



## Postoperative Outcome of Thoracotomy in Children

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### Abstract

**Aim:** This study aimed to examining the complications of thoracotomy and the factors affecting these complications in children.

**Materials and Methods:** The records of the patients who had undergone thoracotomies performed in our clinic between 1998 and 2015 were retrospectively evaluated for age, gender, operation duration, additional anomaly, diagnosis, type of wound and incision, complications, type of analgesia, pulmonary lesions, nutritional status of the patients, and removal time of thoracic tube. Kruskal-Wallis and Pearson Chi-square tests were used in statistical analyses.  $P < 0.05$  was considered significant.

**Results:** 103 thoracotomies were performed. The gender distribution was 63% males and 37% females, with a mean age of 37.1 months (1 day-16 years). The cases were esophagus atresia ( $n=40$ ), thoracic hydatid cyst ( $n=21$ ) and other thoracic lesions ( $n=14$ ). The mean operation duration was 115 minutes (40-240 min.). Thirty-two wounds were clean; 64 were clean-contaminated; and 7 were contaminated. The main complications were atelectasis and wound infection. The postoperative analgesic applications were intravenous (iv) dipyrone in 42 cases, local prilocaine in 3 cases, local bupivacaine in 6 cases, epidural catheterization in 20 cases, local prilocaine - iv dipyrone in 17 cases, and local bupivacaine - iv dipyrone in 15 cases.

**Conclusion:** After pediatric thoracotomies, the incidence of surgical infections is 16% and the pulmonary functions of the patients are often declined. Operation time under 90 minutes and use of local anesthetics for postoperative pain, preferably through epidural procedures, might decrease the risk of pulmonary complications.

**Keywords:** Thoracotomy; Children; Complications

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### Introduction

Thoracotomies of pediatric population are often performed by both pediatric surgery and thoracic surgery departments. Literature has many data about thoracotomy especially in the area of cardiac surgery since 1959. However, literature presents limited information on the experiences in pediatric thoracotomy procedures especially esophageal atresia and others. This study aimed to examining the complications of thoracotomy and the factors affecting these complications in children.

### Materials and Methods

The records of the patients who had undergone thoracotomies performed in our clinic between 1998 and 2015 were retrospectively evaluated for the age, gender, operation duration, additional anomaly, diagnosis, type of wound and incision, complications, type of analgesia used, pulmonary lesions, nutritional status, and removal time of thoracic tube. The incisions, gender, complications, type of analgesia, pulmonary lesion and nutrition were compared statistically by Kruskal Wallis test and for the evaluation other parameters, Pearson Chi-Square test was used.  $P < 0.05$  was considered significant.

### Results

103 thoracotomies were performed (Table 1). The study involved the evaluation of the records of 65 male (63%) and 38 female (37%) patients. The mean age of the patients was 37.1 months (1 day-16 years). The main pathologies of the patients were as follows: 40 patients (38.8%) esophagus atresia (3 patients, isolated atresia; 37 patients, proximal esophagus atresia-distal trachea-esophageal fistula); 21 patients (20%) thoracic hydatid cyst; and 14 patients (13.5%) thoracic mass. In all the cases, crystallized penicillin, ampicillin or cephalosporin were used preoperative and postoperatively.

**Table 1:** The general features of all the throtomies.

	Esophageal atresia	Hydatid cyst	Lesions	Congenital cyst	Others
<b>Age</b>					
0-31 d	37	-	-	3	1
1-12 m	3	-	2	2	6
1-3 y	-	-	4	-	3
3-6 y	-	4	6	-	6
> 6 y	-	17	2	-	9
<b>Type of analgesia</b>					
iv dpyrone	17	6	6	2	11
prilocaine	1	1	-	-	1
bupivacaine	2	1	1	1	1
epidural catheter	4	8	4	-	4
prilocaine+dipyrone	8	3	2	1	3
bupivacaine+dipyrone	8	2	1	1	3
<b>Wound Type</b>					
Clean	-	-	14	5	13
Clean-contaminated	40	19	-	-	5
Contaminated	-	2	-	-	5
<b>Wound infection</b>	9(22.5%)	5(23.8%)	1(7%)	-	2(8%)
<b>Incision</b>					
Right PLT	40	14	8	3	5
Left PLT	-	7	6	2	9
ANT	-	-	-	-	5
Right ALT	-	-	-	-	3
Right AT	-	-	-	-	1
<b>Atelectasia</b>	4(10%)	7(33%)	8(57%)	2(40%)	9(36%)
<b>Preoperative pulmonary infiltration</b>	11	4	1	1	8

**Abbreviations:** PLT: Posterolateral Thoracotomy; ANT: Anterior Thoracotomy; ALT: Anterolateral Thoracotomy; AT: Abdominothoracic Incision; d: day; m: month; y: year

Low birth weight (LBW) was seen in 16 patients, malnutrition was seen in 3 patient and chemotherapy was given before the surgery in 10 patients (Pulmonary metastasis of Wilm's tumor (4), lymphoma (3), pulmonary blastoma (3)). The mean operation duration was 115 minutes (40-240). While 4 patients with esophagus atresia had accompanying anorectal malformation, omphalocele, Morgagni hernia, and duodenal atresia, one patient with liver laceration had sepsis findings preoperatively. The wound types of the patients were 32 clean, 64 clean-contaminated, and 7 contaminated. The thoracotomies were performed with right posterolateral (n=70), left posterolateral (n=24), anterior (n=5), right anterolateral (n=3) and right abdominothoracic incisions. When two methods of incision were compared for complications, more complications had developed after the left posterolateral thoracotomies ( $p < 0.05$ ). In the comparisons of complications associated with type of wound, there was no difference between the rates of clean wound and clean-contaminated wound, while the differences between clean and clean-contaminated wounds and between clean-contaminated and contaminated wounds were statistically significant ( $p < 0.05$ ).

Postoperative complications were noted in 67 patients as wound infections (n=13), salivary fistula (n=11) in the patients with esophagus atresia, wound infection and salivary fistula (n=4), atelectasis (n=30), atelectasis and wound infection (n=7), and hydrothorax-atelectasis (n=2). The postoperative analgesia was provided with intravenous (iv) dipyrone in 42 cases, local prilocaine in 3 cases, local bupivacaine in 6 cases, epidural catheterization in 20 cases, local prilocaine - iv dipyrone in 17 cases, and local bupivacaine -iv dipyrone in 15 cases. The comparisons of the complications associated with the postoperative analgesia used revealed that the rate of complications was higher in the group which was administered dipyrone only than in the other groups except in the group whose peripheral nerve block was achieved by prilocaine administration

( $p < 0.05$ , for each group). There was no significant differences in the incidence rate of complications between local bupivacaine and prilocaine administration and epidural catheter use ( $p > 0.05$ ), while the use of local anesthesia with long-term effectiveness (bupivacaine) had significantly reduced the rate of complications compared to the use of prilocaine alone or in dipyrone combination ( $p < 0.05$ ). The infections in our series were all noted for those with operation durations over 90 minutes; however, the operation durations did not differ significantly with regard to post-operative complications ( $p > 0.05$ ).

The preoperative pulmonary graphs of 26 patients had revealed infiltration. While 4 patients did not require thoracic tube insertion, the thoracic tubes of the other patients were removed at mean of 5.6<sup>th</sup> day (2-18 days). The mean thoracic tube removal time of the patients with esophagus atresia was 8.5 days (6-15 days), whereas it was 5.4 days for other interventions (2-18 days). Atelectasia was seen in the patients especially the removal of chest tube over the 8<sup>th</sup> day ( $p < 0.05$ ).

## Discussion

More than 50% of thoracotomy patients develop postoperative chronic pain in the surgical wound, and epidural analgesia is known to reduce the need for analgesic drug use by 10-20 folds compared to systemic analgesia [1]. The requirement of peripheral nerve blockage for high dose analgesic agent is due to dense vascularization of the area that leads to high systemic absorption, which results in reaching the toxic dose in relatively short time. In addition, repeated injections are both painful and not practical [1-4]. Insufficient pain relief following thoracotomy reduces pulmonary compliance and leads to deep inhalation, restricted cough, atelectasis due to retention of secretions and pneumonia [2-6]. In our series, 30 patients developed atelectasis. Four of these were among esophagus atresia cases, and the remaining (n=26) were among the other cases. The lower incidence of respiratory complications in the newborn (particularly in the cases with esophagus atresia) may be due to postoperative mechanic ventilation of at least 2-3 days and PEEP application. In older children, however, these procedures are not preferred and the patient is subjected to as many pulmonary exercises as possible. The incidence rate of postoperative pulmonary complications has been reported as 10-80 % for upper abdominal surgery and 20% for throtomies [7,8]. In our series, post-thoracotomy pulmonary complication rate was 38%. The complications ratio was higher in the group which was administered dipyrone only than in the other groups (except only prilocaine administration ( $p < 0.05$ ) in this study. The right and left posterolateral thoracotomies were the most common in this series. When two methods of incision were compared for complications, more complications had developed after the left posterolateral thoracotomies ( $p < 0.05$ ).

Surgical wound infections cause major economic and health problems. The incidence rate of surgical wound infections after all operations accounts for 5-17%. Surgical wounds have been classified as preoperatively clean, clean-contaminated, contaminated, and dirty [9,10]. The possible incidence rate of wound infections for each of the wounds has been reported as 1-2.7%, 2.9-10.5%, 7.9-13.5% and 6.3-30% respectively [11,12]. However, in throtomies, these rates are not definite. In our series, the incidence rates of wound infection were 11% for clean wounds, 14% for clean-contaminated wounds, and 57% for contaminated wounds. The incidence rate of wound infections for all the patients was 16% (n=17), more than half (n=9) developing in the newborn population. Evaluation of 41 newborn

in the series revealed an incidence rate of 21% for wound infections. This high rate may be associated with higher rate of esophagus atresia and the development of salivary fistula among the newborn. In a previous study evaluating postoperative surgical wound infections in a series of newborn, the incidence rate of infections was reported to be 11.7%. In other age groups, this rate was 12%. The incidence rate for wound infections in some series after orthopedics surgery has been reported as 1.9%; after gastroenterological surgery, 3.5%; and after plastic surgery, 4.7% [10]. Nevertheless, literature reveals no reports of wound infection rates after thoracic procedures.

In another study evaluating surgical wound infection and operation duration in a series, the infection rate for the cases with operation durations under 30 minutes was 4.7%; between 30 and 60 minutes, 14.8%; and over 2 hours, 15.8% [12]. The infections in our series were all noted for those with operation durations over 90 minutes. In Adebo OA's 10 esophageal atresia series 3 wound infection (30%) had seen but our series was 22% [13]. Our study was shown name of the disease has more effect on the development of complications regarding to type of incision.

Most pediatric thoracotomies are performed to treat esophageal atresia, thoracic hydatid cyst and thoracic lesions. Surgical infections and disordered pulmonary functions are common in the thoracotomies of this age group. Operation duration under 90 minutes and administration of local anesthetic and intravenous analgesic agents to provide pain postoperative pain relief, particularly through epidural procedures, may reduce pulmonary complication to a minimum level.

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