

The importance of combined-combination techniques in the development of trauma surgery

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Abstract: This study explores the application and development of the combined technique of laparoscopy and digestive endoscopy in the disciplines of trauma surgery. Through a systematic review of the literature, the overview and current situation of the technique are comprehensively analyzed. Combined with relevant studies at home and abroad, the combined technology of laparoscopy and digestive endoscopy not only provides precision treatment in digestive tract cancer surgery, but also shows unique advantages in the treatment of acute abdominal trauma and the treatment of chronic inflammatory diseases. However, the high equipment requirements, operational complexity, and postoperative complications are still urgent problems and challenges to be solved. To this end, the solution strategies such as training, equipment optimization and postoperative management are proposed to promote the technology to achieve greater breakthroughs in the future. In the future, technology intelligence, portable equipment and multidisciplinary cooperation will become the development trend in this field. This study provides key insights into the field of trauma and provides guidance for the wide application and further improvement of this technology.

1. Introduction

In today's medical field, trauma surgery is a crucial specialty with the responsibility of handling acute injuries and severe surgical cases^{[1][2]}. The technical level of trauma surgeons and innovation in surgical instruments are essential for the survival of the patient and their recovery. In recent years, the rapid development of minimally invasive techniques such as laparoscopy and digestive endoscopy has brought a whole new therapeutic paradigm to the field of trauma surgery.

The rise of the combined laparoscopic and digestive endoscopy technology marks a revolutionary breakthrough in the field of minimally invasive surgery^[3]. This integrative technique not only combines the unique advantages of laparoscopy and digestive endoscopy^[4], Has also demonstrated a strong application potential in the field of trauma surgery. This study through the thorough study of laparoscopic and digestive endoscopy double endoscopic combined technology development, present situation and existing problems, aims to explore the importance of double mirror combined technology in trauma surgery specialty development, at the same time, the deep understanding of the technology will also provide valuable experience for medical education and

training, to lay a solid foundation for cultivating future trauma surgery professionals. Therefore, this study has important theoretical and practical significance for promoting the progress in the field of trauma surgery and improving the treatment level of patients^[5], Provide strong theoretical and practical support for the future of the field.

2. Overview of the combined technique of laparoscopy and digestive endoscopy

In modern medical practice, laparoscopic techniques have been widely used in multiple surgical procedures, thus reducing the postoperative pain, rehabilitation time, and the incidence of complications in patients^{[6][7]}. Digestive endoscopy, as an endoscopic surgical tool, plays a unique role in the diagnosis and treatment of gastrointestinal diseases^[8]. The organic combination of these two technologies can not only improve the accuracy and effect of the operation, but also reduce the surgical trauma of patients, which is of positive significance for the promotion of the trauma surgery profession.

2.1 Introduction of the laparoscopic technique

The core of the laparoscopic technique is the insertion of a flexible laparoscopy through an underhole in the abdomen, allowing the surgeon to visually observe the abdominal cavity^[9]. The laparoscopy has a high definition camera, and through the image transmission system in the abdominal cavity, the surgeon can clearly see the organs and tissues in the abdominal cavity^[10]. At the same time, through the introduction of operation tools through other small holes, doctors can complete various surgical operations, such as resection, suture and hemostasis, so as to achieve the purpose of treatment.

Extensive use of laparoscopic techniques includes surgery for abdominal visceral organs, such as cholecystectomy^[11] Gastrointestinal surgery^[12] And kidney^[13] And pelvic surgery^[14]. This technique has achieved remarkable achievements in reducing surgical trauma, shortening postoperative rehabilitation time, and reducing postoperative complications, introducing a more advanced and patient-friendly treatment to the field of trauma surgery^[15].

2.2 Introduction of digestive endoscopy techniques

Digestive endoscopy is a kind of endoscopic surgery, which is mainly used for the examination and treatment of digestive tract-related diseases, such as acute hemorrhagic diseases^[16], Chronic inflammation of the digestive tract^[17] Etc., occasionally can also be used for gastrointestinal perforation caused by acute trauma^[18]. The digestive endoscopy consists of flexible tubular probes that enter the gastrointestinal tract through the mouth or rectum, allowing direct observation of subtle changes in the digestive tract mucosa. Digestive endoscopy can not only perform diagnostic examination, but also perform therapeutic operations, such as polypectomy and mucosal biopsy. This technique is of great value for the early detection and treatment of digestive tract cancers, polyps, and inflammatory bowel diseases^[19].

The key to digestive endoscopy technology is its high-resolution lens and sophisticated control system^[20]. Doctors observe the inside of the digestive tract through a camera on the probe and can introduce different tools for treatment when needed. This intuitive observation method enables doctors to more accurately judge the nature and scope of lesions and provide personalized treatment plans for patients.

2.3 Definition of the combination technique of laparoscopy and digestive endoscopy

The combined technique of laparoscopy and digestive endoscopy (also known as double endoscopic combined technique) is a surgical method that organically combines laparoscopic technique and digestive endoscopy technique^[21]. Under this technique, laparoscopy and digestive endoscopy are introduced simultaneously, and through working together, doctors can simultaneously observe both the abdominal cavity and the digestive tract, and perform corresponding therapeutic procedures. This integrated surgical method gives full play to the complementary advantages of the two technologies, which not only reduces the trauma of the operation, but also improves the accuracy and success rate of the operation^[22].

The operation of the dual-mirror combined technology requires doctors to have a deep understanding and skilled skills of the two technologies, and therefore, the requirements for doctors are higher. However, once mastered, the combined technique will bring a more flexible and efficient treatment to the field of trauma surgery. Through this technology, doctors can complete more complex and delicate surgical operations in an intuitive environment, and provide better medical services for patients^[23].

3. The current status quo of the double-mirror combination technology

3.1 Current application situation

Dual-mirror combination technology has been widely used in the surgical field and has achieved remarkable results. In actual surgery, doctors can have a more comprehensive understanding of the patient's condition by using both laparoscopy and digestive endoscopy, providing strong support for accurate treatment^[24]. In colorectal cancer surgery, the double-mirror combination technique is widely used for preoperative diagnosis and intraoperative treatment. Through laparoscopy, doctors can observe the organs in the abdominal cavity in real time and check the condition of the intestines. Colonoscopy can directly enter the colon for a detailed examination of the cancerous tissue^[25]. This multi-angle observation method enables doctors to more accurately assess the location, size and depth of invasion of the tumor, which provides an important basis for the formulation of the surgical plan.

In addition, in the management of acute abdominal trauma, the double-mirror combination technique also shows its unique advantages. The combination of laparoscopic wide vision and digestive endoscopy for local fine observation of the digestive tract can help doctors to detect and handle intra-abdominal damage in a more timely manner, and reduce the risk of missed diagnosis and postoperative complications. In addition, the dual-mirror combination technique also performs well in the treatment of chronic inflammatory diseases. For example, for patients with gastrointestinal GISTs, doctors can have a more comprehensive understanding of the distribution and extent of the lesion and conduct targeted treatment^[26]. At present, this integrated technology has been widely promoted in medical institutions around the world, and its application has achieved many successful cases in different disease fields^[27] To become an important choice for surgery, and it can also be applied to the field of trauma surgery to promote the development of trauma surgery specialty.

3.2 Technology development trend

With the continuous progress of medical technology, double-mirror combined technology is facing a new development trend^[28]. These trends will not only improve the operability and effectiveness of the technology, but also expand its application field in trauma surgery.

The intelligence and digitalization of technology is one of the important development trends in the future. The further optimization of the equipment is also one of the directions of the technology development. The new generation of laparoscopic and digestive endoscopy will be lighter, more flexible, and will have more powerful imaging and manipulation capabilities^[29]. This will help to reduce the operation burden of doctors and improve the accuracy of the surgery. Innovation in surgical training and education will accelerate the popularization and popularization of technology. The application of VR and augmented reality will enable physicians to train in a simulation environment to improve their proficiency in dual-mirror combinations to better cope with a variety of complex cases.

In general, the dual-mirror combined technology is becoming more intelligent, accurate and universal^[30]. This development trend will bring more opportunities for the trauma surgery profession to provide patients with more high-quality and personalized medical services. With the promotion of science and technology and the accumulation of medical practice, the combined double technology will continue to play an important role in the field of trauma surgery.

4. Domestic and foreign research

4.1 Domestic studies

At present, the domestic research on the combined development of laparoscopy and digestive endoscopy in trauma surgery is still limited, but some related studies have been reported. Among them, a study published in 2021 explored the value of laparoscopic combination technology in trauma surgery compared to conventional surgery. The results of this study show that the combined laparoscopic technique can improve the accuracy and safety of trauma surgery, while reducing the incidence of surgical trauma and complications^[31].

Another study, published in 2020, explored the value of laparoscopic combination techniques in the prevention of postoperative complications in trauma surgery. The study selected 30 patients undergoing trauma surgery using laparoscopic combination technique and traditional methods. The results showed that the combined laparoscopic technique can reduce complication rates after trauma surgery while shortening hospital stay and recovery period^[32].

In conclusion, although there are limited research on the development of laparoscopy and digestive endoscopy in trauma surgery, some related studies have been reported. With the continuous development and improvement of the technology, it is believed that this new endoscopic examination and treatment technique will be more widely applied and developed.

4.2 Foreign studies

Foreign studies on the development of the combination of laparoscopy and digestive endoscopy in trauma surgery are relatively extensive. Among them, a 2020 study demonstrated that the laparoscopic combination technique is an emerging safe and effective technique for diagnostic and therapeutic purposes in selected patients with stable abdominal penetrating or blunt trauma^[33].

Another study showed that trauma surgeons should be proficient in combined laparoscopic techniques^[34]. In short, there are many extensive studies on the development of laparoscopy and digestive endoscopy in trauma surgery. With the continuous development and improvement of the technology, it is believed that this new endoscopic examination and treatment technique will be more widely applied and developed.

5. Analysis of the problems existing in the combined technique of laparoscopy and digestive endoscopy

5.1 High equipment and technical requirements, and a steep learning curve

The successful application of dual-mirror combination technology requires doctors not only to master laparoscopic technology, but also to master digestive endoscopy technology, which puts forward higher requirements for doctors' skill level^[35]. At the same time, the equipment requirements of the dual-mirror combined technology are also relatively high, including the high-definition camera, precision control tools, etc. This allows medical institutions to make expensive equipment investments when introducing this technology, which increases the burden of medical resources.

The steepness of the learning curve is also a significant challenge. It takes a long time for doctors to get familiar with and master the technology, which may affect the rapid popularization and application of the technology. Medical students and junior doctors may need more training and practice opportunities to ensure that they are skilled in using the dual-mirror combination technique^[36].

5.2 The operation is difficult and requires experienced doctors to operate

The operation of dual-mirror combination technology is relatively complex, which involves the flexible use of two surgical tools, and requires doctors to skillfully switch and cooperate in practical operation. Due to the integrated nature of the technology, doctors need a higher level of coordination ability and skills in precise operation, which requires doctors to have considerable experience and technical foundation^[37].

For less experienced physicians, more time may be needed to adapt to this complex operation. This not only increases the time of surgery, but may also increase the risk of surgery. In addition, the difficulty of operation also makes medical institutions need to carefully consider the training and skill level of doctors when introducing the technology to ensure the safety and effectiveness of the operation^[29].

5.3 Analysis of related problems such as increased risk of postoperative complications

Although minimally invasive surgery is usually able to reduce the postoperative pain and rehabilitation time, some patients may require longer rehabilitation time due to the complexity of the dual-mirror combination technique. This may have some impact on the patients' quality of life and the utilization of medical resources^[38].

In addressing these problems, the design of technical improvements and training programs becomes crucial^[39]. Medical institutions and manufacturers should work together to continuously improve the design and performance of the equipment to make it easier to operate and learn. In addition, strengthening doctor training and skills is also crucial, which can be improved through simulated surgery, training courses and practical guidance^[40].

6. Solution strategy of the combined technique of laparoscopy and colonoscopy

6.1 Improve the operational skills and training system of doctors

In order to solve the problem of the technical difficulty of combining laparoscopy and digestive endoscopy, it is necessary to strengthen the operation skills training of doctors. Hospitals can

establish specialized training centers or cooperative medical institutions to provide systematic training courses^[36], Let the doctor gradually master the essence and essentials of the technology. The training content can include the explanation of theoretical knowledge, the practical simulation exercise, and the analysis and discussion of clinical cases. In addition, well-known experts at home and abroad can also be invited to provide guidance and exchange to promote learning and experience sharing among doctors. By improving the operation skill level of medical doctors, the safety and success rate of surgery can be improved^[41].

6.2 Optimize the design and function of the equipment to reduce the operation difficulty

In order to reduce the operation difficulty of dual-mirror combination technology, medical institutions can work closely with equipment manufacturers to continuously improve the design and function of equipment. For example, lighter and easy-to-operate devices and instruments can be developed to reduce the operating burden of doctors during surgery. In addition, intelligent technology can also be introduced^[42], Such as robot-assisted surgical systems, allowing doctors to operate more easily. In addition, medical institutions can also carry out the maintenance and maintenance of the equipment to ensure the normal operation and service life of the equipment. By optimizing the design and function of the device, the efficiency and quality of surgery can be improved.

6.3 Strengthen the postoperative monitoring and management to reduce the occurrence of complications

Postoperative complications are one of the important problems faced by the double endoscopic combination of laparoscopic and digestive endoscopy. In order to reduce the occurrence of complications, medical institutions should establish a sound postoperative monitoring and management mechanism^[43]. First, a multidisciplinary collaborative team can be established, consisting of surgeons, anesthesiologists, nurses and other professionals, who are jointly responsible for the postoperative care and monitoring of patients. Good communication and collaboration mechanism should be established among team members to deal with abnormal conditions in patients. Secondly, the pain management and nutritional support for patients should be strengthened. Postoperative pain is a common symptom of discomfort in patients, and the medical staff should develop a personalized analgesic plan according to the specific situation of the patients, and regularly evaluate and adjust the treatment measures. At the same time, we should ensure adequate nutritional intake of patients to avoid the impact of postoperative malnutrition on recovery. Finally, medical institutions should also strengthen psychological support and health education for patients to help patients actively face the disease and rehabilitation process. By strengthening the postoperative monitoring and management, the occurrence of complications can be reduced and the rehabilitation effect of patients can be improved^[44].

In conclusion, the solution strategies of dual-mirror combination technology mainly include improving the operation skills and training system of doctors, optimizing the design and function of the equipment to reduce the operation difficulty, and strengthening the postoperative monitoring and management to reduce the occurrence of complications^[45]. The implementation of these strategies will help drive the technology to function more safely and efficiently in clinical application for the benefit of more patients.

7. Conclusion and outlook

7.1 Summary and induction of this study

This study aims to explore the importance of the combined technique of laparoscopy and digestive endoscopy in the professional development of trauma surgery. Through the review and in-depth analysis of the relevant literature, we have a deep understanding of the overview of the technology, the current situation, the existing problems, and the solution strategy. Dual-mirror combination technology has unique advantages in the field of trauma surgery, and can provide patients with more accurate and minimally invasive treatment options^[46]. However, the challenges faced cannot be ignored and require the joint efforts of the medical community and technical engineering^[47]. To improve the skill level of doctors, optimize the equipment design, strengthen the postoperative management, so as to achieve the maximum use of technology.

7.2 Outlook and suggestions for future development

In the future, the development of laparoscopy and colonoscopy in the field of trauma surgery is expected to show the following trends:

With the continuous development of artificial intelligence and machine learning technology, the two-mirror combined technology is expected to introduce more intelligent elements in the future^[48]. Automated assisted diagnosis, surgical planning and real-time decision making will be possible to help doctors more accurately judge the condition and perform surgical procedures. The lightweight and portability of the equipment will become the trend of the future development. A smaller and more flexible device can make surgery easier and be suitable for a wider range of clinical scenarios, including some specific environmental or emergency situations. Future development still requires more multidisciplinary cooperation. The deep integration of medical field, engineering technology and information science will provide a broader space for technological innovation. At the same time, professionals from all aspects will jointly promote the comprehensive development of double-mirror joint technology. With the deepening of clinical practice, doctors will continue to accumulate the operation experience of dual-mirror combination technology, so as to reduce the learning curve and improve the efficiency and accuracy of surgery^[29]. This will also help the wider application of technology in different levels.

In conclusion, the combination of laparoscopy and digestive endoscopy has a promising future development prospect in the field of trauma surgery, revealing its unique position and potential application value in trauma surgery. The development of this integrated technology not only promotes the in-depth application of minimally invasive technology in the field of trauma surgery, but also provides patients with more advanced and personalized treatment options for them^[49]. Through continuous innovation and improvement, this technology will better serve the patients, and become one of the important tools in the field of trauma surgery. To realize this vision, professionals in the medical community and related fields need to work together to promote the development of technology to a new level.

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