# RESULTS

## *Group I: Laparoscopic ablation of symptomatic renal cysts*

In this group, 10 patients underwent laparoscopic transperitoneal renal cysts ablation via 3 ports. Patients included 6 males and 4 females with mean age ± SD (51 ± 8.69) and ranged between 37-70 years. Peripelvic renal cysts were detected in two patients, and simple renal cysts were detected in eight patients.

The operative results are described in table (8) the mean operative time was 116 minutes (range, 90-180 minutes). The mean estimated blood loss was 54cc (range, 25-150ml) (Fig. 32).

**Table (8):** Shows mean operative time and intra-operative blood loss.

| ***Parameters*** | ***Value*** |
|---|---|
| Operative time/ minute<br>(mean ± SD) range | (116 ± 37.77) 90 – 180 |
| Estimated blood loss/ CC<br>(mean ± SD) range | (54 ± 40.54) 25 – 150 |

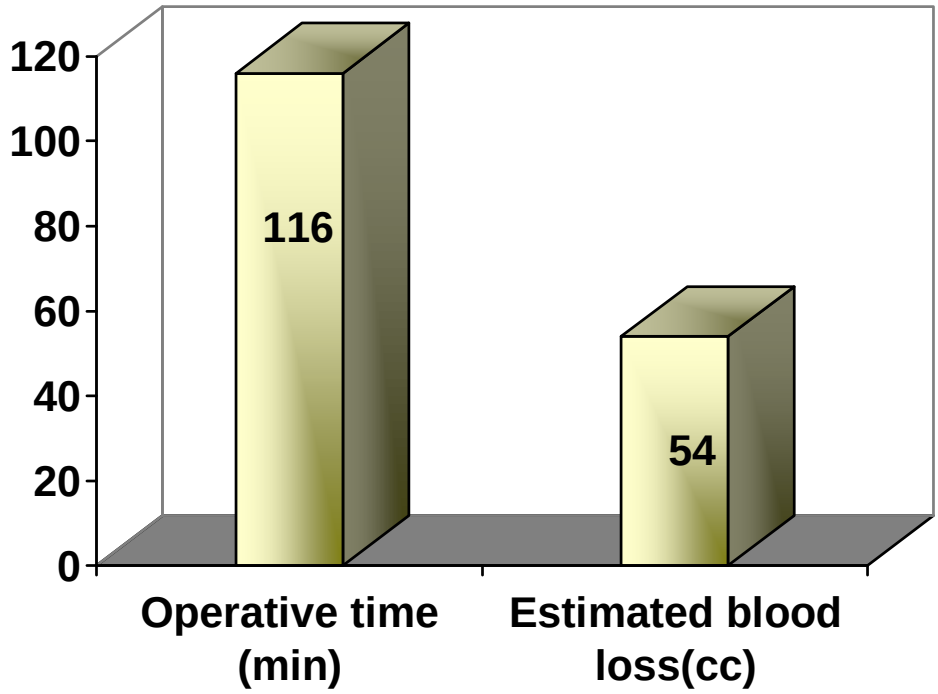


***Fig. (32): Shows mean operative time and intra-operative blood loss.***

Two patients required post-operative parentral analgesia (75-150 mg) of declofenac sodium and the mean for oral feeding was 1.2 (range 1-3) days. The mean time for removal of tube drain was 2.1 days range from 2-3 days. The mean post-operative hospital stay was 3 (range 2-5 days) and the mean time of return to normal activity was 7.6 (range 6-10 days) (Table 9 and Fig. 33, 34).

**Table (9):** Shows post-operative data in group I.

| *Parameters* | *Value* |
|---|---|
| Post-operative complications: No of patients (%) | |
| Infected port site | 1(10%) |
| Prolonged illus | 1 (10%) |
| Parentral postoperative analgesia: No of patients (%) | 2 (20%) |
| Diclofenac sodium (75-150 mg) | |
| Oral feeding in days (mean ± SD) range | (1.2 ± 0.63) 1 – 3 |
| Removal of tube drain in days (mean ±SD) range | 2.1 ± 0.8 (2-3) |
| Hospital stay in days (mean ± SD) range | (3 ± 0.94) 2 – 5 |
| Return to normal activity in days (mean ± SD) range | (7.6 ± 2.6) 6 – 10 |

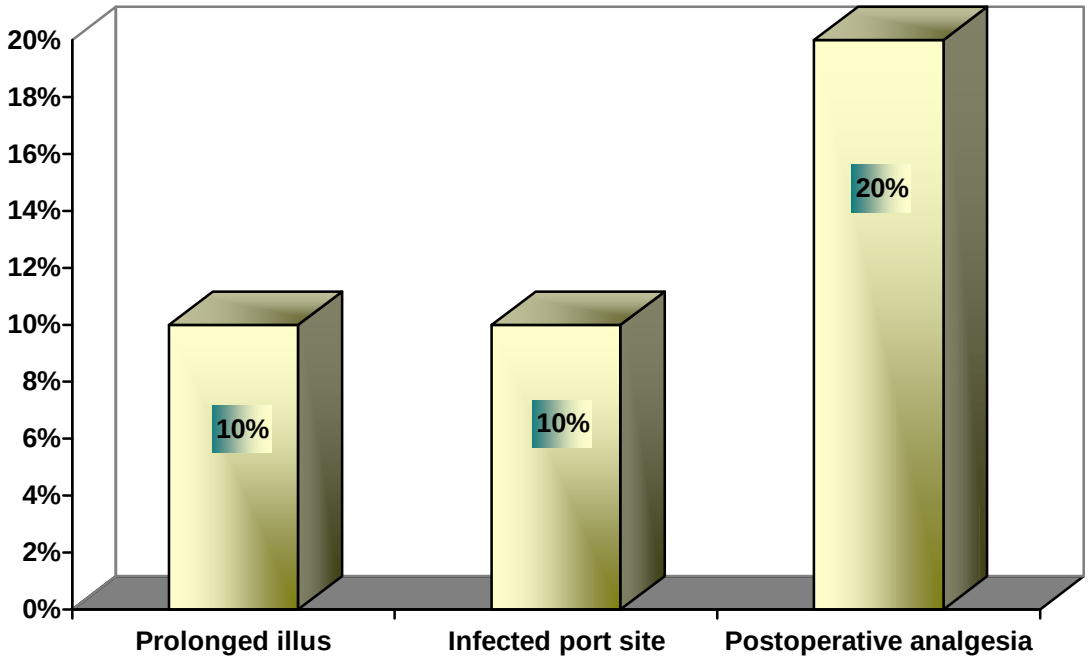


*Fig (33): Shows post-operative complications and post-operative analgesia.*

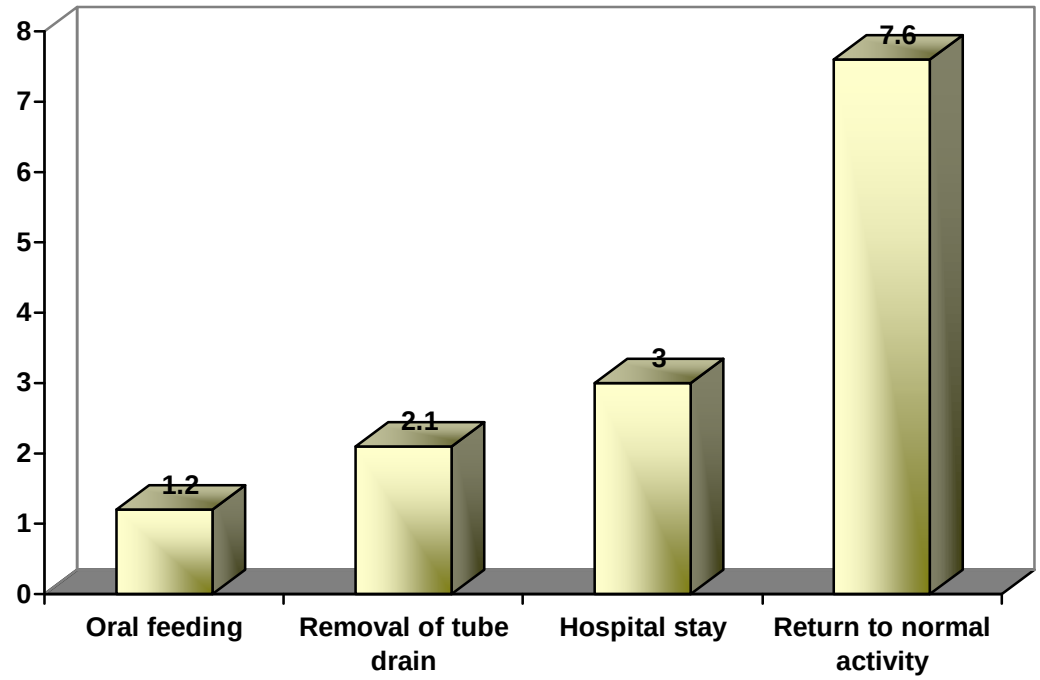


***Fig. (34): Shows the mean oral feeding, removal of tube drain, hospital stay and return to normal activity in days.***

## *Complications:*

No intra-operative complications occurred: there were no conversions to open surgery. Immediate post-operative complications encountered were prolonged (48 hours) ileus in one patient and infected port site in another, both of which resolved with conservative management.

## *Post-operative follow-up:*

Follow-up evaluation included history taking, clinical examination and renal ultrasound scans every 3 and 6 months. All patients were relieved of their symptoms and they remained symptom free, with no recurrence was reported.

## *Group II: Laparoscopic ureterolithotomy*

The stones were successfully removed by the laparoscopic procedure in 13 out 15 patients (86.6%) via 4 ports in first 6 patients and 3 ports in 7 patients. There were 2 operative failures (13.4%) in this group. In one patient, an iliac stone was accidentally migrated downward to pelvic part of the ureter. Semi rigid ureteroscope was advanced through the second port and through the ureterotomy under guidance of laparoscope.

The stone was difficult to extract due to large size of the stone (22 mm) and poor ureteroscope vision due to continuous leakage of irrigation and was converted to open surgery. The other case was converted to open surgery to control bleeding from left common iliac artery, which was injured during ureterotomy by laparascopic knife and the injury was successfully managed. The mean operative time was 119 (range 60-180) minutes and the mean estimated blood loss was 62 (range 30-100cc) (Table 10 and Fig. 35).

**Table (10):** Shows intra-operative data in group II.

| ***Parameters*** | ***Values*** |
|---|---|
| Operative time/ minute<br>(mean ± SD) range | (119.3 ± 38.03) 60 – 180 |
| Port numbers [4 ports – 3 ports): No of patients (%) | 6 (40%) – 7 (66.7%) |
| Estimated blood loss / CC<br>(mean ± SD) range | (62.3 ± 11.6) 30 – 100 |
| Conversion to open: No of patients (%)<br>Lt. common iliac artery injury<br>Distal migration of the stone | 2 (13.4%)<br>1 (6.7%)<br>1 (6.7%) |

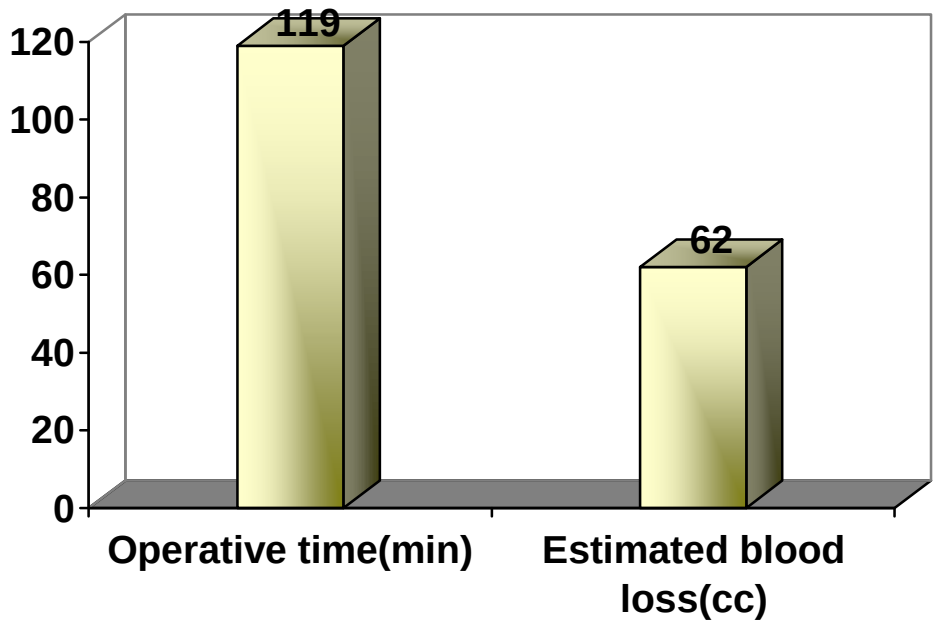


*Fig. (35): Shows the mean operative time and estimated blood loss.*

Drains were removed after a mean of 3.4 (2-6 days) when the ureter was only stented in 10 patients but the drains were removed after mean of 3.2 when the ureter was both stented and sutured in 3 patients (Fig. 36).

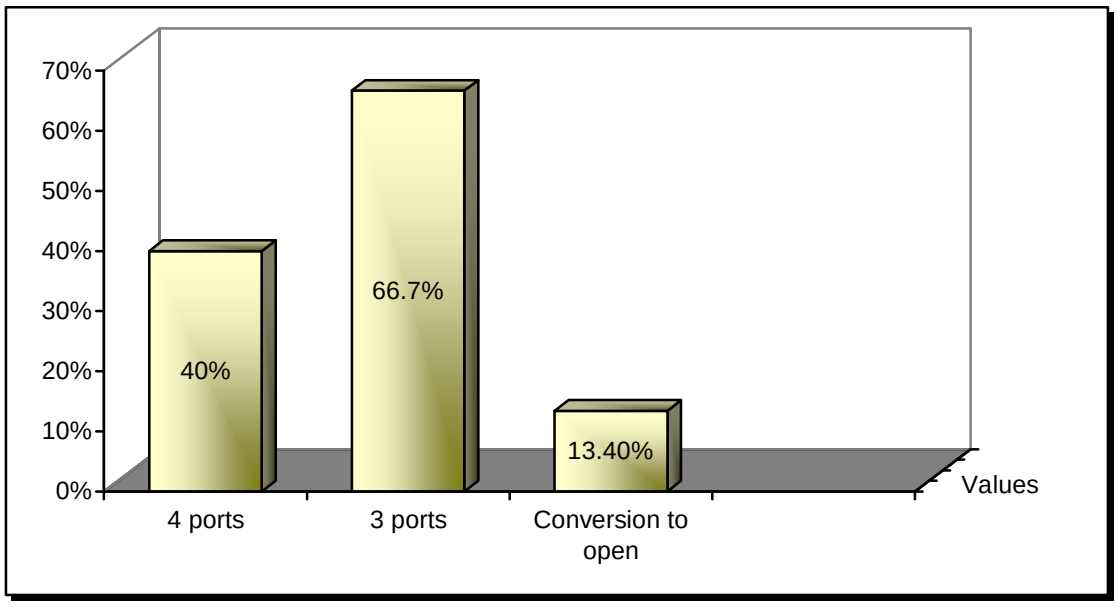


*Fig. (36): Shows the number of ports and conversion to open.*

The mean post-operative parentral analgesia was 150 (range, 75-300) mg of diclofenac sodium. The mean hospital stay was 4.3 (range 3-8 days) and the mean resuming normal activity was 11.6 (range 8-21 days). The mean for oral feeding 1.5 (range 1-3 days) (Table 11 and Fig. 37,38).

**Table (11):** Postoperative data in group II.

| ***Parameters*** | ***Values*** |
|---|---|
| Post-operative complications: No of patients (%) | 2 (13.4%) |
| Paralytic illus | 1 (6.7%) |
| Infected port site | 1 (6.7%) |
| Post-operative analgesia mg Diclofenac sodium (mean ± SD) range | (150 ± 53.03) 75 – 300 |
| Oral feeding in days (mean ± SD) range | (1.53 ± 0.83) 1 – 3 |
| Hospital stay in days (mean ± SD) range | (4.33 ± 1.59) 3 – 8 |
| Tube drain removal in days (mean ± SD) range | (3.4 ± 1.21) 2 – 6 |
| Return to normal activity in days (mean ± SD) range | (11.63 ± 4.37) 8 – 21 |

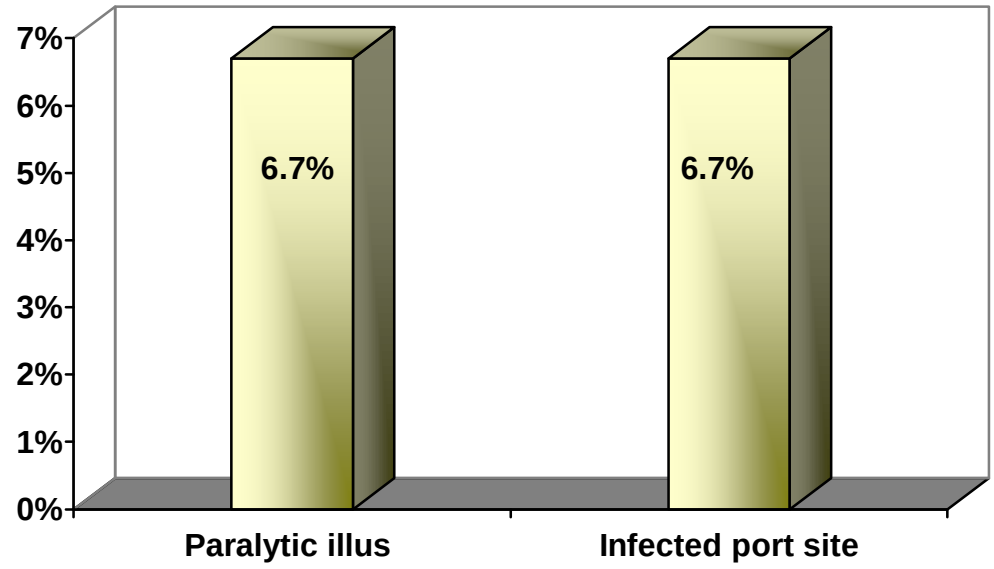


*Fig. (37): Shows post-operative complication.*

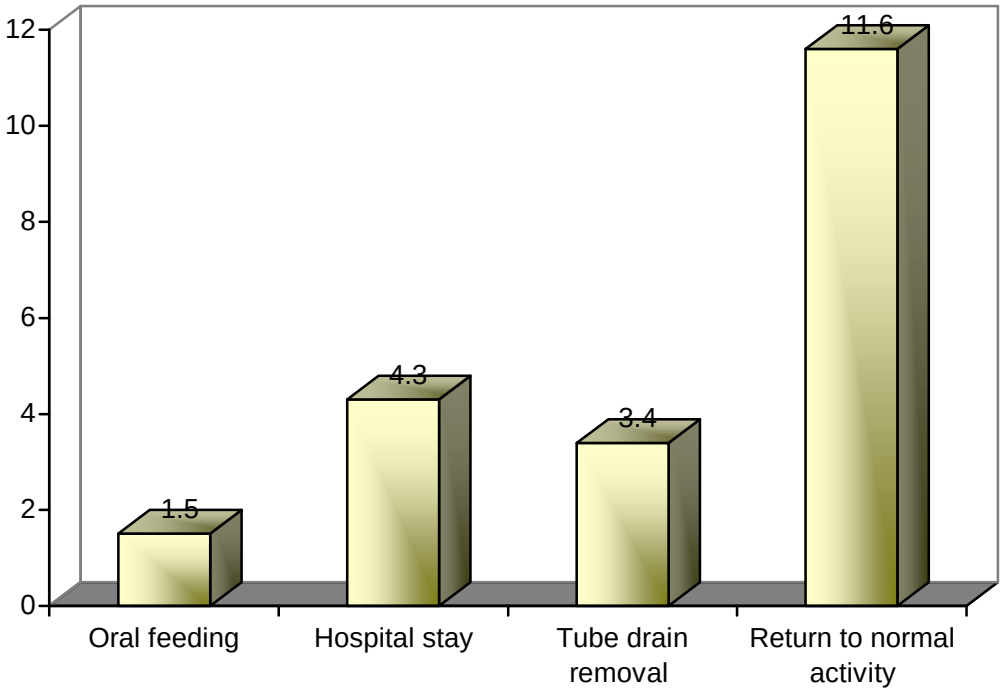


*Fig. (38): Shows the mean oral feeding, hospital stay, tube drain removal and return to normal activity.*

## *Complications:*

There was only one major complication, an injury of the left common iliac artery that required conversion to open surgery and was successfully managed with 2 units of blood transfusion was given.

Early post-operative complication encountered were a prolonged (48 hours) ileus in one patient and infected port site in another patient.

## *Post-operative follow-up:*

IVP, performed in all patients at 3 and 6 months post-operative, never demonstrated ureteral stricture.

## *Group III: Laparoscopic nephrectomy*

In this group, 15 patients underwent laparoscopic nephrectomy for benign disease at Benha University Hospital. Patients included 11 males and 4 females with a mean age ± SD (46.87 ± 11.61) ranged between 23-67 years. The laparoscopic approach employed was transperitoneal in all patients via 4 ports.

The mean operative time was 194.67 ± 39.25 S.D ranged from (120-240) minutes. Renal artery was secured and divided between 3 endoclips in 13 patients, while the renal vein was secured and divided between 3 endoclips in 2 patients and endo-GIA is used to control and division of the large renal vein in 11 patients. The mean estimated blood loss was 134.61 ± 37.16 S.D ranged from (0-200cc) (Table 12 and Fig. 39,40).

**Table (12):** Shows intra-operative data in group III.

| ***Parameters*** | ***Values*** |
|---|---|
| Operative time /minute **(mean ±SD) range** | (194.67 ± 39.25) 120 – 240 |
| Estimated blood loss **(mean ±SD) range** | (134.61 ± 37.16) 0 – 200 |
| Renal artery secured [endoclips]: No of patients (%) | 13 (86.7%) |
| Renal vein secured: No of patients (%) | |
| Endo-GIA | 11 (73.3%) |
| Endoclips | 2 (13.4%) |
| Entrapment and kidney extraction: No of patients (%) | |
| Without endo-catch | 12 (80%) |
| With endo-catch | 1 (6.7%) |
| Conversion to open: No of patients (%) | |
| Perirenal adhesions | 2 (13.4%) |

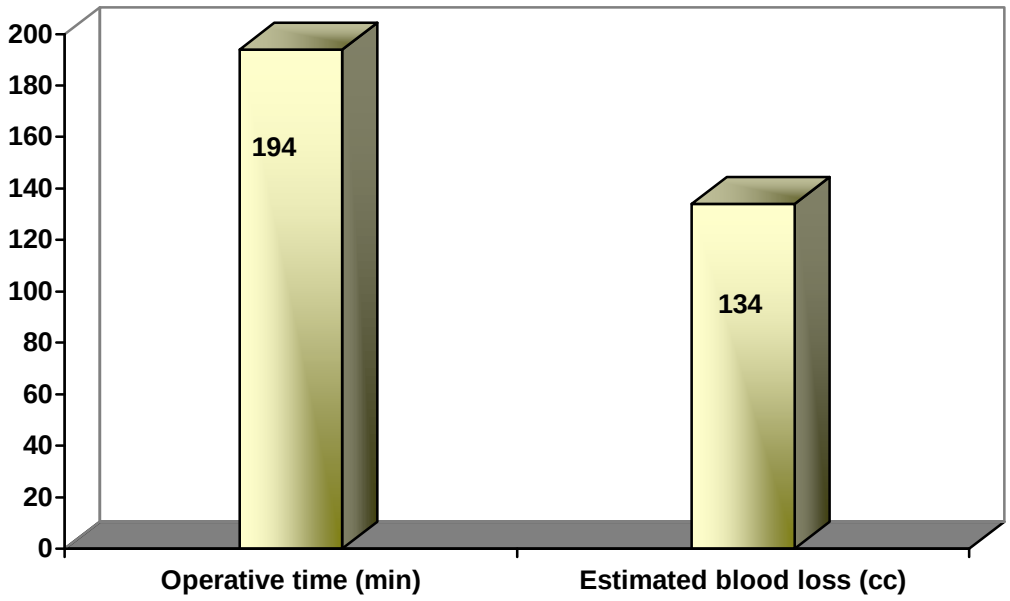


*Fig. (39): Shows the mean operative time in minutes and estimated blood loss (cc).*

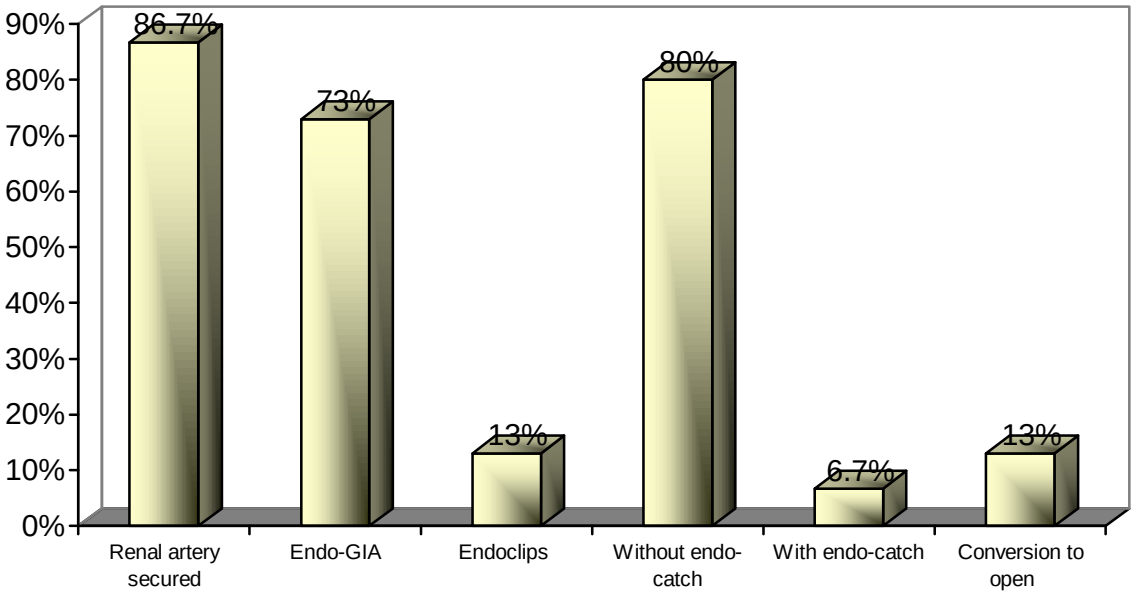


*Fig. (40): Shows renal artery and vein secured, extraction of the kidney and conversion to open.*

The mean hospital stay 4.73 ± 2.25 S.D ranged from (2-11) days and the mean post-operative parentral analgesia was 151 mg (range 75-225mg) of diclofenac sodium. Drains were removed after a mean of 3.2 (range 2-6) days, the mean for oral feeding 2.2 (range 2-4) days and the mean for resuming work 11.93 (range 7-21) days (Table 13 and Fig. 41).

**Table (13):** Postoperative data.

| ***Parameters*** | ***Values*** |
|---|---|
| Postoperative complications: No of patients (%) | |
| Paralytic illus | 1 (6.7%) |
| Fever | 1 (6.7%) |
| Postoperative parentral analgesia/mg (mean ±SD) range | (151.67 ± 37.16) 75 – 225 |
| Oral feeding in days (mean ±SD) range | (2.2 ± 0.56) 2 – 4 |
| Tube drain removal in days (mean ±SD) range | (2.2 ± 0.56) 2 – 4 |
| Hospital stay in days (mean ±SD) range | (4.73 ± 2.25) 2 – 11 |
| Return to normal activity in days (mean ±SD) range | (11.93 ± 3.88) 7 – 21 |

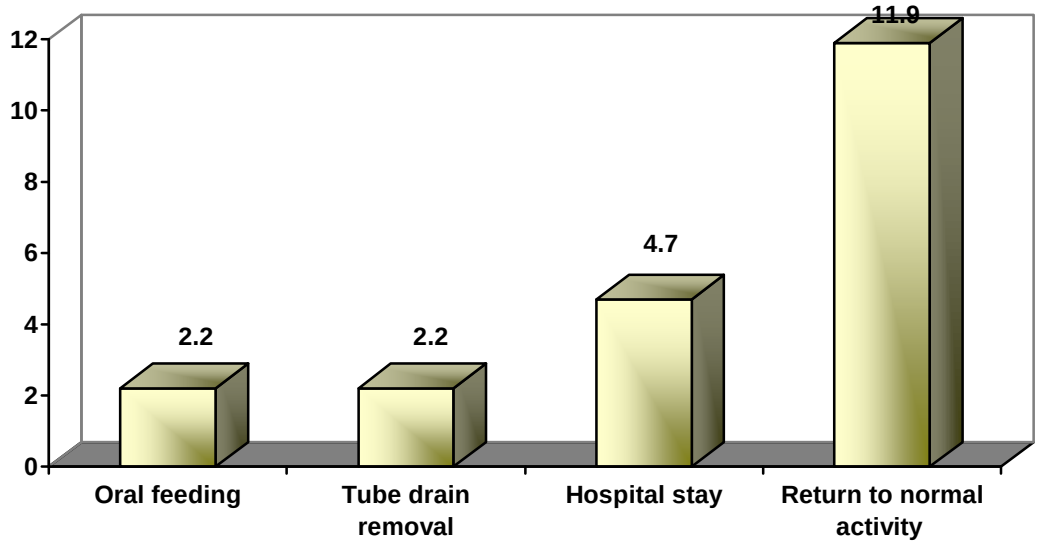


***Fig. (41): Shows the mean oral feeding, tube drain removal, hospital stay and return to normal activity.***

## *Complications:*

In two patients, conversion to open surgery was mandatory to perform complete dissection due to sever adhesions. Resulted from pyelonephritic kidney.

Immediate post-operative complications encountered were prolonged (48 hours) ileus in one patient, a temperature of 38ºC in another patient, both of which resolved with conservative management.

# *Cost analysis*

Financial analysis was based on cost rather than on charges since cost better reflects the economic impact of treatment on the institution. Procedural costs were based on the cost of anesthesia, laparoscopic equipment and instruments, operating room, hospital stay, postoperative pain medication and return to normal activity

All surgical procedures required general anesthesia, thus, this cost was excluded from analysis. Laparoscopic procedures were performed using disposable or reusable laparoscopic equipments. In addition, we did not consider the cost of complications, although the expected incidence for these procedures is low

In our study supported that laparoscopic procedures were associated with a lower analgesia requirement, shorter hospital stay and more rapid rehabilitation than equivalent open procedures.

An attempt was made to calculate the cost of laparoscopic renal cyst decortication using prices that would be typical of Benha University Hospital. If entirely disposable equipment was used, the mean equipment cost was 2580 LE. The mean cost of keeping the patient in hospital was 80 LE. since a patient day typically cost 20 LE and the mean hospital stay was 4 days. Therefore, the mean cost of performing a laparoscopic renal cyst decortication using entirely disposable equipment was 2660 LE. However, equipment costs may be reduced by employing re-usable instruments. This reduces the cost of the procedure by around 2660 LE to 580 LE.

Laparoscopic renal cyst decortication was less costly than the traditional open approach in case of re-usable instruments by 305 LE (885 LE versus 580 LE) (Table 14 and Fig. 42).

**Table (14):** The mean cost of open and laparoscopic renal cyst ablation.

| ***Parameters*** | ***Mean ± SD*** | ***t test*** | ***P value*** |
|---|---|---|---|
| Laparoscopic<br>Reusable | 580 ± 34.96 | 3.8 | <0.001 |
| Disposable | 2660 ± 124.46 | | |
| Open | 885 ± 246.15 | 0.98 | >0.05 |
| Reusable lap. | 580 ± 34.96 | | |
| Open | 885 ± 246.15 | 3.2 | <0.001 |
| Disposable lap. | 2660 ± 124.46 | | |

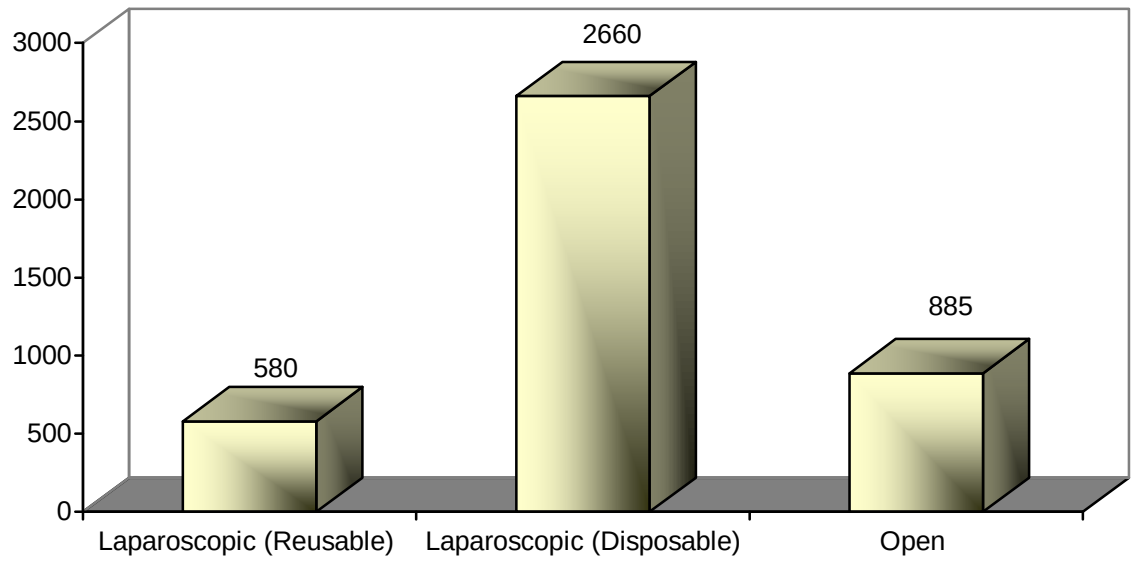


***Fig. (42): Shows the mean cost of open and laparoscopic renal cysts ablation.***

Financial analysis was made to calculate the mean cost of laparoscopic ureterolithotomy with re-usable equipments was 916 LE and the mean cost of keeping the patient in hospital was around 80 LE for 4 days. Therefore mean cost of performing laparoscopic ureterolithotomy using re-usable equipment was 996 LE.

Laparoscopic ureterolithotomy was less costly than ESWL and offered many advantages over ESWL; first for large upper ureteric stone there is a high probability removing the entire stone in single setting. Second: patients do not spend long periods with ureteric stent waiting for fragments to pass, allowing them to return quickly to regular activity. In comparison, the mean cost of laparoscopic ureterolithotomy was 3660 LE when disposable instruments were used. Therefore LU was more costly than the traditional open approach by 2550 L.E (3660 LE versus 1110 LE).

Finally, laparoscopic ureterolithotomy was the same cost of the traditional open approach by using reusable instruments but the patient return to normal regular activity quickly (Table 15 and Fig. 43).

**Table (15):** The mean cost of open and laparoscopic ureterolithitomy.

| *Parameters* | *Mean ± SD* | *t test* | *P value* |
|---|---|---|---|
| Laparoscopic<br>Reusable | 996.67 ± 165.26 | 4.2 | <0.001 |
| Disposable | 3660 ± 216.65 | | |
| Open | 1110.23 ± 432.13 | 0.93 | >0.05 |
| Reusable lap. | 996.67 ± 165.26 | | |
| Open | 1110.23 ± 432.13 | 3.6 | <0.001 |
| Disposable lap. | 3660 ± 216.65 | | |

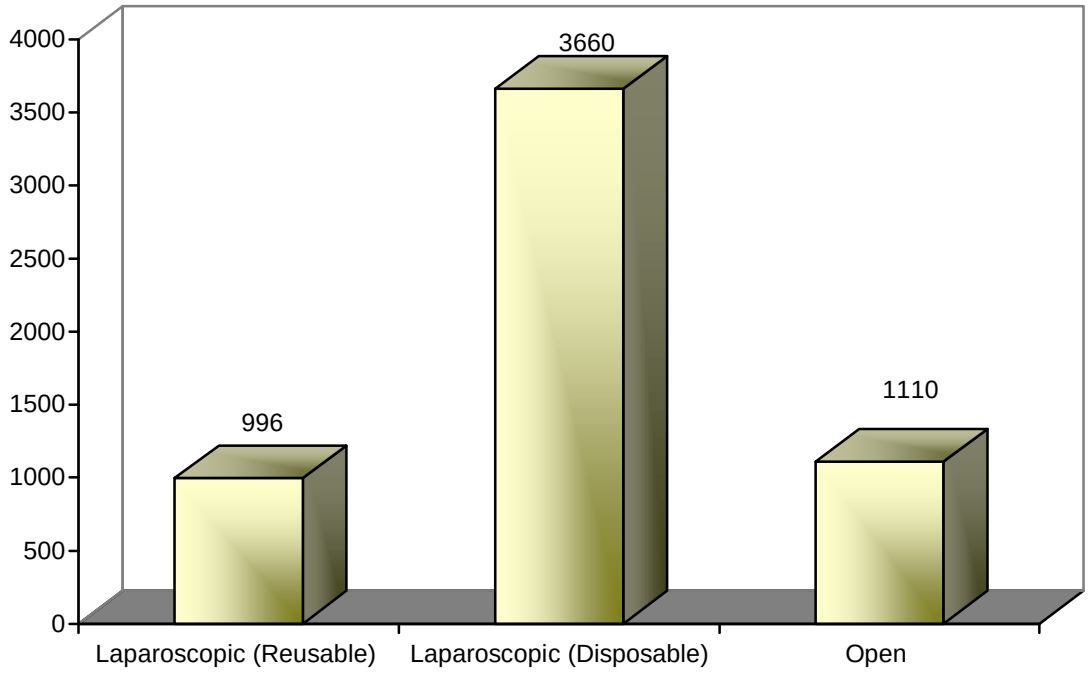


***Fig. (43): Shows the mean cost of open and laparoscopic ureterolithotomy.***

An attempt was made to calculate the mean cost of laparoscopic nephrectomy using the disposable equipment was 5700 LE. The mean cost of hospital stays for 4 day was 80 LE. Therefore, the mean cost of performing laparoscopic nephrectomy using disposable equipment was 5780 LE.

Equipment costs may reduced by employing re-usable instruments combined use of a suture tied around the renal vein and clip applier instead of the endovascular stapler. This reduces the cost of the laparoscopic nephrectomy by around 4000 L.E to 1780 LE.

Laparoscopic nephrectomy was less costly than the traditional open approach with re-usable equipments and avoided the endovascular stapler. However, there are also potential cost implication for the community and the government of the more rehabitation afforded by laparoscopic nephrectomy (Table 16 and Fig. 44).

**Table (16):** The mean cost of open and laparoscopic nephrectomy.

| *Parameters* | *Mean ± SD* | *T test* | *P value* |
|---|---|---|---|
| Laparoscopic<br>Reusable | 1566.67 ± 222.54 | 4.8 | <0.001 |
| Disposable | 5780 ± 456.89 | | |
| Open | 1942 ± 517.15 | 1.2 | <0.5 |
| Reusable lap. | 1566.67 ± 222.54 | | |
| Open | 1942 ± 517.15 | | <0.001 |
| Disposable lap. | 5780 ± 456.89 | | |

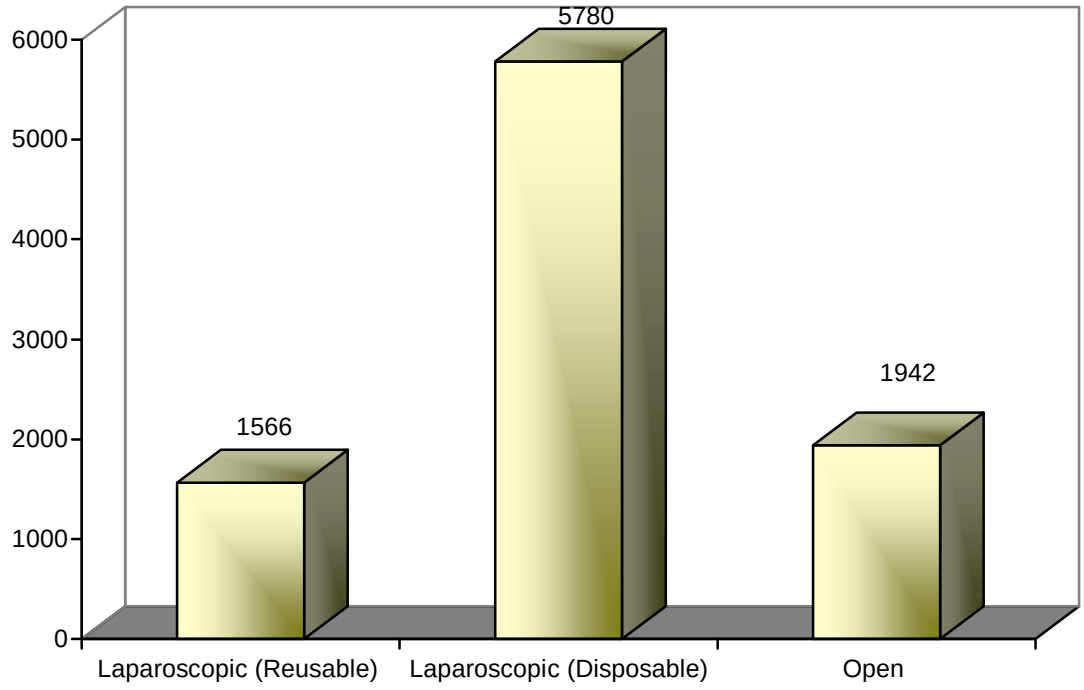


***Fig. (44): The mean cost of open and laparoscopic nephrectomy.***