



Trans Surgical Bowel Endoscopy: A Great Strategy

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Abstract: Introduction: in the surgical act, the surgeon makes crucial decisions depending on findings, material and human resources. Objective: to describe the experience presented in the public hospitals of the Ministry of Health and the Mexican Institute of Social Security, with the indication of trans surgical intestinal endoscopy. Method: a multicenter study with a retrospective, longitudinal, observational and descriptive design of the Colon and Rectal Surgery and Surgery Service, which included three second and third level health care hospitals. Results: from 154 records of these 26 patients with trans operative intestinal endoscopy. There were 17 cases (65.38%) were men and 9 women (34.61%), with an average age of 54 years, in a bimodal value of 43 and 61 years, ranging from 17 to 81 years. Discussion: the oncological benefits are uncertain even with robotic or laparoscopic surgery; in elective surgery with a mechanical colon preparation, the ease of diagnosis is easier when performing endoscopy. It is essential to study intestinal and colon strictures identified by radiological studies, which tip the balance towards performing trans operative endoscopy or not. These filling defects must be studied in a specific and clear manner. For if there is malignancy, the omission can yield disastrous results. Conclusion: trans surgical intestinal endoscopy is a great strategy that allows a correct diagnosis and a complete, effective and efficient treatment that will exponentially optimize the prognosis, survival and quality of life of the patient.

Keyword: Endoscopy, Surgery, Elective Surgery, Laparoscopic surgery, Robotic Surgery, Trans surgical.

INTRODUCTION

In the surgical act, the surgeon must make crucial decisions that will depend on the findings, material and human resources, as well as his skills and experience in the field where he is an expert, both in scheduled surgery and in an emergency surgical event. All for the benefit of the patient with a fair surgical quality, both of a correct and complete diagnosis, and of an assertive treatment together with a prognosis. [1] On the other hand, endoscopy by definition "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". [2] It is therefore an invaluable endoscopic resource for diagnosis, study protocol, preventive/screening and therapeutic use together with resection devices. [3]

Endoscopy is extremely efficient in treating patients with certain pathologies, which were previously only possible with conventional surgery or, failing that, only waiting for the fatal outcome.

It is decisive that endoscopy optimizes costs, evokes less invasion than conventional surgery, is too practical and allows a high quality of care. [2, 4]

The synergy of surgery and endoscopy converge in a scenario that currently represents the main modality for removing distal obstructions; however, there is still no consensus on its efficacy, [5] but it does improve postoperative outcomes due to few cases. [6] It should be noted now that artificial intelligence represents a very powerful tool to help physicians address the complexities of the examination of the Aero-digestive tract. Integrating artificial intelligence into endoscopy and harnessing the power of computer vision allows algorithms to extract meaningful information from visual data (called "videomics"). [7, 8] The test that can visualize the small intestine almost in its entirety is enteroscopy. 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 with 2,000 millimeters long x 12.8 millimeters wide, or the enteroscope with a single balloon or double balloon, which are introduced into the digestive tract with measurements of 340 millimeters long x 13.2 millimeters wide. [9, 10, 11] Injecting air with an average of eight liters in colonoscopy, 3 liters in panendoscopy, and 15 liters in enteroscopy. [12]

On many occasions, esophagogastroduodenoscopy and colonoscopy were not diagnostic. And that is where the enteroscope is suitable for the diagnostic or therapeutic function in the middle intestine or small intestine. [13] An example of therapeutic use of the double balloon enteroscopy is cited, where patients with gastrointestinal tract hemorrhage of angioectasis etiology were identified as the most common lesions (42%). An enteroscopic therapeutic intervention was performed in 51% of the patients, with coagulation with argon plasma being the most frequent (72%). [14] Unlike the diagnostic performance of video capsule endoscopy, it may be limited by reduced visualization of the mucosal surface due to dark debris, bubbles, or detritus, especially in the distal small intestine. [15] As is the case with CT enterography where specificity and sensitivity decrease exponentially, specifically in the small intestine. [16]

For years, the use of MRI to obtain images of the abdomen has been the subject of debate mainly due to its technical limitations. The aim is to improve tissue definition, increase the differences between normal and pathological tissue and provide functional information. [17] This study requires prior preparation with high volumes of oral or rectal contrast to distend the lumen and improve the definition of the intestinal wall. Oral and rectal contrast media can be positive, negative, or biphasic depending on the changes they generate in the intestinal lumen. [18] Oral contrast agents are crucial for distending the intestinal lumen and highlighting the intestinal wall and to reduce movement artifacts due to intestinal peristalsis, the use of an intravenously administered antispasmodic drug, prior to intravenous contrast injection, is suggested. provide a complete assessment of the abdomen and pelvis, enables correct diagnosis in up to 20% of patients with uncertain diagnosis [18] In addition, it is essential to mention positron emission tomography (PET) with fluorodeoxyglucose {[18F]FDG} is a technique used to identify areas of increased glycolytic metabolism, which helps in the diagnosis, staging, and follow-up of neoplastic, infectious, or inflammatory diseases. [19]

OBJECTIVE

To describe the experience presented in the public hospitals of the Ministry of Health of Mexico City and the Mexican Institute of Social Security; with the indication of trans surgical intestinal endoscopy, either scheduled or urgent.

METHOD

It is a multicenter study with a retrospective, longitudinal, observational and descriptive design. In the Colon and Rectal Surgery and Surgery Service, which included three second and third level health care hospitals, in Mexico City and the State of Mexico:

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In a study period that spanned from December 2018 to December 2025, with the surgical indication in patients with trans surgical intestinal endoscopy. The variables of sex, age, etiological diagnosis, modalities of the types of surgical, endoscopic or combined approach, number of surgeries, surgical time, morbidity and mortality were identified. The study of the results was carried out using descriptive statistical procedures. In addition, an analysis of the research of the national and international medical literature on the topic described is carried out.

RESULTS

A total of 154 records were reviewed, of which 26 patients were documented with the indication for trans operative intestinal endoscopy, either scheduled or emergency. Of these, 17 cases (65.38%) were men and 9 women (34.61%), with an average age of 54 years, in a bimodal value of 43 and 61 years, age ranges from 17 to 81 years. Of this study group, only 26 patients were documented where the trans operative endoscopy strategy is performed, in the diagnostic etiology as diverse as that of an elective/or scheduled surgery that becomes urgent due to its evolution, emergency surgery of the first instance in a first surgical time or in a subsequent one. The etiology of the diagnosis, the number of surgeries, initial or subsequent, where the previous surgery was scheduled or urgent, findings, justified the use of the transoperative endoscopy strategy, are specified in **Table 1**.

Table 1: Etiology/Diagnosis Of Patients Undergoing Transoperative Endoscopy Expressed In Number And Percentage

Variables	Number/%
Colon Cancer	2/ 07.69
Rectal Cancer	7 / 26.92
Attenuated Familial Adenomatous Polyposis	4/ 15.38
Familial Adenomatous Polyposis	2/ 07.69
Gardner's Syndrome	3/ 11.53
Non-Specific Intestinal Stenosis	3/ 11.53
Gastrointestinal Bleeding Of Obscure Origin	4/ 15.38
Peutz-Jeghers Syndrome	1/ 03.84
Total Number Of Patients	26/ 100

It was documented that rectal cancer was the most frequent diagnosis where trans operative endoscopy was performed for emergency intestinal occlusion in 3 patients and in

2 of them in elective surgery, in the remaining one it was a second surgery as a diagnostic protocol in an elective/priority intestinal reconnection. [20] The main problem is the preparation of the colon, so that in the surgical/endoscopic practice there is the infrastructure to perform it urgently at that time of the same surgical act mechanically. Unlike them, the intestine is milked and in the small intestine the endoscopic study is performed, in the colon the same procedure is performed, and two to three washes are performed with sterile sun.

The objective is to be able to visualize the inside of the remaining large intestine or the small intestine itself, to make decisions or actions in the same surgical act. This strategic complement allows us to offer definitive treatment in a single surgical time, promoting a better prognosis to the patient, such is the case of a synchronous tumor or not detected by essential or basic radiology, achieving section extension, surgical radicality equated to an R0. In elective surgery with mechanical colon preparation, the ease of diagnosis is easier when performing endoscopy. Patients with familial adenomatous polyposis syndrome who also undergo emergency surgery due to intestinal occlusion or continuous/incoercible lower gastrointestinal bleeding, an intentional search by endoscopy is imperatively performed, and thus, try to complement the diagnosis to perform or not a restorative proctocolectomy in a single surgical time, evidencing this syndrome by endoscopy, ruling out polyposis of other types of the 17 known variants in the midgut and avoiding diagnostic errors or failing that, overtreatment, and not an omission as always happens. Likewise, in this study, gastrointestinal bleeding of origin to be determined or wrongly called obscure, it is essential to locate the specific site of bleeding in case of urgency or lack and infrastructure for its diagnosis/treatment. [21, 22] See Figure 1.

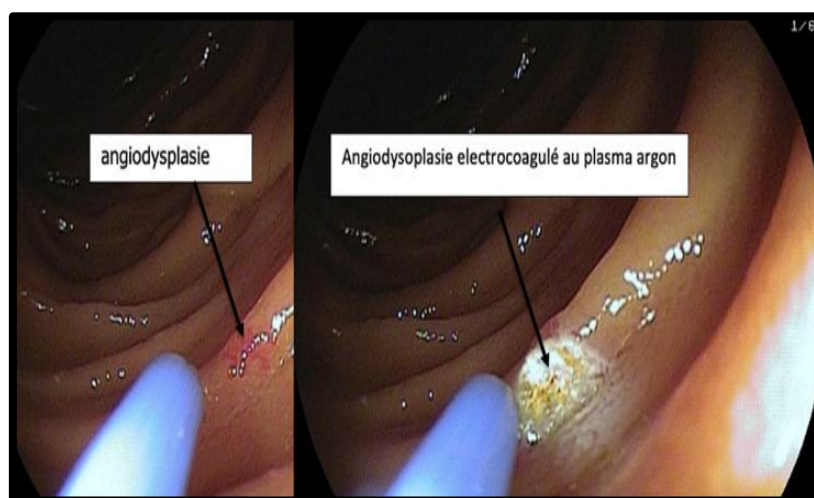


Figure 1: Treatment of small bowel angiodysplasia lesions by argon plasma electrocoagulation Image taken from the publicación: Samy MM, Laroussi R, Adioui T, Seddik H. Exploration du grêle par entéroscopie simple ballon, expérience de l'Hôpital militaire et d'instruction Mohamed V de Rabat: à propos de 51 cas [Exploration of the small intestine through single-balloon enteroscopy, experience in the Mohammed V Training Military Hospital in Rabat: about 51 cases]. Pan Afr Med J. 2021 May 21;39:61. French. doi: 10.11604/pamj.2021.39.61.29200. PMID: 34422184; PMCID: PMC8363961. [23]

The variant of attenuated familial adenomatous polyposis is a complex diagnosis, since they present polyps in the small intestine that are characterized as large and that their malignancy or conversion to cancer is imminent, with a presentation as diverse as intestinal occlusion, intestinal intussusception, diffuse abdominal pain, intestinal pseudo-occlusion or even bleeding from the digestive tract of obscure lower etiology. That is why the complement by transoperative endoscopy is a strategic tool that promotes diagnosis, treatment with multiple polypectomies and with a high possibility of cure in the same emergency surgical act, thus allowing a better prognosis for the patient. [24]

It is essential to study intestinal strictures, which in the colon are identified as a filling defect in the colon by enemy, and in the small intestine sensitivity decreases in the diagnosis due to intestinal transit and it is practically a finding due to suspicion that tips the balance towards performing or not performing trans surgical endoscopy. These filling defects must studied in a specific and clear manner. For if there is malignancy, the omission can yield disastrous results. Although it has been published that filling defect in the colon due to barium enema is a frequent indication in the colon in almost 30%, [25] in the small intestine it is not, firstly because it is less sensitive in the diagnosis, secondly because of the less frequent intestinal transits, entero-resonance, etc., so the intentional search in an enteroscopy or capsule endoscopy is not a classic protocol topic, and the lack of infrastructure condemns the application of strategies such as trans surgical endoscopy of the small intestine. [26] See Figure 2.



Figure 2: Single balloon enteroscopy with outer tube. Image taken from the publication: Manno M, Barbera C, Bertani H, Manta R, Mirante VG, Dabizzi E, Caruso A, Pigo F, Olivetti G, Conigliaro R. Single balloon enteroscopy: Technical aspects and clinical applications. *World J Gastrointest Endosc.* 2012 Feb 16;4(2):28-32. doi: 10.4253/wjge.v4.i2.28. PMID: 22347529; PMCID: PMC3280352. [26]

Of the three cases with nonspecific small bowel stenosis that documented, confirmed diagnoses with pathology reports were intestinal lymphoma, intestinal adenocarcinoma, and Crohn's disease. [27, 28]

The treatment carried out was carried out in a single surgical act where in cases of colon or rectal cancer, with the aim of completing the colonoscopy and in synchronous

disease, intestinal resection or extension of the radicality of the affected side of the colon or of the small intestine itself was performed, with anastomosis restoring intestinal transit immediately or failing that in some patients a colostomy is carried out or derivative ileostomy strategically.[29] See table 2.

Table 2: Treatment Modality After Transoperative Endoscopy

MODALITY	NUMBER	%
Multiple polypectomy	14	53.84
Colon/rectal bowel resection extension	9	34.61
Small bowel bowel resection	6	23.07
Ileostomy/Bypass Colostomy	4	15.38
Plasma Laser Coagulation Argon	4	15.38
Biopsy	18	69.23
Combination	6	23.07
Total	61	100

Biopsy represents almost 70% of all procedures, both in a trans operative scenario and routinely with a subsequent histopathological report, which in certain cases is essential for decision-making regarding the definitive or final treatment. In frequency, the second most frequently performed procedure is cold loop polypectomy in pedunculated polyps completely and successfully, with Haggitt 0, 1 and 2. Or failing that, when the trans operative report shows a Haggitt level 3 or 4 reaching the submucosal layer, the intestinal resection of the intestinal segment is managed. In sessile polyps, complete resection in a single piece is more complex at the endoscopic level, where saline or other solutions (often with adrenaline) injected under the polyp. This elevates the lesion allowing for correct/complete polypectomy. [29] This has an incidence greater than 50%.

In the third site, intestinal resection of the small intestine is frequently placed and added to the extension or the isolated anatomical site and non-extension of the colon and rectum, it presented as a procedure above 50%, adding 15 cases that represent 57.68%. Argon laser coagulation performed in 4 cases of angiodysplasia, three of the terminal ileum and one in the rectum, successfully and without complications. Intestinal resections with ileostomy performed in a single patient and 3 colostomies, two terminal and one loop. It should be clarified that more than two procedures can be performed on a single patient, exceeding 100% of the total study group, so the adjustment should be considered later; since 61 procedures are added up, which is 100%, but the total group under study was only 26 patients, which is where the database was made to contain the percentage of **table 2**, which with adjustment is more significant. The trans surgical time in trans surgical endoscopy documented in 6 minutes on average with ranges of 3 to 9 minutes and polypectomy or biopsy performed, and the range increased to 11 minutes. The colon preparation is sometimes deficient or without it, the trans operative preparation is performed with high difficulty, avoiding contamination but its visualization was achieved in the surgical act, the consistency of the fecal matter, the amount or dilation of the colon, inflamed tissues, or added pathologies that contraindicated it, etc. And whether it was feasible to conduct the study. No morbidity or contamination reported. Infection, no bleeding. There is no mortality to document.

DISCUSSION

The oncological benefits are uncertain even with robotic or laparoscopic surgery, as occurs in rectal cancer, where technically the removal of the meso from the rectum is too complex, with the positivity of the margin of circumferential resection and recurrence less than 3 years after definitive surgery and with evidence of undocumented synchronism. in a false recurrence. [30] On the other hand, routine intraoperative biopsy for perforated gastric ulcers remains a frequent practice in Turkey despite the low rates of malignancy reported in the contemporary literature. Surgeons' decisions about biopsy influenced or governed by the perceived risk of malignancy. [31] The use of trans operative endoscopy has various applications, such as in spine surgery, where transforaminal endoscopic discectomy is an effective approach for the treatment of thoracic and lumbar disc pathologies. 180 cases of transforaminal endoscopy using the trans-SAP approach and continuous neuro myography monitoring. [32, 33]

Another application of trans operative endoscopy can be documented in head and neck neoplasms are classified as metachronous when diagnosed six or more months after the primary tumor, while those detected within 6 months are considered synchronous, or the passing of lesions that were not diagnosed at the beginning, since during the local transoral resection of head and neck carcinoma, Endoscopic examination under general anesthesia offers high-quality examinations of the hypopharynx and larynx, anatomical regions that are difficult to assess otherwise. [34]

In some cases, the detection of tumors in the digestive tract makes decisions such as that a preoperative diagnosis is complex; the definitive diagnosis requires surgical removal and histopathological study, which in an aggressive manner, without the opportunity to report trans operative pathology, trans surgical endoscopy and with overtreatment. [35] Fibrovascular polyps of the esophagus are rare benign tumors composed of fibrous, vascular, and adipose tissue. Open surgical resection has been the treatment of choice for large lesions, with morbidity such as esophageal fistulas, transient dysphonia and prolonged hospitalization, the combined use of endoscopic resection has emerged as an effective alternative. [36] The double-endoscope endoloop technique provided stable traction and safe strangulation of the vascular pedicle, ensuring controlled resection and hemostasis; vs hybrid laparoscopic-endoscopic access: An innovative approach to the surgical treatment of giant fibrovascular polyp of the esophagus. [37] For pancreatic cancer, an R0 with pancreaticoduodenectomy in patients with complete situs inversus and complete common mesentery is feasible and can performed safely with meticulous preoperative planning and endoscopic intraoperative adaptation of a symmetrical anatomy. [38]

It should note that colorectal cancer remains one of the most common malignancies worldwide, in both men and women, and as surgical resection is the only type of treatment with curative intent, in 2023, approximately 153,020 people will diagnose with colon/rectal cancer and 52,550 will die from the disease. including 19,550 cases and 3,750 deaths in people under 50 years of age. [39] In surgical specialties, minimally invasive (laparoscopic) surgery has become a standard technique, as it is associated with less trauma, lower rates of postoperative complications, and faster recovery,[40] interpreting visual data, and finding applications in routine clinical practice in fields such as radiology and endoscopy. [41] In an artificial intelligence research scenario in surgery, there are many unknowns about how artificial intelligence - based intraoperative image navigation affects surgeon

performance, determining whether any end-of-day improvement in clinical outcomes can be achieved and whether it functions properly in various environments without errors or new adjustments. [42, 43] Artificial intelligence in hemorrhage detection and quantification models demonstrated strong technical performance, but multiple barriers limit its application to safe and routine use in operating rooms. Unlike a direct endoscopic vision, it immediately locates the bleeding. In artificial intelligence, user interfaces and ergonomics received little evaluation. [44] Gauze tracking aligned with alarms and video markers for surgeon support, while a robotic suction prototype reported to reduce cognitive and manual load by automating hemostasis. [44] In contrast, other studies lacked surgeon-oriented interfaces, which limited the ergonomic value. [45]

Diagnosis and the tools to carry it out are essential, where adequate hospital infrastructure is necessary for it; pneumoperitoneum is most associated with gastrointestinal perforation and often requires emergency surgical exploration. Diagnostic laparoscopic surgery and intraoperative endoscopy ruled out gastrointestinal perforation. [46, 47] In the gastrointestinal tract, for both benign and malignant conditions. Two techniques were used: endoscopically assisted wedge resection and laparoscopically assisted endoscopic resection of the mucosa. Patients with suspected malignancy underwent stepwise segmental resection if necessary. [48] With the strength of having the option of intraoperative intensification, it constitutes an individualized, organ-conserving approach to the management of complex colonic lesions, minimizing unnecessary surgical resections. [49, 50]

CONCLUSIONS

Trans surgical intestinal endoscopy is a great strategy that allows a correct diagnosis and a complete, effective and efficient treatment that will exponentially optimize the patient's prognosis, survival and quality of life.

The competencies of the surgeon with endoscopic training that has the hospital infrastructure to carry out an endoscopy in the surgical act, in specific cases and/or as warranted, are invaluable for the health of the patient, reducing time and costs for the Health System. It should note that to date there is no publication of this applied diagnostic/therapeutic modality in patients with specific intestinal pathology.

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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