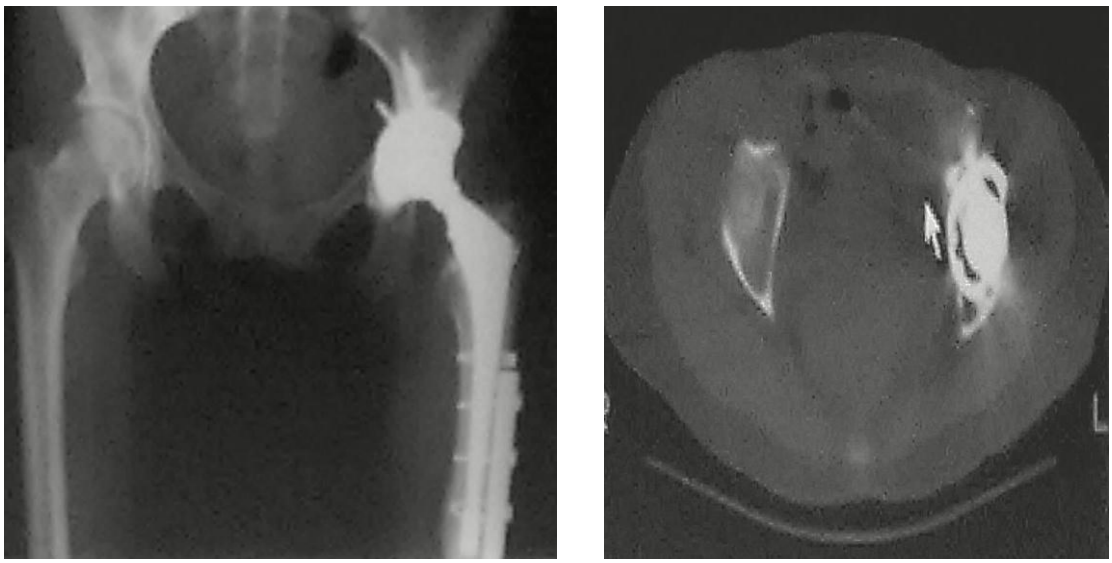


Fig 129 method of detection of the acetabular inclination

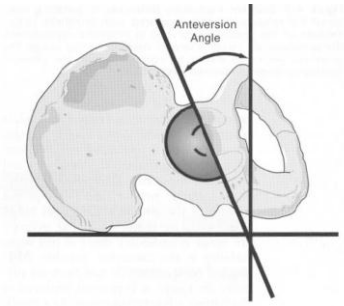
2- Acetabular cup version:

In this system with large metallic head and metallic Cup; anteversion is markedly difficult to be measured accurately using the standard AP views due to the overlap between the metallic components,
So, to accurately detect and calculate the cup version, it is only the CT that can be used; this was not routinely done in every case post-operatively due to financial causes.

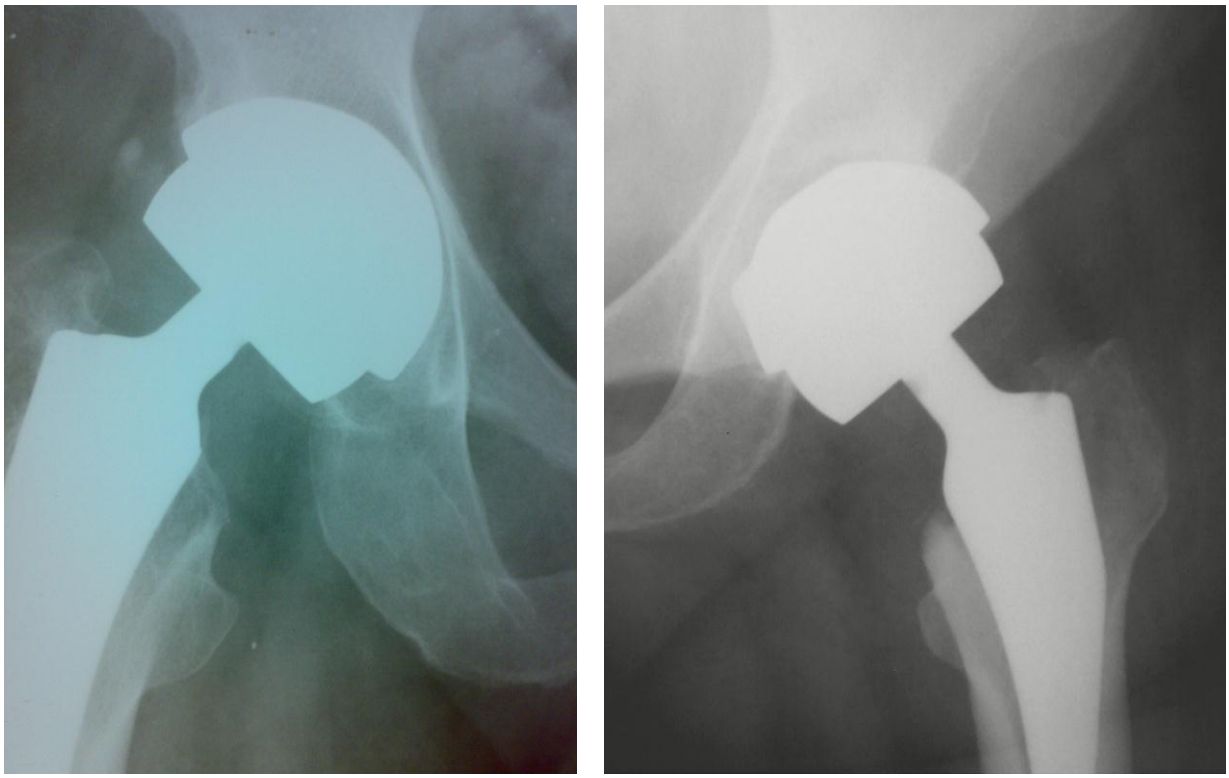


Determination of angle of anteversion (or retroversion) of cup by CT. **A,** Acetabular component appears well positioned in 39-year-old nurse who had multiple revisions and was referred for femoral loosening with recurrent subluxation. **B,** CT scan shows acetabular retroversion of 20 degrees.

However, most surgeons who use this system agree that they can roughly get an idea about cup version from the lateral view by noting the relation between the cup and the bony margins of the acetabular socket, cup version also can be detected from cross-table lateral view radiography as shown in the next figure. However, this view is not easy to take in every patient.



There is consensus that, properly seated cup regarding the version has blunt edges on the true AP view but if the cup is neutral, it appears with sharp edges in the AP view.



Difference in appearance of the edges of the cup in A-P view, it is obvious in the first X-ray that the edges are blunt, while in the second X-ray the edges are sharp.

Abdel-Aziz said in his study that cup anteversion was measured using the method described by Dorr and Wan ***(Dorr and Wan, 1998)*** the mean angle was $18.9^0 \pm 3.81$, ranging from 7.5^0 to 21.1^0.
He said also that, There was insignificant correlation between the degree of acetabular anteversion and the clinical outcome (P=0.3, r= 0.14).

This picture is quoted from ***Abdel-Aziz***, I really found it difficult to interpret these lines and how to draw them on other X-rays.

3- Femoral Stem alignment

The varus, valgus position of the femoral component was determined by measuring the angle between the lateral periosteal surface of the shaft of the femur and the longitudinal axis of the femoral component on the anteroposterior pelvic radiograph . ***(callaghan et al., 1985).*** All stems were in neutral or slight valgus position. The mean angle measured was 1.3^0 ranging 0^0 to 8^0, simply if the tip of the stem is central; it's in neutral alignment (Fig 130 B). If the tip pointed or resting on the lateral cortex; it's in varus alignment (Fig 130 C). If the tip pointed or resting on the medial cortex; it's in valgus alignment (Fig 130 A).

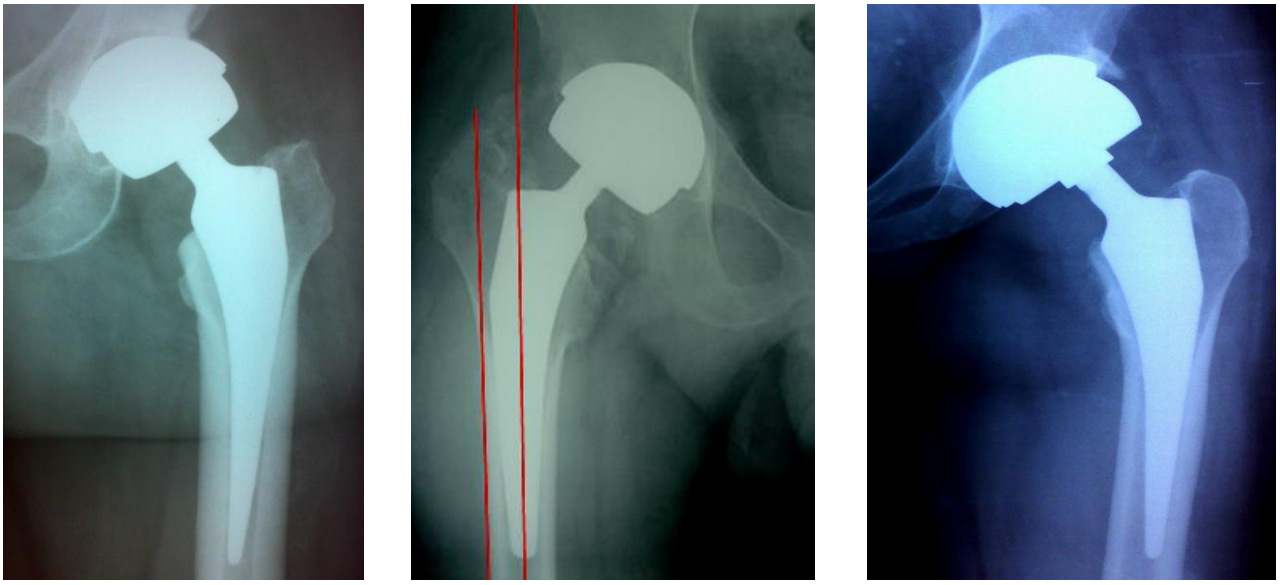


Fig 130 method of detection of femoral stem alignment
A-Valgus aligenment. B-central stem . C- varus aligenmen

All the cemented stems were in neutral position. 1 cementless stem was in valgus position in the immediate post operative film with no change throughout the whole follow up period. The remaining 9 stems were central in alignment in immediate post operative film. In 1 case, after 9 months, the stem had slightly changed its position from central to slight varus with no any complaint from the patient, and her radiological follow up for 1.5 years showed no further change in stem position.

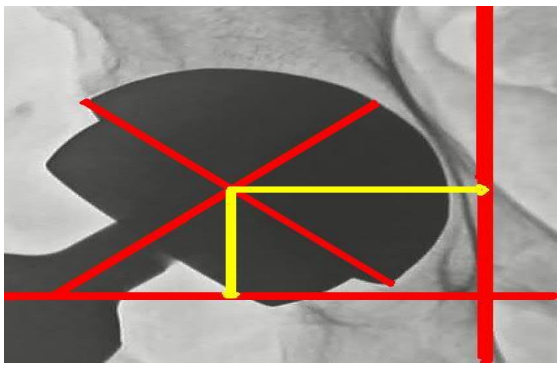
Regarding the influence of the surgical approach (postero-lateral or modified lateral) on the previously mentioned radiographic measurements; it was found that there were no statistically insignificant differences between the two groups regarding cup inclination or stem alignment

Radiological follow up :

Standard radiographs were made for all patients at subsequent follow up examinations. The radiographs were examined for component migration, presence of heterotopic ossification or osteolysis and loosening.

- **Cup rotation or migration**

By detecting the vertical and the horizontal distances between the centre of the cup (centre of rotation of the hip) and the inferior margin of the tear drop and the horizontal distance between the Kohler's line and the top of the dome of the cup. There were no any cases of cup dislodgement or cup migration detected in this series throughout the follow up period.



- **Cup impaction**

Cup impaction is determined by the presence or absence of radiolucency between the cup and acetabular floor, in this study there were four cases (20%) of the studied group showed radiolucent zones between the cup and acetabular floor, radiolucent zones occurred in zone 2 in two cases, in zone 1 in one case and in zones 1&2 in one case .these radiolucent areas were about 2ml in three cases and 3ml in one case, no any case with radiolucency in the 3 zones.
There was progressive decrease in these zones during the follow up period and on the last follow up these zones completely disappeared except in one case .

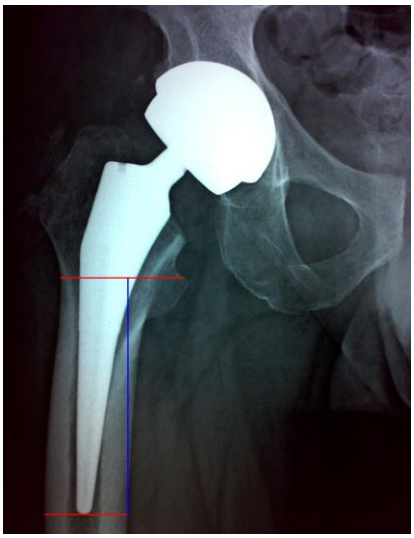
Immediate post-op.

6 months post-op.

last follow up

- **Migration of the stem**

By measuring the vertical distance from the inferior margin of the component to the most proximal point on the lesser trochanter, ***till the last follow up***, ***there were no cases of stem migration or subsidence.***



- **Stem position change**

Regarding the position of the stem (varus or valgus), in one case on a cementless stem ,there was a change in stem position from central position to a slight varus position noted in the follow up x-ray at 9 months manifested by resting of the tip of the stem on the lateral cortex of the femur. With no any complaint from the patient, and her radiological follow up for 1.5 years showed no any further change in stem position. Along the total period of about 27 months no any radiological sign of osteolysis around both the stem and the cup.

- **Presence of heterotopic ossification**

There was one case of heterotopic ossification reported in this study it appeared 3 months after surgery and became mature after 6 months; it was just at the region of the greater trochanter with no pain or any clinical impact on the ROM.

- **There were no reported cases of resorption or endosteal cavitations.**
- **There were no reported cases of peri-prosthetic fractures.**
- **There were no reported cases with bent or broken stems.**