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TUBE THORACOSTOMY IN THE MANAGEMENT OF PLEURAL FLUID COLLECTIONS.

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SUMMARY

Objective: To determine the demographic pattern, indications and complications associated with tube thoracostomy in Nnamdi Azikiwe University Teaching Hospital (NAUTH) Nnewi.

Patients And Methods: A 5-year review of case records of patients who underwent tube thoracostomy at NAUTH Nnewi between January 1999 and December 2003. Demographic data, clinical features, duration of drainage, complications and outcomes were analyzed.

Results: A total of 65 cases were studied, male: female ratio was 2.4:1. Eighteen patients (27.7%) were below 10 years of age. Infective cases accounted for 63.1% (41) of the cases that had tube thoracostomy. Forty-one patients (63.1%) had tube drainage for 10 days or less. Complication rate was 41.5%(27), mostly mild, with dislodgement of the tube accounting for about half. Failure rate of 13.7% (9) was recorded for the procedure. A mortality of 6.2% (4) was recorded but there was no procedure related death. Seven patients (10.8%) required further surgery.

Conclusion: Tube thoracostomy is a simple and efficacious procedure for the treatment of pleural space collections. The safety of the procedure can be improved upon by adequate training in the insertion procedure, while proper selection of cases will reduce failure rate and unnecessary morbidity. Early resort to thoracoscopic or open surgery when tube thoracostomy is considered inappropriate or has failed will improve the success rate in the overall management of pleural fluid collections.

Key words: tube thoracostomy, indications, outcome, complication

INTRODUCTION

Fluid collection in the pleural space following pleural and pulmonary diseases, and trauma remains a major surgical problem in the developing countries. The availability and use of effective antibiotics has definitely reduced its incidence as well as the number of patients requiring surgical intervention for pulmonary infections[1]. The aims of treatment are three-fold; elimination of source of infection if any, evacuation of the entire collection in the pleural cavity, and restoration of normal function of the lung and motility of the chest wall and diaphragm[1,2]. Treatment, most times, is by some form of surgical drainage especially in life threatening situations following trauma where urgent attention is required.

In our environment, these situations are fairly common and given the treatment options available, tube thoracostomy is the commonest mode of treatment. Its purpose is to drain the pleural space of air, blood, fluid or pus and to re-establish negative intrapleural pressure[2-4]. This may not be satisfactory especially in chronic empyema with loculations. Thoracotomy and decortication and other more recent and efficient methods like Video assisted thorascopic surgery (VATS), intrapleural fibrinolytic agents and image guided percutaneous catheter drainage, must be resorted to early since delay in complete drainage will increase the morbidity and mortality [1,4-7]. As simple as the procedure of chest tube insertion can be, serious complications can arise including cardiac tamponade, lung perforation and chronic empyema thoracis [8-11]. A good knowledge of anatomy helps to obviate these problems. Site of insertion depends on the nature of fluid being drained. Drains generally should be inserted in the "triangle of safety" -an area bound by the lateral border of pectoralis major superiorly, the anterior axillary line posteriorly and the sixth rib inferiorly[12]. The most common position is the 5th intercostal space in the anterior axillary line [12].

At Nnamdi Azikiwe University Teaching Hospital Nnewi; (NAUTH) which is a referral center, tube thoracostomy is the main mode of treatment of collections within the pleural cavity. This study is aimed at reviewing our experience with tube thoracostomy in the management of pleural space collections over the past 5 years.

PATIENTS AND METHODS

The case records of all patients who underwent tube thoracostomy at NAUTH between January 1999 and December 2003 were studied. The following parameters were analyzed: Demographic data, diagnosis, aetiological factors, clinical features, duration of drainage, outcome, complications arising from tube thoracostomy, further management.

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RESULTS

A total of 65 patients had tube thoracostomy during the study period. Mean age was 34.6±27.7 years with a range of 1 to 90 years. Details are shown in figure 1. Out of these 65 patients, 27.7% (18) were below the age of 10 years. Male - female ratio was 2.4:1.

The symptoms at presentation are shown in Table 1. Breathlessness was the commonest symptom seen in 72.3%(47). This was followed by cough 69.2%(45). Cough and fever were common and prominent features in the infective group, being present in 95.1% and 73.2% respectively.

Indications for pleural drainage are shown in table 2. The commonest finding was pleural effusion in 41.5% (27), followed by haemothorax 21.5% (14) and empyema thoracis in 16.9%(11).

The causes of pleural collection are shown in table 3. Infective causes accounted for 63.1%(41), Trauma 29.2%(19) while 7.7%(5) were due to tumours. Acute bacteria pneumonia was responsible for 43.9% (18/41) of all the infective cases while TB was 39.0% (16/41) and 17.1% (7/41) were non-specific. Penetrating injuries mostly due to gunshot accounted for 47.4% (9/19) of all trauma cases while Road Traffic Accident and fall from height accounted for 31.6% (6/19) and 21.1% (4/19) respectively. Among the 5 cases of malignant pleural effusion, metastasis from cancer of the breast accounted for 3,while lung cancer and metastasis from salivary gland tumour accounted for one each.

Mean duration of drainage was 11.3 days for all the patients while for cases of haemothorax, pleural effusion and empyema thoracis were 10.7, 10.0 and 19.4days respectively. The longest duration of drainage was 87 days in a case of pyo-pneumothorax with lung collapse associated with pulmonary tuberculosis in a diabetic.

Complication rate was 41.5% (27), mostly mild. Thirteen tubes (20.0%) were dislodged inadvertently and required reinsertion. 9.2% (6) blocked and were unblocked by applying low-pressure suction using Robert's pump. Subcutaneous emphysema and haemorrhage were seen in 4.6% each, all mild while wound site infection was recorded in 3.1% (2). Overall success rate of tube thoracostomy was 86.2% with failure rate of 13.8%. Persistent lung collapse was seen in 6.4%(4) while unresolving empyema thoracis was seen in 4.6%(3).

There was 6.2% (4) mortality, 2 died from pneumonic process while 2 died from tumour metastasis. No death was directly attributed to the thoracostomy procedure. Seven patients (10.8%) required decortication.

Table 1:**Symptoms at Presentation.**

Symptoms	Number	%
Breathlessness	47	72.3
Cough	45	69.2
Chest pain	31	47.7
Fever	30	46.2
Haemoptysis	4	6.2

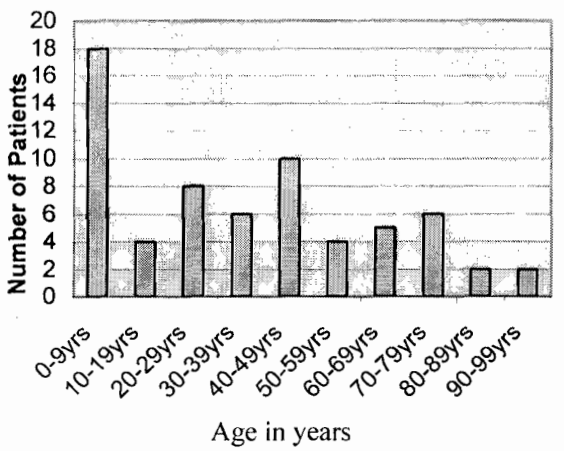
Table 2: **Indications for Pleural Space Drainage.**

Lesion	No	%
1. Pleural Effusion	27	41.5
2. Haemothorax	14	21.5
3. Empyema thoracis	11	16.9
4. Pyopneumothorax	8	12.3
5. Pneumothorax	2	3.1
6. Haemopneumothorax	2	3.1
7. Hydropneumothorax	1	1.6
Total	65	100

Table 3: **Causes of Pleural Space Collection.**

Cause	No	%
Infections	41	63.1
(a) Acute bacterial pneumonia	(18)	(27.7)
(b) Tuberculosis	(16)	(24.6)
(c) Non specific	(7)	(10.8)
Trauma	19	29.2
(a) Penetrating injuries	(9)	(13.8)
(b) Blunt injuries	(10)	(15.4)
Tumors	5	7.7
Total	**65**	**100**

Fig.1. Age Distribution



DISCUSSION

Tube thoracostomy remains the first line and efficacious treatment for fluid collections in the pleural cavity no matter the aetiology and age of the patient. In this study, our patients were spread through all the age groups, from infancy to the very elderly, while aetiology ranged from infections to even malignancies. However, all the patients aged 10 years and below had infective causes (parapneumonic effusion) while malignant effusion was seen mostly in the elderly, the youngest patient being 45 years of age. This observation corroborates previous observations that pneumonia is a common cause of pleural effusion in childhood[1,2,4]. The fact that 63.1% of all the cases were infective in origin indicates the need for prompt and appropriate antibiotic therapy since this has been shown to reduce the need for tube thoracostomy[4].

Among the symptoms, breathlessness and cough were the most common and are obvious of respiratory distress. Breathlessness particularly was the main reason for presentation to the hospital. It also determined the speed of intervention.

Trauma was the second commonest indication for thoracostomy accounting for 29.2%. As much as 47.4% of all traumas were due to penetrating injuries, mostly from gunshot, resulting from increasing violent crimes. There is obviously a rising incidence when compared to earlier report from this region where gunshot accounted for only 5.5% of all chest injuries[2].

Some authors have hinged success of tube thoracostomy on patient selection[13]; our patients were not selected since this was the only treatment modality available to us. However, 86.2% of all the cases were completely drained without recurrence at follow up. This shows that tube thoracostomy with appropriate antibiotic therapy is still the mainstay of treatment of infected pleural space collection as observed by Yilmaz et al[14]. The few cases of outright failure were cases of chronic empyema with lung collapse that required decortication eventually. This group of patients is known to require other more drastic surgical procedures like thoracotomy and decortication in order to clear their disease[1,2,4,5].

The mean duration for drainage of 11.3 days recorded is comparable to experience of others[2,15]. Haemothoraces and parapneumonic effusions resolved earlier than the empyemas. This observation is not surprising because of the nature of the pathology and is similar to other reports[2].

Complication rate of 41.5% is quite high compared to other reports[9,11,13]. These were mostly mild and non-life threatening; about 50% of all complications were dislodgement of the tubes. In their report of Nigerian children treated for pleural space collection by thoracostomy, Anyanwu et al[2] reported accidental tube extrusion in as much as 8 cases out of 19. This high rate of tube dislodgement was probably related to the expertise of the medical personnel carrying out the procedure. Most of these procedures were carried out by residents as emergency. We are highlighting this in order to emphasize the need for proper training of medical personnel on chest tube insertion, a point earlier made by other authors[9]. This application of proper technique will also reduce other complications arising from tube thoracostomy like haemorrhage, pneumothorax and subcutaneous emphysema, especially if tube is placed after confirmation of an open pleural space instead of the blind use of trocar for the placement as advocated by Millikan et al[8].

A mortality of 6.2% recorded in this study is comparable to other reports[2]. However, no death was directly related to the procedure, rather they were related to the primary pathology that caused the pleural fluid collection. A particular feature related to morbidity was the stage of the disease at presentation, interval between the earliest symptom and presentation to the hospital. The malignant cases were late stages and mortality was related to the disease process.

Tube thoracostomy is a simple and efficacious procedure for the treatment of pleural space collections. The safety of the procedure can be improved upon by adequate training while proper selection of cases will reduce failure rate and unnecessary morbidity. Early resort to thoracoscopic or open surgery when tube thoracostomy is considered inappropriate or has failed will improve the success rate in the overall management of pleural fluid collections.

REFERENCES.

1. **Angelillo-Mackinlay T, Lyons GA, Piedras MB, Angelillo-Mackinlay D.** Surgical Treatment of Postpneumonic Empyema. World J Surg. 1999; 23:1110-1113.

2. **Anyanwu CH, Egbue M.** Management of Pleural Sepsis in Nigerian Children. Thorax.1981; 36:282-285.

3. **Sahn SA.** Management of Malignant Pleural Effusions. Monaldi Arch Chest Dis. 2001; 56:394-399.

4. **De Hoyos A, Sundaresan S.** Thoracic Empyema. Surg Clin N Am. 2002; 82:643-671.

5. **Magovern CJ, Rusch VW.** Parapneumonic and Posttraumatic Pleural Space Infections. Chest Surg Clin N Amr. 1994; 4:561-568.

6. **Balci AE, Eren S, Ulku R,Eren MN.** Management of Multiloculated Empyema Thoracis in Children: Thoracotomy versus Fibrinolytic Treatment. Eur J Cardiothorac Surg. 2002; 22:595-598.

7. **Moulton JS.** Image Guided Management of Complicated Pleural Fluid Collections. Rad Clin North Amr. 2000; 38:345-374.

8. **Millikan JS, Moore EE, Steiner E, Aragon GE, Van-Way CW.** Complications of Tube Thoracostomy for Acute Trauma. *Amer J Surg* 1980; 146(6): 738-41

9. **Deneuville M.** Morbidity of Percutaneous Tube Thoracostomy in Trauma Patients. *European Journal of Cardiothoacic Surgery* 2002; 22(5): 673-8.

10. **Hesselink DA, Van-Der-Klooster JM, Bac EH, Scheffer MG, Brouwers JW.** Cardiac Tamponade Secondary to Chest Tube Placement. *Eur J Emerg Med.* 2001; 8(3): 237-9

11. **Bailey RC.** Complications of Tube Thoracostomy in Trauma. *J Accid Emerg Med* 2000; 17(2): 111-4.

12. **Jones TJ, Rajesh PB.** Pneumothorax and Insertion of a Chest Drain. *Surgery* 2004; 22(5): 101-2.

13. **Meier AH, Smith B, Raghavan A, Moss RL, Harrison M, Skarsgard E.** Rational Treatment of Empyema in Children. Arch Surg. 2000; 135:907-912.

14. **Yilmaz E, Dogan Y, Aydinoglu AH, Gurgoze MK, Aygun D.** Parapneumonic Empyema in Children: Conservative Approach. Turk J Pediatr. 2002; 44:134-138.

15. **Cohen G, Hjortdal V, Ricci M, Jaffe A, Wallis C et al.** Primary Thoracoscopic Treatment of Empyema in Children. *J Thorac Cardiovasc Surg.* 2003; 125(10: 79-84.