Routine postoperative chest radiography is not needed after flank incisions with eleventh rib resection

Ali Fuat Atmaca, MD, Ziya Akbulut, MD, Serkan Altinova, MD, Alper Çaglayan, MD, Mehmet Tuzlali, MD, M. Derya Balbay, MD

Urology Clinic, Ankara Ataturk Training and Research Hospital, Ankara, Turkey

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Introduction: *We wanted to determine whether routine postoperative chest radiography is needed after surgery with eleventh rib resection.*

Materials and methods: *Data on 80 patients who underwent radical or partial nephrectomy, nephroureterectomy or adrenalectomy through 82 flank incisions with eleventh rib resection were collected and analyzed retrospectively.*

Results: *Radical and partial nephrectomies, nephroureterectomies and adrenalectomies were done through 47, 20, 6 and 9 flank incisions in 80 patients, respectively. Among these, one patient underwent a partial nephrectomy and subsequent contralateral radical nephrectomy, and another patient underwent simultaneous bilateral adrenalectomies. The intrapleural space was entered accidentally in 16 flank incisions (19.51%). Repair was performed with a simple evacuation technique at the time of surgery, and a chest tube was needed in only three patients (18.75%) according to postoperative chest x-ray evaluation after pleural repair. Of the remaining patients who had no evidence of pleural opening on the water seal test before wound closure, none developed respiratory distress postoperatively and no chest x-rays were ordered, except for one patient who developed subcutaneous emphysema on the day of surgery where no evidence of pneumothorax was detected.*

Conclusions: *We concluded that when pleural injury was not observed and confirmed via the water seal test, none of the patients developed respiratory distress, and this suggests that there is no need to check for its presence with chest x-ray postoperatively.*

Key Words: flank incision, pneumothorax, pleural injury, rib resection

Introduction

The pleural space may be entered during flank operations, especially those involving rib resections. At most institutions, it is the standard of care to obtain routine postoperative chest radiographs to check for the presence of pneumothorax due to incidental or unrecognized pleural injury in patients undergoing open flank surgery.[1] However, we routinely obtain chest radiography in the postanesthesia care unit only for patients in whom pleural injury occurred and was treated during the same operation. In the remaining patients, we do not obtain chest radiographs to evaluate postoperative early pneumothorax. We wanted to determine whether all pleural injuries could be detected intraoperatively, and with this in mind we performed a retrospective analysis of 80 patients who had undergone radical nephrectomy, partial nephrectomy, nephroureterectomy or adrenalectomy through a total of 82 flank incisions, all involving resection of the eleventh rib.

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Address correspondence to Dr. Ali Fuat Atmaca, 475. sokak 20/20 Çukurambar 06520, Çankaya, Ankara, Turkey

Material and methods

We carried out a retrospective analysis of 80 patients who underwent a total of 82 flank incisions with resection of the eleventh rib. The indication for surgery was renal or adrenal tumor, and operative procedures included radical nephrectomy (47 incisions), partial nephrectomy (20 incisions), nephroureterectomy (6 incisions) and adrenalectomy (9 incisions), all performed at our institution during the period June 2004-November 2006. The patients' mean age was 56.86 ± 14.22 years (range 19-88 years); 48 were male (60%) and 32 were female (40%). One patient underwent a partial nephrectomy and subsequent contralateral radical nephrectomy, and another patient underwent simultaneous bilateral adrenalectomies. Characteristics of the patients are summarized in Table 1.

Only the eleventh rib was resected in 76 flank incisions (92.68%), whereas more than one rib was resected in six flank incisions (7.32%). Of these latter six, three involved the tenth and eleventh ribs, and three involved the eleventh and twelfth ribs. All patients were checked for evidence of pleural opening with the water seal test, and if present this was repaired with a running 3/0 polyglycolic suture after a simple evacuation of the pleural space. The water seal test is performed by filling the surgical wound with saline up to the level of the skin incision and observing any air bubbles coming through the pleura and/or diaphragmatic structures during respiratory movements.

Chest x-rays for the detection of pneumothorax were obtained in the postanesthesia care unit only for the patients who underwent pleural repairs. Three patients needed chest tube placement postoperatively as indicated by radiographic findings of persistent pneumothorax. None of the remaining patients underwent chest x-ray examinations postoperatively or developed any evidence of respiratory distress thereafter, except one patient who developed subcutaneous emphysema.

For statistical analyses, Fisher's exact test, Student's t test and the chi-square test were used, and *p* values less than 0.05 were considered to be statistically significant.

Results

There were no statistically significant differences between patients with and patients without pleural opening in terms of age (p = 0.667, Student's t test), gender (p = 0.782, Fisher's Exact test), surgical procedure (radical nephrectomy, partial nephrectomy, nephroureterectomy or adrenalectomy, p = 0.446, chi-square test), or sidedness of the kidney operated on (p = 0.781, Fischer's Exact test) Table 1.

In the group of patients with no pleural opening, one patient who had both tenth and eleventh ribs resected developed subcutaneous emphysema without any pneumothorax. This was managed conservatively and it resolved spontaneously within 3 days. The remaining patients without pleural opening did not undergo any radiographic examination after surgery, and were discharged after an uneventful postoperative course.

Pleural openings occurred in 16 of 82 flank incisions (19.51%). Of these 16, 13 (81.25%) were

TABLE 1. **Patient characteristics**

	With pleural injury	**Without pleural injury**	**p value**
Age (mean ± SD)	58.00 ± 11.40	56.53 ± 14.70	0.667*
Surgery(#)			
Radical nephrectomy	11	36	
Partial nephrectomy	4	16	0.446**
Nephroureterectomy	1	5	
Adrenalectomy	0	9	
Localization(#)			
Right	8	29	0.781***
Left	8	37	
Gender(#)			
Male	9	40	0,782***
Female	7	26	

*Student t test; **Chi-square analysis; ***Fisher's Exact test

TABLE 2. **Incidence of pleural injury and chest tube placement secondary to rib resection**

Procedure	No. with pleural injury/total no. (%)	No. with chest tube/total no. (%)
Eleventh rib	13/76 (17.10%)	2/76 (2.63%)
Tenth and eleventh rib	1/3 (33.33%)	1/3 (33.33%)
Eleventh and twelfth rib	2/3 (66.7%)	-
Total	**16/82 (19.51%)**	**3/82 (3.66%)**

eleventh rib resections, two (12.5%) were eleventh and twelfth rib resections and one (6.25%) was a tenth and eleventh rib resection. All pleural openings were both detected and repaired intraoperatively. Portable radiography of the chest was performed in the postanesthesia care unit for these 16 patients. Twelve of these radiographs were normal while there were two cases of less than 10% and two other cases of manifest pneumothorax in the remainder. Three patients were treated with chest tube placement: two patients with manifest pneumothorax and one patient with less than 10% pneumothorax but worsened on the first postoperative day, Table 2. The mean duration of chest tube use was 4 days.

Discussion

The flank position is frequently used for certain urological procedures but it can lead to several complications, such as the pulmonary complications which have been reported to occur in 19% of patients undergoing surgery in the flank position.[2] The flank approach to the kidney via rib resection requires an understanding of thoracic and abdominal wall anatomy to prevent injury to the pleura and subsequent pneumothorax. Pneumothorax usually results from attempts to separate the pleura from the diaphragm, and precise appreciation of the pericostal anatomy allows the surgeon to remain extrapleural during the flank incision.[3]

Pleural injuries are usually recognized intraoperatively and can be rectified by simple measures.[1] If operative pneumothorax occurs, placement of a chest tube is rarely necessary.[3]

Poore et al reported that the incidence of pleurotomy was 24.9% (63 of 253 cases). All involved flank operations but in 19 incisions there were no rib resections. Of 63 pleurotomies, 61 were recognized intraoperatively and all were treated successfully by a simple evacuation technique. Chest tubes were not needed in any of those patients, including two patients who had intraoperatively unrecognized pneumothorax, who were managed conservatively.[1]

Latchamsetty et al[4] reported 150 patients who underwent open nephrectomy. Seventy patients had rib resections. In 10 of these 150 cases (6.67%) pleural injuries were recognized intraoperatively and nine had undergone rib resections. One patient in that study developed pneumothorax postoperatively without pleural injury being identified intraoperatively. In addition, they reported that 10 pleurotomies, 14.3% of 70 cases, occurred during rib resections and only one patient needed chest tube placement.[4]

In a study of nephroureterectomy in living donors, rib resections were performed on only 58 of 130 kidney donors through a flank incision.[5] Of the 130 donors, 11 were diagnosed with pleural injuries, and nine of these had undergone rib resection. Two patients in that study were treated with chest tubes.

We observed pleural injury in 16 (19.51%) of our patients. All injuries were recognized intraoperatively and were repaired with the simple technique mentioned in the methods. This technique was successful in 13 patients (81.25%), and in the remaining three patients chest tubes were needed.

Postoperative chest radiography is recommended when clinically indicated, for conditions such as recognized intraoperative pleural injury, central line placement preoperatively, respiratory difficulties or abnormal physical examination.[4] However, many surgeons routinely obtain a chest x-ray postoperatively to check for pneumothorax in patients without a known intraoperative pleural injury.

Two different studies, published in 1996 and 2005, have addressed the specific issue of whether radiographic evaluation is necessary after nephrectomy. Poore et al[1] and Latchamsetty et al[4] reviewed 253 and 150 patients, respectively, who underwent open nephrectomy. Only nine patients (3.4%) in the former retrospective review did not undergo postoperative chest radiography. On the other hand, 58 (38.7%) of the 150 patients in the latter study were reported as being managed without postoperative chest radiography, but only 12 of the patients had either eleventh or twelfth rib resections.

Our study suggests that postoperative chest radiography is not needed in patients without an intraoperatively recognized pleural injury. In agreement with Latchamsetty et al,[4] although we could not estimate how many of our 63 patients (65 flank incisions) without a chest x-ray developed a pneumothorax, we can conclude that any unrecognized occurrences of pneumothorax in this group were clinically insignificant because no patient in this group developed any respiratory sequelae or complications. Our study is notable because all cases underwent rib resections and it was found that routine postoperative chest x-ray was not necessary in patients undergoing eleventh rib resection who had no intraoperative evidence of pleural injury and no postoperative respiratory distress.

Although Poore et al[1] reported that female gender was significantly associated with pleurotomy in the absence of any anatomical or physiological explanation we did not find a statistically significant difference in pleural injury with respect to gender in our study.

Conclusion

The risk of pleural injury during surgery through a flank incision with rib resection is not associated with age, gender, type of operation, or side of incision. Patients who undergo rib resection with no intraoperative signs of pleural injury can be managed postoperatively without chest x-ray if there are no signs of respiratory dysfunction. □

EDITORIAL COMMENT

This is a common sense paper addressing the routine use of chest x-ray after an eleventh rib access to the retroperitoneum. The authors present their experience and argue that postoperative chest x-rays can be avoided in most cases, and should be done only for specific clinical indications. I believe most of our readers would agree with this, although some may comment that most of these cases could have been done through a subcostal incision, thereby reducing the likelihood of entering the pleura in the first place.

Gabriel P. Haas, MD
Upstate Medical University
Syracuse, New York
USA

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