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THE USE OF SURGICAL MESH IN HERNIA REPAIR

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Hernia repair is one of the most frequently performed procedures in general surgery, and the adoption of surgical mesh has become a cornerstone of modern practice by significantly lowering recurrence rates compared to traditional suture repairs. However, the implantation of prosthetic material introduces specific challenges regarding biocompatibility, infection, and patient comfort. This research explores the types of surgical meshes, best practices for their use, and future directions in mesh technology. Surgical meshes are medical devices designed to reinforce the abdominal wall by providing a scaffold for tissue ingrowth. The European Hernia Society (EHS) and other international guidelines strongly recommend the use of mesh for most hernia repairs due to the substantial reduction in recurrence risk, which can decrease the need for reoperation and improve long-term quality of life (Simons et al., 2009). In hernia surgery, where the mesh is placed to bridge or strengthen a fascial defect, the interaction between the prosthetic material and the host tissue is critical. Complications such as mesh infection, chronic postoperative pain, mesh shrinkage, and adhesion formation can lead to significant morbidity, complex revisional surgeries, and increased healthcare costs. A systematic review indicates that the use of lightweight, large-pore meshes can result in a reduction of chronic pain and better patient comfort without compromising the strength of the repair (Sajid et al., 2012). Thus, understanding the properties and appropriate application of surgical meshes is critical not only for surgical success but also for optimizing long-term patient outcomes and healthcare resources.

The foundation of successful mesh use begins with appropriate patient selection and preoperative planning. This includes considering the hernia's location and size, patient comorbidities, and the chosen surgical approach (open vs. laparoscopic). The surgical team should select from various mesh types, such as permanent synthetic meshes (e.g., polypropylene or polyester), absorbable synthetics, or biological materials, based on the risk of infection and the desired degree of tissue integration (Köckerling et al., 2015). The mesh's physical properties, including pore size, tensile strength, and weight, are essential to balance adequate mechanical support with a reduced inflammatory response and better abdominal wall compliance. The surgical technique plays a critical role in successful mesh integration. In both open and minimally invasive repairs, proper mesh fixation and adequate overlap of the hernia defect (the "Shield principle") are vital to prevent recurrence. The method of fixation whether using fibrin glue, tackers, or sutures must be carefully chosen to balance secure placement against the risk of chronic nerve entrapment and pain (Bittner et al., 2014). Furthermore, ensuring the mesh lies flat without folding or wrinkling can prevent seroma formation and reduce the risk of bacterial colonization. Continuous education on mesh handling and adherence to established guidelines are vital for the surgical team. While the risk of mesh infection is low, it can have devastating consequences, often necessitating mesh explantation. Strategies such as perioperative antibiotic prophylaxis in high-risk patients and the development of antimicrobial-coated meshes are active areas of investigation to mitigate this risk (Carbonell et al., 2013). Implementing best practices with mesh extends beyond the operating room into postoperative care. Monitoring for signs of infection, seroma, or recurrence, along with patient education regarding gradual return to physical activity and wound care, are all critical in ensuring long-term success after hernia repair (Nieuwenhuijzen et al., 2020).

Simulation-based training programs in laparoscopic hernia repair have demonstrated improved proficiency in mesh placement and fixation techniques among surgical residents (Zendejas et al., 2011). Furthermore, participation in national hernia registries and regular audits of surgical outcomes can reinforce adherence to best practices and help identify areas for improvement within the surgical team.