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Comparison of Drainage Bag and Chest Bottle for Pleural Drainage

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ABSTRACT

Background: *A chest tube is used as a close system for drainage of fluid in the pleural space in trauma patients or after thoracic surgery. A chest bottle used at present is generally made from hard synthetic material with the possibility of breaking. Furthermore, some amounts of sterile solution (normal saline) should be always added into the chest bottle to prevent return of air back into the pleural cavity creating a vacuum and decreasing the mobility of the patient significantly.*

The purpose of this study was to use a drainage bag which is a new device made from soft and light synthetic materials like those used in urinary bag, so that drainage of fluid and air can be done through the pleural space without any complication related to the use of chest bottle.

Materials and Methods: *The present study was an interventional clinical trial. Fifty patients were selected among those who had been hospitalized in Hazrat Rasoul Akram Hospital between 2006 and 2007 and chest tubes were placed for them. After obtaining consent for participation in the study, they were divided into two groups (each comprising 25 patients) randomly. Chest bottle and drainage bag were used in groups 1 and 2, respectively. Both groups were compared for severity of chest pain, satisfaction from the device and duration of hospitalization.*

Results: *The study showed the mean pain severity in patients with a drainage bag to be 4.1 units compared to those with chest bottle as 5.4 units. Satisfaction of the patients regarding their ability to move and ease of replacement of the device was 81% in the group with drainage bag and 43%in the group with chest bottle. Mean hospitalization period was 4.8 days in patients with drainage bag and 8.5 days in patients with chest bottles.*

Conclusion: *The present study showed that using drainage bags instead of chest bottles in all patients who have chest tubes, can result in decreased pain, more satisfaction, shorter hospitalization and acceleration of recovery provided that the patients do not need more negative pressure (suction) within the pleural space.* ***(Tanaffos 2007; 6(3): 36-39)***

Key words: *Pleura, Chest tube, Chest bottle, Drainage*

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INTRODUCTION

Drainage of fluid through pleural space following thoracic surgery in trauma patients has always been challenging for the surgeon. Chest tubes have been used as a closed drain since the past century. It consists of three parts: chest tube, chest bottle and the connecting tube. A chest bottle, which is used at present, is generally made from hard flexible synthetic materials (1). Furthermore, some amounts of sterile solution (normal saline) should be always added into the chest bottle to create a one-way vacuum and to prevent return of air back into the pleural cavity resulting in pressure on the patient's chest wall, irritating the parietal pleura, causing pain resulting in significant decrease in patient mobility (2). On the other hand, there is a possibility that the chest bottle break. Moreover, replacement of the chest bottle should be performed under sterile conditions by expert personnel (3). At present, chest tubes are widely used in medical centers for drainage of the pleural space. This study was performed to evaluate the use of drainage bags; a new device made from soft light materials (similar to those used in a urinary bag) so that adequate drainage of pleural space may be possible without the drawbacks of the chest bottle.

Drainage bags are very light. There is no need to add sterile solution, it is easily replaceable and may decrease hospitalization. Additionally, it is cost-effective.

MATERIALS AND METHODS

This interventional clinical trial was performed on 50 patients selected among those who had been hospitalized at Rasoul Akram Hospital during 2006-2007 and chest tubes were placed for them. To avoid confounding variables (especially in evaluation of pain), those patients who had undergone thoracotomy or had rib fracture and chest pain, were excluded from the study. Thus, only patients who underwent diagnostic thoracoscopy or a chest tube was placed for them for other reasons (pleural effusion, spontaneous pneumothorax, etc.) entered the study. The study patients were randomly divided into two groups (each comprising 25 cases) after obtaining consent. Chest bottles were used for one group and drainage bags for the other. First the drainage bag was designed schematically and ordered from a medical equipment company abroad. There are special valves inside the drainage bag which allow the discharge of pleural fluid by respiratory function (inspiration and expiration) and gravity inhibiting fluid reflux (Figure 1).

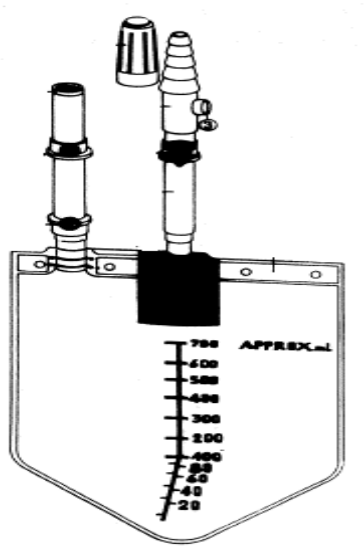

Figure 1. Schematic model of the ordered drainage bag.

After making the first four samples by the company, one of them with an approximate volume of 2 liter and 4 one-sided drainage valves, was selected and then ordered (Figure 2).

After recording the demographic data during a 6-hour period of chest tube placement, the patients were asked about the severity of pain by expert

nurses using a visual analog scale (VAS) (4). The assessment was repeated in certain intervals and results were recorded in work sheets. Both groups were compared regarding their satisfaction from their ability to move and feasibility of device replacement and also duration of chest tube placement during the following days. Data were analyzed by using SPSS software.

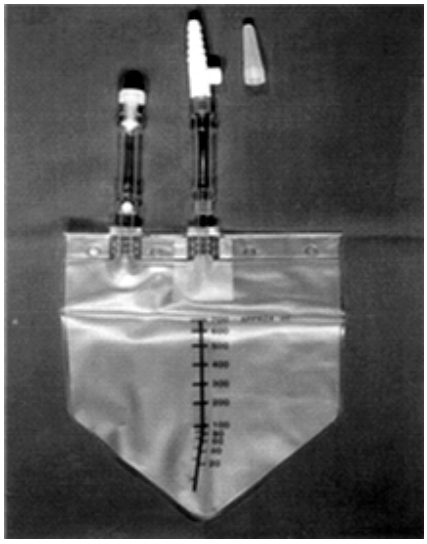

Figure 2. Sample of the drainage bag made by the company.

RESULTS

The present study showed that the mean pain severity in patients with drainage bags and chest bottles were 4.1 units and 5.4 units, respectively.

Eighty-one percent of patients with drainage bags and 43% of those with chest bottles were satisfied by easy replacement of the device and their ability to move around.

Mean duration of hospitalization was 4.8 days and 8.5 days in patients with drainage bags and chest bottles, respectively.

Indications for chest tube placement were also evaluated in these patients which are as follows: pneumothorax in 15 cases (40%), pleural effusion in 18 (36%), diagnostic thoracoscopy in 12 (24%) and hemothorax in 5 cases (10%). Other factors such as diagnosis of underlying diseases, place of residence and level of education were also evaluated.

DISCUSSION

The results showed that the severity of pain in patients with drainage bags was less than those with chest bottles. Since the chest pain directly affects pulmonary ventilation, decreasing the severity of pain especially in trauma patients after surgery is one of the most essential factors for prevention of future complications (5). Matching the patients and elimination of other confounding variables producing pain (like thoracotomy, rib fracture; etc) help to achieve higher accuracy.

Another important factor in our study was patient satisfaction from their ability to move about with the chest tube which was higher in the drainage bag group (81% vs. 43%). The chest bottle with its connecting tube is located under the patient's bed and causes severe pain induced by chest tube retraction during movement (6). But the drainage bag can be kept close to the patient so that the patient is able to move freely (Figures 3, 4). In addition, chest bottle replacement requires sterile conditions and normal saline solution so that the long tube of the chest bottle can be dipped 2-3cm within the solution whereas the drainage bag can be replaced easily without solution and may be done by the patient himself or his relatives after brief training instructions are given.

Although the patients were randomly divided into two groups without considering the underlying diseases and the reason for chest tube placement, the mean duration of hospitalization in patients with drainage bags was less than the other group (Figure 3). Although the drainage bag is not made in our country at present, its cost will be less than a chest bottle. It can be produced abundantly in our country.

Despite the above mentioned benefits regarding the drainage bag, it must be mentioned that it can not be used in conditions requiring negative pressure in the pleural space (using suction) because of its soft quality. Furthermore, if the drainage bag is placed under the patient's body, its function will be impaired; therefore, it is necessary to educate doctors regarding the careful use of drainage bags (Figure 4).

Figure 3. Drainage bag beside the patient with connection to chest tube.

Figure 4. Drainage bag during standing position.

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