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Endoscopy is a Resource With Diagnostic/Therapeutic Power

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ABSTRACT

Introduction: endoscopy is in a unique position at the interface between various medical and surgical disciplines. Endoscopy is a medical procedure that allows the interior of the entire gastrointestinal tract to be visualized by means of an instrument, among other organs and/or systems of the human body. Objective: To carry out art history based on an exhaustive search of the national and international medical literature on endoscopy in the medical field. Discussion: endoscopic studies have evolved the form of better diagnosis, in prevention, or as a screening, for an early cure, for a timely treatment or, failing that, in a palliation in the prognosis of patients in symptomatologic scenarios, to a degree as specific or even surprising. From procedures where, only observation is performed to specialized surgical treatments with effective, decisive techniques and in a multi-application environment. Conclusions: endoscopy is currently a resource that has evolved by leaps and bounds due to abrupt and constant technological progress, allowing its application in such a varied way in the medical and/or surgical field, with the aim of a diagnostic/therapeutic approach, which benefits patients in their health exponentially, facilitates medical work and reduces costs exorbitantly.

Keywords: Endoscopy, Colonoscopy, Panendoscopy, Minimal invasion, Capsule endoscopy.

INTRODUCTION

Endoscopy is in a unique position at the interface between various medical and surgical disciplines, as Surgical Endoscopy serves as a focal point for the international Galenic community and/or surgeons to exchange information on practice, theory, and research, significantly boosting this minimally invasive field through their contributions. [1] Endoscopy is a medical procedure that allows the interior of the entire gastrointestinal tract to be visualized by means of an instrument, among other organs and/or systems of the human body. This instrument is an endoscope, duodenoscope, colonoscope and many more. Endoscopy in general is a weapon to combat many diseases in medicine of our era. The above is a background in a field of opportunities to take advantage of the vast endoscopic knowledge and its applicability, expressed in the experience in the literature presented. [2]

Hippocrates 400 B.C. is the one who first describes the term endoscopy and tries to see the rectum through a tube and a candle. On the other hand, at the end of the first millennium of the Christian era, the Arab physician Albus Kasim (936-1013) used the reflection of light for the first time to examine the cervix. In the nineteenth century, the German physician Philip Bozzini (1773-1809) introduced the Lechleiter or light conductor with which he visualized the urethra. Adolph Kussmaul from Freiburg in Germany in 1868, tries to perform the first esophagogastroduodenoscopy. Von Mikulicz in Vienna in the same year was successful. The history of the evolution of the endoscope is divided into segments: the rigid endoscope (1868-1932), the semi-flexible endoscope (1932-1957), the fiberscope (1957-present), and the video

endoscope (1983-present) [3, 4]. In 1969, Wolf and Shinya performed the first complete colonoscopy with flexible fiber optics [5]. In Mexico, the first time a colonoscopy was documented was carried out in 1973, with an act followed by the first 23 more studies performed. [6]

The applications of endoscopy have allowed such a varied and effective range or portfolio of procedures, which allow a giant evolution in medicine with the benefit that at the end of the day is reflected in patients; it has been documented since robotic surgery, with the technical advantage over the laparoscopic approach in terms of superior images and better ergonomics. [7] Or the use of transforaminal spinal endoscopy, which is a minimally invasive technique used to treat various spinal conditions, with less blood loss, faster postoperative hospital discharge, faster recovery, and fewer complications. [8] Laparoscopic surgery is another area that opportunely takes advantage of the advances of decades in endoscopy, and which is currently called advanced surgical endoscopy, in very complex pathology. [9]

The harsh reality is that of specifying or understanding what the definition of endoscopy is, since it is confusing or even antagonistic, this is proven by the fact of calling it "minimal invasion". It should be specified that minimally invasive surgery is in the surgical approach as the process of making small incisions and specialized tools to perform surgical procedures with less damage to the body than traditional or conventional surgery. [10] However, endoscopy is an invasive procedure where instruments can vary in size where the endoscope measures 1,330 millimeters long x 9.8 millimeters in diameter, the colonoscope is 2,000 millimeters long x 12.8 millimeters wide, or the enteroscopy with a single balloon or double balloon, which are inserted into the digestive tract with measurements of 340 millimeters long x 13.2 millimeters wide, contrary to their nature, physiology and with an amount of air of up to eight liters on average in colonoscopy, 3 liters in pan endoscopy and 15 liters in enteroscopy. [10, 11, 12] While they may prevent surgery or error, the patient's disease conditions can cause surgery. [13] But it does not comply with the basic principles of least invasiveness, such as laparoscopic surgery vs. conventional surgery; and it cannot be generalized or standardized in this area, just because of the use of tropicalized optical lenses in the laparoscopes they share with endoscopes. [14]

OBJECTIVE

To carry out art history based on an exhaustive search of the national and international medical literature on endoscopy and its variants in the medical and/or surgical field in its applicability.

DISCUSSION

Endoscopic studies have evolved so much, in such a way that it facilitates a better diagnosis, prevention allowed by excellent screening, for early cure, timely treatment or, failing that, in an efficient palliation and project an improvement in the prognosis of patients in symptomatologic scenarios, to such a specific degree that it becomes surprising. [15] An example of this is simultaneous white light chromoendoscopy of suspicious predefined mucosal lesions, becoming the gold standard in endoscopy care. [16] Or in a synergy corroborated by the specificity of transoral ultrasound and endoscopy in diagnosing initial lesions in the oral cavity/tonsils, in a potential sum of their individual strengths. [17] Endoscopy or esophagogastroduodenoscopy or upper gastrointestinal endoscopy is a medical procedure that

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examines the upper digestive tract. With an endoscope that is a thin, flexible tube with a camera and a light source at its tip through the mouth, esophagus, stomach, and duodenum. [18]

The main role of upper endoscopy is diagnostic, which can evolve into therapeutic/palliative, the fact that it is a study that is performed in a common and frequent way, with uses as specific as even in the complications of other major surgical procedures such as laparoscopic vertical gastrectomy. [19]

Superficial non-ampullary duodenal tumors with the recommendation of endoscopic treatment for duodenal adenomas or cancers that are limited to the mucosal layer, where cold loop polypectomy and underwater endoscopic mucosal resection, by means of white light magnification endoscopy with crystal violet staining, improves the diagnosis and selects the appropriate endoscopic resection. [20] See figure 1.

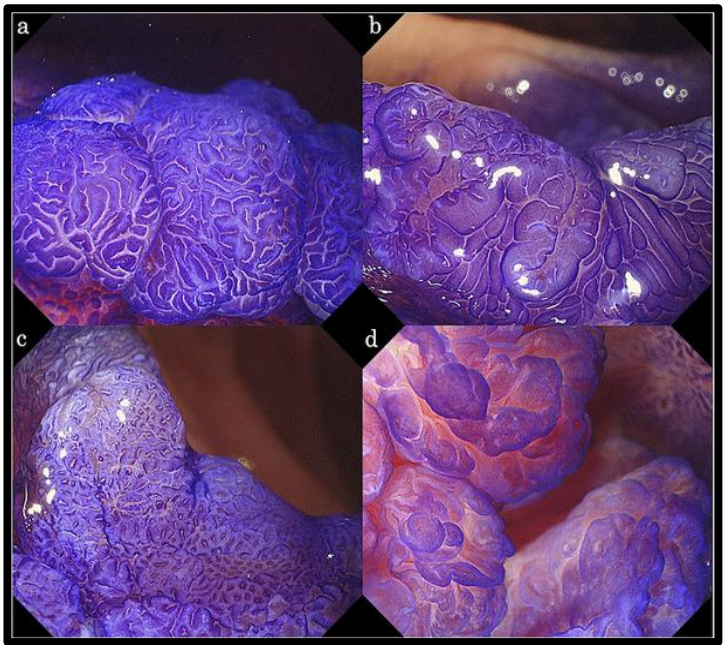

Figure 1: Endoscopic images of magnifying endoscopy with crystal violet staining (ME-CV). (a) Contoured pattern. (b) Leaf-shaped pattern. (c) Reticular/Sulciolar pattern. (d) Pineapple pattern. Image taken from the reference: Fukuda M, Tada N, Maeda M, Oishi K, Ito M, Hasegawa Y, Futakuchi T, Kobayashi M, Tamai N, Shimoda M, Sumiyama K. Successful Endoscopic Excision for a Rapidly Enlarging Esophageal Histopathologically Unclassified Subepithelial Lesion: A Case Report. DEN Open. 2025 Oct 15;6(1): e70219. doi: 10.1002/deo2.70219. [20]

The role of endoscopy in bariatric surgery is necessary to fully and correctly protocol the patient with an upper endoscopy, where several clinically relevant gastric pathologies could have been detected preoperatively; however, approximately two-thirds did not undergo this evaluation, so it should be considered routine and non-selective. [21] With complications vs. reinforcement of esophagitis, Barrett's esophagus, and punctual endoscopic follow-up. [22] The endoscopic resource as a diagnosis, study protocol, preventive and therapeutic use that, together with the full-thickness resection device, offers an innovative therapeutic approach for lesions not suitable for traditional endoscopic resection, [23] such as simple polypectomy or endoscopic resection of mucosal lesions; on the other hand, the device increases the depth of

the resection such as submucosal dissection, tunneling or full-thickness extraction. [24] Upper gastrointestinal endoscopy is reiterated for its diagnostic usefulness, detecting mild exudative hemorrhage due to gastric antral vascular ectasia, and the therapeutic option such as argon plasma coagulation. [25] In addition, gastrointestinal endoscopic examination reveals the very presence of parasites such as hookworms in the pyloric ring, antrum, and duodenum, which were removed with biopsy forceps. [26] Esophageal subepithelial lesions are detected incidentally during esophagogastroduodenoscopy, with endoscopic submucosal dissection, initially developed for the in bloc removal of superficial gastrointestinal neoplasms, it can also be used for subepithelial lesions arising from the submucosa, with an accurate diagnosis and even complete or future therapy. [27] See figure 2.

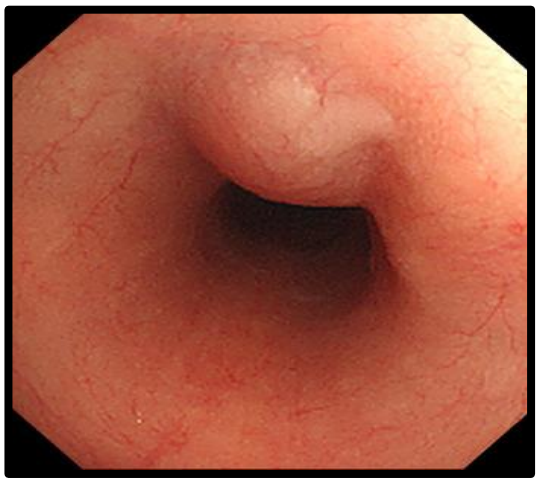

Figure 2: Image of a subepithelial lesion from the initial esophagogastroduodenoscopy. Image taken from the reference: Fukuda M, Tada N, Maeda M, Oishi K, Ito M, Hasegawa Y, Futakuchi T, Kobayashi M, Tamai N, Shimoda M, Sumiyama K. Successful Endoscopic Excision for a Rapidly Enlarging Esophageal Histopathologically Unclassified Subepithelial Lesion: A Case Report. DEN Open. 2025 Oct 15;6(1):e70219. doi: 10.1002/deo2.70219. [27]

Procedures such as gastroenterostomy guided by endoscopic ultrasound versus placement of duodenal metal stents should be mentioned in the management of unresectable malignant obstruction of the gastric tract, allowing to alleviate the symptoms, malnutrition of the patient and offering a certain quality of life. [28]

Peroral endoscopic myotomy is a minimally invasive treatment for achalasia, but it is often associated with gastroesophageal reflux disease. Adding a fundoplication can reduce reflux while maintaining the benefits of myotomy, does not include fundoplication, an anti-reflux procedure to prevent postoperative gastroesophageal reflux, a pooled success rate of 94.8%, becoming a safe and effective treatment for achalasia, as it offers high success rate, symptomatic relief. [29]

Advances in artificial intelligence with large language models have the potential to revolutionize digestive endoscopy by improving diagnostic accuracy, procedural efficiency, and clinical decision support. [30] This is how two-way endoscopy, which is defined as a medical procedure that combines upper gastrointestinal endoscopy and colonoscopy in a single day, in the search for a diagnosis, confirms the extent of the disease or by certain syndromes or specific

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diseases. [31] Shocking technical advances in flexible endoscopy over the past four decades have resulted in endoscopic retrograde cholangiopancreatography being used as the primary method for diagnosing and treating many biliary diseases, not always differentiating the biological nature of bile duct lesions and not determining their intraluminal extent. In addition, provide information on biliary mucosal lesions that do not project into the biliary lumen. [32, 33] The only single operator Chol angioscopy system currently available is the Spyglass direct visualization system. Chol angioscopy is an endoscopic technique that allows the diagnosis and endoluminal treatment of biliary diseases. According to the route of access to the bile duct, there are 3 different types: peroral or trans papillary (orally), percutaneous and intraoperative, which began to be performed in 1975. [32, 34]

Or pancreatoscopy, which is a novel medical procedure (for more than 10 years) that consists of performing an endoscopy inside the pancreas thanks to the use of extremely thin tubes, just 3 mm, which contain a light and an optic. These endoscopic tubes can be inserted into the pancreatic duct and provide an inside image of the pancreatic duct for diagnostic purposes. [35] Or combining single-operator digital videopancreatoscopy-guided lithotripsy proved safe and effective in long-term follow-up in pain control, and ductal decompression has become the primary approach for the treatment of patients with symptomatic calcifying chronic pancreatitis and signs of ductal hypertension. [36] Endoscopic surgical resection procedures for diagnosis and treatment are also performed on the mucosa of the right nasal septum and were removed along with the cartilage and septum bone. [37] On the other hand, endoscopic applicability is carried out in air-digestive foreign bodies and is commonly used for visualization and removal of foreign bodies in patients. [38] Another development that has demonstrated its diagnostic value is deep enteroscopy, which has identified most causes of small bowel hemorrhage, where angiodysplasia accounts for many vascular lesions and sometimes even their treatment. [39] Another item that cannot be left unmentioned is the magnetically controlled capsule endoscopy, by capsule systems that use anchored and magnetic control methods, for esophageal examination that highlights the high sensitivity, specificity, and accuracy of the diagnosis of esophageal diseases, suggesting that it is a promising alternative for patients who cannot undergo esophagogastroduodenoscopy. [40] The application of endoscopy is taken to such extremes as in the diagnosis of a spontaneous leak of cerebrospinal fluid of unknown etiology, with multiple attempts and difficult to diagnose and repair, especially in its location with fluorescence with indocyanine green. [41] See figure 3.

The therapeutic/palliative strengths of endoscopic procedures, among others, is the dilation of esophageal stricture in adults with eosinophilic esophagitis by means of the enhanced endoscopic fixation cap was viable, clinically effective with satisfactory results. [42]

The diagnostic and therapeutic power of colonoscopy in colon and rectal pathology, such as chronic diarrhea, inflammatory bowel disease which is an idiopathic disorder characterized by repeated relapses and remissions, cancer, constipation or many more: becoming the main, essential or vital tool. [43, 44] Colonoscopy is the gold standard of choice with high certainty in the prevention, diagnosis, treatment, and surveillance of most colorectal diseases, polyps, cancer, etc. It is vital as a priority instrument to implement any health strategy by this body. [45]

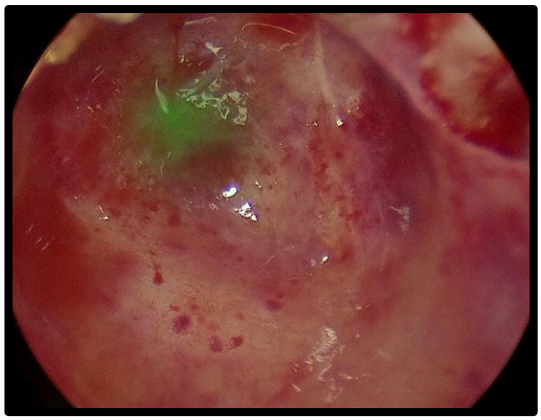

Figure 3: Distinctive green, fluorescent areas were observed in the clivus. Image taken from the reference: Chen Z., Zhang J., Wong P.J.C., et al. Enhancing Localization in Multiple Spontaneous Cerebrospinal Fluid Leakage Reconstruction With Fluorescence Endoscopy: A Case Study. Plast Reconstr Surg Glob Open. 2025; 13(6): e6834 [41]

Polypectomy, a diagnostic and curative colonoscopy procedure, sometimes gives the possibility of making other unsuspected diagnoses such as the metastatic spread of breast cancer to the gastrointestinal tract, which is rare, diagnosed by a colonic polyp detected during a routine screening colonoscopy. [46] Colonoscopy colonic stenting has become an alternative to facilitate elective surgery, potentially reducing the need for urgent surgical intervention and improving patient outcomes in obstructive left colon cancer, which is often clinically challenging due to the acute nature of the obstruction or its clinical conditions that are deferred to elective surgery. With a decrease in morbidity and mortality and with a better option for improvement in the prognosis. [47] Conversely, colonoscopy can be understood as a preventive or screening study that allows for early diagnosis and timely treatment that improves prognosis, being the second leading cause of cancer-related deaths in the United States. [48]

Acute endoscopic gastrointestinal perforation, a rare but potentially life-threatening complication of endoscopic procedures, presents a significant challenge to its management. Although surgical repair has been the traditional approach, endoscopic closure offers a highly successful alternative, which will depend on the early detection of perforations, the early initiation of appropriate antibiotic therapy and the achievement of a safe and adequate endoscopic closure; applying various endoscopic closure techniques, including standard clips, double-action clips, Mantis clips, the Overstitch system, endoscopic suturing systems and the use of coated metal stents. [49, 50] Another added value of colonoscopy is to be able to perform hemostasis in patients with colon diverticulitis and lower gastrointestinal tract hemorrhage, with the nitinol-based shape memory clip, preserving the surrounding blood flow avoiding perforation, the endoscopic ligation with a detachable loop was effective for him, avoiding new bleeding after the placement of the clip and not reaching arterial embolization or the same surgery. [51] See figure 4.

Gel immersion endoscopy offers benefits such as buoyancy, traction, and a clear field of vision without gas insufflation, however, there are several challenges with respect to difficult lesions, such as lesions located on the side of gravity that are immersed in fluids, lesions located in the flexures that are difficult to address, and vertically oriented lesions that are difficult to access during submucosal dissection. [52]

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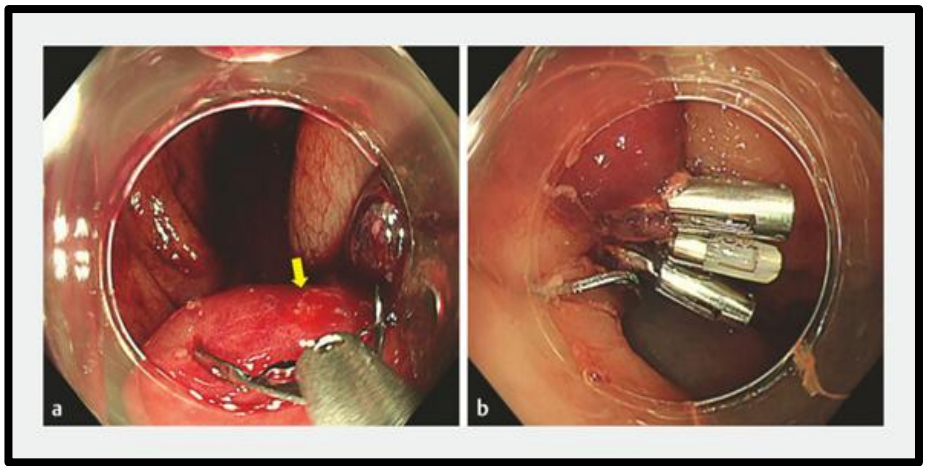

Figure 4: Image a: Colonoscopy performed after early rebleeding after primary hemostasis with an OTS clip. The OTS clip remains in place, keeping the diverticulum inverted and bulging, but active bleeding (yellow arrow) is observed from the apex. Image b: Clipping was performed to stop active bleeding, achieving temporary hemostasis. Abbreviation: OTS, on the endoscope. Image taken from the reference: Kishino T, Sawa T, Kitamura Y. Endoscopic detachable snare ligation for rebleeding after over-the-scope clip placement in colonic diverticular bleeding: salvage treatment. Endoscopy. 2025 Dec;57(S 01): E543-E544. [51]

On the other hand, biliary pathology is so varied and complex that in most cases it presents as chronic lithiasis cholecystitis, with or without an acute course; less frequently, an a lithiasis cholecystitis, which is otherwise acute on a single occasion. 10% of lithiasis cholecystitis will be present with choledocholithiasis. [53] Decompensated liver disease increases the risk of morbidity and mortality from cholecystectomy, and many practitioners prefer nonsurgical methods, such as cystic duct stenting by endoscopic retrograde cholangiopancreatography, preventing readmissions and greater decompensation of liver disease compared with other treatment modalities. [54] With the primary focus for the management of these often complicated cases, performing sphincterotomy, naso biliary drainage, and stenting, which seek to relieve pressure within the bile duct, facilitating depressurization and promoting leak healing. [55] Endoscopic retrograde cholangiopancreatography is an invasive endoscopic procedure used primarily to treat hepatopancreatobiliary diseases; in a published study, 37,743 procedures (56.4%) of a total of 66,993 procedures performed urgently, especially in patients with suppurative cholangitis, were performed in biliary tract lesions, the remainder was elective, and the findings were reported to be bile duct stone (78.7%), pancreatic tumor (3.9%), papillary tumor (3.3%), cholangiocarcinoma (2.6%), sphincter of Oddi dysfunction (2.4%), biliary leak after cholecystectomy (2%). With a resolution of the pathology or success of 90%. [56] See figure 5.

Advances today have emancipated endoscopic technology, an example of which is that it has been documented that hepaticogastrostomy guided by endoscopic ultrasound is a useful alternative treatment for the failure of endoscopic retrograde cholangiopancreatography, using the resources in the field of endoscopic cholangiopancreatography. [58] Pseudoaneurysms and hemobilia are relatively rare complications of endoscopic treatment. An incidence of pseudoaneurysm formation following stenting in the bile duct has been reported during endoscopic retrograde cholangiopancreatography of 1.2%. [59]

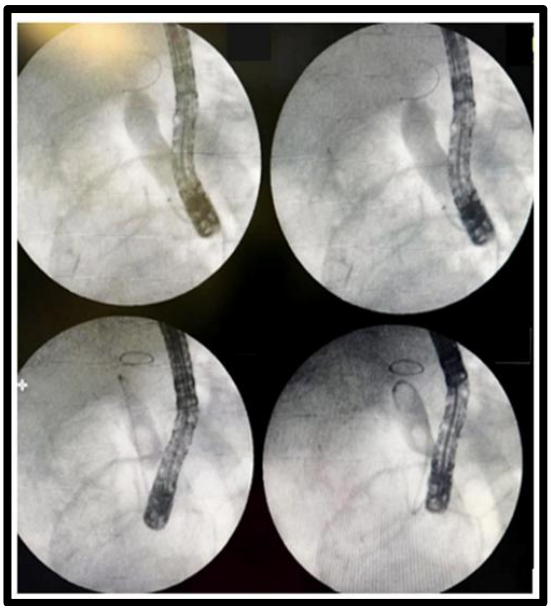

Figura 5: ERC of a Patient with Residual Choledocholithiasis in a Partial Cholecystectom. Image taken from the reference: Ramírez, A. G., Hernández, P. N., Zavala, A. B., Ocampo, A. E. I., Miranda, K. B. P., Gómez, J. R. D., Felipe, T. C. B., Terrones, C. I. D., Zenteno, S. F., Cruz, B. S. M., Domínguez, O. O., Ríos, A. A., Padilla, R. I. G., Salgado, K. E. M., & Sánchez, M. A. G. (2025). Subtotal Cholecystectomy and Endoscopic Retrograde Cholangiopancreatography: A Colossal Synergy. British Journal of Healthcare and Medical Research, Vol -12(04).274-29. [57]

It should not be forgotten that the endoscope has multiple applications, diagnostic, therapeutic, palliative, prevention/screening, etc., in various specialties such as urology, orthopedics, pulmonology, otorhinolaryngology, anesthesia, neurosurgery, gynecology, etc. [60, 61]

CONCLUSIONS

Endoscopy is currently a resource that has evolved by leaps and bounds due to abrupt and constant technological progress, allowing its application in such a varied way in the medical and/or surgical field, with the aim of a diagnostic/therapeutic approach, which exponentially benefits patients in their health. In addition, endoscopy is extremely efficient and largely effective in diagnosing and treating patients with certain pathologies, which previously was only possible with conventional surgery or that was only waiting for the fatal outcome.

It is decisive that endoscopy optimizes costs, evokes less invasion than conventional surgery, is too practical and allows an unsurpassed quality of medical care for the patient. Endoscopy is currently a resource that has evolved by leaps and bounds due to abrupt and constant technological progress, allowing its application in such a varied way in the medical and/or surgical field, with the aim of a diagnostic/therapeutic task, which benefits patients in their health exponentially, facilitates medical work and optimizes human resources. inputs and financial in an exorbitant way.

Conflict of Interest

The authors stated that they had no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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