The Analysis of the Chest Tube Thoracostomies Performed in a Newly Established Hospital of a Medical School

Yeni Kurulan Bir Üniversite Hastanesi Göğüs Cerrahisi Kliniğinde Uygulanan Tüp Torakostomi Sonuçlarının Analizi

Tüp Torakostomi Sonuçlarının Analizi / The Analysis of the Chest Tube Thoracostomies

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Özet

Amaç: Bu çalışma ile kliniğimizde uygulanan tüp torakostomi (TT) işlemlerinin sonuçları araştırılmıştır. Gereç ve Yöntem: Aralık 2009 – Temmuz 2013 arasında Çanakkale Onsekiz Mart Üniversitesi Tıp Fakültesi Göğüs Cerrahisi Kliniği tarafından TT uygulanan 130 hastanın kayıtları retrospektif olarak incelendi. Bulgular: TT uygulanan 130 hastanın 102'si erkek (%78) 28' i (%22) kadındı. Hastaların ortalama yaşı 58.9±20.4 yıldı. Hastaların %19' unu (n:25) Göğüs Cerrahisi servisinin hastaları oluştururken %81' ini (n:105) dış servislerden tarafımıza konsülte edilen hastalar oluşturmaktaydı. TT endikasyonları arasında en sık rastlanan neden plevral efüzyondu (34,6%, n:45). Çeşitli nedenlerle plevral efüzyonu olan hastaların (%63, n:84) ortalama drenaj miktarı 1462.80±1054.46 ml olarak bulundu. Çeşitli nedenlerle pnömotoraks olan hastaların (%37, n:46) ortalama hava drenaj süresi 5.8±3.1 gün olarak bulundu. Kliniğimizde TT uygulanan 130 hastanın sadece bir tanesinde komplikasyon gelişti (%0,8). Bu komplikasyonda intraparankimal dren konulması idi. Tartışma: Genellikle acil koşullarda uygulanmak zorunda kalınan bu cerrahi girişimin potansiyel birçok ciddi komplikasyonunun da olması Göğüs Cerrahisi kliniklerindeki asistan eğitiminin önemini arttırmaktadır. Doğru endikasyonda, doğru yerden, cerrahi prensiplere uygun olarak takılan ve komplikasyon oranları çok düşük olan TT, Göğüs Cerrahlarının bulundukları hastanedeki önemini daha da arttıran ve diğer klinikler ile ilişkilerini geliştirmede önemli rol oynayan cerrahi bir işlemdir.

Anahtar Kelimeler

Torakostomi; Pnömotoraks; Plevral Efüzyon; Komplikasyon

Abstract

Aim: We have analyzed the chest tube thoracostomies (CTT) performed in our Thoracic Surgery clinics of our newly established medical school hospital. Material and Method: The medical records of 130 patients to whom CTT were performed by the Thoracic Surgery Clinics of the Çanakkale Onsekiz Mart University from December 2009 to July 2013 were retrospectively analyzed. Results: 102 patients (78%) out of 130 were male and 28 (22%) were women. Mean age of the patients were 58.9±20.4. 19% (n:25) of these patients were diagnosed at our clinics and the remaining 81% (n:105) were consultated from other clinics The most common indication of CTT was pleural effusion (35%, n:45). The mean fluid drainage of the patients with pleural effusions for various reasons (63%, n:84) were 1462.80±1054.46. The mean air drainage time for the patients with pneumothorax for various reasons (37%, n:46) were 5.8±3.1 days. There was only one complication (0,8%) in these 130 patients which was the intraparanchymal drain placement. Discussion: As a procedure that is usually performed under emergency conditions CTT has a high potential for development of serious complications and thus increasing the importance of resident doctor training in Thoracic Surgery clinics. CTT has a low rate of complications when performed with the right indication, at the appropriate location and in devotion to the surgical principles; can increase the importance of the Thoracic Surgeons in the medical centers that they are working at and can also increase the relationship of the Thoracic Surgery clinics with the other clinics.

Keywords

Thoracostomy; Pneumothorax; Pleural Effusion; Complication

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Introduction

Chest Tube Thoracostomy (CTT) is a surgical procedure which is used in cases of air or fluid loculations in the pleural cavity and maintaining the lung expansion after pulmonary surgery. Performed under local anesthesia, this procedure is usually performed in emergency situations in which prompt diagnosis and treatment is mandatory. CTT can be performed in traumatic hemopneumothoraces which occur in thoracic trauma and can also be performed in indications such as spontaneous or tension pneumothorax, pleural effusions (malignant effusions, parapneumonic effusions, chylothorax, hydrothorax and pyothorax). It has been stated that thoracic trauma occurs in 12 out of 1 million people daily and 25% of the patients who have thoracic trauma need CTT.[1,2] It can be stated that there may be lack of trained personnel and lack of necessary equipment in a newly established medical school hospital. We have analyzed the CTT's performed in our Thoracic Surgery clinics of our newly established medical school hospital in a period of 3 and a half years.

Material and Method

The medical records of 130 patients to whom CTT were performed by the Thoracic Surgery Clinics of the Çanakkale Onsekiz Mart University from December 2009 to July 2013 were retrospectively analyzed. Patient demographics, clinics which consulted to our clinic, indications of CTT, duration of drainage and complications were analyzed.

CTT was performed through the intersection of 5th or 6th intercostal space (ICS) and mid-axillary line in abnormal fluid accumulations such as pleural effusion and hemothorax, and through the intersection of 2nd ICS in abnormal air accumulations such as pneumothorax. CTT was performed through the intersection of 1st ICS and mid-clavicular line under ultrasonographic guidance because of the location of the loculated fluid found in a patient with mediastinitis. 1gr of Cefazoline was injected intravenously in each patient prior to surgery for prophylaxis. CTT site was scrubbed using a %10 povidone iodine solution in order to provide surgical asepsis. An incision of 2 cm width was made to the designated ICS after local anesthesia was performed to skin, subcutaneous tissues and the parietal pleura using a 2% prilocaine hydrochloride. Subcutaneous tissues was sharply dissected with scissors and a purse suture and two drain fixation sutures were made at each side of the incision using atraumatic silk USP (United States Pharmacopeia) 1 suture material. The parietal pleura was incised using a dissection scissors and the pleural dissection is widened with a thick clamp. Manual dissection through the tunnel was performed by the surgeon to ensure possible pleural attachments are removed. 24, 28, 32, 36 F chest drains were used in CTT. Drain size, location of the drainage site was chosed according to the patients' ICS size and the drainage indication. 28 and 32 F drains were used for air drainage and 32 and 36 F drains were used for fluid drainage. 24 and 36 F drains were only used once. Drains were placed into the pleural cavity using a clamp. Drains were guided to the apex if the indication was pneumothorax and to the costophrenic sinus if the indication was pleural effusion. After guiding the drain to the appropriate position drains were connected to underwater seal and the air and/or fluid drainage is observed. In cases of massive pleural effusions drainage was made intermittently in order to prevent re-expansion pulmonary edema formation. Later on drains were fixated to their positions by the two sutures that were made earlier on each side of the incision. Drain position and the status of the lungs were assessed with a posterior-anterior (PA) chest x-ray 24 hours postoperatively. Chemical pleurodesis with talc was performed in the patients with malignant pleural effusion when the daily fluid drainage rate dropped less than 250ml. The indication for ending the drainage was less than 100ml of pleural effusion daily for 48 hours and no air drainage for 48 hours. Drains were removed at the time the patient performed maximum inspiration and held his/her breath during the removal. PA chest x-rays were taken 24 hours after drain removal and assessed for any pneumothorax and or pleural effusion accumulation. Patients who have normal x-rays were discharged of hospital and were called for outpatient clinics 7-10 days after the drain removal for the removal of sutures.

The data obtained was analyzed using SPSS for Windows 19.0.

Results

102 patients (78%) out of 130 who were performed CTT were male and 28 (22%) were women. Mean age of the patients were 58.9±20.4. 19% (n:25) of these patients were diagnosed at Thoracic Surgery outpatient clinics and the remaining 81% (n:105) were consultated from other clinics (Table 1). During this period 310 patients were consultated to our clinics and thus we performed emergency thoracic surgical intervention in 42% of the patients who were consultated from other clinics.

Table 1. Consultations according to clinics which requested them

Consulting Clinics	No=105	%
Emergency Medicine	62	58%
Pulmonary Medicine	10	9%
General Surgery	8	8%
Otorhinolaryngology	6	6%
Cardiology	5	5%
Neurosurgery	3	3%
Internal Medicine	3	3%
Urology	2	2%
Orthopedics	2	2%
Cardiovascular Surgery	2	2%
Intensive Care Unit	1	1%
Neurology	1	1%

Table 2. Indications for chest tube thoracostomy

Indications	No	%
Pleural Effusion	45	34,6%
Spontaneous Pneumothorax	21	16,2%
Traumatic Pneumothorax	24	18,5%
Traumatic Hemo-Pneumothorax	17	13%
Traumatic Hemothorax	11	8,4%
Malignant Pleural Effusion	7	5,4%
Tension Pneumothorax	3	2,3%
Mediastinitis	1	0,8%
Chylothorax	1	0,8%
Total	130	100%

The most common indication of CTT was pleural effusion (34,6%, n:45) (Table 2). CTT sites were right %48 (n:64), left %39 (n:50), right anterior %9 (n:12), left anterior %4 (n:4). The mean fluid drainage of the patients who had pleural effusions for various reasons (63%, n:84) were 1462.80±1054.46 ml (range: 200-3300 ml). The mean air drainage time for the patients who had pneumothorax for various reasons (37%, n:46) were 5.8±3.1 days. Four patients died because of various reasons in the drainage period (3,1%) (Table 3). The mean age of these 4 patients was 62,25±30,94 (range: 16-80). The mean drainage time for these patients was 1,75±0,96 days (range: 1-3 days). There was only one complication (0,8%) in these 130 CTT performed in our clinics. The complication was intraparanchymal placement of the drain in a patient who had developed a right sided pneumothorax following a transthoracic fine needle aspiration biopsy procedure in another hospital. A right sided CTT was performed in our clinics and we observed that right lung did not expand and the drain was malposed. The malposed drain was removed and another drain was used for CTT but that drain was also malposed in the same manner as the first drain and there was prolonged air leak from the right lung. Because of this prolonged air leak from the right hemithorax we have performed a mini right lateral thoracotomy and found fibrotic attachments between the parietal and the visceral pleura and there was a parenchymal laceration secondary to intraparanchymal drain placement on the right lung that we repaired intraoperatively.

Table 3. The underlying causes of mortality (Out of 130 patients)

Causes of Mortality	No	%
Acute Renal Failure	2	1,5
Small Cell Lung Cancer	1	0,8
Larynx Cancer	1	0,8
Total	4	3,1

Discussion

CTT is a life-saving procedure that can cause numerous complications.[3] Inadequate air or fluid drainage, drain malposition, intraabdominal drain placement, parenchymal lung injury, diffuse subcutaneous emphysema can be observed in patients who have undergone CTT. In addition to these, complications such as pulmonary infarction secondary to internal mammarian artery erosion, esophagus perforation, gastric perforation, pulmonary artery or intercostal artery injuries, cardiogenic shock due to right ventricular compression have been defined in several studies.[4-10] The most serious complications are related to the drain placement techniques.[1,11,12] It was found that classical surgical CTT technique might cause more complications than a hybrid technique comprising both classical surgical technique and the trocar technique in a study comparing the relationship between drain placement techniques in CTT and the complications related to CTT.[13] But there are numerous studies that claim the trocar technique can cause a significantly higher risk for complications than the classical surgical technique such as pulmonary artery injury.[14,15] We also think that the classical surgical technique is safer than the trocar technique in CTT placement in terms of complications and use the classical surgical technique in our clinics.

As a procedure that is usually performed under emergency conditions CTT has a high potential for development of serious complications and thus increasing the importance of resident doctor training in Thoracic Surgery clinics. In another study the complication rates of CTT's which were performed by emergency medicine physicians are significantly higher than the CTT's performed by the Thoracic Surgeons (13% and 6% respectively $p<0.0001$); and thus it was emphasized that resident doctor training may lower the complication rates of CTT.[11] In contrast to other studies, our clinics' complication rates are significantly lower as there is only one complication in our series.

In addition to advantages of being easily and rapidly performed CTT has another advantage of allowing additional therapeutic interventions. Among these interventions fibrinolysis and chemical pleurodesis can be considered. Fibrinolysis can be considered to be an additional therapeutic procedure to ensure increased amounts of pleural drainage in cases of advanced empyema where inadequate drainage might occur.[16] In our clinics adequate drainage was established in 3 patients who had empyema without using fibrinolysis. Chemical pleurodesis is used in recurrent pleural effusions (especially malignant pleural effusions) and recurrent pneumothorax cases. Talc, tetracycline derivatives, bleomycine and povidone iodine are used as the chemical agent of the chemical pleurodesis. There were 9 malignant pleural effusion cases among 130 patients that we performed CTT and chemical pleurodesis with talc was performed to all of them and in only one patient developed recurrent pleural effusion.The success rate of the chemical pleurodesis performed in our clinics is 89% which is correlated with the other studies as their success rates are approximately 90%. The most common complications of the chemical pleurodesis performed with sterile talc is pain and fever.[17] Our patients whom were performed talc pleurodesis in our clinics developed no complications.

The mean air drainage time for the patients who had pneumothorax for various reasons (37%, n:46) were 5.8±3.1 days which is similar in another series focusing on 230 patients with spontaneous pneumothorax.[18]

Emergency medicine is the most common clinics to consultate to our clinics (%62). Çobanoğlu stated in his study that emergency medicine was the first clinics among the ones that requested for Thoracic Surgery consultation with a rate of %50.5 which is correlated to our study.[19] As being an emergency procedure, CTT is performed especially for the treatment of the complications of thoracic trauma and thus it is expected that the most common clinics to consultate to the Thoracic Surgery clinics to be the emergency medicine. As stated in the study of Çobanoğlu the second most common clinics to consultate to Thoracic Surgery clinics to be Pulmonary Medicine.

There may be numerous problems in newly established medical centers such as equipment shortages and lack of trained staff. Especially the lack of trained nurses in the field of Thoracic Surgery might be a potential problem. Inadequacies in the nursing care of the patients with CTT during the postoperative period may cause serious complications. For example, clamping the CTT during the transfer of a patient with ongoing air drainage may cause subcutaneous emphysema, pneumothorax or even tension pneumothorax if left clamped for longer periods; or removing the clamp prematurely in a patient with massive pleural

effusion may cause re-expansion pulmonary edema which may be fatal. Also inadequacies in the medical education in terms of Thoracic Surgery may lead to unnecessary consultations to the Thoracic Surgery clinics and vice versa because of misinterpreting the patients' clinical situation and may cause unnecessary waste of time and resources which may be used to save lives. We believe that a basic mandatory course of Thoracic Surgery should be given to every medical student which might increase the knowledge and awareness about the potential life threatening emergencies such as pneumothorax.

Conclusion

CTT has a low rate of complications when performed with the right indication, at the appropriate location and in devotion to the surgical principles; can increase the importance of the Thoracic Surgeons in the medical centers that they are working at and can also increase the relationship of the Thoracic Surgery clinics with the other clinics.

Competing interests

The authors declare that they have no competing interests.

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