Post-traumatic Massive Abdominal Wall Defect- A Challenge

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Introduction

Blast trauma due to fragmentation devices can be devastating. The management of complex and multiple injuries, particularly when associated with intra-abdominal injuries and complicated by abdominal wall defect is a test of endurance for both patient and the surgeon. The reconstructive goals for the abdominal wall defect in such cases are to preserve life by providing a speedy cover to exposed abdominal viscera, protect the abdominal contents and provide functional support. Full thickness abdominal wall defects exceeding 6 cm in transverse diameter have been categorized as massive [1]. Their closure requires import of autogenous tissue in the form of vascularised flaps. Reconstruction by local or regional flaps may not be feasible in the acute stage on account of involvement of donor areas and the resultant defect at the donor site. We report a case of staged reconstruction of a massive abdominal wall defect following blast trauma from a land mine explosion by tissue expansion and prosthetic mesh.

Case Report

A 44 years old serving JCO sustained polytrauma due to mine blast in August 99. Brunt of the blast was borne by the trunk leading to massive full thickness tissue loss from the anterior abdominal wall with multiple injuries to the liver, colon and stomach and other extra-abdominal injuries. Immediate management was of the associated injuries. Anterior abdominal wall could not be closed at this stage. Omentum was draped over the viscera and a polypropylene mesh was sutured to the margins of the defect after 12 days, as the patient stabilized haemodynamically.

A split skin graft covered the defect after 3 weeks of injury. Subsequently, he developed multiple discharging sinuses in the skin grafted area due to osteomyelitis of the lower sternum and anterior segments of the right 7th to 10th ribs. These were excised and the sinuses healed. He had a massive ventral

hernia of 22 X 17 cm size in the central abdomen. Abdominal wall reconstruction was planned by tissue expansion and expanders were placed between External and Internal oblique muscles (Fig 1). Serial expansion at weekly intervals was carried out for 8 weeks. The lower quadrant expander on the left side got deflated due to an accidental puncture after four inflations. The remaining expanders were then hyper-inflated (Fig 2). Expanded tissue was used for abdominal wall reconstruction along with an inlay polypropylene mesh for structural support (Fig 3). Post-operative elective ventilatory support was required for 48 hours due to ineffective respiratory excursions. Eight months after the surgery there has been no recurrence of ventral hernia and no respiratory embarrassment (Fig 4).

Discussion

Massive abdominal wall defect is a challenge to any reconstructive surgeon. Defects due to blast trauma are very difficult to manage due to associated injuries, infection and non-availability of local tissue for

Fig. 1 : Schematic diagram showing placement of tissue expanders with their shapes and sizes. * Expander D was accidentally deflated after 4 expansions

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Fig. 2 : Massive central abdominal defect with ventral hernia. Tissue expanders A, B and C in situ and expanded

reconstruction. Infection rate is as high as 40% in contaminated wounds. Repairs have to be delayed until all inflammation is controlled to ensure an acceptable functional and aesthetic result. Repair should also be delayed if the patient is unstable or reconstructive options are limited and risky [2]. Secondary repairs are made difficult by scar tissue and adhesions. Patients with musculo-fascial defects require fascial support to prevent evisceration. Our patient illustrates all the above factors. In the acute stage, the abdomen can be closed temporarily with mesh allowing the surgeon to maintain domain, protect intra-abdominal contents, provide support and allow drainage. The granulating bed is split skin grafted as soon as possible to achieve temporary closure of the abdomen [3,4].

The abdominal wall defect is classified as midline or lateral and belonging to the upper, middle or lower third of the abdomen. A number of local, regional and micro vascular free flaps have been described for the reconstruction of the abdominal wall defect. Local flaps for the correction of midline defects, as in our case will be of limited value due to their limited arc of rotation and an associate sacrifice of strength of the lower abdominal wall. Distant flaps are usually harvested from

Fig. 3 : Tensionless closure of defect achieved after advancement of expanded tissue flaps over an inlay polypropylene mesh

Fig. 4 : Five months post-operative picture showing well reconstructed anterior abdominal wall. No ventral hernia

lateral positions and as such are difficult to advance to midline. Their use as a first line option for reconstruction of large midline defects is dubious and ought to be discouraged [2]. Component separation technique as described by Ramirez is ideal for midline musculo-fascial defects greater than 3 cm in size and by the use of bilateral relaxing incisions and release, advancements up to 10 cm in upper, 18 cm in middle and 6-10 cm in lower thirds of the abdomen may be obtained [5]. This technique however requires an intact and innervated

rectus abdominis muscle, which may not be available in victims of blast trauma or after ablative surgery for cancer [1]. Excessive scarring in the vicinity and at the margins of the defect also limit its use. Tissue expansion can provide autogenous tissue to close skin and subcutaneous defects larger than 15 cm size after initially achieving temporary closure. Reconstruction requires expansion on both sides of the defect. Though a lengthy staged procedure, it provides well-vascularized innervated autologous tissue for reconstruction [6]. Expansion is achieved between external and internal oblique or between internal oblique and transverses abdominis muscles. Tissue expansion also restores abdominal domain thus allowing easy reduction of visceral contents of the ventral hernia and prevents post-operative respiratory embarrassment [7]. Although a complication rate of 20% in the form of premature exposure and infection has been reported, it probably remains the best choice in situations with massive midline defect involving almost the whole of vertical extent of the abdomen. Additional strength to the reconstructed abdominal wall can be provided by use of prosthetic mesh. The mesh can be placed intraperitoneally where the intra-abdominal pressure provides support and limits associated complications [8]. Sufficient time should elapse to attain control of infection before a definitive reconstruction using prosthetic mesh is attempted. Paletta has shown excellent results in reconstruction of massive abdominal wall defects by the use of mesh in conjunction with tissue expanders in cases of necrotizing fascitis and gunshot wounds, with no incidence of mesh infection or extrusion, entero-cutaneous fistula or recurrent hernia [6]. Our patient, in spite of the failure of one of the expanders, confirms the role of tissue

expanders and prosthetic mesh in difficult reconstruction of a massive abdominal wall defect. Accidental deflation of tissue expander is a complication which may occur due to the expander and injection port coming too close to each other and overlapping after partial inflation of the expander, due to limited space availability and the need to hyper inflate the expander, in order to gain maximum possible tissue for reconstruction.

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