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The Wittmann Patch™ as a temporary abdominal closure device after decompressive celiotomy for abdominal compartment syndrome following burn

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ARTICLE INFO

Article history:
Accepted 24 June 2007

Keywords:
Burn
Abdominal compartment syndrome
Celiotomy
Wittmann Patch™

ABSTRACT

Background: Abdominal compartment syndrome is frequently the result of aggressive fluid resuscitation after burn. Management of the open abdomen following decompressive celiotomy is a major problem.

Methods: From 2004 to mid-2005, six patients required decompressive celiotomy after developing abdominal compartment syndrome as a result of burn. A Wittmann Patch™ was used to close the abdominal wound. Patients were re-explored when clinical parameters improved and the abdomen was closed, with long-term follow-up for the abdominal wound.

Results: Of the six patients, five had thermal injury and one had electrical injury. The mean total body surface area affected for thermal burn was 78% and for electrical burn was 37%. Diagnosis of abdominal compartment syndrome was based on elevated bladder pressure and organ dysfunction. The patients were treated with decompressive celiotomy and Wittmann Patch™ closure. Survivors subsequently underwent primary abdominal closure, with no evidence of ventral hernia at long-term follow-up.

Conclusion: In burn cases with abdominal compartment syndrome, a Wittmann Patch™ may prove a helpful method of temporary abdominal closure, followed by primary closure with no complications.

1. Introduction

People with extensive burns requiring large-volume fluid resuscitation are at risk for development of intra-abdominal hypertension (IAH) and abdominal compartment syndrome (ACS) [1,2]. ACS mandates decompressive celiotomy to relieve the multisystem effects of IAH [3–5]. Management of the consequent open abdomen is challenging despite advances in critical care medicine.

The purpose of temporary abdominal closure is to protect the intra-abdominal viscera from mechanical injury, prevent bowel dessication, minimise abdominal-wall tissue damage, prevent contamination of the peritoneal cavity and control egress of peritoneal fluid. Various methods of temporary and primary abdominal wound closure after clinical improvement of the patient have been described [6–12], but in most cases adhesions of intestinal loops to the abdominal wall and retraction of the fascial edges make closure very difficult or

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0305-4179/$34.00
doi:10.1016/j.burns.2007.06.024

impossible. The morbidity among these cases remains high and is mostly due to intestinal fistula and ventral hernia [13,14]. In such cases, closure of the abdominal wall is performed by split-thickness skin graft over omental or visceral granulation tissue, as well as reconstruction of the abdominal wall with flaps or mesh requiring several operative procedures [15–17].

The Wittmann Patch™ (Starsurgical, Burlington, WI) minimises the difficulty in dealing with ongoing fluid losses, the development of intestinal fistulae and the resulting massive ventral hernia. This material has been used for temporary abdominal closure after damage control procedures in trauma and general surgery [18]. The purpose of this report is to show the efficacy of the Wittmann Patch™ as a temporary, gradual means for abdominal closure for severely burned people with abdominal compartment syndrome.

2. Methods

A retrospective review of burn cases requiring decompressive celiotomy for abdominal compartment syndrome was performed from January 2004 to April 2005 at St. John's Mercy Medical Center, a level I trauma and major burn centre. Diagnosis of compartment syndrome was made on evidence of bladder pressure above 30 mmHg, using an indwelling urinary catheter, in association with evidence of renal dysfunction, cardiopulmonary compromise and haemodynamic instability. Six patients required temporary abdominal closure with the Wittmann Patch™.

The two biocompatible sheets (Fig. 1) of the patch were sutured to the opposing abdominal fascial edges, as described by Wittmann et al. [18] by running non-absorbable sutures (Fig. 2). They were fastened together (Fig. 3) with particular attention paid to abdominal pressure by monitoring urinary bladder and peak airway pressures. A suction catheter with several side-holes cut with scissors was placed over a gauze pack (Fig. 4), covered with another gauze pack and sealed with an occlusive dressing to create a vacuum dressing which was connected to wall suction (Fig. 5). On improvement of their clinical symptoms, patients underwent abdominal re-exploration. The patch edges were trimmed and refastened, pulling the fascial edges closer until a formal tension-free primary closure was possible. In cases where sepsis developed with multisystem organ failure, the abdominal cavity was explored again, peritoneal fluid was obtained for microbiology and the patch was refastened.

3. Results

Six patients underwent temporary abdominal closure with the Wittmann Patch™. All were men, with ages ranging from 19 to 54 years (mean 34 years); five (83%) had sustained thermal injuries and one (17%) electrical injury. Total body surface area burned ranged from 65% to 85% (mean 78%) for thermal injuries and 37% for electrical injury. All the men required decompressive celiotomy after massive fluid resuscitation and subsequent development of ACS. ACS was defined by hypoxaemia and hypercarbia with elevated peak airway

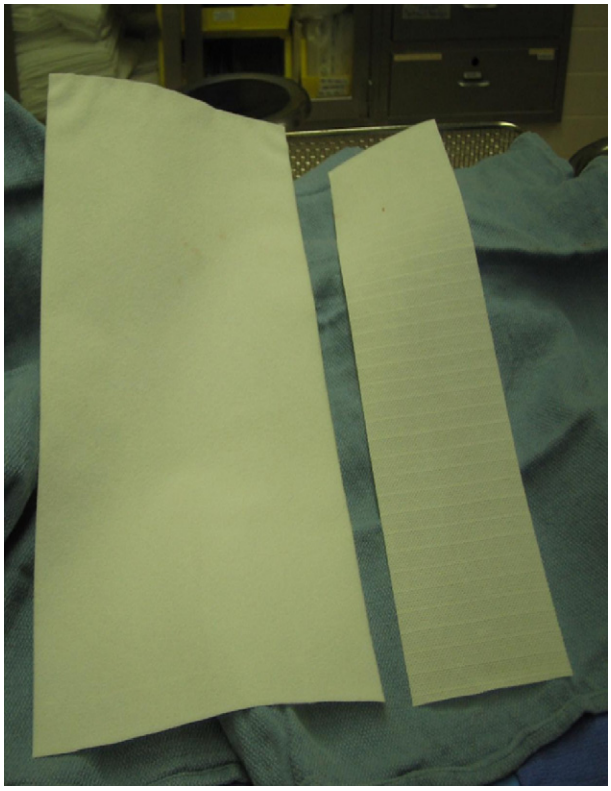

Fig. 1 – Two sheets of biocompatible material (Wittmann Patch™) which adhere to each other.

Fig. 2 – Wittmann Patch™ sutured to fascia with non-absorbable suture in a running fashion.