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Spleen Tissue Implantation in The Chest Cavity After Splenectomy in Patient with Spontaneous Spleen Ruptured Caused by Blunt Trauma from A Traffic Accident: A Case Report

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ABSTRACT

A traffic accident is an incident that occurs suddenly and cannot be predicted. According to The Organization for Co-operation and Development (ORDC), the definition of a traffic accident encompasses an event that occurs between vehicles, people, and pedestrians or between animals and vehicles itself it happens on public roads, resulting in one or more people being injured or killed. A 14-year-old male patient came to the emergency unit of Tabanan Regional General Hospital with complaints of chest pain after being thrown backward from a motorbike when hit by a piece of a coconut tree while riding a motorbike. After falling, the patient felt shortness of breath. On physical examination, the patient was found to be in pain. The chest X-ray results showed erosion of the left acromion and an incomplete fracture of the left lateral os costae 8.9. The USG FAST result positive (+) in hepatorenal and paravesica. Because of this phenomenon, researchers want to review information on the spleen tissue implantation in the chest cavity after splenectomy in a patient with a spontaneous spleen ruptured.

Keywords: ruptured spleen; spleen tissue implantation; blunt trauma; traffic accident.

INTRODUCTION

A traffic accident is an incident that occurs suddenly and cannot be predicted. According to The Organization for Co-operation and Development (ORDC), the definition of a traffic accident encompasses an event that occurs between vehicles, people, and pedestrians or between animals and vehicles itself it happens on public roads, resulting in one or more people being injured or killed. In Indonesia, traffic accidents are one of the major causes of death and can have significant social and economic effects [1]. Traffic accidents are not uncommon nowadays. As many as 1.24 million people die each year worldwide and 20-50 million people are injured due to traffic accidents. A 2015 global road safety report revealed that Indonesia, located in Asia, had the third highest number of deaths in traffic accidents, with a total of 38.279 deaths, just behind China and India. Indonesia's first classification is based on the mortality rate, which is 0.0015% of traffic accidents. Based on data from the Central Statistics Agency, the number of accidents that occurred in Indonesia in 2016 was 106,129 cases, with 26,185 fatalities, 22,558 serious injuries, 121,550 minor injuries, and material losses reaching 226,833 million rupiah. According to the Traffic Corps of the Indonesian National Police, from April to June 2018 there were 26,592 cases with 6,444 fatalities [2].

An accident can lead to injury to a victim from minor injuries to a disability, and even the most fatal skills can lead to death. Injuries are physical injuries that occur when the human body experiences or undergoes acute (sudden) contact from unbearable energy levels. [3]. Several studies have stated that in cases of traffic accidents, various types of injuries and trauma can be found, but the most frequently reported ones include blunt trauma, lacerations, abrasions, and bruises due to hard impacts from a surface to the surface of the skin [4]. Abdominal trauma is one of the biggest impacts of traffic accidents that is increasing from year to year. Splenic rupture occurs in 40-55% of all blunt abdominal trauma. Splenic rupture occurs due to rapid deceleration, compression, energy transmission

through the posterolateral chest wall to the spleen, or it can also be due to surrounding rib fractures that pierce inward and affect the spleen. [5].

Splenic rupture in blunt abdominal trauma can be defined as the occurrence of a tear or rupture of the spleen, which is a soft, movable organ, which occurs due to blunt trauma, directly or indirectly. Splenic rupture is a condition of damage to the spleen due to a significant impact on the spleen from several sources. These are mainly caused by direct or indirect damage to the ruler capsule and partial or complete tear of the spleen. The spleen has a very important function for the body, working as a blood reserve reservoir, producing specific immune responses, phagocytosis of foreign substances in the circulation, and destroying old erythrocytes. The spleen is physiologically circulated by blood up to 350 liters a day, so if a splenic rupture occurs, this condition is very dangerous for the body because it can cause very severe bleeding. [6].

In the case of spleen damage, it is important to consider the proximity of life-threatening signs as it is unnecessary hypotension in the shoulder due to membrane damage, and certain bleeding that appears to be seen as stomach pain. Determination of the scale is used to obtain objective information because not all splenic ruptures require surgery, CT scan is a supporting examination that can help determine the grading of splenic rupture. Late treatment of splenic rupture has a relatively high mortality rate (5-15%) [6].

CASE REPORT

A 14-year-old male patient came to the emergency unit of Tabanan Regional General Hospital with complaints of chest pain after being thrown backward from a motorbike when hit by a piece of coconut tree while riding a motorbike. After falling, the patient felt shortness of breath. On physical examination, the patient was found to be in pain, with a primary survey: airway: clear; breathing: spontaneous, respiration rate 20 x/min, saturation 99%; circulation: blood pressure 120/70 mmHg, pulse rate 86 x/min, capillary refill time <2 seconds; disability: compos mentis, GCS E4V5M6; exposure: temperature 36 ^{o}C. In the secondary survey found: rhinorrhea (-/-), otorrhea (-/-); thorax: lesion (+) in thorax sinistra; pulmo: vesicular (+/+), rhonci (-/-), wheezing (-/-); cor: single S1S2, regular, murmur (-); abdomen: lesion (-), tenderness (-), bowel sounds (+) within normal limits; back: lesion (-); extremities: lesion (-). In the local status of the left shoulder region found edema (+), deformity (-), tenderness (+), and limited range of motion because of pain. In the local status of the left thorax region, multiple lesions were found. The patient's condition when he first arrived is shown in the following image:

FIGURE 1: A patient's condition when coming to Tabanan Regional General Hospital.

After that, the patient underwent chest X-ray and ultrasound examinations, and the following results were obtained:

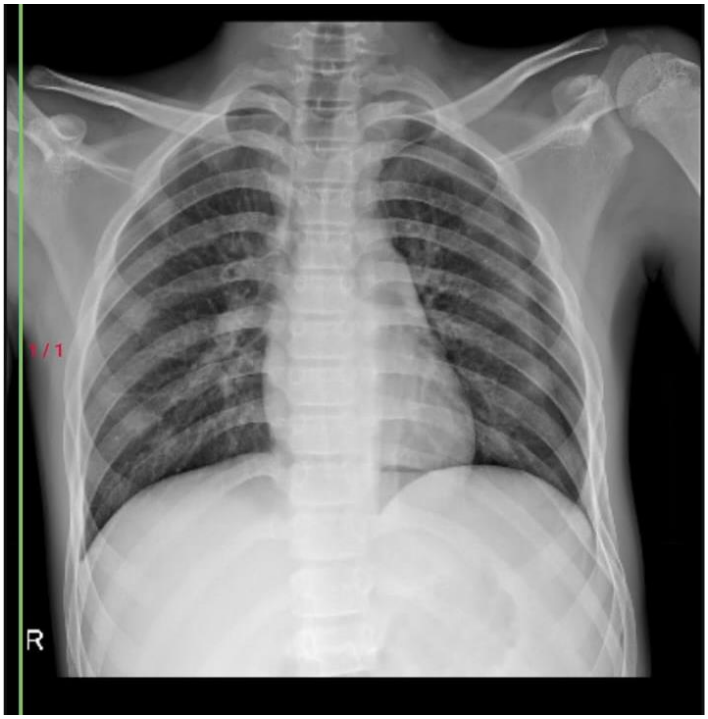

FIGURE 2: Results of the patient's chest x-ray examination.

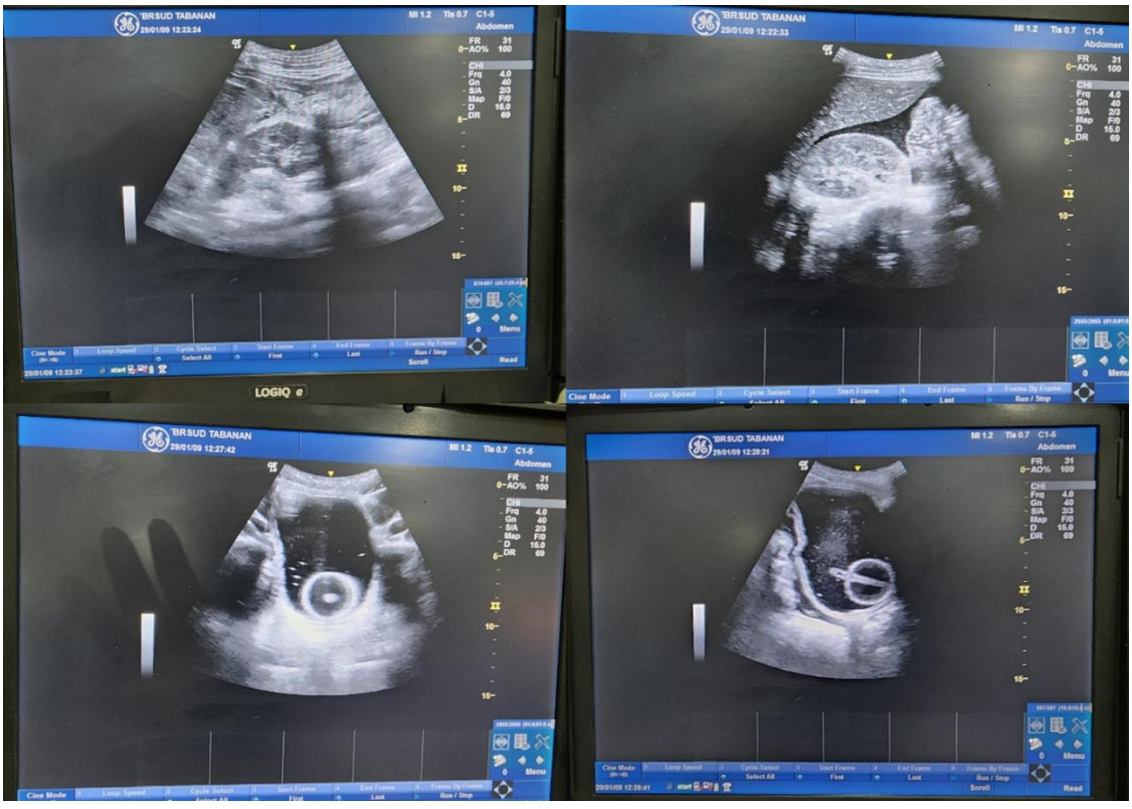

FIGURE 3: The condition of the patient's arm after the operation.

The chest X-ray results showed erosion of the left acromion and an incomplete fracture of the left lateral os costae 8.9. The USG FAST result positive (+) in hepatorenal and paravesica.

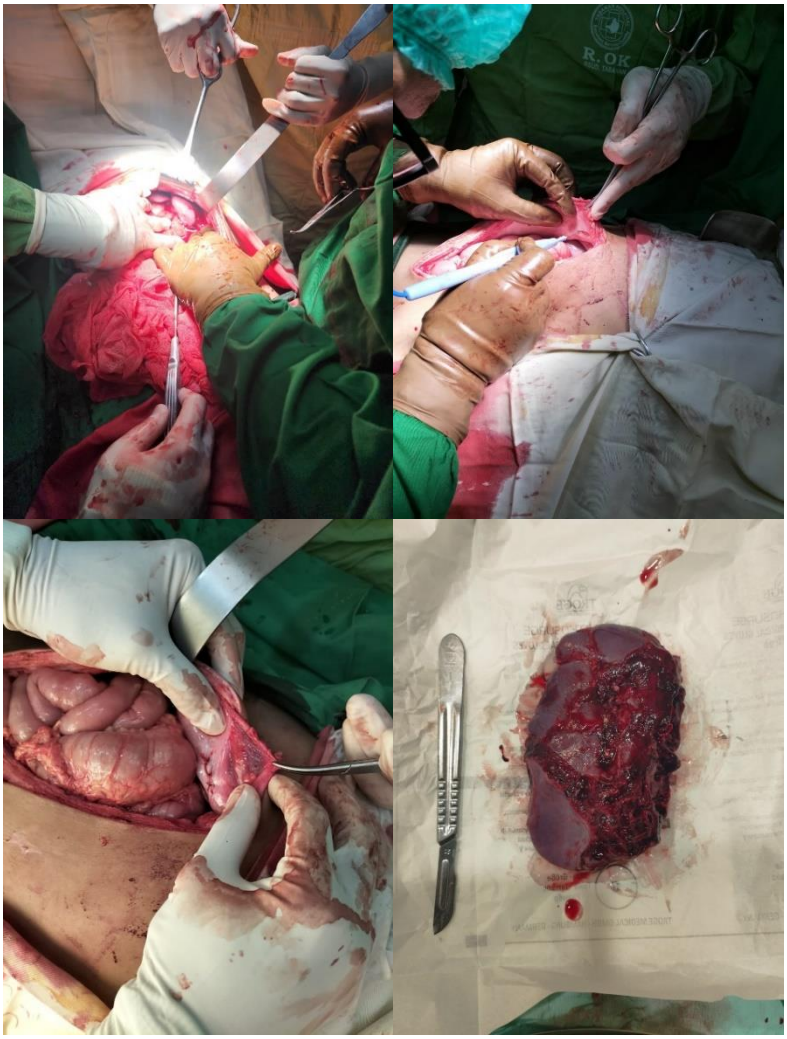

FIGURE 4: Splenectomy Procedure and Resected Spleen.

After exploration of laparotomy + splenectomy accompanied by spleen tissue implantation, the patient received ceftriaxone therapy 2x1 g IV, paracetamol 3x1 g IV, ibuprofen 3x200 mg IV, ondansetron 3x4 mg IV, piracetam 3x3 g IV, moxifloxacin 4x400 mg IV, PRC transfusion 1-2 kolf/day with a target Hb > 10 g/dL.

DISCUSSION

Splenic rupture is a serious condition that often occurs due to blunt trauma, such as a traffic accident, a fall from a height, or a direct blow to the abdomen. The spleen, located in the upper left quadrant of the abdomen, is a highly vascular structure that is very susceptible to injury. In cases of blunt trauma, sudden and strong pressure on the abdomen can cause a tear in the splenic capsule, potentially resulting in significant internal bleeding. The severity of splenic rupture varies from a mild subcapsular hematoma to a complete rupture with massive, life-threatening hemorrhage [7].

The main symptoms of splenic rupture include left upper abdominal pain, left shoulder pain (Kehr's sign), dizziness, low blood pressure, and shock due to rapid blood loss. Diagnosis of splenic rupture is usually done through physical examination, ultrasound (FAST scan), or abdominal CT scan to assess the extent of the injury and the amount of bleeding that has occurred. In mild to moderate cases, conservative management with close monitoring and blood transfusion may be performed.

However, if there is massive bleeding or the patient's condition is unstable, surgery such as splenectomy (removal of the spleen) or selenography (suturing of the spleen) may be needed to stop the bleeding. As in this case, a total splenectomy or removal of the entire spleen was performed to save the patient's serious condition [8].

Splenectomy or removal of the spleen is often required in cases of severe trauma, hematological diseases, or other disorders that cause splenic dysfunction. Although this procedure can be lifesaving, the removal of the spleen can impact the immune system, increasing the risk of serious infections, especially against capsular bacteria such as Streptococcus pneumoniae, Haemophilus influenzae, and Neisseria meningitidis. Therefore, various methods have been developed to maintain immunological function after splenectomy, one of which is the implantation of spleen tissue into the chest cavity. Splenic tissue implantation aims to allow partial regeneration of splenic function in a different location.

The thoracic cavity is chosen as one of the potential locations due to its accessibility in surgical procedures and the possibility of better tissue vascularization. Several experimental studies have shown that transplanted spleen tissue can undergo revascularization and retain some of its phagocytic and immunological functions. However, the long-term effectiveness of this method is still controversial, and further research is needed to understand its benefits and risks [9].

Technically, the implantation procedure involves cutting the spleen tissue into small pieces and implanting them into a prepared site in the chest cavity. This technique aims to increase the chances of tissue survival by allowing for the establishment of an adequate blood supply. Factors such as the size of the transplanted tissue, the vascularization conditions at the implantation site, and the body's immune response to the implanted tissue greatly influence the success of this procedure [10].

Despite the potential benefits, splenic tissue implantation also has certain challenges and risks. One of these is the possibility of the formation of fibrotic tissue that inhibits the function of the regenerated spleen. In addition, there are concerns about potential complications such as infection or unwanted immune reactions. Therefore, patients who undergo this procedure need to be closely monitored to evaluate its effectiveness and identify possible complications. In some studies, the results showed that spleen tissue implantation can provide partial immunological protection against post-splenectomy infection. However, its effectiveness still needs to be compared with other methods such as vaccination and prophylactic antibiotic therapy. With the development of medical technology and further research, it is hoped that this method can be a more effective alternative to reduce the negative impact of splenectomy, especially in patients at high risk of infection [11].

CONCLUSION

Splenic tissue implantation aims to allow partial regeneration of splenic function at a different location. Splenic tissue implantation may provide partial immunological protection against post-splenectomy infections. Despite the potential benefits, splenic tissue implantation also has certain challenges and risks. One of these is the possibility of the formation of fibrotic tissue that inhibits the function of the regenerated spleen.

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