Following thoracic surgery; post- drain removal routine chest x ray, is it valuable?

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Abstract

Background There has been considerable debate concerning the common practice of ordering a chest x-ray after having an intercostal tube removed. The indication for the x-ray was the removal of the tube, with the common justification being a look for any remaining or newly formed pathology. The research, namely studies of trauma and cardiac surgery patients, seems to contradict this idea. Reviewing the literature, we were unable to find any definitive research on the appropriateness of routine chest x-rays for post-operative thoracic surgery patients after intercostal tube removal.

Patients and Methods: 120 patients fulfilled the criteria in the study were included in a prospective retrospective cohort study done at the Cardiothoracic Surgery Department at Zagazig University Hospitals, in the duration from January 2023 to August 2023 . Patients were divided into two groups. First group: Post- drain removal routine chest x ray and the second group: No Post- drain removal routine chest x ray, follow up patients done for 24 hours or developing any signs of respiratory distress or hemodynamics instability needing immediate performing new x ray for detecting of the need of new drain in the second group.

Results: There was 60 patients in each group ,number of cases developed pleural pathology after drain removal were 2 patients (1.7٪) in 1st group and 4 patients (3.3٪) in 2nd group without statical significant difference between the two groups, number of patients need insertion of new drain was 1 patient (0.8٪) in 1st group and 1 patient (0.8٪) in 2nd group without statical significant difference between the two groups.

Conclusion: as the presence of pleural space pathology after removal of chest tube is sporadic. so, routine chest radiograph after this maneuver does not increase clinically serious data for the patients, as CXR associated with increase in hospital cost and radiation exposure so, it should be done when clinically indicated only. So, patients safety and clinical outcomes were not affected by performing a post Intercostal tube removal CXR.

Keywords: routine chest radiograph, intercostal tube removal, thoracic surgery.

Abbreviations: CXR :chest x ray, V.A.T.S: video assisted thoracoscopic surgery.

Introduction

Recently, there has been debate regarding whether or not routine chest x-rays should be performed once intercostal tubes are removed[1]. Intercostal tube removal is a common reason for a chest x-ray, with the underlying assumption being a look for any lingering or newly manifested pathology. The research, namely studies of trauma and cardiac surgery patients, seems to contradict this idea[2]. It is well known that post-thoracic surgery patients benefit little from regular routine chest radiography[3]. We were unable to find any research that directly addressed the question of

whether or not post-operative thoracic surgery patients should undergo routine chest x-rays after the removal of intercostal tubes.

Materials and Methods

Ethical Statement

The approval number is (10962/18-7-2023) from Zagazig University's institutional review board (IRB). All patients who participated in the trial provided written informed consent.

Study Design and Population

This retrospective prospective cohort study done at the Cardiothoracic Surgery Department at Zagazig University Hospitals, in the duration from January 2023 to August 2023. The research was conducted in accordance with the World's Code of Ethics. Declaration of Helsinki, developed by the World Medical Association, for use in human research.

The inclusion criteria were thoracic surgery patients either open surgery or video assisted thoracoscopic surgery(V.A.T.S) .

The exclusion criteria were ventilated patients.

Patients were divided into two groups. First group :Post- drain removal routine chest x ray and the second group: No Post- drain removal routine chest x ray, follow up patients done for 24 hours or developing any signs of respiratory distress or hemodynamics instability needing immediate performing new x ray for detecting of the need of new drain in the second group.

III- Administrative design:

Statistical analysis:

SPSS (Statistical Package for the Social Sciences) version 20.0 was used for data collection, verification, and editing, and analysis. Quantitative and qualitative information was presented in the same way. Quantitative information was summarized by a minimum and maximum, as well as the mean, median, and standard deviation. Two-tailed significance testing was performed on all data. P-values below 0.05 are statistically significant, while P-values above 0.05 are not.

Results:

An adequate number of patients (120) were found to meet the study's criteria. The pathology and type of operation in each patient done are tracked in Table 1 and 2 correspondingly. Patients' average age was 55. (range 14-80). A total of 66 men and 54 women were treated, with 75 receiving a single tube and 45 receiving two. An average of 3.5 days was spent with tubes in place (range 2-12 days). One to eight radiographs were taken of each patient upon hospital admission till discharge (mean 2.6). number of cases developed pleural pathology after drain removal were 2 patients (1.7٪) in 1st group and 4 patients (3.3٪) in 2nd group without statical significant difference between the two groups, number of patients need insertion of new drain was 1 patient (0.8٪) in 1st group and 1 patient (0.8٪) in 2nd group without statical significant difference between the two group.

Table 1: pathological diagnosis by category.

pathological diagnosis	number of cases	percentage
malignant lung	11	9.1٪
benign lung	18	15٪
malignant pleural	12	10٪
benign pleural	17	14.2٪
benign mediastinal	13	10.8٪
infective pathology	13	10.8٪
pneumothorax	22	18.2٪
hemothorax	11	9.1٪
malignant chest wall	3	2.5٪

Table 2: surgical procedure by category

surgical procedure	number of cases	percentage
V.A.T.S+ pleural biopsy	11	9.1٪
V.A.T.S+ lung biopsy	4	3.3٪
V.A.T.S+ bullectomy	5	4.2٪
V.A.T.S+ thymectomy	6	5٪
Thoracotomy + pleural biopsy	6	5٪
Thoracotomy + lung biopsy	5	4.2٪
Thoracotomy + wedge resection	6	5٪
Thoracotomy + bullectomy	2	1.7٪
Thoracotomy + lobectomy	5	4.2٪
Thoracotomy + pneumonectomy	2	1.7٪
Thoracotomy + decortication	24	20٪
Thoracotomy + mediastinal lesion excision	7	5.8٪
chest wall resection and reconstruction	3	2.5٪

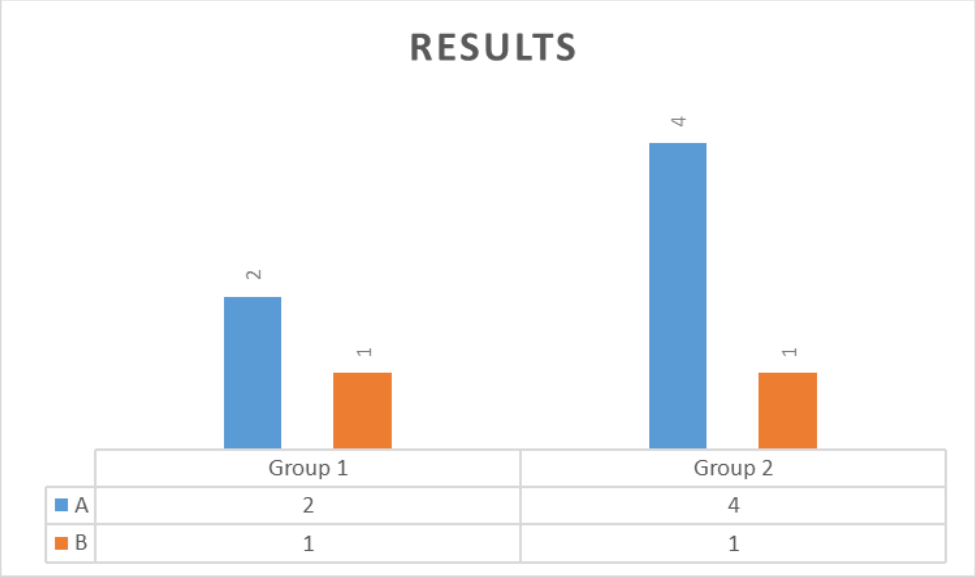

Figure1:Results . A----number of patients developed pleural pathology after drain removal . B---- number of patients need insertion of new drain.

Discussion

When there is a pathology in the pleural space like air, fluid or blood the treatment of choice is the chest drain after its omission ,Routine CXR is the usual of the care in many hospitals [4].The timing of Intercostal tube omission usually depends on the clearance of a the pleural pathology, or a specified decrease in amount of the drain[5]. CXR performed after removing the Intercostal tube suggests there has been no recurrence of the disease, although recurrent pneumothorax or reabsorption of fluid is possible[6]. In our study number of cases developed pleural pathology after drain removal were 2 patients (1.7٪) in 1st group and 4 patients (3.3٪) in 2nd group while number of patients need insertion of new drain was 1 patient (0.8٪) in 1st group and 1 patient (0.8٪) in 2nd group, In other study 28 patients (8.6%) from the 327 in Group 1 that post chest drain omission CXR discovered to have a pneumothorax. Of these, only 3 patients (10.7%) need chest drain reinsertion, and 2 of these 3 patients were clinically symptomatic. The lasting patient had also need chest drain reinsertion after CXR done. In adult studies, similar findings of a low

prevalence of iatrogenic pneumothoracies were found[7]. Out of 73 patients studied retrospectively, 8 (10.9%) developed pneumothorax following drain removal. Clinical evidence suggests that just 2 of these 8 patients require reinsertion of their Intercostal tube[8].Another study indicated that 12 out of 105 patients (11%), who had intercostal tube removal followed by pneumothorax, required reinsertion of the tube due to clinical symptoms in only 1 patient[9]. The authors conclude that practitioners should monitor patients clinically because not every pneumothorax, hemothorax, or pleural effusions are serious enough to require placement of a chest tube[10]. Both the percentage of patients with results following drain removal and the percentage of patients who required reinsertion are very similar across the trials reported here and the studies published elsewhere. In our investigation, dyspnea due to symptomatic recurrent pneumothorax was the most common symptom signaling the need for chest tube reinsertion. In this analysis, the results of routine CXR did not affect patient care. One patient in Group 1 and one patient in Group 2 required reinsertion of their Intercostal tube due to the development of clinical signs and/or symptoms (such as hypoxia, difficulty breathing, and reduced air entry). Group 2's final three patients share the same situation as Group 1's final patient: they acquire little clinical signs and/or symptoms, but CXR findings suggest that reinsertion of the intercostal tube may not have been necessary. All patients in this study who needed a reinsertion of an Intercostal tube did so within 24 hours, hence it is advised that patients be followed for 12-24 hours before being discharged. If there is a must for discharge before this time, or if there are social circumstances that may get the patient at risk, so, CXR done before discharge. the cost of CXR about 200 L.E, Our results are consistent with previous research showing that CXRs performed following the removal of Intercostal tubes do not contribute to decision making and that re-intervention is instead prompted by the presence of symptoms and the clinician's clinical judgement. These findings support the idea that CXR should be saved for symptomatic patients only following Intercostal tube excision. Patients should be monitored for a sufficient amount of time to make sure they don't develop any symptoms that might necessitate reinserting the Intercostal tube[11].The authors of a report on patients who had undergone heart surgery and had their Intercostal tubes removed came to the conclusion that CXR should only be acquired if a patient was in respiratory distress or developed hemodynamic instability after their tubes were removed[12]. pneumothorax, bleeding, infection, and engaged chest tube pieces were the reported Complications may arise after Intercostal tube omission[13]. the need for Intercostal tube reinsertion was the only complication in our study. There was no statistically significant difference in hospitalization or chest tube installation times in the current trial. This contradicts the findings of earlier research that found that performing routine CXRs after removing Intercostal tubes prolonged patients' stays in the hospital[14]. All of our patients who underwent a post-removal CXR did so within 24 hours of omitting, suggesting that our average length of stay was similar to theirs. The post Intercostal tube removal CXR is also linked to an increase in hospital costs and radiation exposure, according to research[15].

Conclusions

As the presence of pleural space pathology after chest tube removal is sporadic. so, routine chest radiograph after this maneuver does not increase clinically serious data for these patients, as CXR associated with increase in hospital cost and radiation exposure so, it should be done when clinically indicated only. So, patients safety and clinical outcomes were not affected by performing a post Intercostal tube removal CXR.

Limitations of the study

The very limited number of patients surveyed could be seen as a drawback of the study. But in the near future, we hope to implement a larger study that will allow us to examine more facets of the patients' intraoperative and postoperative course.

Ethical Approval

Consent from the appropriate institutional review board was achieved.

Informed Consent

All patients provided their written informed consents.

References:

1. Kingma BF, Marges OM, Van Hillegersberg R, Ruurda JP. Routine chest X-rays after the removal of chest tubes are not necessary following esophagectomy. J Thorac Dis. 2019;11(7):S799-S804. doi:10.21037/jtd.2018.12.74
2. Sweet AAR, Beks RB, De Jong MB, et al. Is a chest radiograph indicated after chest tube removal in trauma patients? A systematic review. J Trauma Acute Care Surg. 2021;91(2):427-434. doi:10.1097/TA.0000000000003118
3. Reeb J, Falcoz PE, Olland A, Massard G. Are daily routine chest radiographs necessary after pulmonary surgery in adult patients? Interact Cardiovasc Thorac Surg. 2013;17(6):995-998. doi:10.1093/icvts/ivt352

4. Merkle A, Cindass R. Care of a Chest Tube. StatPearls. January 2023. https://www.ncbi.nlm.nih.gov/books/NBK556088/. Accessed August 18, 2023.
5. Ravi C, McKnight CL. Chest Tube. Pediatr Surg Diagnosis Treat. October 2022:933-937. doi:10.1007/978-3-030-96542-6_84
6. Diaz R, Patel KB, Almeida P, Shekar SP, Hernandez F, Mehta JP. Are Chest Radiographs Routinely Indicated After Chest Tubes Placed for Non-Surgical Reasons Are Removed? Cureus. 2020;12(3). doi:10.7759/cureus.7339
7. Sepehripour AH, Farid S, Shah R. Is routine chest radiography indicated following chest drain removal after cardiothoracic surgery? Interact Cardiovasc Thorac Surg. 2012;14(6):834-838. doi:10.1093/icvts/ivs037
8. Abuejheisheh A, Qaddumi JAS, Darawad MW. Chest drains: prevalence of insertion and ICU nurses' knowledge of care. Heliyon. 2021;7(8):e07719. doi:10.1016/j.heliyon.2021.e07719
9. Lee YY, Hsu PK, Huang CS, Wu YC, Hsu HS. Complications after chest tube removal and reinterventions in patients with digital drainage systems. J Clin Med. 2019;8(12). doi:10.3390/jcm8122092
10. Kwiatt M, Tarbox A, Seamon M, et al. Thoracostomy tubes: A comprehensive review of complications and related topics. Int J Crit Illn Inj Sci. 2014;4(2):143. doi:10.4103/2229-5151.134182
11. Hallifax RJ, McKeown E, Sivakumar P, et al. Ambulatory management of primary spontaneous pneumothorax: an open-label, randomised controlled trial. Lancet. 2020;396(10243):39-49. doi:10.1016/S0140-6736(20)31043-6
12. Leigh-Smith S, Harris T. Tension pneumothorax - Time for a re-think? Emerg Med J. 2005;22(1):8-16. doi:10.1136/emj.2003.010421
13. Zarogoulidis P, Kioumis I, Pitsiou G, et al. Pneumothorax: from definition to diagnosis and treatment. J Thorac Dis. 2014;6(Suppl 4):S372-6. doi:10.3978/j.issn.2072-1439.2014.09.24
14. Goodman MD, Huber NL, Johannigman JA, Pritts TA. Omission of routine chest x-ray after chest tube removal is safe in selected trauma patients. Am J Surg. 2010;199(2):199-203. doi:10.1016/J.AMJSURG.2009.03.011
15. Beattie G, Cohan CM, Chomsky-Higgins K, Tang A, Senekjian L, Victorino GP. Is a chest radiograph after thoracostomy tube removal necessary? A cost-effective analysis. Injury. 2020;51(11):2493-2499. doi:10.1016/J.INJURY.2020.07.055