Koksal AR and Ramazani-Necessary C, J Gastroenterol Hepatology Res 2019, 4: 025
DOI: 10.24966/GHR-2566/100025

HSOA Journal of Gastroenterology & Hepatology Research

Mini Review

Antibiotic Prophylaxis in Gastrointestinal System Endoscopy

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Abstract

Infections are a rarely observed complication following gastrointestinal endoscopic procedures. All endoscopic procedures are not shown to be equally risky. Transient bacteremia after the routine diagnostic procedures and clinically significant de-novo infections after the interventional endoscopic procedures should be considered as different circumstances. In addition, patient-related factors also play a very important role in the decision of antibiotic prophylaxis. Although there are many guidelines on this controversial issue, the number of recently published studies is low and the information may need to be interpreted considering clinical experience. We aimed to present a general opinion about the principles of prophylactic antibiotic usage in gastrointestinal endoscopic procedures in light of the information coming from the main clinical guidelines and some recent studies.

Abbreviation

ESD: Endoscopic submucosal dissection; EMR: Endoscopic mucosal resection; NOTES: Endoscopic surgery through natural openings; POEM: Peroral endoscopic myotomy

Introduction

Antibiotic prophylaxis in gastrointestinal (GI) endoscopic procedures has been a controversial issue for many years. Which patients are in need? Which procedures require antibiotic prophylaxis?Which antibiotics should be used in which doses? Is it given before or after the procedure? There are many guidelines published by international associations aiming to answer these questions [1,2]. Under normal conditions, occurrence of an infection after an endoscopic procedure is extremely rare. The main purpose of antibiotic prophylaxis is to prevent this rare complication. However, bacterial antibiotic resistance caused by unnecessary use of antibiotics, side effects of antibiotics, allergic reactions and drug costs are prohibitive factors in their use. Antibiotic prophylaxis was recommended for many gastrointestinal endoscopic procedures in previous years, especially in patients with heart valve disease, but this practice has completely changed today [1,3].

After endoscopic procedures, infections occur in two ways; the first way is that a microorganism in the body transfers to the blood flow as a result of mucosal trauma, which is called 'bacterial translocation' or 'bacteremia'. Another way is through use of endoscope and/or accessories to a previously known sterile cavity during procedures such as contrast injection, drainage, aspiration or pathological sampling [4].

In this regard, two important points should be considered when evaluating the patient:

1. Which procedure is going to be performed? Does the planned procedure pose a risk of a new infection or bacteremia?
2. What are the patient-dependent risk factors? What is the risk to the patient in terms of infectious complications? (Special patient groups such as patients with neutropenia, patients who have cirrhosis, renal failure or history of heart valve replacement).

Bacteremia and Infection Risk of Gastrointestinal Endoscopic Procedures

The risk of transient bacteremia following gastrointestinal endoscopic procedures is lower than that caused by many routine activities in daily life. For example, tooth brushing and flossing (20-68%), using toothpicks (20-40%), consuming chewable foods (7-51%) have a risk of temporary bacteremia [5,6].

High-Risk GI Endoscopic Procedures for Bacteremia

Dilatation in esophageal strictures

Multiple dilatations and malignancy-related dilatations have a higher risk [7].

Sclerotherapy for esophageal varices

The procedure of injecting a sclerosing agent into or around the varices is reported to have a 15% risk of bacteremia, but band ligation is not considered as a high risk [8]. In a recent study, 60 cirrhotic patients undergoing endoscopic band ligation for variceal bleeding and 112 elective ligation procedures were evaluated. *Streptococcus mitis* and *Staphylococcus epidermidis* were found in 3 post-procedural blood cultures. These findings were interpreted as transient bacteremia by the authors [9].

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Citation: Koksal AR, Ramazani-Necessary C (2019) Antibiotic Prophylaxis in Gastrointestinal System Endoscopy. J Gastroenterol Hepatology Res 4: 025.

Received: October 28, 2019; **Accepted:** November 07, 2019; **Published:** December 09, 2019

Endoscopic retrograde cholangiopancreatography (ERCP)

If there is a bile flow obstruction, the risk of bacteremia during the procedure as well as risk of post ERCP cholangitis are increased [10]. If biliary drainage is considered to be unsuccessful, antibiotics should be continued until drainage is achieved and cholangitis signs disappear. A review of the gastrointestinal endoscopic performance measures in ERCP and EUS procedures a published by European ESGE in 2018 emphasized the importance of pre-ERCP antibiotic use in patients with appropriate conditions [11].

Procedures with High Risk for Infection Independent of Bacteremia

Fine needle aspiration biopsy during the endoscopic ultrasonography (EUS-FNA)

Although this procedure has a low risk of bacteremia, the overall risk of infection has been found to be high [1]. The most important factor is the structure of the lesion. While the risk is higher with any intervention for cystic lesions, sampling of solid lesions is considered to be practically no risk of infection [12]. Prophylactic antibiotic usage before the puncture of cystic lesions is mentioned as another requirement for higher procedure performance in the ESGE review [11]. When all the results are evaluated, EUS-guided biliary drainage and cyst drainage are considered as high risk for infection and bacteremia [1].

Percutaneous endoscopic feeding tube placement (Gastrostomy-PEG- or Jejunostomy-PEJ-)

Studies have shown that pre-procedure antibiotic administration reduces the risk of wound infection at the site of tube insertion [13]. In a recent retrospective study of 781 patients, the rate of peristomal infection was reported to be 21.9%. The risk of peristomal infection was higher in patients receiving chemotherapy or radiotherapy [14].

The efficacy of submucosal gentamicin lavage before myotomy was evaluated in 124 POEM cases. This treatment does not reduce the risk of infection but may reduce the systemic inflammatory response [15]. In a prospective randomized controlled study by Lee et al., 100 patients undergoing colorectal ESD were evaluated. Post-ESD electrocoagulation syndrome was significantly low in the prophylactic ampicillin sulbactam group. In addition, C-reactive protein (CRP) elevation and abdominal pain were also observed less frequently in this group [16]. Although there is not much new information about these procedures in the literature, these procedures can be considered as high-risk procedures for bacteremia and de novo infections.

Procedures with Low Risk for Infection and Bacteremia

Diagnostic gastroscopy, colonoscopy and flexible rectosigmoidoscopy are considered low risk for infection and bacteremia [4,17]. Although a recent case of *Streptococcus Bovis* endocarditis has been reported after colonoscopic polypectomy, authors concluded that performing biopsy and polypectomy during the procedure is considered low-risk for infection and bacteremia [18].

Patient Factors and Special Patient Groups

Cardiac diseases

Patients who have prosthetic heart valves or history of infective endocarditis are considered to be high-risk cardiac lesions. However, guidelines in both cardiology and gastroenterology do not recommend prophylaxis before the GI endoscopic procedures even in these patients [1,2]. The only exception to this is to give prophylaxis in this group of patients if there is any known GI infection associated with active Enterococci before the procedure.

Immunocompromised patients

Although there are not enough studies with a high level of evidence, the risk of infection after GI endoscopy is increased in patients with severe neutropenia (<500 cells /mm^3) or advanced hematologic malignancy [19]. Therefore, to give an antibiotic prophylaxis before high-risk procedures is recommended. These patients should be followed up closely after low-risk procedures even if antibiotics are not given. Antibiotic prophylaxis before the endoscopic procedure is not recommended for immunocompromised patients who do not meet these conditions [1].

Cirrhosis

Patients with cirrhosis who present with GI bleeding should be given antibiotics whether endoscopic procedure is planned or not [20]. In addition, since the risk of bacterial translocation is higher in patients with cirrhosis and ascites, prophylaxis before high-risk procedures may be appropriate [21].

Patients with synthetic vascular graft

Prophylaxis is not required for low-risk endoscopic procedures. In high-risk endoscopic procedures, if the endoscopic procedure is elective, it is recommended to wait for 6 months after graft placement. If the patient is unable to wait for that period of time, the antibiotic prophylaxis should be given [2].

Patients with joint prosthesis

Antibiotic prophylaxis prior to GI endoscopic procedures is not recommended in the main guidelines [1,22].

Patients with peritoneal dialysis

Cases of peritonitis have been reported after colonoscopy and especially after polypectomy. In a study retrospectively evaluated 45 peritoneal dialysis patients undergoing endoscopy. The authors found that oral or intravenous prophylactic antibiotic use prior to non-EGD (non-esophagogastroduodenoscopy) examination significantly reduced the endoscopy associated peritonitis rate compared to that without antibiotic use [23]. However, in a recent prospective study showed that there was no significant difference in the rate of peritonitis between pre-procedure intraperitoneal antibiotic (ceftazidime) and non-antibiotic groups. In the same study, it was shown that polypectomy did not change the frequency of peritonitis [24]. Furthermore, The American Society of Gastrointestinal Endoscopy (ASGE) recommends that the peritoneal cavity should be empty and give antibiotic prophylaxis before the colonoscopy [1].

Which antibiotic should be given in which dose?

Antibiotics and their dosages according to patient and procedure risk are summarized in the table 1 [1,25,26].

Procedure	Patient/Clinical condition	Antibiotics and doses
PEG/PEJ	All Patients	• Cefazolin o 2 gr IV < 120 kg. within 60 min before the procedure o 3 gr IV ≥ 120 kg. • Penicillin allergy present: o Clindamycin 900 mg IV • MRSA risk present: o Vancomycin 15 mg/kg (max 2 g) IV infused over 60 to 90 min and beginning within 120 min before the procedure
ERCP	Biliary obstruction and cholangitis If bile duct drainage is insufficient (Primer sclerosing cholangitis, hilar stenosis, biliary problems after liver transplantation) If drainage is sufficient, antibiotics are not required.	• Ciprofloxacin 500 mg oral within 60 min before the procedure or the other alternatives, • Ciprofloxacin 400 mg IV infused over 60 min and beginning within 120 min before the procedure • Amoxicillin-clavulanate 1750 gr oral • Ampicillin-sulbactam 3 gr. IV • Ampicillin 2 gr + gentamicin 5mg/kg IV Antibiotics should be continue until to provide effective biliary drainage
EUS FNA	Drainage of pancreatic or mediastinal cysts Sampling for cystic mass lesions Walled-off pancreatic necrosis	• Ciprofloxacin 500 mg oral within 60 min before the procedure or, • Ciprofloxacin 400 mg IV infused over 60 min and beginning within 120 min before the procedure • Continue 3 days post-procedure.
ESD EMR POEM	Although there is no sufficient data, it can be given according to clinical experience.	Same as options for EUS FNA
High risk endoscopic procedures for bacteremia (Dilatation of esophageal strictures, sclerotherapy to esophageal varices)	Immunocompromised patients • Severe neutropenia (<500 cell/mm^3) • Advanced hematologic malignancy Cirrhosis with ascites	• Amoxicillin 2 gr oral within 60 min before the procedure or, • Ampicillin 2 gr IV/IM within 60 min before the procedure • Penicillin allergy present: • Clindamycin 900 mg IV
Colonoscopy or Polypectomy	Patients with Peritoneal dialysis	Ampicillin 2 gr + gentamicin 5mg/kg IV Max:120 mg pre-procedure

Table 1: Antibiotic doses according to endoscopic procedures and clinical conditions.

EUS: Endoscopic Ultrasonography; FNA: Fine Needle aspiration; ERCP: Endoscopic retrograde Cholangiopacreatography; EMR: Endoscopic mucosal resection; ESD: Endoscopic submucosal dissection; MRSA: Meticillin Resistant *Staphylococcus aureus*; POEM: Peroral endoscopic myotomy

Conclusion

Antibiotic prophylaxis in gastrointestinal endoscopic procedures is strongly recommended in two conditions: before the gastrointestinal endoscopic procedures with a high risk of developing new infections or patients whose disease increase susceptibility to infection and who will undergo a high bacteremia risk procedure. These guidelines form a road map based on the information provided by the medical literature. However, in borderline topics like antibiotic prophylaxis, it is necessary to interpret these information within one's own clinical experience.

Conflict of Interest

None declared.

Source of Funding

Ali Riza Koksal was supported by funds received from the Akdamar Fellowship Program, Department of Gastroenterology and Hepatology, Tulane University Health Sciences Center.

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