

Minimally invasive gi and metabolic advancements.

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Introduction

The field of minimally invasive gastrointestinal interventions has seen remarkable growth, with endoscopy now offering advanced solutions for a wide array of complex conditions. Novel endoscopic techniques are significantly advancing the management of pancreaticobiliary diseases, encompassing procedures like endoscopic ultrasound-guided interventions, cholangioscopy, and radiofrequency ablation. These less invasive approaches enhance diagnostic accuracy and therapeutic outcomes, signaling a departure from traditional surgical methods and directly improving patient care [1].

Further innovations extend to the resection of challenging colorectal polyps, where endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD) are proving to be effective and safe alternatives to more invasive surgical interventions. These techniques demonstrate favorable outcomes and a low complication rate, underscoring the expanding capabilities of endoscopic procedures in gastroenterology [2]. Beyond endoscopy, advancements in surgical approaches include single-incision laparoscopic surgery (SILS), which offers comparable oncological outcomes and safety profiles to traditional multi-incision laparoscopic surgery for colorectal cancer, along with potential cosmetic benefits. This supports a broader trend towards less invasive colorectal resections [3].

Obesity management is also transforming through endoscopic interventions. Endoscopic sleeve gastropasty (ESG) stands out as a safe and effective treatment option, leading to significant total body weight loss and improvements in associated comorbidities with minimal adverse events. This highlights the growing influence of endoscopic bariatric therapies in clinical practice [4]. For acute cholecystitis, endoscopic ultrasound-guided gallbladder drainage (EUS-GBD) utilizing lumen-apposing metal stents (LAMS) provides a safe and viable alternative to percutaneous drainage or open surgery, especially benefiting high-risk patients. This method showcases the increasing precision and therapeutic scope of interventional endoscopy [5].

The evolution of endoscopic surgery also includes Natural Orifice Transluminal Endoscopic Surgery (NOTES) for procedures such as cholecystectomy. Studies suggest that NOTES cholecystectomy is

a feasible and safe approach, potentially offering advantages like reduced postoperative pain and superior cosmetic results. This reinforces the potential for NOTES to become a more commonly adopted advanced endoscopic surgical technique [6]. Challenging gastrointestinal lesions, particularly those unsuitable for standard EMR or ESD, are now effectively managed with endoscopic full-thickness resection (EFTR). This technique is minimally invasive, highly effective, achieves high complete resection rates, and has manageable complications, making it a critical tool in advanced interventional endoscopy [7].

Crucially, the safety and applicability of advanced endoscopic submucosal dissection (ESD) procedures for large gastric lesions are significantly improved by endoscopic suturing. This technique is essential for closing defects post-ESD, effectively preventing complications such as bleeding and perforation, and thereby enabling more complex resections [8]. Providing essential nutritional support, percutaneous endoscopic gastrostomy (PEG) tube placement remains a vital endoscopic procedure. A thorough understanding of insertion techniques, potential complications, and management strategies is paramount, emphasizing the need for careful patient selection and meticulous procedural execution to ensure patient safety and efficacy [9]. Finally, the treatment landscape for primary achalasia has been refined through comparative analyses of various endoscopic options, including pneumatic dilation, botulinum toxin injection, and peroral endoscopic myotomy (POEM). Such insights are critical for guiding clinicians in making informed, tailored treatment decisions for this complex esophageal motility disorder, further exemplifying the versatility of endoscopic interventions [10].

Conclusion

The provided research highlights significant advancements in minimally invasive endoscopic and laparoscopic techniques for a wide range of gastrointestinal and metabolic conditions. This evolving field offers safer and more effective alternatives to traditional surgical approaches. Innovations include novel endoscopic methods for pancreaticobiliary diseases, such as EUS-guided interventions, cholangioscopy, and radiofrequency ablation, which improve diag-

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nostics and therapeutic outcomes. For colorectal health, advanced endoscopic surgical techniques like EMR and ESD are successfully resecting challenging polyps with low complication rates. Laparoscopic advancements, like single-incision laparoscopic surgery for colorectal cancer, provide comparable results with cosmetic benefits.

Obesity management has been transformed by endoscopic sleeve gastroplasty, demonstrating significant weight loss and comorbidity improvement. Acute conditions like cholecystitis benefit from EUS-guided gallbladder drainage using LAMS, a safe alternative to more invasive options. Newer surgical approaches, such as Natural Orifice Transluminal Endoscopic Surgery for cholecystectomy, offer reduced pain and improved cosmetic results. For complex gastrointestinal lesions, endoscopic full-thickness resection provides highly effective removal. Enhancing safety for advanced procedures, endoscopic suturing plays a crucial role in closing defects after large gastric lesion resections, preventing complications. Essential supportive care, like Percutaneous Endoscopic Gastrostomy tube placement, also sees continuous review for best practices. Finally, a comparative analysis of endoscopic treatments for primary achalasia, including POEM, guides tailored therapeutic decisions. Collectively, these studies underscore a robust shift towards precise, less invasive, and patient-centered care.

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