Original Article

OPEN RENAL APPROACH: COMPARATIVE ANALYSIS OF SUB-COSTAL INCISION VERSUS TRANS-COSTAL INCISION WITH EXCISION OF 12TH RIB

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ABSTRACT

Objective: To compare the outcome of sub-costal incision with trans-costal incision & 12th rib resection in the surgical approach for benign renal disease.

Methodology: It is a prospective, analytical, comparative study using randomized controlled trial (RCT), conducted at Fatima hospital-Baqai medical university (Karachi), from June 2005 to December 2008. In total 54 patients were enrolled in the study, who either underwent pyelolithotomy or nephrectomy via sub-costal (group A: 27 patients) or trans-costal incision (group B: 27 patients). Incision time, duration of operation, postoperative pain, duration of hospital stay, & peroperative and postoperative complications were noted.

Results: Incision time & duration of operation were longer in group B patients (p-value 0.002 & 0.029 respectively); pain perception was also markedly high in this group (p=0.001). Total period to stay in hospital was marginally higher in group B (p=0.212). Peroperative & postoperative complications were also slightly higher in group B patients (p-value 0.064 & 0.838 respectively).

Conclusion: Sub-costal renal approach provides adequate exposure, is quick, safe and less painful.

KEY WORDS: Renal approach, Subcostal incision, Transcostal incision, 12th rib excision, Pyelolithotomy, Nephrectomy.

Pak J Med Sci July - September 2009 Vol. 25 No. 4 557-562

How to cite this article:

Shamim M, Iqbal SA. Open renal approach: comparative analysis of sub-costal incision versus trans-costal incision with excision of 12th rib. Pak J Med Sci 2009;25(4):557-562.

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* Received for Publication: January 1, 2009

* Received for Publication: June 22, 2009

* Revision Accepted: June 25, 2009

INTRODUCTION

Operative renal exposure must be adequate to perform the operation and to deal with any possible complications, because of its deeper location in upper retroperitoneum. Injuries to renal vascular pedicle may be difficult to control or repair through small incisions, especially in the presence of large tumor. Poor exposure also leads to excessive retraction, with consequent increase in postoperative pain. Factors which should be considered in selecting an appropriate renal incision include operation to be performed, renal pathology, previous operations, extrarenal pathology that requires another simultaneous operation, need for bilateral renal operations, and body habitus.[1]

Open renal surgery may be carried out by four principal routes: extraperitoneal flank approach, dorsal lumbotomy, abdominal incision, or thoracoabdominal incision.[2-4] The flank approach provides good access to renal parenchyma and collecting system, avoiding peritoneal contamination. The drawback is that exposure of renal pedicle is not as good as with anterior transperitoneal approaches.

The most commonly used flank approach is through the bed of 11th or 12th rib.[5] The choice of rib depends on renal position and on whether the upper or lower pole is the site of disease. Sub-costal flank incision is indicated for surgery on lower renal pole or upper ureter, insertion of nephrostomy tube, or drainage of perinephric abscess.[1] It has the disadvantage of being rather low in relation to renal position.

The aim of this study was to compare the outcome of open renal surgery via sub-costal incision versus trans-costal incision with excision of 12th rib, in terms of incision and operative times, complications, postoperative pain, & postoperative stay.

METHODOLOGY

This study was conducted at Fatima hospital-Baqai medical university (Karachi), from June 2005 to December 2008. It was a prospective, analytical, comparative study using randomized controlled trial (RCT). Blocked randomization was used for allocation of patients in two groups (A & B). The patients are divided in blocks of two, & within each block the first patient was allocated in group A & the second in group B.

A total of 54 patients were enrolled. Group A, 27 patients, underwent renal surgery via sub-costal incision. Group B, 27 patients, underwent renal surgery via trans-costal incision with excision of 12th rib. The inclusion criteria were all patients with renal disease requiring surgery. The clinical presentation included on/off renal colics or fixed renal pain, renal swelling, & urinary complaints e.g. burning, dysuria, hematuria. The exclusion criteria were: renal tumors (anterior peritoneal approach was preferred) & cases with incomplete patients' data & patients who were lost to follow-up.

An informed written consent was taken and patients were counseled about the merits and demerits of both procedures. A thorough record of patients' data was performed, including the history & clinical examination. Investigations included blood complete picture (CP), fasting blood sugar (FBS), urea, creatinine & electrolytes (UCE), urine detailed report (D/R), hepatitis B surface antigen (HBsAg), anti-hepatitis C virus (anti-HCV), ultrasound abdomen & intravenous pyelogram (IVP). Diethylene-triamine-penta-acetic acid (DTPA) scan were performed in cases with poor renal function on IVP.

Operative Procedure: All the patients were operated under general anesthesia. Antibiotic prophylaxis was done, using 200 mg of intravenous Ciprofloxacin at the time of induction of anesthesia. The dose was repeated at 12 hours interval twice in post-operative period.

The patients were placed in the lateral position after being anesthetized, with back fairly close to the edge of the operating table & tip of 12th rib positioned over the kidney rest. The bottom leg was flexed to 90^{o}, the top leg straightened, a pillow placed between the knees, and a sponge pad placed under the axilla (to prevent compression of the axillary vessels and nerves); the patients were secured in this position with a wide adhesive tape passed over the greater trochanter and attached to the moveable portion of the table. Elevation of the kidney rest resulted in increased space between the costal margin and the iliac crest and put the flank muscles and skin on tension.

The trans-costal incision was made directly over the 12th rib, beginning at the lateral border of sacrospinalis. Incision was deepened dividing external oblique, latissimus dorsi & periosteum over the rib. Periosteum was completely mobilized round the rib with the periosteal elevator. The proximal end of the rib was transected as far back as possible, & the rib was then separated from the muscles attached anteriorly to complete its removal. Pleural reflec-

tion was safe in 12th rib excision, as it crosses the lower border of 11th rib at the junction of the anterior and middle thirds. The incision finally made through the periosteal bed of the rib to expose Gerotas fascia.

The subcostal incision begun at the renal angle, & carried forward about a fingerbreadth below the lower border of last rib onto anterior abdominal wall. Anteriorly it was curved slightly downward over the midaxillary line to avoid the subcostal nerve, and extended towards the lateral border of rectus abdominis. Latissimus dorsi & serratus inferior posterior were divided posteriorly, while external oblique, internal oblique & transversus was divided anteriorly.

In both groups, the incision was completed by incising the lumbar fascia and inserting two fingers into the perinephric space to push the underlying peritoneum forward. The perinephric space was entered by incising Gerotas fascia posteriorly to avoid injury to the peritoneum. After dealing with the renal pathology, the musculo-fascial incision was carefully approximated in three layers with continuous polypropylene No. 1; skin was closed with subcuticular polypropylene No. 2/0. Bupivacaine (0.2%) was infiltrated into the wound & in fascial sheath around the intercostal nerves (in patients with trans-costal incisions) to decrease postoperative pain. Drains were brought out posteriorly through a separate stab incision below the wound.

All patients received Diclofenac suppository 50 mg at the end of the procedure, followed by oral diclofenac 50 mg twice in 1st 24-hours. The dressing was removed on 1st postoperative day, followed by daily application of local antiseptic ointment (polyfax). The drains were removed after discharge dropped to less than 30 ml per day. Patients were discharged on 5th-7th postoperative day, & then called for follow-ups for 6 months (weekly in 1st month, & then monthly); thereafter asked to report in case of any problem/complication related to urinary tract & operation. Skin sutures were removed on 10th post-operative day.

The variables noted & analyzed were: demographic data, presenting complaint, associated medical disease, abdominal tenderness, WBCs count, UCE, urine D/R, abdominal ultrasound, IVP, DTPA scan, type of incision, type of operation, operative findings, incision time, operation time, complications (peroperative and postoperative), postoperative pain, histopathology report, postoperative hospital stay & follow-ups. Strict patient's follow-up period was six months.

Incision time was defined as the time from start of skin incision to the incision of Gerotas fascia. Operative time was defined as the time between the placements of incision to the last suture applied. Severity of pain was defined using verbal rating scale (VRS). Statistical analysis was done using SPSS 16. The inferential statistics were calculated using chi-square & student's test. A P-value of <0.05 was considered significant.

RESULTS

Group A consisted of 27 patients, 11 were males while 16 were females; mean age was 31.59 years (standard deviation 8.303, range 16-51). In group B (27 patients), females were 14 and males were 13; mean age was 29.63 years (standard deviation 8.153, range 19-48). Thirty seven patients presented with pain in lumbar region alone (17 group A, 20 group B), while the rest 17 patients presented with pain in lumbar region alongwith urinary symptoms like burning, frequency, dysuria (10 group A, 07 group B); p-value is 0.379 (not significant). Mild tenderness was present in 15 patients with urinary symptoms (08 group A, 07 group B); p-value is 0.761 (not significant). Urine D/R showed numerous pus cells in all patients with urinary symptoms. Associated diseases include diabetes mellitus 5 patients, & hypertension 6 patients, while three patients had history of previous abdominal surgery (02 caeserian section & 01 appendicectomy); p-value is 0.276 (not significant). Final preoperative diagnosis were staghorn calculi (functioning kidney) 26 patients (14 group A, 12 group B), multiple renal calculi 17 patients (07 group

Table-I: Comparative analysis of duration of operaion, incision time, pain VRS score & hospital stay

Variable	*Type of incision*	*Mean*	*N*	*Std. Deviation*	*Std. Error of Mean*	*Minimum*	*Maximum*	*P-value*
Duration of operation (minutes)	Sub-costal	51.68	27	6.31	1.21	44.00	68.00	0.047*
	Trans-costal	84.45	27	11.71	2.25	64.70	106.30	
Incision time (minutes)	Sub-costal	3.826	27	0.2297	0.044	3.40	4.20	0.005*
	Trans-costal	12.078	27	2.385	0.459	9.20	17.00	
Pain VRS score	Sub-costal	4.56	27	1.476	0.284	2	7	0.001*
	Trans-costal	6.96	27	1.480	0.285	5	10	
Hospital Stay (days)	Sub-costal	5.37	27	2.529	0.487	3	15	0.212
	Trans-costal	6.59	27	4.317	0.831	3	25	

* P = <0.05

A, 10 group B), & non-functioning kidney (staghorn calculi) 11 patients (6 group A, 5 group B); p-value is 0.679 (not significant). Procedure performed were: pyelolithotomy 31 patients (16 group A, 15 group B), extended pyelolithotomy 12 patients (5 group A, 7 group B), & nephrectomy 11 patients (6 group A, 5 group B). Both the operative & incision times were significantly longer in Group B patients (Table-I); the severity of pain on VRS score was also significantly higher in this group (Table-I). Mean hospital stay of patients was marginally higher in group B (Table-I). Both preoperative & postoperative complications were also marginally higher in group B (Table-II).

DISCUSSION

Urinary lithiasis is very common disease.[6] Urolithiasis or nephrolithiasis occur in 5% of the population.[7] Urinary infection is a risk factor for lithiasis.[8] Bilateral stones, late metabolic diagnosis and infection are factors that can induce an alteration of the renal function. Staghorn stone is a grave disease for the renal function.[9] In this study there were 37 patients with staghorn stone, & 11 of those were with non-functioning kidney.

In this study, 24 (44.44%) patients were males while 30 (55.56%) were females; mean age was 30.61 years (standard deviation 8.210, standard error 1.117). Trinchieri[10] found male predominance with male/female of 2.19, & higher mean age (in males 45.5+/-13.0 vs in females 42.5+/-15.5). Benchekroun et al[11] found female predominance (females 62% & males 38%), & higher mean age (46 years). Benchekroun et al[11] found urinary infection in 30 cases (34%), & impaired renal function in

Table-II: Comparative analysis of complications.

Variables	*Complications*	*Sub-costal incision*	*Trans-costal incision*	*Total(%)*	*P-value*
Peroperative complications	Pleural breach	0	5	5(9.3)	0.064
	Peritoneal breach	5	4	9(16.7)	
	None	22	18	40(74.1)	
Post-operative complications	Wound infection	2	2	4(7.4)	0.838
	Seroma	1	3	4(7.4)	
	Hematuria	1	2	3(5.6)	
	Urine leakage (fistula)	1	1	2(3.7)	
	Incisional hernia	1	0	1(1.9)	
	None	21	19	40(74.1)	

15 patients (17%). We found urinary infection in 17 patients (31.5%), & non-functioning kidney in 11 patients (20.8%).

As with Benchekroun et al, we performed nephrectomy in patients with non-functioning kidney; other patients required nephrolithotomy, pyelonephrolithotomy or pyelolithotomy.[11] The most common indications for open surgery were complex stone burden, failure of extracorporeal shock wave lithotripsy (ESWL) or endourological treatment, anatomic abnormalities such as ureteropelvic junction obstruction, morbid obesity and co-morbid medical disease.[12-14] Open surgery of complex staghorn calculi has better results than percutaneous nephrolithotomy (PCNL) associated with ESWL.[15] Non-availability of resources, a poor health care system, the lack of PCNL & ESWL facilities &/or expertise, the cost & need for multiple sessions &/or ancillary procedures in these minimally invasive techniques & the vigorous follow-up required still make open surgery a viable & an applicable option in Pakistan's socioeconomic setup, as in this study.[16] Johnson in a series of 104 open renal surgeries performed conservative operations (pyelolithotomy, ureterolithtomy & nephrolithotomy) in 85.5% cases, & partial nephrectomy or nephrectomy in the remainder.[17] In comparison out of 54 cases, we had performed pyelolithotomy in 43 (79.63%) patients & nephrectomy in the remaining 11 (20.37%).

Mean hospital stay in this series was 5.37 days (group A) & 6.59 days (group B), respectively. This is comparable to that found by Paik[12] 6.4 days, & Diblasio[3] five days. Errando et al in a series of 52 nephrectomies (40 via lumbotomy incision & 12 via subcostal incision) had a mean operating time of 161 minutes (range: 90-245).[4] Diblasio in a series of 167 partial or radical nephrectomy using a supra-11th rib mini-flank incision, had median operative duration of 2.9 hours, and median hospital stay of 5 days.[3] Diblasio concluded that supra-11th rib mini-flank incision offers a practical alternative to traditional open or laparoscopic naphrectomy as it provide optimum exposure without compromising cancer control, with excellent cosmetic results and a lower risk of late complications at the wound site.[3] Aguiar et al in 60 donor nephrectomies (30 through lombotomy and another 30 via subcostal mini-incisions) found that the position of the mini-incision (lombotomy or subcostal) had no significant impact on surgical outcomes & pain perception, & both represent fast and safe approaches to perform nephrectomy.[2] Bayazit suggested lumbotomy incisions in donor nephrectomy either a rib resection or subcostal approach, were reliable, provides excellent exposure for surgeon and has minimal morbidity.[18] Srivastava in a series of 82 donor nephrectomies, via subcostal or transcostal mini-incisions, found rib sparing, subcostal mini incision donor nephrectomy has significantly less morbidity and a shorter hospital stay compared with the rib resection transcostal technique.[19] In comparisons, the overall mean operative time in our series was 68.06 minutes (range: 44-106.30), & it was significantly higher in patients with transcostal incisions vs. sub-costal incisions (84.45 vs. 51.68). Similarly, incision time was significantly higher in patients with trans-costal incisions (Table-I); there is no data available on national or international database to compare the incision time at present.

We encountered 25.9% morbidity consisting of wound infection, seroma, urinary fistula, hematuria, & incisional hernia. Lechevallier had reported postoperative complications of stenosis, fistula and infections.[14] Tazi et al in a series of 63 open renal operations reported septic complications in 12 patients, hemorrhage in 5 case and fistula in one case.[15] Errando reported immediate postoperative complications in 17% and late postoperative complications in 10% patients.[4] Dzeranov et al had reported complications in 79.9% patients; they described peroperative complications from opening of the pleural and peritoneal cavities in 8.5%.[20] Bayazit in a series of 100 donor nephrectomies (via incisions made subcostally or by an 11th or 12th rib resection) had reported peritoneal breech in 2%, & pleural breech 24% patients; all lacerations were repaired without place-

ment of a peritoneal drain or chest tube, but postoperatively chest tube insertion was required in 2 patients.[18] We had 16.7% incidences of peritoneal breech (repaired without drainage), & 9.3% incidences of pleural breech (repaired with placement of chest drain). There was no mortality in our series, which was similar to most other reports.[3,4,12] Johnson reported 7.7% morbitiy & 1.9% mortality (in patients with stone anuria).[17]

CONCLUSION

Sub-costal renal approach provides adequate exposure, & is quick, safe & less painful.

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