Complications And Hazards Of Gastrointestinal Endoscopy

Yousef Mohammed Alshammari[1] , Amal Hamdan Al Enezi[2] , Amal Hussain Alsadah[3] , Awad Mohmmdh Al Qahtani[4] , Saleh Taya Saleh Bawazeer[5] , Arwa Luqman Al-Ahmadi[6] , Wedad Shilash Alanazi[7]

[1]Staff Nurse 1.
[2]Clinical Nurse Coordinator (Cnc)
[3]Clinical Resource Nurse (Crn)
[4]Endo Scopy Technician.
[5]Endoscopy Technician.
[6]Clinical Resource Nurse Crn King Abdulaziz Medical City For National Guard Health Affairs In Riyadh.
[7]Nurse Coordinator King Abdulaziz Medical City For National Guard Health Affairs In Riyadh.

1. Introduction to

2. Gastrointestinal Endoscopy

Several general and specific rules can help to minimize complications and hazards of gastrointestinal endoscopy: routine, careful pre-endoscopic patient assessment; adequate premedication, depending upon the patient's physical status and emotional condition; observation of the patient during the entire endoscopic procedure; and adherence to recognized guidelines for diagnostic and therapeutic endoscopic interventions. The necessary equipment to cope with specific endoscopic complications and hazards should be readily available in or near the endoscopy suite – and the operating staff should be well trained in its use.

Diagnostic and therapeutic gastrointestinal endoscopy is a frequently performed elective procedure involving minimal risks. It permits inspection of the entire length of the gastrointestinal tract, allows tissue biopsy, excision of polyps and tumors, treatment of bleeding lesions, dilatation of strictures, and other procedures. For various parts of the upper and lower gastrointestinal tract, different types of endoscopes are utilized –

which vary in length, diameter, and technical complexity. Complications and hazards can result from any part of the endoscopic procedure – including patient preparation, sedation, the insertion or withdrawal of the endoscope, and specific interventions performed during the examination. The major complications are hemorrhage, perforation, and reactions to sedation medication. Other possible complications are aspiration, cardiopulmonary events, vasovagal reactions or other disturbances of the autonomic nervous system, complications related to enteral feeding tubes and stent insertion, and transmission of infectious diseases.

1.1. Definition and Purpose

The term endoscopy is derived from the Greek words "endon" and "scopein", meaning to look inside. Gastrointestinal endoscopy allows an excellent view of the interior of the esophagus, stomach, duodenum, large bowel, and other hollow organs. It is essential to appreciate that the primary purpose of this chapter is to stress the many risks, possible complications, and negative aspects of gastrointestinal endoscopy. This is necessary to ensure a balanced view of both the advantages and the hazards of endoscopy. Medical and lay beliefs concerning the infallibility of invasive medical procedures, diagnostic tests, or experts must be dispelled, since such idealized concepts do not hold true in reality. The fact that one expert refers to an experienced individual in high-technology investigative procedures is often ignored when discussions arise concerning complications or failed procedures.

Diagnostic tests and therapeutic interventions are often associated with potential risks. The hazards of upper and lower gastrointestinal endoscopy (diagnostic or therapeutic) as recognized presently include the following: (1) complications of dimpling using sedative or narcotic agents; (2) cardiopulmonary complications or reaction to sedatives; (3) complications related to preendoscopy exposure to barium contrast medium (discussed owing to relevance); (4) hazards related to endoscopic cholangiopancreatography or other advanced procedures; and (5) complications or hazards related to upper or lower endoscopy. A variety of gastrointestinal symptoms in some patients, gastrointestinal blood loss in others, and findings of almost complete bowel obstruction in the remaining group have been described after radiologic exposure to contrast medium. Although

most symptoms disappear after 24 hours, some individuals require longer time periods to recover. Treatment and prevention of symptoms and possible tissue damage are discussed. (Ehfeda et al.2021)

1.2. Types of Gastrointestinal Endoscopy Procedures

In addition to diagnostic endoscopy procedures, there are several advanced endoscopy techniques that are used for both diagnostic and therapeutic purposes. These include endoscopic ultrasonography, which is used for the diagnosis of submucosal lesions, for staging of neoplastic lesions, and for guidance of needle biopsy for cytological examination of lesions adjacent to the gastrointestinal wall; and several other techniques that are used primarily for therapeutic purposes, such as hemostasis of bleeding lesions, removal of polyps, dilatation of strictures, enteral nutrition, etc.

The most common diagnostic endoscopy procedures are esophagogastroduodenoscopy (also called upper endoscopy) and colonoscopy. Lower gastrointestinal endoscopy also includes sigmoidoscopy and proctoscopy, the two being often performed using a short rigid or flexible endoscope. Other less common diagnostic procedures are the small bowel enteroscopy, which can be performed using long endoscopes or very small endoscopes known as upper gastrointestinal pediatric scopes or fiber-optic systems, and the gastroendoscopy, which is often performed before surgical or endoscopic interventions on the upper part of the stomach. (Limsrivilai et al., 2021)

Numerous different endoscopy techniques have been developed to allow visualization of all regions of the gastrointestinal tract for diagnostic and/or therapeutic purposes. Diagnostic endoscopy procedures usually do not require significant modifications of the endoscope, whereas some therapeutic procedures, such as hemostasis of bleeding ulcers, removal of polyps, or dilatation of strictures, may require the use of special accessories attached to the endoscope.

2. Common Complications of Gastrointestinal Endoscopy

The development of clinical guidelines of care and other well-designed endoscopy units have minimized the risk of complications of gastrointestinal endoscopy. Major complications include cardiopulmonary events, bleeding, and perforation.

Mortality from upper GI endoscopy varies. It is higher in unselected series of patients and ranges from 1:1000 to 1:1500. Mortality is predominantly due to cardiopulmonary events related to sedation. The risk of perforation of the gastrointestinal tract during endoscopy is overall very low. Its incidence is around 1:2000 for diagnostic colonoscopy and 1:500 for colonoscopy with biopsy or polypectomy. The risk of perforation during upper GI endoscopy is about 1:10000. The risk of perforation during endoscopic dilatation of benign strictures in the esophagus is around 1:100. The risk of perforation during endoscopic ultrasonography is about 1:1000.

Gastrointestinal endoscopy is generally a safe procedure but is associated with complications. The most common early complications occur during or immediately after the procedure and include cardiopulmonary events, bleeding, and perforation. Most other complications occur 12 to 72 hours after the procedure and involve the recognition and treatment of lesions and wounds. Normally, they are admitted to the endoscopy unit, but if they are very sick, they will be sent directly to the ER and admitted to the hospital. These complications can be caused by the endoscopic procedure itself, the sedation used during the endoscopic procedure, or the lesions or pathology being endoscopically treated or diagnosed. These complications can be prevented and/or made to occur less frequently with proper patient selection and adequate preoperative, intraoperative, and postoperative care. (Lieber et al.2020)

2.1. Bleeding

Endoscopy is crucial in both the diagnosis and the treatment of lower gastrointestinal bleeding. However, the use of colonoscopy in the evaluation of the bleeding may also be associated with complications such as perforation, hemorrhage, and cardiorespiratory events. Colonoscopy-related bleeding occurs predominantly after polypectomy or biopsy of a lesion. The overall frequency of bleeding after diagnostic colonoscopy is low, with reported rates varying from 0.03 to 1.6%. After therapeutic colonoscopy, the incidence of bleeding is estimated to be 0.6 to 3.1% in patients who undergo polypectomy, and 1 to 2.4% in patients who undergo biopsy of a lesion. However, the true incidence of bleeding associated with colonoscopic polypectomy may be higher, as some studies have reported delayed bleeding in

patients who had already been discharged from the hospital. The exact risk factors for colonoscopy-related bleeding are unclear.

Upper gastrointestinal hemorrhage is a commonly encountered and potentially serious clinical problem. Endoscopy is the most accurate way to diagnose the cause of hemorrhage and to localize bleeding lesions. It can also provide therapeutic measures in some cases. However, endoscopic procedures may cause hematogenous bleeding either by laceration or by erosion of the mucosa. Such iatrogenic bleeding is more common in diagnostic than in therapeutic endoscopy, with an average frequency of 0.9 to 1.6% in diagnostic upper endoscopy. The incidence is higher in patients who have undergone biopsies, with the reported frequency ranging from 2.4 to 7.7%. Biopsy-associated bleeding is usually minor and self-limited, and rarely requires further intervention. It usually occurs 3 to 8 days after the procedure. (Kanno et al.2021)

2.2. Perforation

Endoscopic perforation of the upper GI tract most frequently occurs in the process of dilating strictures or performing other therapeutic procedures with the endoscope. The risk of perforation from diagnostic upper endoscopy with mucosal biopsy is also higher than that of the lower endoscopy. According to a large survey, the overall risk of upper endoscopic perforation was 0.09%, but it was only 0.02% without biopsy and 0.2% with biopsy. The perforation rate in pediatric upper endoscopy is likewise higher, because it is mostly related to dilatation of congenital or acquired strictures. Data from a large pediatric series showed a perforation rate of 0.8%. Perforation may not be immediately recognized at the time of endoscopy, and failure to do so could have catastrophic consequences. Although the risk of delayed perforation after diagnostic endoscopy without therapeutic procedure is exceedingly low, it could occur with clinically silent mucosal injuries, especially if patients are on anticoagulant therapy.

Perforation is the most serious and most feared complication of endoscopy. It may be caused by the endoscope itself or it may be secondary to mucosal injury produced by biopsy or polypectomy. The risk of perforation during diagnostic endoscopy without therapeutic procedures is low, usually 0.03% to 0.1% according to large survey studies. However, when endoscopic biopsy is performed in order to obtain tissue specimens for histological

examination, there is significant risk of perforation in some diagnostic and therapeutic situations. Large or rigid polyps account for most of the perforations during colonoscopy. The incidence of perforation during diagnostic sigmoidoscopy is likewise very low, but it is higher than during colonoscopy. Reported rates vary between 0.015 to 0.06%. (Paspatis et al.2020)

3. Less Common Complications

Another endoscopic microsurgical technique is the so-called polypectomy, used for the removal of benign large colonic polyps which could not be removed by colonoscopy. This lesion lies in the submucosa. If resected conventionally, the muscularis propria would be penetrated, and there is a serious risk of perforation. The complication of polypectomy, peculiar to this procedure, is the inadequate resection of the polyp. A local recurrence may then occur, which has usually a malignant degeneration. For these reasons all large benign-looking colonic polyps should be doubly checked: one extra time during colonoscopy, and a pathologist should confirm the benign nature of the lesion before its excision during polypectomy.

The accidental ligation of an artery during variceal sclerotherapy may have a lethal outcome. It is preferable to use a balloon catheter under direct vision in order to prevent this complication. Insertion of a nasogastric tube is always a blind procedure and should be avoided in patients with varices. They are often prevented from vomiting by medication (e.g., propranolol) and always have a risk of developing a hepatic coma, which would also increase the danger of nasogastric intubation blindly. (Gasser et al.2020)

The most serious, although fortunately extremely rare, esophageal complication is perforation. This can be caused by a too vigorous examination or a badly applied instrument. It can also be spontaneous in an already diseased or weakened wall, especially after biopsies. The main clinical feature is a sudden, severe chest pain which persists even when the patient is not swallowing. Subcutaneous emphysema and mediastinal air on a chest X-ray film are diagnostic. Treatment is then immediate with intravenous antibiotics and surgery. The natural course of an esophageal perforation is infection and mediastinitis, leading to sepsis unless it is rapidly removed by a thoracotomy.

3.1. Infection

Endoscopes are not capable of being sterilized by the usual methods because of plastic and optical components. High-level disinfection of the endoscope is recommended after each use to prevent transmission of infection. Infection could occur during colonoscopy because of breaches in standard endoscope cleaning and disinfection techniques. There have been reports of transmission of hepatitis B, non-A, non-B, and C viruses by inadequately sterilized endoscopes. The transmission of infection due to the endoscopic ultrasonography needle is one of the best-documented hazards of percutaneous endoscopic procedures; cases of transmission of Mycobacterium tuberculosis and cytomegalovirus have been reported. Disinfection methods for endosonography needles have not been standardized, but the risk of infection is likely to be reduced by appropriate microbiologic techniques. (Snyder, 2020)

Percutaneous endoscopic procedures may require transcutaneous passage of an endoscope for diagnostic and/or therapeutic intervention in the gastrointestinal tract. These procedures carry an increased risk of infection because of the introduction of exogenous skin flora to the endoscope and passage through the alimentary tract mucosa, which is known to contain potentially infectious microorganisms. Standard gastrointestinal endoscopy with esophageal dilatation, paracentesis, and percutaneous endoscopic gastrostomy are included in this group. The reported risk of infection after paracentesis is approximately 1%, with a higher reported risk after percutaneous endoscopic gastrostomy. Infection is a known complication after esophageal dilatation and usually presents as mediastinitis. Specialized microbiologic techniques have documented the presence of aerosolized microorganisms in the vicinity of the endoscope during endoscopic retrograde cholangiopancreatography; this is a recognized hazard of the procedure. (Limpias et al.2021)

3.2. Aspiration

To minimize the risk of aspiration, procedures should be as short as possible. It has been suggested that elective upper endoscopy require a mean time of 8.7 minutes to become worthwhile as a diagnostic or screening procedure. If the medical condition of the patient permits, brief interruptions of the procedure can be taken, during which the endoscope is removed and the patient is given

the opportunity to recover sufficiently to protect against aspiration. The next section discusses some of the other complications of gastrointestinal endoscopy.

During endoscopy, patients are placed in various body positions and given sedative medications. This can lead to respiratory depression, and the protective airway reflexes may be impaired. Additionally, endoscopy may release noxious gastrointestinal contents or other irritative substances. This can lead to coughing or laryngospasm, increasing the risk for aspiration. Small increases in the intrinsic positive end-expiratory pressure and decreases in blood oxygenation have been detected during upper endoscopy. Supporting these pulmonary effects during upper endoscopy, it has also been demonstrated that laryngopharyngeal and gastroesophageal reflux occur during upper endoscopy. (Goudra & Singh, 2020)

4. Risk Factors for Complications

In summary, the risk of developing a complication of endoscopy is certainly present but is extremely low. For those with suspected or known coagulopathy, appropriate adjustments in therapeutic endoscopy can be undertaken to reduce the risk. The patient who appears to be at highest risk for a procedure-related complication is one who is about to undergo therapeutic sclerotherapy for massive hemorrhage or liver transplantation prior to variceal formation.

The incidence of complications after both diagnostic and therapeutic endoscopy is extremely low. Patient-related risk factors include: known or suspected coagulopathy; recent myocardial infarction; advanced age; and the presence of multiple comorbid diseases. Sedation-related complications are the most common and may be reduced by careful monitoring of oxygen saturation and blood pressure. Most at risk for this complication are patients who are very old, have associated lung disease, or receive large doses of sedatives. Endoscopist-related risk factors are poor technique and lack of experience - violating rules of safety. Therapeutic procedure-related risk factors include the type of procedure and the use of sclerosing agents which create the highest risk of complications. Recent studies have reported the influence of patient position on cardiopulmonary complications during ERCP. (Săftoiu et al.2020)

4.1. Patient-Related Factors

It has long been recognized that increased physical status of the patient leads to a decreased rate of complications in both medical and surgical patients. The bleeding ulcer continues to have a mortality rate many times greater than the elective ulcer operation. The majority of problems and complications during and after endoscopy are related to drug administration, venting of air or CO2, or presence of foreign bodies in the gastrointestinal tract. High-risk patients are those who have an increased risk of complications because of the presence of one or more diseases. Typically, these patients are ASA risk class III or IV and have a higher likelihood of being admitted to the hospital, having an extended postoperative hospital stay, or experiencing problems either during or immediately after the examination.

The majority of problems and complications during and after endoscopy are related to drug administration, venting of air or CO2, or presence of foreign bodies in the gastrointestinal tract. The patient unwilling to cooperate can make both the examination and the therapeutic intervention hazardous, uncomfortable, or impossible to perform. A biting block or mouthpiece, gentle restraint of the patient, and explanation or reassurance by the medical or nursing staff will usually suffice in the uncooperative patient. Patient-related factors that may increase the risk of complications of endoscopy are: age, sex or pregnancy, presence of one or more diseases making the patient ASA risk class III or IV, and alcohol abuse. Before performing endoscopy, the physician should consider some special issues in the following types of patients: the very young, the elderly, pregnant women, mentally handicapped patients, and patients with specific diseases such as diabetes, heart or lung disease, or patients who are hemodynamically unstable with GI bleeding. (Gotoda et al.2021)

4.2. Procedure-Related Factors

Several endoscopic techniques can lead to arteriovenous fistulas. It has been reported that overinflation of the colon during colonoscopy and the use of laser therapy can precipitate colonic perforation. Other complications that result from excessively aggressive or blind techniques or overly zealous applications of therapy include perforation and fistula formation. Colonic perforation has been reported following blind application of a bougie during esophageal stricture dilatation. Adequate

supervision and caution in the performance of such procedures should prevent these complications.

A variety of procedure-related issues can increase the risks of endoscopy. Poor visualization leads not only to inadequate examination but also to potential complications. This may occur when blood, with its iron oxide content, is observed accumulating in the lumen or the loss of normally clear fluid; both are indicators of hemorrhage into the bowel lumen. In some cases, blood may be seen oozing from the mucosa and collecting in the lumen. These patients may have an acute gastrointestinal hemorrhage where lavage by the endoscopist is not feasible. (Mullady et al., 2020)

5. Prevention and Management of Complications

There are several important rules for prevention and management of endoscopy complications. If in doubt about any aspect of endoscopy or complications, an experienced endoscopist should be consulted. The endoscope should be introduced very gently and carefully through the mouth, pharynx and esophagus into the stomach and duodenum, and no forcing should be done at any stage. The upper endoscopy procedure is essentially a blind one, and so the direction in which the endoscope is passed is also blind. Therefore, professional skill and knowledge are required to ensure that the endoscope is advanced in the correct, safe manner. Advancement under direct vision is possible only during one specific stage of the procedure.

The ideal method of preventing complications is to avoid performing endoscopy in inappropriate or poor-risk patients. If the procedure is indicated, the endoscopist must accept full responsibility for providing appropriate surveillance and treatment of the patient during and after the endoscopic procedure. An endoscopist inexperienced in handling complications should have an assistant present who is able to help. Complications can largely be prevented by careful patient selection and through the use of proper techniques. When complications are recognized promptly, they can usually be managed easily and effectively with appropriate treatment.

5.1. Pre-Procedural Assessment

From a cardiovascular point of view, upper gastrointestinal endoscopy is usually well tolerated. The main sources of complications are the sedation, discomfort, vagal reactions, and

the actual endoscopy procedure. It is important to stress the potential hazards of endoscopy to the patient, and for the endoscopist to be able to recognize the onset of adverse reactions and to take appropriate action. The risk of serious complications during upper endoscopy, such as perforation and major hemorrhage, is very small, estimated at about 0.1%. The risk of perforation during diagnostic colonoscopy is also small; the reported incidence is 0.03 to 0.1%. The major hazards during colonoscopy are excessive sedation, autonomic disturbance, and perforation. The overall incidence of serious or fatal complications during or after colonoscopy is estimated to be about 0.15%, and the most common cause of major morbidity is thought to be perforation. For this reason, it is important, when planning a colonoscopic procedure, to take into account the conditions that predispose to perforation.

As we are cautiously optimistic about this new form of volume sensory experience, we must not forget that the most important component of endoscopy is the pre-procedural assessment. This serves several functions: to establish the indication for the procedure; to ensure that an informed and competent individual (patient) has given valid consent for the procedure; to assess the patient's general fitness and suitability for the procedure; and, in the case of therapeutic procedures, to plan the treatment. Ultrasonography is usually the best method for assessing the mass effects both within and outside the wall of the upper gastrointestinal tract. It is now part of the routine staged assessment of esophageal and gastric carcinoma. It also has a role in the assessment of submucosal lesions of the stomach and in the differentiation of benign and malignant mediastinal and periesophageal lesions. Computerized tomography is used when ultrasonography findings are inconclusive, and has a role in staging as well. (Vaicekauskas et al.2020)

5.2. Technological Advances in Endoscopy

With recent advances enabling less invasive and miniaturized diagnostic and therapeutic modalities to be performed via natural orifices, the discipline has started developing into natural orifice transluminal endoscopic surgery (NOTES). While the vision for NOTES is a lofty one, its main drawback at present is the high risk of complications associated with the access methods used to reach the peritoneal cavity and secure the gastrointestinal viscus for

reliable endoscopic interventions. It has been said that unless the complications of these access methods are addressed, the development of NOTES will be significantly hindered. Moreover, not only should the access-related complications be adequately addressed, the vision of NOTES may also be bolstered by advanced imaging systems, endoscopic instruments, and techniques that decrease the risk of therapeutic endoscopy-related hazards and complications. The development of new endoscopic technologies is therefore essential in both the refinement of NOTES and its underlying principles, as well as in the reduction of therapeutic endoscopy-related complications.

Endoscopy has become an indispensable means of both diagnosis and therapy in the fields of gastroenterology and surgical gastroenterology. While a number of complications related to endoscopy can be ascribed to human factors, a significant proportion is technology-related. Advances in endoscopic equipment design and manufacture can pave the way to decreased risk of examination difficulties, time taken, and adverse events or complications. Therefore, updated and modern technology is essential in alleviating some of the complications encountered during both diagnostic and therapeutic endoscopy. This review describes recent technological developments in the field of endoscopy that are specifically aimed at lessening gastrointestinal endoscopy-related complications. (Tieber & Lewandrowski, 2020)

6. Legal and Ethical Considerations

If the patient is a minor, incompetent, or is threatened with serious harm by his own actions, decisions regarding endoscopy must be made on his behalf. As members of a profession serving the public, physicians are given a number of special privileges by society. In return, we are expected to be guided by a code of ethics enforced by our peers. Autonomy respects the right of competent persons to make their own decisions regarding medical care. Informed consent is the mechanism through which patients can be given adequate information to allow them to make reasoned decisions about their medical care. Compliance with this requirement is designed to protect the patient, as well as the physician, and is a question of risk management as well as ethics.

As patient advocates, physicians practicing gastrointestinal endoscopy must not only strive to ensure good outcomes, but also be able to demonstrate that they have done everything reasonable

to minimize risk. Patient competence is an issue that arises frequently in gastrointestinal endoscopy. Often, a patient who refuses to permit examination or treatment is doing himself a disservice. However, that is his right, and his decision must be respected.

6.1. Informed Consent

Different medical specialists have their own unique ways to facilitate patient understanding and cooperation in the informed consent process. Surgeons allow ample time for preoperative discussion because the decision-making process for surgery is usually not an emergency. During the course of their surgical practice, they reaffirm such discussions when obtaining signed consents. Gastroenterologists often perform endoscopic procedures on new patients without prior discussion. Emergency admissions do not allow for any discussion; the procedure must be performed as a matter of urgency to save the patient's life. Patients' questions should be encouraged, and discussions should be held with the patients when their family members are present because family support plays an important role in the patients' decision-making process. Providing patients with written materials to take home for further reading can help reinforce their understanding of the proposed endoscopic procedure.

Informed consent has become an essential prerequisite before performing diagnostic, therapeutic, or experimental procedures on both humans and laboratory animals. It is a form of self-determination that allows a person to control what happens to his or her own body. It is not only a permission granted to a physician by a patient but a responsibility-sharing partnership agreed upon by both parties. This concept can only be fulfilled if the patient is adequately informed in layperson's terms about the nature of the endoscopic procedure, including its purpose, risks, benefits, complications, and alternative options. If complications are more likely to occur in patients who have not been properly prepared for an endoscopy, informed consent includes that part of the process of obtaining permission that involves instructions given by the endoscopist about the preparation requirements for the procedure. The more complex the procedure, the more detailed the discussion regarding the patient's informed consent should be. (Probst et al.2020)

6.2. Professional Liability

In a recent survey, more than half of the respondents of a national poll feared they would be victims of medical errors if they underwent surgery, although none had personal experience nor knew anybody who had gone through such an experience. Another survey revealed that more than one-third of the US population fear that during their lifetime, they will be badly injured because of negligent medical care. Moreover, the fear of inadequate medical care is, in fact, part of a more general fear of professionals, including lawyers, policemen, used-car salespersons, and journalists. All of this confirms the importance of awareness and the continuous improvement of professional performance in all domains, including medicine and therefore also endoscopy. In our technocratic societies, increasingly educated groups of citizens have become able to judge the quality of services provided by professionals.

The increased exposure of the endoscopist to complications-related lawsuits over the past years is a real concern. Referring to this situation as a malpractice crisis is appropriate. Not only have the number of lawsuits and complaints increased, but also the size of the awarded compensations. This evolution has occurred in spite of a real decrease in the number of complaints democratically. Also worrisome is the fact that a sizeable proportion of endoscopists who are subjected to a complaint for an alleged procedure-related injury do not find support and understanding among their colleagues, a necessary element when acting under stress from a legal perspective. The causes of this crisis are many-fold and sometimes inherent to the present tort system. The important impact of public opinion and the contribution of the News Media in the malpractice environment are also discussed.

References:

Ehfeda, M. A. M., Ganaw, A., Ahmed, S. M. G., Chanda, A., Mahood, Z., Jabira, S., ... & Zeeshan, Q. (2021). Anaesthetic Considerations in Gastrointestinal Endoscopies. In Esophagitis and Gastritis-Recent Updates. IntechOpen. intechopen.com

Limsrivilai, J., Sakjirapapong, C., Pongpaibul, A., Apisarnthanarak, P., Phaophu, P., Subdee, N., ... & Pausawasdi, N. (2021). Diagnostic Performance of Esophagogastroduodenoscopy, Colonoscopy, and Small

Bowel Endoscopy in Thai Adults with Chronic Diarrhea. researchsquare.com

Lieber, S. R., Heller, B. J., Martin, C. F., Howard, C. W., & Crockett, S. (2020). Complications of anesthesia services in gastrointestinal endoscopic procedures. Clinical Gastroenterology and Hepatology, 18(9), 2118-2127. cghjournal.org

Kanno, A., Yasuda, I., Irisawa, A., Hara, K., Ashida, R., Iwashita, T., ... & Yokode, M. (2021). Adverse events of endoscopic ultrasound-guided fine-needle aspiration for histologic diagnosis in Japanese tertiary centers: Multicenter retrospective study. Digestive Endoscopy, 33(7), 1146-1157. [HTML]

Paspatis, G. A., Arvanitakis, M., Dumonceau, J. M., Barthet, M., Saunders, B., Turino, S. Y., ... & van Hooft, J. E. (2020). Diagnosis and management of iatrogenic endoscopic perforations: European Society of Gastrointestinal Endoscopy (ESGE) position statement–update 2020. Endoscopy, 52(09), 792-810. thieme-connect.com

Gasser, M. C., Sadowski, B. W., Baird, D. E., & Kwok, R. M. (2020). Perforated Hemocholecyst: An Unintended Consequence of Endoscopic Variceal Ligation?. ACG Case Reports Journal, 7(4), e00369. lww.com

Snyder, G. M. (2020). Introduction to Transmission of Infection: Potential Agents Transmitted by Endoscopy. Gastrointestinal Endoscopy Clinics. [HTML]

Limpias Kamiya, K. J., Hosoe, N., Takabayashi, K., Hayashi, Y., Fukuhara, S., Mutaguchi, M., ... & Kanai, T. (2021). Factors predicting major complications, mortality, and recovery in percutaneous endoscopic gastrostomy. JGH Open, 5(5), 590-598. wiley.com

Goudra, B. & Singh, P. M. (2020). Oliceridine and its potential to revolutionize GI endoscopy sedation. Saudi Journal of Anaesthesia. lww.com

Săftoiu, A., Hassan, C., Areia, M., Bhutani, M. S., Bisschops, R., Bories, E., ... & Ponchon, T. (2020). Role of gastrointestinal endoscopy in the screening of digestive tract cancers in Europe: European Society of Gastrointestinal Endoscopy (ESGE) Position Statement. Endoscopy, 52(04), 293-304. thieme-connect.com

Gotoda, T., Akamatsu, T., Abe, S., Shimatani, M., Nakai, Y., Hatta, W., ... & Inoue, H. (2021). Guidelines for sedation in gastroenterological endoscopy. Digestive Endoscopy, 33(1), 21-53. [HTML]

Mullady, D. K., Wang, A. Y., & Waschke, K. A. (2020). AGA clinical practice update on endoscopic therapies for non-variceal upper gastrointestinal bleeding: expert review. Gastroenterology. gastrojournal.org

Vaicekauskas, R., Urbonienė, J., Stanaitis, J., & Valantinas, J. (2020). Evaluation of upper endoscopic and endoscopic ultrasound features in the differential diagnosis of gastrointestinal stromal tumors and leiomyomas in the upper gastrointestinal tract. Visceral Medicine, 36(4), 318-325. karger.com

Tieber, F. & Lewandrowski, K. U. (2020). Technology advancements in spinal endoscopy for staged management of painful spine conditions. Journal of Spine Surgery. nih.gov

Probst, A., Freund, S., Neuhaus, L., Ebigbo, A., Braun, G., Goelder, S., ... & Messmann, H. (2020). Complication risk despite preventive endoscopic measures in patients undergoing endoscopic mucosal resection of large duodenal adenomas. Endoscopy, 52(10), 847-855. [HTML]