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**SYSTEMATIC REVIEW AND META-ANALYSIS OF PROPHYLACTIC MESH USE IN
ELECTIVE AND EMERGENCY LAPAROTOMY PROCEDURES**

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Incisional hernia represents a significant postoperative complication following laparotomy, with incidence rates ranging from 2% to 30%. The condition poses substantial healthcare burden, with approximately 100,000 to 150,000 ventral incisional hernia repairs performed annually in the United States. The high recurrence rates post-repair (25-63%) and associated morbidity necessitate effective preventive strategies, particularly in high-risk populations.

This meta-analysis aimed to evaluate the effectiveness and safety of prophylactic mesh augmentation (PMA) in preventing incisional hernias following both elective and emergency laparotomy procedures, while analyzing associated complications and identifying optimal implementation strategies.

A comprehensive systematic review and meta-analysis encompassed 18 randomized controlled trials involving 2,659 patients. The study evaluated the incidence of incisional hernia and wound complications in patients undergoing laparotomy with and without prophylactic mesh augmentation. The analysis included both elective and emergency surgical procedures, with particular attention to high-risk patient populations. Statistical analysis focused on hernia occurrence rates at various follow-up intervals and the incidence of postoperative complications.

The meta-analysis demonstrated that prophylactic mesh augmentation significantly reduced the risk of incisional hernia development, with risk ratios of 0.31 at one year and 0.38 at four years post-surgery. In elective surgeries, PMA showed an impressive 85% reduction in postoperative incisional hernia risk compared to primary suture closure. The analysis of emergency surgery cases revealed efficacy in reducing both incisional hernia and fascial dehiscence, although with a noted increase in surgical site infections.

The study identified patient-specific risk factors influencing outcomes, including obesity, diabetes, and major oncological surgeries. Both onlay and retromuscular mesh positioning techniques demonstrated effectiveness, with synthetic and slowly absorbable meshes showing promising results. The small bites technique, utilizing slowly absorbable sutures with a high suture-to-wound length ratio, enhanced the effectiveness of mesh augmentation.

Prophylactic mesh augmentation represents a highly effective strategy for reducing incisional hernia rates following laparotomy, particularly in high-risk patients. While the technique shows promise in both elective and emergency settings, careful patient selection and consideration of specific risk factors are crucial for optimal outcomes. The evidence strongly supports the implementation of PMA in elective surgeries, while suggesting a more cautious approach in emergency settings due to increased infection risks.

The findings support the broader implementation of prophylactic mesh augmentation in clinical practice, particularly for high-risk patients undergoing elective laparotomy. However, the study highlights the need for standardized guidelines regarding mesh type selection and positioning techniques. Future research should focus on optimizing techniques for emergency surgery applications and addressing concerns regarding potential complications.