

# Comparison of Morbidity of Three Flank Approaches for Open Renal Surgery

1. Abdul Ghaffar 2. Abdul Saboor Soomro 3. Qadeer Ahmed Ch 4. Rafique Anjum

1. Asstt. Prof. of Urology, SMC Sahiwal 2. Asstt. Prof. of Urology, GMMMC / Teaching Hospital, Sukkur  
3. Asstt. Prof. of Urology, GMC, DG Khan 4. Head of Urology Department, NMC, Multan

## ABSTRACT

**Objective:** The aim of this study was to compare the morbidity of three flank incisions, subcostal, transcostal and supracostal for open renal surgery in terms of incision times, postoperative pain, postoperative hospital stay and long term complications.

**Study Design:** Prospective comparative and analytic study.

**Place and Duration of Study:** This study was conducted at Department of Urology, Nishtar Hospital Multan and Department of Urology, Ghulam Mohamed Maher Medical College/Teaching Hospital Sukkur from January 2007 to December 2011.

**Materials and Methods:** In this study twelve hundred sixty (n-1260) patients who underwent open surgical procedures over a period of five years are analyzed. Patients were studied in three groups. Group A, subcostal, (n-407) 32.3%. Group B transcostal (n-526) 41.7% and Group C, supracostal, included (n-327) 25.9%. Mean incision time in Groups A, B and C was 17.3 min, 21.08 min and 23.81 min respectively. Mean amount of injectable analgesic required in first three post operative days in Groups-A, B and C was 41.36 mg, 46.87 mg and 49.40 mg of Nalbin respectively. Mean Post operative hospital stay in Group A and C was 4.63, 5 days and 4.64 days respectively.

**Results:** Pleural injury was none in Group A, thirty five (n- 35) cases (6.61%) in Group B and thirty nine (n-39) cases (11.9%) in Group C. Incisional hernia was noted in Group A 12 cases 3%, Group B 6 cases 1.1 % and none in group C.

**Conclusion:** With subcostal approach, incision time, dose of analgesia and pleural injury is minimum but high incidence of incisional hernia is there. In transcostal and supracostal approach the incision time, dose of analgesia and incisional hernia is minimum but incidence of pleural injury is relatively high.

**Key Words:** Transcostal, Supracostal, Incisional Hernia

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## INTRODUCTION

Endourology and Laparoscopy have come to the forefront of urologic surgery for the management of various urological conditions. With this, an increasing number of urologists are performing routine and complex laparoscopic and endourologic procedures. The natural corollary of these developments has been the steady decline of open surgery in urology. Open surgery for stone disease is now used in less than 5% cases.<sup>1</sup> This also means that urologists in training presently and in the future will have a very limited exposure to open surgery. Both physicians and patients are likely to opt for open surgery as a failure of other minimally invasive techniques. On the contrary, there still exist some situations where open surgery may be the treatment of choice. This is not to say that open surgery is the "only option" but probably the "most suitable option". In developing world the main bulk of

renal surgery is still based on open surgical procedures. This may be due to cost of equipments and disposables of minimally invasive surgery, patient's unwillingness and lack of significant surgeon training and experience. Open surgery is less expensive, more effective, more dependable and more easily available than minimally invasive alternatives.<sup>2,3</sup>

Basic principle of open surgery is adequate exposure to perform the operation and to deal with any possible complications. Kidneys are deeply located in upper retroperitoneum. Poor exposure can trouble the surgeon to complete the procedure and manage complications like injury to renal vascular pedicle. This also leads to excessive retraction, with consequent increase in postoperative pain and analgesic requirement. Factors which should be considered in selecting an appropriate renal incision include the operation to be performed, renal pathology, previous operations, extrarenal pathology that requires another simultaneous operation, need for bilateral renal operations, and body habitus.<sup>4</sup>

Open renal surgery may be carried out by four principal routes: extraperitoneal flank approach, dorsal lumbotomy, transperitoneal anterior abdominal incision, or thoracoabdominal incision.<sup>5,6</sup> The flank

**Correspondence:** Dr. Abdul Ghaffar,  
Assistant Professor of Urology, SMC Sahiwal.  
Cell No.: 03336105110  
Email: aghaffaruro@yahoo.com

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 approaches are subcostal, transcostal and supracostal. Thoracoabdominal incision is used for suprarenal tumors and the renal tumors extending in the supradia phragmatic IVC. The choice of incision 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.<sup>7</sup> It has the disadvantage of being rather low in relation to renal position. Care must be taken to avoid damage to subcostal nerve. Transcostal approach offers the best exposure to kidney with minimum chance of entering the pleura. It can be performed through any of the lower three rib beds by resecting the concerned rib. It gives good control of pedicle and approach to the pelvicalyceal system and upper pole. Resecting the rib while avoiding pleural injury and the neurovascular bundle needs expertise. Supracostal approach can be made more easily than transcostal incision and gives equal exposure. Based on the length of 11<sup>th</sup> or 12<sup>th</sup> rib and extent of exposure required, one can choose supra eleven or supra twelve incision. There is risk of injury to pleura while dissecting on the inner aspect of the rib. Rib is not resected; rather it is pivoted on costovertebral joint and moved away from the field by a self retaining retractor.

Most important operative complication of flank approach related to incision is pleural injury. Due to close anatomical relationship between kidneys and costodiaphragmatic recess of pleural space, violation of thorax might occur during flank approach. It has been reported that rib resection might increase the risk of pleural injury via flank incision.<sup>8,9</sup> Pleural injuries that occur during renal surgery through flank approach can be diagnosed easily and can be repaired successfully by simple evacuation technique. However, a small percent of these patients might require postoperative chest tube insertion due to the presence of manifest pneumothorax although repaired intraoperatively.<sup>10</sup>

The aim of this study was to compare the morbidity of three flank approaches for open renal surgery in terms of incision times, complications, postoperative pain, & postoperative hospital stay.

**Table No.4: Multiple comparison of incision time, dose of analgesia for 3 days and hospital stay**

Group	Incision Time			Dose of Analgesia for 3 days			Hospital Stay		
	Range (minutes)	Mean (minutes)	Std. Deviation	Range (mg)	Analgesia Mean (mg)	Std. Deviation	Range (days)	Mean (days)	Std. Deviation
A	10-28	17.13	3.706	20-90	41.38	12.548	3-10	4.63	1.139
B	10-80	21.08	6.024	30-90	46.87	13.970	3-10	5	1.050
C	15-30	23.81	2.956	20-90	49.40	15.984	3-10	4.64	1.078

## MATERIALS AND METHODS

This study was conducted at Department of Urology; Nishtar Hospital Multan and Department of Urology, Ghulam Mohamed Maher Medical College/Teaching Hospital Sukkur from January 2007 to December 2011. It was prospective comparative and analytic study. Patients were studied in three groups. Group A having subcostal incision, Group B having Transcostal incision and Group C having supracostal incision All the patients undergoing open renal surgery through flank approach for any indication were included in the study.

## RESULTS

Mean age in all the three groups was 40 years with range from 14 years to 72 years. Regarding male to female ratio in our study there is male predominance (Table-1). Procedure distribution is given in Table 2. Distribution regarding Incision is seen in table-3. Mean amount of injectable analgesic required in first three postoperative days in Group A was 41.36 mg, in Group B was 46.87 mg and in Group C was 49.40 mg . Mean Post operative hospital stay in Group A was 4.63 days in Group B was 5 days and in Group C was 4.64 days. Statistical difference between the groups is calculated by ANOVA test. Table-4.

**Table No.1: Gender distribution in three groups**

Group	No.	%	Incision	Male	Female	Ratio
A	407	32.3%	Sucostal	266	141	1.88:1
B	526	41.7%	Transcostal	372	154	2.41:1
C	327	26.0%	Supracostal	210	117	1.79:1

**Table No.2: Distribution of procedures**

Procedure	Right (n=649)	Left (n=611)	Total (n=1260)
Pyelolithotomy	447	377	824
Nephrolithotomy	63	86	149
Nephrectomy	101	105	206
Pyeloplasty	38	43	81

**Table No.3: Distribution regarding Incision**

Incision	Right (n=649)	Left (n=611)	Total (n=1260)	%age
Subcostal	298	109	407	32.30
Transcostal	221	305	526	41.74
Supracostal	130	197	327	25.95

Postoperative long term complication like scar pain and Incisional hernia was noted on one year follow up. Only few patients came for follow up after one year and those were the patients who developed recurrent stones or incisional hernia. Persistent pain in the scar was also noted (Table 5).

**Table No.5: Comparison of operative data**

Parameter	Subcostal (n-407)	Transcostal (n-526)	Supracostal (n-327)
Plueral Injury	0	35 cases (6.61%)	39 cases (11.92%)
Incisional Hernea	12 cases (2.98%)	6 cases (1.14%)	0

**p = 0.000**

## DISCUSSION

Renal diseases that need surgical treatment are very common. Urolithiasis or nephrolithiasis occur in 5% of the population<sup>11</sup>. Most renal calculi can be managed by ESWL or minimally invasive endoscopic techniques. Staghorn stone, stone associated with anomalies of the pelvicalyceal anatomy and dense hard stone not manageable by PNL/ESWL may need open surgery. The stone-free rate of open surgery is over 90%.<sup>12</sup> Open surgery maintains its important role for treatment of renal and ureteral calculi because of its safety and efficacy.<sup>13</sup> Partial nephrectomy or simple nephrectomy for non functioning kidney may require open surgery. Although laparoscopic nephrectomy is now an established procedure<sup>14,15</sup> but it may not be available or not feasible so open procedure is done. Anatomic abnormalities like UPJ obstruction, ureteral stricture or calyceal diverticulum are managed by open surgery. Paik, et al<sup>16</sup> noted that 24% of their open surgery cases were due to one of these conditions.

In this study we found male predominance in all the three groups with male to female ratio in Group A 1.81:1, Group B 2.41:1 and in Group C 1.79:1. Trinchieri et al<sup>17</sup> found male predominance with male /female of 2.1:0.9. Mean incision time in Group A was 17.3 min, in Group B was 21.08 min and in Group C was 23.81 min. We have assessed the incision time and not the operation time and there is no parallel study that compares the incision time only. We have found that the flank subcostal incision (Group A) takes minimum time to reach to Gerota's fascia from the skin as compared to transcostal incision (Group B) and Supracostal incision (Group C). This is comparable to the study of Shamim<sup>18</sup>, where they have found that incision time was higher in patients with transcostal incisions; there is no data available on national or international database to compare the incision time at present. Short incision time in Group A may be because of the fact that in this incision, there is no threat of injury to the pleura and more so in Group B and C, surgeon is always careful for pleura due to its close proximity to the last rib.

Postoperative hospital stay in Group A was 4.63 days Group B was 5 days and in Group C was 4.64 days. This is comparable to that found by Paik of 6.4 days<sup>19</sup> and by Diblasio of 5 days.<sup>20</sup> Postoperative hospital stay is based on the type of surgery, comorbidities and postoperative complications like infection and bleeding. This is not solely based on the incision that may be one factor. 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.<sup>21</sup> Post operative analgesic requirement was assessed in three groups in first three post operative days and it was found that patients in Group A required minimum analgesia where as the dose of analgesic required in group B and C where rib is manipulated is a little bit higher.

During open renal surgery through flank incisions there is risk of injury to pleura .This risk is increased if rib resection is also performed.<sup>22,23</sup> Atmaca et al in their study of 109 open nephrectomies have found pleural injuries in 18 cases (16.5%) with rib resection We have seen pleural injury in 35 cases in Group-B (6.6%) and 39 cases (11.9%) in Group-C. We did not encounter any pleural injury in Group-A where as Atmaca et al have encountered one case of pleural injury among 39 cases (2.6 %) without rib resection. Association of pleural injury with age , gender, type of surgery and site of surgery is not well studied and Atmaca et al did not detect any such association in their study. More so they did not observe significant association between the type of incision and pleural injury occurrence but in our study there is significant association of pleural injury with type of incision as there is no report of pleural injury in Group A (subcostal incision) where as the incidence of pleural injury is well documented with rib resection as in Group B and Group C. Another important issue related to intraoperative pleural injuries is insertion of prophylactic chest tube routinely in addition to water tight repair of rent. If the rent is repaired adequately as in our study, the incidence of pneumothorax requiring chest tube insertion is very low.<sup>24</sup>

Similarly in our study where in we encountered pleural injuries in Group-B 6.61% and Group-C 11.92 % and we never required post operative chest tube insertion to manage the pneumothorax. More so complications like pneumonia and development of atelectasis are reported to be seen less with associated lower pain scores and shorter length of hospital stays in patients whose pleural injuries are repaired intraoperatively without chest tube insertion.<sup>24</sup>

Long term complication like incisional hernia was noticed on one year follow up. Unluckily the response to follow up was very poor. This may be due to poverty, illiteracy, lack of health education or failure on

our part to counsel the patients. Only those patients who developed incisional hernia, recurrence of primary disease like stone or chronic pain came for follow up. Only twelve (n-12) 2.9 % of group A and six cases in group B (1.1%) and none in group C developed incisional hernia that required proline mesh repair. They were admitted and with the help of general surgery colleagues, the hernia was repaired. Bayazit et al have reported high incidence of incisional hernia of 7% in their series of 100 cases of donor nephrectomies through flank incision.<sup>25</sup>

This may be due to the fact that they have not studied the patients separately in subcostal and transcostal groups. More so they have not felt the need of hernia repair. These patients have not complained any cosmetic problem. Some of the patients in groups A and B developed bulge of anterior abdominal wall beyond the incision line. This was not hernia in reality but weakness of abdominal wall muscles due to nerve injury during muscle cutting. This is mentioned in literature as abdominal asymmetry that does not need surgery but may cause cosmetic concerns. Anuar et al have mentioned high incidence of abdominal asymmetry in subcostal (59.4%) and trans costal groups (64.9%) which he says is undesirable in healthy kidney donor volunteers.<sup>26</sup> These rates are higher than the average of 48% reported in the literature.<sup>27</sup> The supracostal approach is considered as a better method with excellent exposure to the kidney and adrenal and is anatomically comprehensive.<sup>28</sup>

## CONCLUSION

With subcostal approach, incision time, dose of analgesia and pleural injury is minimum but high incidence of incisional hernia is there. In transcostal and supracostal approach the incision time, dose of analgesia and incisional hernia is minimum but incidence of pleural injury is relatively high.

**Conflict of Interest:** This study has no conflict of interest to declare by any author.

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