

Duration of Prophylactic Antibiotic in Patient with Intercostal Chest Drain

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Abstract:

Introduction: These days of industrialization and automobiles chest injury is a common problem in patients sustaining blunt or penetrating trauma.¹ Chest injury occurs in 16% of poly trauma cases, around 25% of all trauma death is due to chest injury.² The incidence of hemothorax, pneumothorax and combined hemo-pneumothorax following blunt chest trauma accounts for around 37.4%, 18.4% and 21.5% respectively.³ Not every need thoracotomy, majority can be managed with a closed tube thoracostomy and simple fluid resuscitation.^{4,5} A major morbidity associated with this is empyema. Although the prophylactic use of antibiotic has been well established and proved beneficial for many trauma related interventions^{6,7} the value of prophylactic antibiotics in decreasing infectious complications after tube thoracostomy remains controversial.⁹

Objectives: To study the incidence of haemothorax and pneumothorax following blunt chest trauma.

Incidence of need for closed thoracostomy.

To study the duration of prophylactic antibiotic therapy.

Methodology: Hospital based prospective study carried out in total of 69 patients with blunt chest trauma presenting in Manipal Teaching Hospital in 2 years (2012-08-01 to 2014-08-01).

Data were collected on age, gender and trauma type, length of hospital stay, surgical interventions, use of prophylactic antibiotics one day or five day course and mortality. Data and all statistical analysis were done using SPSS 16 Software.

Results: Blunt chest trauma accounted for 69 cases in last 2 years. Fall injury was found to be the most common mode of injury. Among the 69 patients 57 patients had undergone ICD insertion as a procedure for management. Five patients (20%) from group A who received antibiotics for 1 day developed ICD related complications with odds ratio of 1.139 with 95% confidence interval of 0.587-2.211 and 4 patients (16%) from group B who received antibiotics for 5 days with odds ratio of 0.868 with confidence interval 0.394-1.310 developed ICD related complications. The odds ratio calculated was 1.3125 with 95% confidence interval 0.3077-5.5977 which implies that the complications are more or less same in both the groups.

Conclusion: Intercostal drain tube insertion was needed in 57 patients(89%) with blunt chest trauma. There is no significant difference in development of complications of short course (1 day) or prolonged course (5 days) of antibiotics following intercostal drainage following blunt chest trauma with haemothorax, pneumothorax or haemo-pneumothorax.

Keywords: Blunt chest trauma, haemo-thorax, pneumothorax, intercostal drain, prophylactic antibiotics.

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I Introduction

Enhanced availability and organization of emergency medical services, improvements in pre-hospital care and establishment of sophisticated pre-hospital medical command systems have improved the transport of critically injured patients to trauma centers. As a result of these initiatives, many patients who formerly would have died at the scene or during transport are reaching the emergency department (ED).

Initial evaluation and resuscitation of the trauma patient is a dynamic process. It incorporates the data accrued from quick and accurate physical examination with pattern recognition of physiologic insult incurred from injury. Resuscitation involves not only the ongoing assessment of physiologic response to therapy, but the co-ordination of multiple hospital resources as well. Modern trauma center after a complex and intricate balance of resources and surgical specialties aimed at providing the best outcome possible for the injured patients.

The incidence of post-chest tube infections ranges from 2% to 25%.⁹ Empyema is a less common post chest tube infection, with a reported incidence of 0% to 18% in the civilian population.^{10,11,12} Empyemas often require more aggressive management including further chest tube insertion, surgical excision and drainage, and prolonged antibiotics.^{10,11,13} The potentials etiologies of infection after chest tube insertion include iatrogenic

infection of the pleural space, secondary infection from diaphragmatic or intra-abdominal disruption, inadequate drainage of haemothorax, and para-pneumonic infection or bacteria introduced following penetrating trauma.

The most common infectious organisms described are staphylococcus aureus and Streptococcus species, although more recent studies show the emergence of nosocomial organisms as infectious agents.¹⁴ Prophylactic antibiotics have been shown to reduce the incidence of infections in some types of surgery but the efficacy of prophylactic antibiotics in preventing post chest tube thoracostomy infections is not well delineated. The use of antibiotic prophylaxis in closed tube thoracostomy though is controversial prolonged use may lead to antibiotic resistance. Recently the duration of antibiotic prophylaxis has been studied in meta-analysis there was no difference in outcome after single dose of antibiotic use and prolong use.

Our main purpose of this study is to determine the duration of prophylactic antibiotic therapy in patients having intercostal chest drain.

II Materials And Methods

A prospective hospital based study done in Department of General Surgery, Manipal Teaching Hospital, Pokhara Nepal. Fifty nine patients were included in this study, patients of all age and sex present in blunt chest trauma in emergency and OPD of Manipal Teaching hospital in 2 years (2012-08-01 to 2014-08-01) period of time.

All patients hospitalized for management of non-iatrogenic chest injuries in Manipal Teaching Hospital were included in this study. The criteria for hospitalization were intra-thoracic injury that is clinically significant rib cage injury, or clinical suspicion of significant thoracic injury like subcutaneous emphysema. All patients who arrive dead, patients who do not complete their treatment or leave against medical advice, isolated laryngeal or cervical injuries, esophageal and tracheal injuries due to foreign body swallowing or aspiration, and non-traumatic injuries to the chest (burns, electrical shocks, etc.) were excluded from this study.

Patient's data were analyzed according to age, gender, mode of injury, hospital length of stay, Intensive care admission, mechanical ventilation, surgical interventions, and mortality. The injured patients were first triaged by a doctor in emergency room. Patients in poor condition or those with flail chest were admitted to the ICU and given respiratory support. All patients were given pain management, and mucolytic treatment, provided with respiratory physiotherapy. The indication for thoracotomy were:- initial chest tube output >1500 ml or hourly output >200 ml for 4 hours, haemopericardium, prolonged air leakage, radiologic or endoscopic indicators of injury in esophagus, trachea and bronchi, heart and great vessels.

Among the study group needing tube thoracostomy, 50 patients were divided into group A and group B. Group A received antibiotic prophylaxis for 1 day while in the other group it was continued till the chest tube was removed which was usually on 5th day if no complications were there. The antibiotic used was Clavam (amoxicillin+clavulanic acid). The empirical drug used being Clavam because it covers organisms like staphylococcus aureus, Pneumococcal, H. influenza. Clavulanic acid being used because of frequent co-existence of penicillin resistance aerobes and anaerobes. Penicillins combined with B-lactamase penetrate the pleura very well. The incidence of complications in both group were studied. Consent from all patient was taken. Clearance from Ethics & Research Committee was taken.

All data were analyzed using SPSS Software version 16.0.

III Result

There were total 69 cases admitted in Manipal Teaching Hospital i2012 to 2014. The age of the patients ranged from 4 years to 88 years with mean of 52.28 (standard deviation of 18.190). The mean age for female were 56 years with range from 4 years to 80 years while that for the male was 50.40 with range from 15-88 years. Among the 69 patients majority of them were male accounting for 47 of them. Female were 22 in number with male: female ratio of 2.13:1. **Mode of injury:**

Fall injury was found to be as the mode of injury in majority of cases accounting for 55.1% of cases and road traffic accidents accounting for 44.9%. The mean interval between the incident and time of presentation was 4.28 hours (1 hour to 24 hours). For 52 patients who were from Pokhara, their mean interval was 4.28 hours (standard deviation 3.22) whereas for 15 who presented from Syanja, it was 4.50 hours (standard deviation 3.24). There were 2 patients, 1 from Chitwan and the other from Lamjung whose had presented after 24 hours of the incident.

Among the 69 patients 57 of the patients had unilateral chest injuries whereas only 2 of them had bilateral injuries. The mean duration of ICD in situ was 4.28 (standard deviation 2.326) ranging from 2 days to 10 days. There were 3 patients who had ICD in situ for 10 days, Among them in 2 of them the prolong ICD was needed as they had to be kept on mechanical ventilation owing to their inability to maintain the oxygen saturation. The remaining one ICD was kept for prolong duration as the ling expansion was not adequate. The mean duration of Intensive Care Unit stay was 2 days (standard deviation 1.649) which ranged from 1 day to 10 days.

Among the total, 57 of them had undergone intercostal tube insertion. Five of them has associated other system involvements. The indications of intercostal drainage were haemopneumothorax in 23 (40.3%), while haemothorax and pneumothorax were seen in 23 (40.3%) and 11 (19.2%) respectively. From the remaining 52 patients, 50 patients were included in the study for the complications following short course and long course of antibiotic prophylaxis. Among the 69 patients, 12 patients did not require Intercostal drain tube as there was no evidence of haemothorax/pneumothorax apart from rib fractures and soft tissue injuries.

Among the patients following intercostal drain tube insertion complications related to it was found only in 9 for them which accounts for 17.6% of cases. Amongst them 2 (3.9%) of them developed empyema, 4 (7.8%) of them developed surgical wound site infection and 3 (5.9%) developed pneumonia. 5 patients (20%) from group A who received antibiotics for 1 day developed ICD related complications with odds ratio of 1.139 with 95% confidence interval of 0.587-2.211. Four patients (16%) from group B who received antibiotics for 5 days with odds ratio of 0.868 with confidence interval 0.394-1.310. the odds ratio calculated was 1.3125 with 95% confidence interval 0.3077-5.5977 which implies that the complications are more or less same in both the groups.

Table 1: Group Characteristics

Group	Group A	Group B
Antibiotic	Amoxicillin + Clavulanic acid	Amoxicillin + Clavulanic acid
Antibiotic Duration	1 day	5 days
Mean Age	Mean 50.64 (19.263)	52.04 (17.594)
Sex	Male=15, Female=10	Male=17, Female=8
Complications	5	4
Empyema	1	1
Surgical Site Infection	1	3
Pneumonia	1	2
Odd Ratio	1.139	0.868
95% Confidence Interval	0.587-2.211	0.394-1.310
Mean duration of ICU Stay	5 days	5 days
Mean Interval	6 hours	6.50 hours

IV Discussion

Kenneth Heng in 2004 published an article which stated that chest injury was the result of blunt trauma in 90.2% and penetrating trauma in 9.8%. The infection rate was 2.4%, comprising two superficial and three deep (empyema thoraces) infections.¹⁵ Robert M. Shorr in 1987 did a retrospective study in 515 patients and stated that 36% of patients develop a morbidity secondary to their chest trauma. Atelectasia is being the most common complication. The cause of death is being ARDS, heart failure and multi organ failure. M.B. de Jong in 2012 did a meta-analysis encompassing 1241 chest drains in 1234 patients and reported that the patients treated with antibiotic prophylaxis had an approximately threefold lower risk of developing empyema compared with patients not receiving it. He also reported that empyema was the most common complication. Brunner and colleagues in 1990 conducted a prospective randomized trial in 90 patients with isolated chest trauma due to blunt or penetrating injuries that resulted in haemothorax, pneumothorax or haemopneumothorax and that required tube thoracostomy. He concluded that both the duration of the chest tube drainage and the length of stay in the non-antibiotic group were prolonged compared to those of the antibiotic prophylaxis.¹⁶

The efficacy of antibiotics for chest trauma patients with tube thoracostomy was assessed in a double blind, randomized trial conducted by Gonzalez and colleagues in 1990. 139 patients with haemothorax and/or pneumothorax who suffered isolated chest injury secondary to blunt or penetrating trauma were enrolled. The most common pathogen responsible for infectious complications was *Staphylococcus aureus*. No significant difference was found in length of stay or average length of chest tube insertion in group receiving antibiotic and placebo.¹⁷ Gonzales and Holevar also performed a study that suggested that antibiotics reduced the risk of infection in chest tube insertion. In this study of 142 patients, 71 patients received placebo while 71 patients received cefazolin, 1 g every 8 hours, until chest tube removal.

V Conclusion

The result of the present study shows that blunt chest trauma accounts for significant number of admissions in Manipal Teaching Hospital. Majority of mode of injury is due to fall injury owing to fall while climbing hilly areas and trees for their basic household needs. Most of the cases of blunt chest trauma require intercostal tube drainage and can be treated with intercostal drainage alone.

The study also shows that there is no significant difference in development of complications after short course (1 day) and prolong course (5 days) following ICD insertion for blunt chest trauma with haemothorax/pneumothorax or haemopneumothorax. Therefore if prophylactic antibiotics are to be used following intercostal drainage 1 day course is as effective as 5 days course.

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