

EDITORIAL

Updated Guideline on Abdominal Wall Closure from the European and American Hernia Societies: Transferring Recommendations to Clinical Practice for Vascular Surgeons

INTRODUCTION

The European Hernia Society (EHS) and the American Hernia Society (AHS) recently published an updated guideline on closure of abdominal wall incisions.¹ A diverse multidisciplinary team of experts was formed, including a biomedical information specialist, a certified guideline methodologist, a patient representative, and surgeons from a variety of specialties, with representation from vascular surgery. A rigid, pre-specified methodology was followed in the guideline development process: seven key questions were defined at the outset and formulated according to the PICO framework (population, intervention, comparison, outcomes); key question specific literature search strategies were developed for different biomedical databases; the GRADE approach (Grading of Recommendations, Assessment, Development and Evaluation) was used to determine the certainty of evidence; GRADE evidence to decision frameworks were implemented to develop recommendations and guide healthcare choices; and the AGREE II instrument was used to ensure methodological rigour and transparency throughout the process.

Aspects of the guideline are pertinent to vascular surgery. Herein, recommendations with a particular reference to vascular surgery involving abdominal wall incisions are presented with supporting evidence from the vascular literature (Table 1).

RECOMMENDATIONS RELEVANT TO VASCULAR SURGERY

What incision should be used in patients undergoing abdominal surgery?

Based on two systematic reviews including 24 randomised controlled trials (RCTs) and reporting on more than 3 700 unselected patients, a recommendation was made to avoid midline abdominal incisions, when possible, owing to the increased risk of incisional hernia compared with non-midline (transverse or paramedian) laparotomies (low quality of evidence, weak recommendation).

A search of the vascular literature identified one systematic review that compared transverse with midline laparotomy including one RCT with 69 patients with abdominal aortic aneurysm (AAA) and four observational

studies with a total of 3 300 patients with AAA or aorto-iliac occlusive disease.² Meta-analysis showed no significant difference in incisional hernia rates. The certainty of evidence was judged to be very low, mainly because of the observational study design, risk of bias, and inconsistency. A recent Cochrane review of five RCTs with a total of 152 participants comparing the retroperitoneal with the transperitoneal approach for elective AAA repair showed no difference in abdominal wall hernia or post-operative pain rates.³

Selection of a midline vs. transverse laparotomy or transperitoneal vs. retroperitoneal approach for aorto-iliac surgery should be at the discretion of the treating surgeon, based on preference and local expertise (very low quality of vascular specific evidence, weak recommendation).

What is the preferred strategy for closing a laparotomy?

Although no evidence exists to demonstrate the superiority of a continuous over interrupted technique for abdominal wall closure, continuous suturing better distributes tension along the suture line, is quicker, and leaves less foreign body behind; thus, the guideline group advised its preferential use over interrupted closure for elective laparotomies. Furthermore, a weak recommendation was given for the small bite suturing technique with a slowly absorbable suture for closure of elective midline abdominal incisions based on low quality evidence. The small bite technique consists of tissue bites of 5 – 9 mm to incorporate the aponeurosis only, with stitches placed 5 mm apart. As opposed to fast absorbing sutures, slowly absorbable sutures provide sufficient tensile strength through the healing process. Furthermore, although there is no evidence to suggest that slowly absorbable sutures are beneficial in reducing incisional hernia over non-absorbable sutures, they cause less pain and suture sinuses; hence, the guideline group recommended their use in elective laparotomies.

There is a dearth of data on strategies for laparotomy closure in patients undergoing aorto-iliac reconstruction, and evidence can only be extrapolated from unselected patients undergoing laparotomy for a variety of indications. Meta-analysis of two observational studies comparing a suture to wound length ratio of greater vs. less than 4:1 in patients undergoing surgery for AAA via midline laparotomy showed a significantly reduced rate of incisional hernia in the former group, lending support to the small bite technique recommended by the guideline group.²

Table 1. Synopsis of key clinical questions and recommendations of the updated European Hernia Society and American Hernia Society (EHS/AHS) guideline on abdominal wall closure with a specific reference to vascular surgery.

Key question	Recommendation	Strength of recommendation	Certainty of evidence
What incision should be used in patients undergoing abdominal surgery?	Selection of midline vs. transverse laparotomy or transperitoneal vs. retroperitoneal approach for aorto-iliac surgery should be at the discretion of the treating surgeon based on preference and local expertise	Weak	⊕○○○ Very low*
What is the preferred strategy for closing a laparotomy?	A continuous small bite suturing technique with a slowly absorbable suture is suggested for closure of midline abdominal incisions in patients undergoing elective surgery for AAA or aorto-iliac occlusive disease	Weak	⊕⊕○○ Low
Is mesh augmentation beneficial in closure of elective laparotomies?	Vascular surgeons may consider prophylactic mesh augmentation for midline laparotomy closure in patients undergoing elective AAA repair or aorto-femoral or aorto-iliac bypass for occlusive disease	Weak	⊕⊕○○ Low
Which type of mesh should be used for prophylactic mesh augmentation?	A permanent synthetic mesh is suggested for prophylactic mesh augmentation in patients undergoing elective surgery for AAA or aorto-iliac occlusive disease via a midline laparotomy	Weak	⊕○○○ Very low
Which abdominal plane should be used for prophylactic mesh augmentation?	The onlay or sublay (retromuscular) plane is suggested for prophylactic mesh augmentation in patients undergoing elective surgery for AAA or aorto-iliac occlusive disease via a midline laparotomy	Weak	⊕○○○ Very low
Is mesh augmentation beneficial in closure of emergency laparotomies?	No recommendation made	NA	NA
Are abdominal binders advantageous in open abdominal surgery?	No recommendation made	NA	NA
Is restriction of activity advantageous after open abdominal surgery?	No recommendation made	NA	NA

The strength of recommendation and certainty of evidence are based on the GRADE framework (Grading of Recommendations, Assessment, Development and Evaluation). AAA = abdominal aortic aneurysm; NA = not applicable.

* The certainty of evidence was judged to be low by the EHS/AHS guideline group, but appraisal of the vascular specific evidence using the GRADE framework yielded a very low certainty.

Which patients are at increased risk of incisional hernia development?

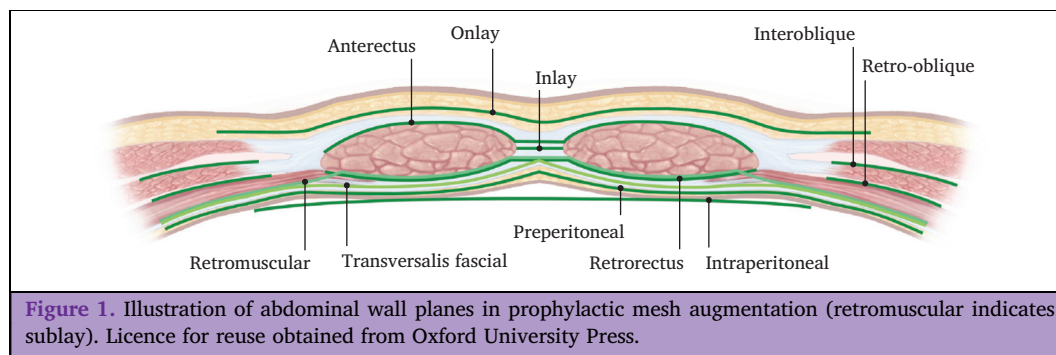
AAA is a recognised risk factor for incisional hernia, with meta-analyses showing that patients undergoing AAA repair through a midline laparotomy have a 2.9 fold increased risk of developing post-operative incisional hernia vs. patients treated for aorto-iliac occlusive disease.⁴ Furthermore, smoking and chronic obstructive pulmonary disease, which are prevalent in patients with AAA and aorto-iliac occlusive disease, have been identified as risk factors for incisional hernia, reiterating the importance of applying appropriate laparotomy closure techniques in this patient cohort. The guideline group advised using risk stratification tools, such as the HERNIA score, to identify high risk patients and implement preventative strategies.

Is mesh augmentation beneficial in closure of elective laparotomies?

An abundance of evidence, albeit of low quality, exists that demonstrates the potential benefits of prophylactic mesh augmentation over primary closure of midline abdominal incisions, both in unselected patients and patients at increased risk of incisional hernia.

A search of the vascular literature identified a meta-analysis of four RCTs comparing prophylactic mesh reinforcement with the standard suture closure of midline abdominal incisions in a total of 388 patients with AAA.⁵ Meta-analysis showed that mesh reinforcement significantly reduced the risk of incisional hernia, but the certainty of evidence was judged to be moderate. The PRIMAAT trial recently published its five year results, which were not included in the aforementioned meta-analysis, and demonstrated decreased rates of incisional hernia with prophylactic mesh reinforcement after midline laparotomy for the treatment of AAA.⁶ An additional, more recent RCT including 104 patients with AAA found no significant difference in the rates of incisional hernia development within 24 months between mesh augmentation and primary closure of midline abdominal incision.⁷ A number of methodological and reporting flaws have been noted in this trial, the most important being that only 37% of the calculated sample size was reached.⁸

Based on a moderate or low quality of evidence, a weak recommendation can be made for the use of prophylactic mesh augmentation over primary closure of midline laparotomy in patients undergoing AAA repair.



Which type of mesh should be used for prophylactic mesh augmentation?

No studies have directly compared the potential benefits of specific types of mesh for abdominal wall closure. The guideline group suggests that a permanent synthetic mesh should be used for abdominal wall closure, to reduce the risk of incisional hernia (very low quality of evidence, weak recommendation). Currently, there are no proven benefits of fast absorbable synthetic or biological meshes over primary laparotomy closure, and there are no data on biosynthetic or slowly absorbable synthetic meshes.

No studies have examined the effects of different mesh types in patients with AAA or aorto-iliac occlusive disease. A variety of meshes were used in the five RCTs that compared prophylactic mesh augmentation with primary suture closure of midline laparotomies, making it difficult to make inferences about the potential advantages of one type over another in the setting of aorto-iliac surgery.

Which abdominal plane should be used for prophylactic mesh augmentation?

A network meta-analysis of 20 RCTs that compared different closure techniques for midline laparotomy in unselected patients demonstrated that onlay and retromuscular (sublay) mesh placement reduced the risk of incisional hernia compared with primary closure.⁹ The guideline group recommended the use of either the onlay or sublay technique in prophylactic mesh augmentation (very low quality of evidence, weak recommendation). Although onlay mesh implantation has a higher risk of seroma, it is technically easy to perform and leaves the retromuscular plane intact should future abdominal wall reconstruction be required (Fig. 1).

Of the five RCTs that compared mesh augmentation with primary suture closure in aorto-iliac surgery, three used the onlay and the other two the sublay technique. In line with the EHS/AHS recommendation, either technique can be used in vascular surgery, depending on local expertise.

Is mesh augmentation beneficial in the closure of emergency laparotomies?

Data on the preferential use of mesh augmentation over primary suture fascial closure in emergency settings are heterogeneous and limited; therefore, no recommendation is made.

Are abdominal binders advantageous in open abdominal surgery?

Although limited data suggest that abdominal binders may reduce post-operative pain, no recommendation was made by the guideline committee due to lack of pertinent data on incisional hernia and burst abdomen.

Is restriction of activity advantageous after open abdominal surgery?

No recommendation on restriction of strenuous physical activity after abdominal surgery was made due to a paucity of data. Although there is no high quality evidence demonstrating benefits of early mobilisation after open aortic surgery, several studies that applied enhanced recovery pathways in open aortic surgery used early mobilisation as a part of their care bundles. Considering data from other surgical settings, it can be advocated that early mobilisation after aortic surgery may decrease complications and improve patient outcomes.¹⁰

CLINICAL IMPLICATIONS AND IMPLEMENTATION

Open surgery remains an essential component of vascular surgical practice. The ever decreasing experience of vascular specialists in open aorto-iliac surgery goes hand in hand with a diminishing expertise in abdominal wall closure and reconstruction. This document constitutes a guide for vascular surgeons and has implications for the provision of open aorto-iliac surgery services in specialist centres.

A weak recommendation is made for the continuous small bite suturing technique with a slowly absorbable suture for closure of elective midline abdominal incisions in aorto-iliac surgery. Vascular surgeons may consider prophylactic mesh augmentation for midline laparotomy using a permanent synthetic mesh in the onlay or retromuscular plane.

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George A. Antoniou^{a,b,*}, Filip E. Muysoms^c, Eva B. Deerenberg^d

^aDepartment of Vascular and Endovascular Surgery, Manchester University NHS Foundation Trust, Manchester, UK

^bDivision of Cardiovascular Sciences, School of Medical Sciences, Manchester Academic Health Science Centre, The University of Manchester, Manchester, UK

^cDepartment of Surgery, Maria Middelaers Hospital, Ghent, Belgium

^dDepartment of Surgery, Franciscus Gasthuis en Vlietland, Rotterdam, The Netherlands

*Corresponding author. Room G37, Vascular Offices, J Block, The Royal Oldham Hospital, Rochdale Road, Oldham OL1 2JH, UK.

E-mail address: georgios.antoniou@manchester.ac.uk, antoniou.ga@hotmail.com (George A. Antoniou).