USE OF CONTINUOUS LOW PRESSURE SUCTION ON CHEST DRAIN IN THORACIC SURGICAL UNIT

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Objective: To assess the merits and demerits of continuous Low Pressure Suction applied to the chest drain in both preoperative and postoperative thoracic patients.

Place and Duration: Department of Cardiothoracic Surgery, Postgraduate Medical Institute, ady Reading Hospital Peshawar from Jan 2005 to March 2005.

Materials and Methods: It was a prospective study carried out over the period of three months to assess the benefits of Low Pressure Suction. Patients with Chest trauma, inflammatory disease of the lung & pleura, carcinomas and postoperative patients were included in the study. Patients with multiple trauma and moribund patients were excluded from the study.

Postoperative patients were given priority for suction beds. The suction applied to the chest drain ranged from -05 to -20 KPa. It was continuously applied to the chest drain 24hrs a day & 7 days a week and only interrupted at the time of bottle change or patients going to toilets.

A total of 180 patients were included in the study, which were divided into two groups depending upon the availability of suction beds.

Group I: Included those patients who were put on Continuous Low Pressure Suction
Group II: Included those patients who were not put on Continuous Low Pressure Suction because lack of suction beds

Ninety patients were included in group I and similar number of patients into group II.

Results: In group I out of 90 patients 40 were non-operative and 50 were operative. In group II out of 90 patients 55 were non-operative while 35 were operative. Out of operated patients (total 85) full lung expansion was achieved in 42 (84%) in group I and 25 (71.4%) in group II while partial lung expansion was achieved in 08 (16%) in group I and 10 (28.6%) patients in group II.

Out of non-operated patients (total 95) full expansion was achieved in 35 (87.5%) in group I and 42 (76.4%) in group II while partial expansion was achieved in 05 (12.5%) patients in group I and 13 (23.6%) in group II. Out of 5 partial expansions in group I suction had to be discontinued in 2 patients because of increasing air leak.

Conclusion: Continuous low pressure suction helps to decrease the need for surgery in patients following chest trauma, inflammatory lung disease and decreases morbidity in postoperative patients.

Key Words: Low Pressure Suction, Chest Drains, Air Leak, Lung Expansion

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INTRODUCTION

Air in the pleural space or pneumothorax and pleural effusions have been appreciated since ancient times and have been well described by different authors in the past years[1,2]. Hippocrates and Gallon were also aware of the disease process involving the pleural space.[3] Different diseases of pleural cavity whether pneumothorax or inflammatory disease of the pleura and lungs are from time to time treated by thoracic surgeon. Early disease usually responds to chest drain insertion and in resistant cases some respond low pressure suction, before embarking on surgery[3].

Continuous low pressure suction is the application of suction force on the pleural cavity, which further increases the negative pressure in the pleural space which helps in the expansion of the lung.

We performed prospective study on patients who were put on continuous low pressure suction and determined its effects on the expansion of the lung. This study was carried out for a period of 03 months time in the Department of Cardiothoracic Surgery. Postgraduate Medical Institute, Lady Reading Hospital, Peshawar from January 2005 to March 2005.

MATERIAL & METHODS

This study was conducted to assess the benefits of continuous low pressure suction to chest drains of patients with chest trauma, inflammatory lung and pleural disease malignancy and post-operative patients. Postoperative patients were given priority for suction beds. Multiple trauma and moribund patients were excluded from the study. There are eighteen suction units of BOC Company installed in Cardiothoracic unit which has 31 regular beds with 5 extra beds for chest trauma patients and six bedded ICU. The suction applied to the chest drains ranged from -5 to -20 KPa. It was continuously applied to chest drain 24hrs a day and 7 days a week and only interrupted at the time of bottle change or patients going to toilet. This suction is run by the oxygen plant of the hospital and runs uninterrupted.

A total of 180 patients were included in the study who were divided in to two groups depending upon the availability of suction beds.

Group I: Included those patients who were put on continuous low pressure suction priority was given to postoperative patients and those patients transferred from other units for low pressure suction.

Group II Included those patients who were not put on continuous low pressure suction Ninety patients were included in group I and similar number of patients in group II.

RESULTS

There were 62 (68.9%) males and 28 (17.1%) females in group I and 50 (55.6%) males and 40 (44.4%) females in group II (Table I).

SEX DISTRIBUTION (n =180)		
SEX	GROUP I	GROUP II
Male Female	62 (68.9%) 28 (31.1%)	50 (55.6%) 48 (44.4%)

Each group had patients of all ages ranging from as low as 04 years to 76 years. The main bulk of patients being formed by the patients between ages 20 – 60 years in each group (Table II).

AGE DISTRIBUTION (n = 180)		
AGE IN YEAR	GROUP I	GROUP II
04 – 20 years	19 (21.1%)	17 (18.9%)
21 - 40 years	25 (27.8%)	35 (38.9%)
41 – 60 years	30 (33.3%)	24 (26.7%0
> 61 years	16 (17.8%)	14 (15.6%)

Each group contained both of operated as well as non-operated patients.
In group I out of 90 patients 50 were operated and 40 were non-operated while in group II out of 90 patients 35 were operated and 55 were non-operated (Table III).

PATIENT CATEGORY (n =180)		
PATIENT CATEGORY	GROUP I	GROUP II
Operated	50 (55.6%)	35 (38.9%)
Non-operative	40 (44.4%)	55(61.1%)

The disease distribution in non-operated patients revealed a variety of diseases and included spontaneous pneumothorax in 15 (37.5%) patients, post traumatic hemopneumothorax in 07 (17.5%), empyema in 13 (35.5%), malignant Pleural Effusion in 04 (10%) and chylothorax in 01 (1.11%) in group I while spontaneous pneumothorax in 12 (21.8%), post traumatic hemopneumothorax 27 (49.1%), empyema in 08 (14.5%) and malignant Pleural Effusion in 03 (5.5%) in group II.

The number of patient who underwent were Decortication in 15 (30%) patients, evacuation of clotted haemothorax in 09 (18%), bullectomy / pleurectomy in 08 (16%), lobectomy 08 (16%), ruptured diaphragm in 05 (10%), chest wall tumour excision in 04 (08%) and mediastinal mass excision in 01 (02%) in group I while Decortication in 04 (11.4%), evacuation of clotted haemothroax in 13 (37.1%), Bullectomy / Pleurectomy in 03 (8.6%), Lobectomy in 05 (14.3%), Repair of ruptured diaphragm in 03 (8.6%), excision of chest wall tumour in 03 (8.6%) and excision of mediastinal mass in 04(11.4%)patients in group II.

The results of low pressure suction applied to chest drains in group I compared to group II are given in Table IV & Table V.

TABLE IV

LUNG EXPANSION IN NON-OPERATED PATIENTS		
LUNG EXPANSION	GROUP I (n = 40)	GROUP II (n =55)
Full Expansion Partial Expansion	35 (87.5%) 05(12.5%)	42 (76.4%) 13 (23.6%)

TABLE V

LUNG EXPANSION IN OPERATED PATIENTS		
LUNG EXPANSION	GROUP I (n = 50)	GROUP II (n =35)
Full Expansion Partial Expansion	42 (84%) 08(16%)	25 (71.4%) 10 (28.6%)

Out of operated patients in both groups (total 85) full expansion was achieved in 42 (84%) in group I and 25 (71.4%) in group II patients while partial expansion was achieved in 08 (16%) patients in group I and 10 (28.6%) in group II..

In the non-operated patient in both groups (total 95) full expansion was achieved in 35 (87.5%) in group I and 42 (76.4%) in group II, whilst partial expansion was achieved in 05 (12.5%) in group I and 13 (23.6%) patients in group II. Out of five partial expansions in group I, suction had to be discontinued in two cases because of increasing air leak.

DISCUSSION

The normal pressure in pleural space ranges from -02 to -06 mmHg. This tends to keep the lung expanded against its elastic recoil which tends the lung to collapse [3,4]. The application of low pressure suction to chest drains helps increase this negative pressure thereby helping the lung to expand.[5]

In thoracic surgery the main aim is to obtain full lung expansion. In the West, the disease is diagnosed and treated in the early stages, thoracic trauma cases reaches the hospital very well in time, thoracic neoplasms are detected & treated at early stages and there is negligible amount of inflammatory disease. Therefore there may be no need for continuous low pressure suction to the chest drains[6,7] as the lungs are so compliant that they come up very easily with chest drainage and physiotherapy only.In our setup, there is much inflammatory disease and patients report to the clinicians very late. There is more incidence of trauma to the chest specially in people living in far off areas who reach to specialist centre very late. By the time they reach for medical advice, their lung has become much less compliant and the inflammatory disease much advanced. In such situations the application of continuous low pressure suction is much more helpful and helps to avoid major surgical intervention. In our study too, most of the patients who had been referred to us for possible surgical intervention benefited from continuous low pressure suction and avoided major thoracic surgery.

Some papers from the West argue against the use of low pressure suction stating that it may aggravate air leak or may cause major complications like re-expansion pulmonary edema [6,7]. Situation there is quite different from that of ours because they are mainly dealing with malignancy whereas the bulk of our workload is mainly inflammatory. The malignant lungs have preserved compliance while inflammatory lungs are quite stiff and need all possible support for re-expansion both pre & postoperatively. Therefore in our setting the continuous low pressure suction to the chest drains combined with Vigorous Chest Physiotherapy is a better option before deciding for surgical intervention.

In our study we did not encounter any major complication like re-expansion pulmonary edema [8,9]. In one patient suction had to be discontinued because of increased air leak. this patient had bronchopleural fistula which was closed later on surgically.

CONCLUSION

Continuous low pressure suction helps to decrease the need for surgery in patients with chest trauma, early empyemas and spontaneous pneumothorax as well as effusions.

It expedites the re-expansion of the lung by evacuating air, fluid or blood out of the pleural spaces.
It decreases tne post operative morbidity by expediting the expansion of the lung.
It avoids the high cost of thoracic surgical procedures in a poor society like ours.
So inspite of high initial cost of installation, the continuous low pressure suction is still a helpful tool in our setup to reduce the morbidity & cost of thoracic surgery.

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