Original Article

Current Practices in Midline Laparotomy Closure: Results of a Portuguese National Survey

Práticas Atuais no Encerramento da Laparotomia Mediana: Resultados de um Inquérito Nacional Português

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https:/doi.org/10.34635/rpc.1166

ABSTRACT

Introduction: Incisional hernias after midline laparotomy significantly affect quality of life and healthcare costs. Adequate fascial closure, including evidence-based suture techniques and the use of prophylactic mesh in selected patients, is essential for prevention. This study aimed to evaluate current abdominal wall closure practices in Portugal.

Methods: A 26-question online national survey was conducted and shared through surgical societies, email lists, and social media. The questionnaire addressed surgeon demographics, suture materials, closure techniques, prophylactic mesh use, and abdominal wall practices related to stoma creation and emergency settings.

Results: A total of 233 surgeons completed the survey (31.2% residents; 68.8% consultants). Long-lasting absorbable sutures were preferred for laparotomy closure (47%) and burst abdomen repair (39.3%). The small-bites technique was known by 94.4% of surgeons, correctly understood by 77.4%, but only 59.8% routinely applied the recommended 4:1 suture length-to-wound length ratio. More than 60% reported never using prophylactic mesh, even during definitive colostomy creation. Techniques for burst abdomen management varied widely.

Received/Recebido: 09/02/2026 **Accepted/Aceite:** 16/02/2026 **Published online/Publicado online:** 27/02/2026 **Published/Publicado:** 16/03/2026

Conclusion: Abdominal wall closure practices in Portugal remain highly variable, with only partial adherence to guideline-recommended techniques. Key components such as the 4:1 suture length-to-wound length ratio and the selective use of prophylactic mesh—particularly in high-risk patients and during definitive stoma creation—are underutilized. These findings highlight the need for wider guideline dissemination and structured training to promote more uniform, evidence-based practice.

Keywords: Abdominal Wound Closure Techniques; Incisional Hernia; Laparotomy; Surveys and Questionnaires; Suture Techniques

RESUMO

Introdução: As hérnias incisionais têm um impacto significativo tanto em qualidade de vida como em nos custos para a saúde. Um encerramento da parede abdominal adequado, de acordo com a evidência e a utilização de prótese profilática em doentes selecionados, é essencial para a prevenção desta patologia. Este estudo teve como objetivo avaliar as práticas atuais de encerramento da parede abdominal em Portugal.
Métodos: Foi realizado um inquérito nacional *online* com 26 questões, divulgado através de sociedades cirúrgicas, listas de *e-mail* e redes sociais. O questionário abordou características demográficas dos cirurgiões, materiais de sutura, técnicas de encerramento, utilização de prótese profilática e práticas relacionadas com a parede abdominal no contexto de estomas e em situações de urgência.
Resultados: Um total de 233 cirurgiões completaram o inquérito (31,2% internos; 68,8% especialistas). As suturas absorvíveis de longa duração foram preferidas para o encerramento de laparotomias (47%) e para a reparação de evisceração (39,3%). A técnica de *small bites* é conhecida por 94,4% dos cirurgiões, adequadamente compreendida por 77,4%, mas apenas 59,8% aplicam por rotina o rácio recomendado de 4:1, entre o comprimento da sutura e o comprimento da incisão. Mais de 60% referiram nunca utilizar prótese profilática, mesmo durante a confeção definitiva de colostomias. As abordagens no tratamento da avisceração apresentaram grande variabilidade.
Conclusão: As práticas de encerramento da parede abdominal em Portugal permanecem altamente variáveis, com adesão apenas parcial às técnicas recomendadas por *guidelines* internacionais. Componentes fundamentais, como o rácio de 4:1, entre o comprimento da sutura e o comprimento da ferida, e a utilização seletiva de prótese profilática — particularmente em doentes de alto risco e na confeção definitiva de estomas — encontram-se subutilizados. Estes resultados reforçam a necessidade de maior divulgação das recomendações e de formação estruturada, promovendo uma prática mais uniforme e baseada na evidência.

Palavras-chave: Hérnia Incisional; Inquéritos e Questionários; Laparotomia; Técnicas de Fechamento de Feridas Abdominais; Técnicas de Sutura;

INTRODUCTION

Incisional hernias occur in 10%–23% of patients after midline laparotomy and may exceed 35% in high-risk groups.[1,2] This affects quality of life, leads to reoperations, and has an economic burden. Optimization of fascial closure is therefore critical. The European Hernia Society (EHS) and American Hernia Society (AHS) recommend a continuous small-bites technique using a slowly absorbable monofilament suture with a suture length-to-wound length (SL:WL) ratio ≥4:1.[2]

STITCH trial demonstrated a significant reduction in incisional hernias from 21% to 13% when small bites were compared with large bites.[3] ESTOIH trial found suture material and technique standardization key for low incisional hernia occurrence, despite suture techniques.[4]

Prophylactic mesh usage is another area with major practice variation.[5,6] PRIMA trial showed that prophylactic mesh effectively reduces incisional hernia in high-risk patients without increasing complications.[7,8]

To date, no national data existed on abdominal wall closure practices in Portugal.

Similar surveys from Spain and the Netherlands showed large practice heterogeneity.[6,7] This study aimed to characterize current Portuguese practice patterns, identify disparities relative to guideline recommendations, and highlight targets for quality improvement.

METHODS

A cross-sectional, anonymous nationwide survey was conducted using a 26-item questionnaire addressing surgeons' training, suture materials, closure techniques, small-bites adoption, SL:WL ratio, prophylactic mesh, trocar closure, and burst abdomen management. Previous international surveys[6,7] and current international practice guidelines[2,8] were taken into account. The survey was shared through surgical societies, institutional mailing lists, and social media. Data was analysed descriptively using percentages for categorical variables. Reporting follows the EQUATOR reporting guidelines.

RESULTS

1. CHARACTERISTICS OF PARTICIPANTS

A total of 233 surgeons responded to the survey. Consultants represented 68.8% of participants, and residents were 31.2% (20.5% in years 4–6 and 10.7% in years 1–3). Regarding subspecialisation, 41.5% reported no area of differentiation, most of whom were residents. Among those with a subspecialty, 10.7% do abdominal wall surgery, 32.9% upper gastrointestinal, hepatobiliopancreatic or colorectal surgery, and 15% reported another area.

In terms of operative volume, 44% of surgeons reported performing fewer than 30 laparotomies annually, 39.3% between 30 to 60 procedures, and 16.7% more than 60 laparotomies per year.

2. SUTURE MATERIALS AND TECHNIQUES

Long-lasting absorbable sutures were the most frequently used in laparotomies (47%), followed by extra-long-lasting absorbable sutures (38.9%). Non-absorbable sutures represented only 10.7%. In burst abdomen repair, the use of non-absorbable sutures increased substantially to 28.2%, although absorbable sutures still accounted for the majority of choices (71.7%).

Monofilament sutures were overwhelmingly preferred (91.4%).

Suture diameter "0" was the most common (46.2%), followed by "2/0" (27.4%) and "1" (23.5%). Loop sutures were used by 60.7%. Single-layer closure was preferred (62.8%) to multilayer closure (36.8%).

Small-bites technique was known to 94.4% and applied electively by 80.3%, although only 59.8% reported using the recommended 4:1 SL:WL ratio. In contrast, 18.8% continue to use the large-bite technique.

3. MINIMALLY INVASIVE SURGERY

Trocar sites ≥10 mm were closed by 94.4% of respondents, mainly using medium-duration absorbable sutures (70.5%), followed by long-lasting absorbable sutures (21.4%).

Pfannenstiel was the most frequently used extraction incision (55.1%). Midline incisions were used in 28.6% of cases, whereas transverse (11.1%) and paramedian (5.1%) approaches were less commonly chosen.

4. PROPHYLACTIC MESH

Prophylactic mesh was infrequently used across all settings. Perceived benefit was also limited: only 25.2% believed that prophylactic mesh reduces the risk of incisional hernia, whereas 53.4% did not consider it beneficial and 16.7% were unsure. For midline laparotomy closure, 60.3% reported never using mesh, and during the creation of a definitive end colostomy, this proportion increased to 76.5%. Following temporary stoma closure, 62% never used mesh, and 36.8% applied it selectively in high-risk patients.

5. INCISIONAL HERNIA

Retention sutures or suture-holding systems were rarely used routinely (1.3%), but 69.2% of surgeons reported using them selectively in high-risk patients, while 29.5% did not use them at all.

Regarding preventive strategies for incisional hernia or burst abdomen in high-risk patients, 41.5% did not use any adjunctive measure and relied solely on a meticulous closure technique. Among surgeons adopting additional reinforcement, 26.5% used total retention sutures, 17.9% used suture-holding systems, and 14.1% reported using prophylactic mesh.

Management of burst abdomen varied considerably: 37.2% used continuous suturing with retention sutures, 18.4% used interrupted sutures, 15.8% used continuous suturing alone, 14.1% employed mesh reinforcement, and 11.1% used figure-of-eight sutures.

Overall, 65% of surgeons reported changing their closure technique since early residency. In most cases (88%), the surgeon performing the procedure was also responsible for closing the laparotomy.

Concerning awareness of postoperative outcomes, 44.9% stated they did not know the incisional hernia rate in their department. Among the responses provided, 44.9% estimated a rate between 5%–10%, 9.8% between 10%–20%, and only 0.4% reported a rate above 20%.

DISCUSSION

This national survey provides the first comprehensive assessment of abdominal wall closure practices among Portuguese surgeons. The findings reveal substantial variability in suture techniques, material selection, and preventive strategies, with only partial adherence to the latest guideline recommendations.

The EHS/AHS guidelines advise closure of midline laparotomy using a continuous small-bites technique with a slowly absorbable monofilament suture and a SL:WL ratio ≥4:1.[2] In our cohort, knowledge of the small-bites technique was nearly universal (94.4%), and 80.3% reported using it electively. However, only 59.8% applied the recommended 4:1 ratio, despite robust evidence demonstrating its protective effect against incisional hernia formation and surgical-site complications.[3,10] Furthermore, 18.8% of respondents continued to use a large-bites technique, which is discouraged due to its association with increased wound morbidity when compared with small-bites closure.[3,10]

The preference for monofilament sutures (91.4%) and for slowly or extra-slowly absorbable materials aligns with guideline recommendations favouring slowly absorbable monofilament sutures for optimal fascial healing and reduced infection risk.[2,10] Nonetheless, the shift toward increased use of non-absorbable sutures in burst abdomen repair (28.2%) deviates from guideline suggestions. EHS and WSES guidance emphasizes that slowly absorbable monofilament sutures remain safe and effective even in contaminated or high-risk scenarios,[2,9] although the use of non-absorbable material in emergency settings likely reflects surgeon preference when faced with compromised tissue integrity.

Regarding prophylaxis of incisional hernia, EHS/AHS guidelines state that it may be considered in high-risk patients undergoing midline laparotomy.[2] Despite this, 60.3% of surgeons reported never using mesh in routine laparotomy closure. Similarly, only 14.1% used mesh as a preventive measure during high-risk closure, highlighting a limited adherence to guideline recommendations.

Use of prophylactic mesh at stoma creation was even less frequent. The recent EHS Rapid Guideline on parastomal hernia prevention recommends that prophylactic mesh can be considered during elective end colostomy formation to reduce hernia rate.[8] In contrast, 76.5% of respondents reported never using mesh in this context, indicating a significant gap between guideline-supported strategies and national practice patterns.

Minimally invasive surgery practices were more consistent with published recommendations. Nearly all surgeons (94.4%) closed trocar sites ≥10 mm, which is appropriate given the elevated hernia risk associated with larger port sites.[2]

The predominance of Pfannenstiel incisions as the favourite extraction site is evidence supported by a lower hernia rate of non-midline incisions.[9]

Management of high-risk patients and burst abdomen demonstrated considerable heterogeneity. Although 41.5% relied on meticulous closure alone, others used retention sutures (26.5%) or suture-holding systems (17.9%). WSES guidelines recognize that retention sutures may be used selectively in situations of fascial fragility, but they are not recommended routinely.[9] The wide variation in burst abdomen management—from continuous suturing with retention sutures to mesh reinforcement—reflects the lack of standardized national protocols and the complexity of the clinical scenarios.

A notable proportion of surgeons (44.9%) were unaware of their department's incisional hernia rate. EHS guidelines emphasize the importance of outcome monitoring, noting that hernia rates after midline laparotomy frequently range from 12%–20% at two years, even when closure follows recommended techniques.[11] Lack of awareness of institutional outcomes may limit opportunities for targeted quality improvement.

Encouragingly, 65% of surgeons reported modifying their closure technique since early residency, suggesting increased uptake of evidence-based practices among newer generations. Nevertheless, persistent gaps—including incomplete adoption of the 4:1 SL:WL ratio, limited use of prophylactic mesh in high-risk or stoma settings, and variation in emergency closure approaches—highlight areas for further education and standardized training.

Overall, this survey demonstrates that while many Portuguese surgeons incorporate key elements of guideline-based abdominal wall closure, substantial variability remains. Broader dissemination of EHS and WSES recommendations, institutional audits, and the development of national protocols may improve adherence and ultimately reduce the burden of incisional and parastomal hernias in Portugal.

CONCLUSION

This national survey reveals substantial variability in abdominal wall closure practices among Portuguese surgeons. Although

knowledge of evidence-based practices, such as the small-bites technique and the use of slowly absorbable monofilament sutures, widespread, adherence to key components, including the recommended 4:1 SL:WL ratio, remains inconsistent. Preventive strategies for incisional and parastomal hernia, particularly the selective use of prophylactic mesh, are also underutilized. Emergency closure approaches and the management of high-risk patients demonstrated marked heterogeneity.

Improved dissemination of international guidelines, alongside standardized surgical training and dedicated abdominal wall closure courses, may help promote consistent adoption of best practices. Additionally, enhanced institutional outcome monitoring could reduce the incidence of incisional hernias and support more uniform, evidence-based surgical practice nationwide.

LEARNING POINTS

- High awareness but incomplete application of small-bites and SL:WL ratio.
- Prophylactic mesh underused, especially in definitive colostomy.
- Burst abdomen management is heterogeneous.
- Many surgeons lack data on their incisional hernia rates.
- Standardization could significantly improve outcomes.

AWARDS AND PREVIOUS PRESENTATIONS/PRÉMIOS E APRESENTAÇÕES ANTERIORES:

Oral presentation at 5ª reunião da Sociedade Portuguesa de Hérnia e Parede Abdominal

ETHICAL DISCLOSURES

Conflicts of Interest: The authors have no conflicts of interest to declare.

Financing Support: This work has not received any contribution, grant or scholarship

Confidentiality of Data: The authors declare that they have followed the protocols of their work center on the publication of patient data.

Protection of Human and Animal Subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and those of the Code of Ethics of the World Medical Association (Declaration of Helsinki as revised in 2024).

Provenance and Peer Review: Not commissioned; externally peer-reviewed.

RESPONSABILIDADES ÉTICAS

Conflitos de Interesse: Os autores declaram a inexistência de conflitos de interesse na realização do presente trabalho.

Fontes de Financiamento: Não existiram fontes externas de financiamento para a realização deste artigo.

Confidencialidade dos Dados: Os autores declaram ter seguido os protocolos da sua instituição acerca da publicação dos dados de doentes.

Proteção de Pessoas e Animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pela Comissão de Ética responsável e de acordo com a Declaração de Helsínquia revista em 2024 e da Associação Médica Mundial.

Proveniência e Revisão por Pares: Não comissionado; revisão externa por pares.

CONTRIBUTORSHIP STATEMENT

PR: Conceptualization/ study design, statistical analysis, interpretation of results, drafting of the manuscript.
XS: Study design, questionnaire development, critical revision of the article.
TC: Critical revision of the article, final approval of the version to be published.
SL: Questionnaire development, critical revision of the article.
MI: Methodological supervision.
JP, PV, HF and JF: Study design, critical revision of the article.
All authors approved the final version to be published.

DECLARAÇÃO DE CONTRIBUIÇÃO

PR: Conceitualização/desenho do estudo, análise estatística, interpretação dos resultados, redação do manuscrito.
XS: Desenho do estudo, desenvolvimento do questionário, revisão crítica do artigo.
TC: Revisão crítica do artigo, aprovação final da versão a ser publicada.
SL: Desenvolvimento do questionário, revisão crítica do artigo.
MI: Supervisão metodológica.
JP, PV, HF e JF: Desenho do estudo, revisão crítica do artigo.
Todos os autores aprovaram a versão final a ser publicada.

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