



We Asked the Experts: Modified Mesh-Mediated Fascial Traction in the Management of the Open Abdomen

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Introduction

Laparostomy is a well-established method for managing surgical catastrophes either as a planned open abdomen for re-look laparotomy or because the initial pathology precludes closure of the midline. A similar management dilemma can occur when a patient has an acute fascial dehiscence, or “burst abdomen” following major surgery. Patients in this situation are typically critically ill with high abdominal pressures, poor nutrition, significant wound sepsis and possibly loss of abdominal domain. This makes it difficult to oppose and close the fascia.

A temporary abdominal closure is needed to physically protect the intestines, maintain a clean environment and avoid excessive heat, protein and fluid loss. A vacuum (VAC) dressing is often employed to manage the defect whilst the underlying tissues granulate and are ultimately skin grafted. The downsides of this approach are a prolonged admission, the need for multiple further procedures and inevitably, significant ventral herniation, often with loss of domain. Many patients are left with a defect that is never closed. Furthermore, there is a high incidence of enteroatmospheric fistula in patients only treated with VAC dressings. The challenge is to protect the viscera and

prevent lateral retraction of the fascial edges leading to loss of abdominal domain. Early fascial closure gives the best outcomes [1, 2].

Mesh-mediated fascial traction (MMFT) when used in combination with negative pressure wound therapy (NPWT) has achieved primary fascial closure rates of up to 93% [1, 2]. The technique employed has varied with inlay, sublay and onlay mesh placement used. At our institution, we have refined the original technique initially described by Petersson in 2007 [3] and modified by Vilalobos [4], in two ways. Firstly, the routine addition of chemodenervation with botulinum toxin A (BTA) as an early step in the process. Secondly the application of the mesh as a “wrap” around the fascial edges to protect and preserve the fascia reducing the risk of maceration and “cutting out”.

Operative method

Before commencing closure of the abdominal fascia, the patient must be stable and have their primary pathology treated. Botox injection can be instituted as soon as practical, but MMFT is only commenced once the acute pathology has been dealt with. Under ultrasound guidance botulinum toxin A (150 IU per side in divided doses) is injected into the three muscle layers (external oblique, internal oblique and transversus abdominis) of the abdominal wall as soon as is feasible after the index laparotomy or first change of VAC.

Under sterile conditions and a general anaesthetic in the operating theatre, the midline wound is opened or reopened

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Fig. 1 Mesh wrapping of fascial edge

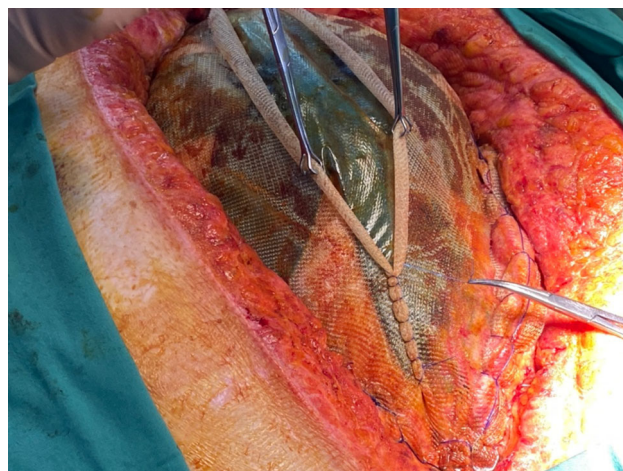


Fig. 3 Rolling the mesh edges out to tighten

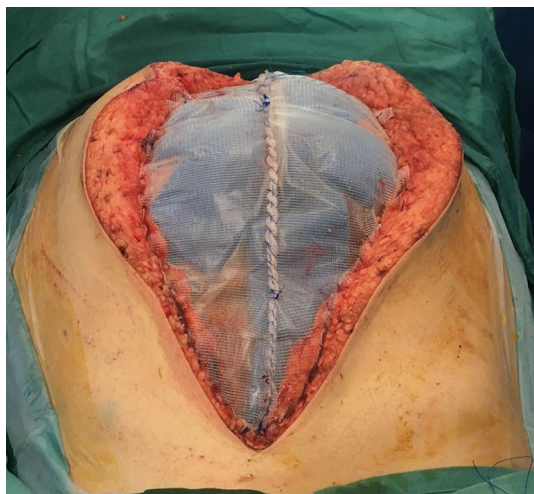


Fig. 2 Re-sutured mesh after tightening

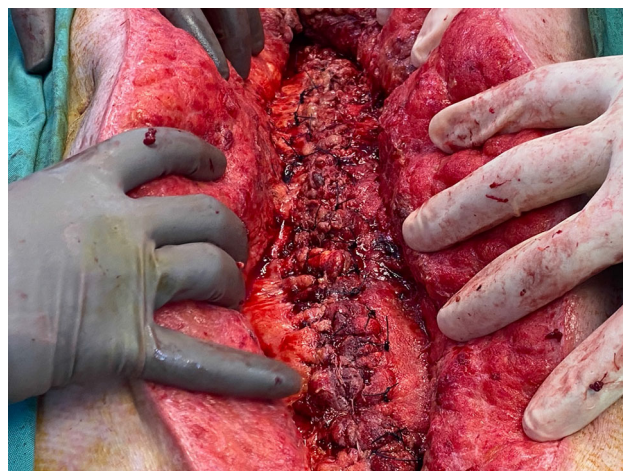


Fig. 4 Fascial approximation and closure abdominal wall

and dressings removed. If required, the anterior abdominal wall is carefully separated from any underlying viscera. A negative pressure dressing (ABThera™ Open Abdomen Negative Pressure Therapy System, KCI, San Antonio, TX) or a sterile plastic sheet is placed deep to the anterior abdominal wall with the edges towards the paracolic gutters. This acts as a protective layer between the underlying abdominal content and the overlying mesh.

A heavyweight polypropylene mesh (Prolene™) is wrapped around the fascial edge, over and underlapping by about 2.5 cm and then, employing a blanket stitch (Fig. 1), sutured to the fascia with a continuous 0 or 1 non-absorbable monofilament (Prolene™) suture. The mesh is divided down the middle, and traction is applied whilst suturing the two halves together with a continuous 2–0 non-absorbable monofilament (Prolene™) suture (Fig. 2).

After closure, the ventilatory pressures are checked with the anaesthetist to ensure that a significant rise in intraabdominal pressure (IAP) has not occurred.

The mesh is then covered with a cut-to-size foam dressing, a commercial vacuum-assisted wound closure system (V.A.C.™, 3M-KCI, San Antonio, TX) applied and placed under 125 mmHg suction. The foam is not stapled to the skin edges.

Patients return to the operating room every 3–4 days to remove the superficial VAC and change the ABTHERA dressings; the midline cut mesh edges are further rolled outwards and re-sutured to increase tension (Fig. 3).

When the fascia is fully approximated, the ABTHERA dressing is ceased and the Prolene™ mesh can be explanted, or if well incorporated, left in situ and the midline closed with either continuous or more usually interrupted figure of 8 non-absorbable sutures if the mesh remains, or slowly absorbable suture if removed. (Fig. 4).

The skin wound is further VAC'd for 72 h before delayed primary skin closure. A NPWT (PrevenaTM) is then applied for 5–7 days.

Over a recent three-year period, 12 patients underwent VAC-assisted MMFT to close the abdominal wall after either a surgical laparostomy ($n = 8$) or burst abdomen ($n = 4$). All patients achieved complete fascial closure over 1–9 progressive mesh re-tensionings (median 4.5 “tightenings” IQR 2.25–5.0). The median time from starting VAC-assisted MMFT to closure of the abdominal wall was 11.5 days (IQR 8.25–18.5). All patients had a length of stay longer than 30 days (Median 70.0 days, (IQR 46.25–99.0)).

There were no complications related to the Botox injection. Two patients died during the follow up period. One from Stevens–Johnson syndrome during the index admission and the other from multi-organ failure during a later admission. None of the remaining 10 patients has developed either a clinical recurrence or fascial dehiscence to a median follow-up time of 194.5 days (IQR 73.75–436.75). One patient developed a parastomal hernia.

The addition of chemodenervation and wrapping of the fascial edge further refines an effective method of abdominal closure in cases of surgical catastrophe,

resulting in a high rate of fascial closure, limited morbidity and infrequent long-term herniation. The technique is equally applicable to patients with existing large incisional hernias who require emergent laparotomy.

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