



Open chest wound dressing (Pneumothorax Bandage)

Rahmanian Koshkaki Farzad¹, Saadatmand Vahid², Rahmanian Koshkaki Elham*³,
Poorgholami Farzad⁴ and Asadi Mahdi⁵

¹Paramedic of Jahrom University of Medical Sciences, Jahrom, Iran

²Critical Care Nursing and Paramedic Faculty Member of Jahrom University of Medical Sciences.

³Anatomy and Embryology, Cellular and Molecular Gerash Research Center, Grash School of Medical Science, Shiraz University of Medical Science, Shiraz, Iran

⁴Research Center for non-Communicable Diseases, Jahrom University of Medical Sciences, Jahrom, Iran

⁵Emergency Medicine Specialist Assistant Professor, Jahrom University of Medical Sciences, Jahrom, Iran

ABSTRACT

Trauma is the most important causes of mortality and incidence of complications in societies and is considered as the main cause of death in patients less than 40 years old. Chest injuries can be created followed by penetrating and/or non-penetrating injuries and injury is the cause of death in 25% of the cases, so finding a new solution to reduce the risk of such injuries is inevitable and is the main purpose of this study. A solution has been provided in this initiative plan in relation to prevention of Pneumothorax risks. An anti-allergenic, transparent adhesive (20×20 cm) and with a one-way valve has been used for this purpose. This valve is adhered to the considered adhesive by liquid glue as well as gasket. The valve acts so that air can exit from it but any air cannot enter to the chest wound through it. The results of this study showed that the adhesive has a high efficiency in order to reduce the risk of pneumothorax risks in different types of open wounds in the chest at all ages and genders and the one-way valve embedded in the adhesive in this study has high ability in controlling the negative pressure around the lungs (pleural space). According to the above it was found that the adhesive is designed and built for the first time in Iran and has many advantages in terms of casualties caused by open chest wound and its use is recommended in all cases of open chest wound.

Keywords: Dressing, Open Wound, Chest, Pneumothorax

INTRODUCTION

Trauma is the most important causes of mortality and incidence of complications in societies and is considered as the main cause of death in patients less than 40 years old [1]. Chest injuries can be created followed by penetrating and/or non-penetrating injuries and injury is considered as the cause of death in 25% of the cases [2, 3]. However, most of these injuries can be treated with simple measures such as Thoracostomy [4], but the chest injuries cannot be treated in this manner in 10 to 15% of the cases [5]. Traumas are the third most common cause of death regardless of age. Almost half of deaths due to traumas are occurred during the first few minutes after injury and chest injuries are considered as an important cause of these kinds of death [2]. Studies have been found that the chest penetrating injuries are significant difficulties in accidents and despite benignity of the majority of these kinds of injuries; there is also the risk of death [4]. Pneumothorax or accumulation of air in the pleural space is also one of

the events that occurs in most injuries of the chest and makes negative pressure that causes the lungs to stick to the chest wall to be reduced.

Studies have been shown that Pneumothorax and the mortality caused by it has worldwide prevalence; and the prevalence of this illness, according to conducted studies, in men (80%) is more than in women (20%) [6]. Given to the role of man as the fundamental axis of a family, finding a quick way to reduce the risk of Pneumothorax is vital and necessary. Pneumothorax is a disorder that may be created in penetrating or blunt traumas of the chest and needs early diagnosis and fast treatment due to its urgency nature. Current diagnosis procedures include chest x-ray (CXR) and chest CT-scan. However some patients with Pneumothorax have sustainable condition and cannot be referred for CXR and chest CT-scan [7]. In addition, it has been stated in studies that currently the treatment of Pneumothorax include: aspiration with simple needle, insertion of tracheostomy tube, implementation of thoracotomy or thoracoscopy, resection of the lesion and stitched the location of leaks. Pleurectomy Surgery, associated with separating of all the parietal pleura of the lower ribs and intercostals muscles, is also done in advanced cases [8-12]. Since most of treatment options are time consuming and require extensive equipment and facilities; so finding fast and clinical treatment methods have importance value. Based on performed studies and despite the importance of Pneumothorax and increased mortality caused by it, no detailed study has been offered yet on quick, easy and low cost treatment of the illness.

In this invention design, we decide to introduce an easy, quick and low cost device to reduce further damage to patients with Pneumothorax and to reduce mortality in accidents either in pre-hospital environments and crisis or in hospitals, to provide further contribution to saving the lives of these patients.

EXPERIMENTAL SECTION

In the open chest wound adhesive tape design with patent number 86601 dated on 01.08/2015, a solution is offered to prevent the risks of Pneumothorax. The instruments used in this design include:

- A 30cm leukoplast adhesive dressing in role
- Transparent and flexible plastic
- A one way valve of mercury sphygmomanometer
- Liquid glue, made in Iran
- Cutter, made in Iran
- Washer, made in Iran

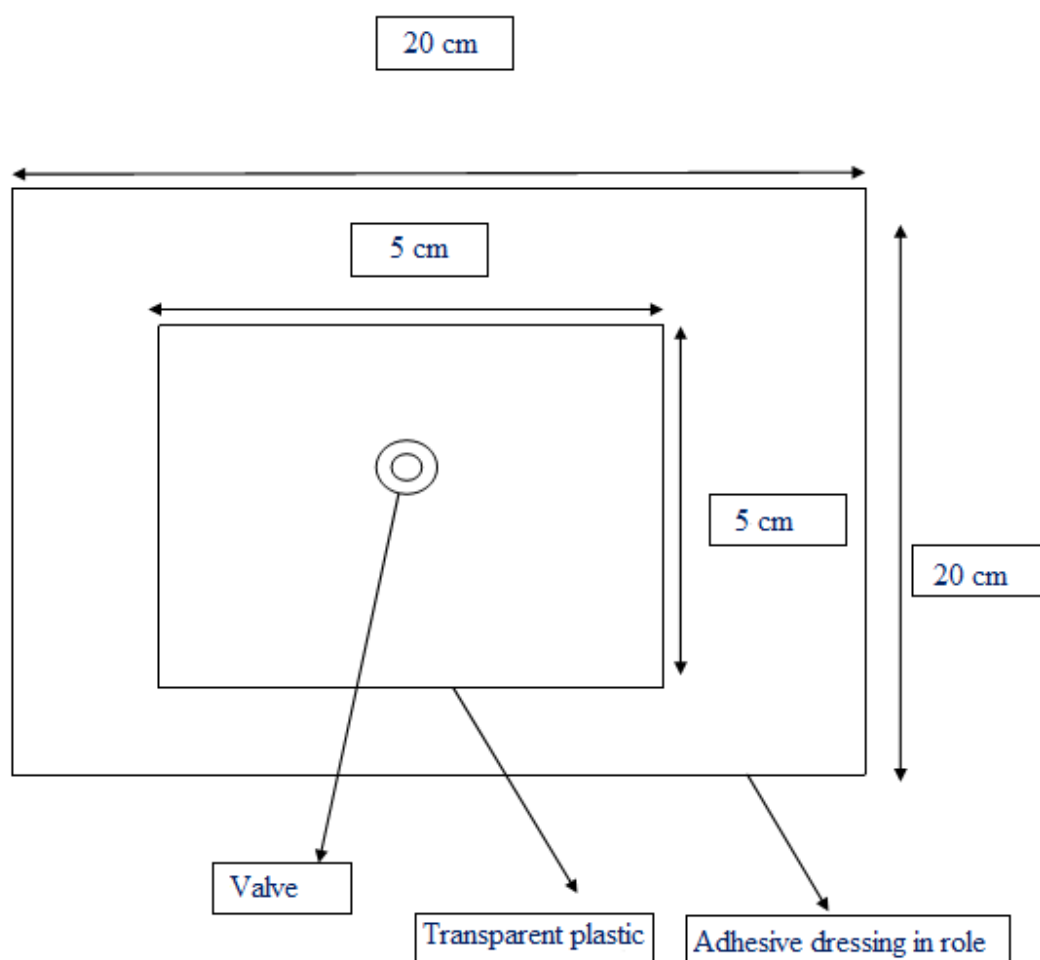
After preparation of the above instruments the process can be followed as the bellow guideline. The adhesive tape is cut into squares at first; preferably (20×20 cm). A square with a side length of 5cm is then brought out using a cutter; the transparent and flexible plastic is then cut preferably (8×8 cm) proportional to the dimension of the pores existed in the adhesive and attached to adhesive dressing in role by liquid glue. A pore proportional to the size of the considered valve is created in the middle of the plastic or preferably on its edges and then the washer is placed at the bottom of the valve and fixed (this is done to create more cross-sectional area to attach the valve). Using glue, the valve(s) (one or three valve(s)) is then attached to the plastic. It is noteworthy that the orientation of the valve(s) must be toward a direction that air can be able to exit but no air can be allowed to transfer into it from outside of the body.

It should be noted that it has been tried in this study to use hypoallergenic adhesives as well as 100% sterile equipment's. In order to use this adhesive, a location has been considered for easy removal of the back cover of it.

RESULTS

The results of this study showed that the use of this adhesive tape is essential to reduce the risks and losses of Pneumothorax. It can be used in situations of crisis and pre-hospital and hospital emergency. The existence of one way valve in this adhesive causes the proper function of it (Figure 1) and also prevents the entrance of air into the chest. The transparency of the adhesive that also causes the wound to be clearly visible has quick applications and prevents from the entrance of possible contaminations into the chest. This innovative adhesive tape is not large and has the ability of flexibility as well as it can be used for patients in all ages.

Figure 1- Typical open chest wound adhesive tape designed in this study



DISCUSSION

This plan is presented for the first time in Iran and there is no similar design to it in this country. The offered adhesive tape is used in patients with open chest wound. This means that after application of the adhesive tape on the wound, it prevents the entrance of air into the chest through the wound and meanwhile it helps the air to exit from the body.

This adhesive tape can also be used in patients after removal of the chest tube. It also can be used in male and female patients at all ages. The adhesive tape application does not require any special expertise due to its quick and easy usage.

Since every invention at first is facing with problems, and this invention is not exempt too, it has been tried in this design to minimize the percentage of problems. However, it is possible that application of adhesive tape on the location of trauma to be faced with problem in patients who have hairy chest. Of course, a small percentage of error is allocated to this error rate and the proposed solution to solve this problem may be in several ways that the fastest and easiest solutions include:

Use of shaver device (razor) and use of hair removing wax to eliminate the injury hairs. In severe bleeding, the trauma location should be first cleaned with sterile gauze and then the adhesive tape can be used.

CONCLUSION

According to the above, the mentioned adhesive tape has been designed and prepared in Iran for the first time. It has many advantages in reducing losses caused by an open chest wound and its usage does not require any special expertise. Application of this adhesive tape is recommended in all open wounds of the chest.

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