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Safety of endoscopic procedures after acute myocardial infarction: A systematic review

Marek Cena[1]*, Javier Gomez[1]*, Tareq Alyousef[2], Richard G. Trohman[3], Krzysztof Pierko[1], Rajender Agarwal[1]

[1]Department of Medicine, John H. Stroger Jr. Hospital of Cook County, Chicago, IL, USA
[2]Division of Cardiology, John H. Stroger Jr. Hospital of Cook County, Chicago, IL, USA
[3]Section of Cardiology, Rush University Medical Center, Chicago, IL, USA

Abstract

Background: *The management of patients who develop gastrointestinal (GI) bleeding after acute myocardial infarction (MI) is difficult due to concerns about possible cardiovascular complications. Gastroenterologists are often reluctant to perform endoscopic procedures despite urgent indications. We performed a systematic review of the literature to determine the safety of endoscopic procedures after MI.*

Methods: *We searched MEDLINE, EMBASE and the Cochrane Central Register of Controlled trials for controlled clinical trials or case series examining the diagnostic efficacy and complications of esophagogastroduodenoscopy (EGD), colonoscopy and flexible sigmoidoscopy after MI. Title and abstract screening was followed by full-text review with subsequent data extraction of included studies.*

Results: *A total of seven studies met inclusion criteria. Four studies evaluated safety and efficacy of EGD after MI. The reported complication rate ranged between 1–8%, with a large predominance of minor complications. We found one study addressing safety of flexible sigmoidoscopy that reported minor complications in two patients. We also identified one study addressing the safety of colonoscopy after MI, which showed a complication rate of 9%. Most of these complications were minor. A decision analysis was also included in this review.*

Conclusions: *Our review demonstrated that endoscopic procedures are safe and beneficial in stable patients with GI bleeding after recent MI and should be performed without a requisite delay. Unstable patients should undergo endoscopic procedures only in the intensive care setting, after stabilization and with close monitoring.* (Cardiol J 2012; 19, 5: 447–452)

Key words: endoscopy, myocardial infarction, systematic review

Introduction

Patients with myocardial infarction (MI) may, in theory, be more susceptible to cardiovascular complications caused by endoscopic procedures. Management of patients who develop gastrointestinal (GI) bleeding after acute MI, or patients with evidence of active GI bleeding at the time of MI is challenging. Despite urgent indications, gastroenterologists may be reluctant to perform endosco-

Address for correspondence: Rajender Agarwal, MD, MPH, Department of Medicine, Stroger Hospital of Cook County, 1901 W Harrison Street, Chicago, IL 60612, USA, tel: 215-873-1820, e-mail: rajender.agarwal@gmail.com

**Marek Cena and Javier Gomez contributed equally to the manuscript and should be treated as co-first authors.*

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Table 1. Sample search strategy for OVID MEDLINE.

Phase 1: Search terms for myocardial infarction
1. exp Myocardial Infarction
2. (myocardial adj infarction).mp.
3. exp Acute Coronary Syndrome
4. or/1-3
Phase 2: Search terms for endoscopy
5. exp Endoscopy
6. exp Endoscopy, Gastrointestinal or exp Endoscopy, Digestive System
7. exp Esophagoscopy
8. exp Gastroscopy
9. exp Duodenoscopy
10. exp Colonoscopy
11. (EGD or endoscopy).mp.
12. or/5-11
Phase 3: Combining the searches and restricting to English
13. 4 and 12
14. limit 13 to English language

pic procedures in patients with acute or recent MI. In the absence of diagnostic and therapeutic endoscopy, standard percutaneous coronary intervention (PCI) protocols, including anticoagulation or fibrinolytic therapy are frequently withheld resulting in poorer outcomes.

Currently, there are no guidelines to address these difficult issues. We performed a systematic review of the safety and efficacy of endoscopic procedures in the setting of acute or recent MI in order to clarify the risk/benefit ratio and provide preliminary recommendations.

Methods

Study selection

We searched MEDLINE (1950 to March 2012), EMBASE (1980 to March 2012) and the Cochrane Central Register of Controlled Trials (inception to March 2012) using keywords and/or medical subject headings (MeSH) for MI and endoscopic procedures. The detailed search strategy can be found in Table 1. We screened the titles and abstracts of references identified in our search and those meeting our inclusion criteria were retrieved for full-text review.

Two investigators (MC and JG) independently screened titles, abstract and full-texts. To be included, a study had to be a clinical trial or case series (with predefined inclusion study sample size above 20 patients), examining the diagnostic efficacy and complications of esophagogastroduodenoscopy (EGD), colonoscopy or flexible sigmoidoscopy within 30 days after MI. References not published in English were excluded.

Data extraction

We extracted data on the study design, patient population, endoscopic procedure used, and the size of the study sample. The primary outcome of interest was development of cardiovascular complications during or after the endoscopic procedures. In addition, we examined the efficacy of the endoscopic procedures in terms of diagnostic yield and impact on management.

Results

Study flow and characteristics

Our literature search yielded 420 references of which 25 full text articles were retrieved. Seven studies [1–7] met our predefined inclusion criteria.

Study characteristics are shown in Table 2. No randomized controlled trials were identified. Three studies were controlled clinical trials [1, 3, 4], three studies did not have control groups [2, 5, 6] and one was a decision analysis [7]. The seven studies included 1081 patients. All study participants had a diagnosis of GI bleeding (upper or lower) as the indication for endoscopy. Five studies included patients undergoing EGD [3–7], one evaluated flexible sigmoidoscopy [2] and one evaluated colonoscopy [1].

Outcomes

Flexible sigmoidoscopy. Cappell [2] evaluated the risks and benefits of flexible sigmoidoscopy after MI. This study demonstrated a diagnostic yield of 37%. Therapeutic benefit was achieved in 9% of patients. Two patients had complications, of which one was considered minor (asymptomatic transient bradycardia) and the other one was an MI.

Colonoscopy. A study by the same authors evaluated the safety and efficacy of colonoscopy after MI in a controlled trial, the control group included patients with GI bleed without history of MI. The diagnostic yield was similar, 46% in the MI group and 40% in the control group ($p = 0.47$). There was a higher complication rate of 9% (9 patients) in the MI group vs. 1% (1 patient) in the control group ($p < 0.03$). However, 8 of the 9 patients had minor complications (transient hypotension in 7 patients and transient bradycardia in 1 patient) which resolved upon conclusion of the procedure. One major complication was reported (death 14 h

Table 2. Study characteristics.

Author, year (reference)	Study design	Study objective	Population	N	Intervention	Control
Flexible sigmoidoscopy						
Cappell, 2004	Uncontrolled	Risk vs. benefit of flexible sigmoidoscopy after MI	Patients 30 day after MI	78	Flexible sigmoido-scopy	None
Colonoscopy						
Cappell, 2004	Controlled	Risk vs. benefit of colonoscopy soon after MI	Patients 30 days after MI	200	Colono-scopy	Patients having colonoscopy without MI
EGD						
Cappell, 1999	Controlled	Establish safety and efficacy of EGD after MI	Patients undergoing EGD within 30 days after MI	400	EGD	Patients having EGD without MI in last 6 months
Lin, 2006	Controlled	Predictors of endoscopic therapy in patients with UGIB and MI	Patients with UGIB and MI (7 days)	183	MI after UGIB	UGIB after MI
Mumtaz, 2007	Uncontrolled	Safety and utility of EGD in post-MI patients	Patients undergoing EGD within 4 weeks of MI	85	EGD	None
Spier, 2007	Uncontrolled	Safety and efficacy of EGD after MI	Patients undergoing EGD within 30 days after MI	135	EGD	None
Decision analysis						
Yachimski, 2008	Decision analysis	Safety of EGD prior to CATH in patients with MI	Patients with UGIB and MI	10,000 hypo-thetical	EGD before CATH	Direct CATH (no EGD)

CATH — cardiac catheterization; EGD — esophagogastroduodenoscopy; MI — myocardial infarction; UGIB — upper gastrointestinal bleeding

after colonoscopy) and was not believed by the investigators to be related to the procedure [1].

Esophagogastroduodenoscopy. Four studies evaluated the safety and efficacy of EGD after MI [3–6]. Mumtaz et al. [5] found a diagnostic yield of 88%. A therapeutic intervention was performed in 30% of patients at the time of the procedure. The complication rate was 8% (7 patients), which included hypotension (3 patients), bradycardia (2 patients) and hypoxia (2 patients). There were no procedure related deaths in the study.

Cappell and Iacovone [3] studied EGD after MI in a controlled study; the control group had similar indications for EGD without MI within 6 months. The diagnostic yield was 85% in the MI group and 83% in the control group ($p = 0.79$). There was a therapeutic benefit in 6% of the MI group patients. The complication rate was 1.5% (3 patients) in the control group and 7.5% (15 patients) in the MI group. Of these, complications in 13 patients were considered mild and included 11 instances of transient hypotension and 2 of transient hypoxia. The other 2 complications where major and included 1 fatal ventricular tachycardia and 1 near respiratory arrest.

Spier et al. [6] demonstrated that the diagnostic yield of EGD was 68.4% associated with a therapeutic benefit in 19.4% of patients. The complication rate was 1.5% (2 patients who experienced hypotension, bradycardia and hypoxia). In a subgroup analysis, there was no increased risk of complications in patients with ST elevation MI ($p = 1.0$), patients with depressed left ventricular function ($p = 0.41$) or those with elevated troponin levels ($p = 1.0$). Six patients had all three risk factors and did not experience any complications.

Lin et al. [4] evaluated predictors of endoscopic therapy in patients with both upper GI bleed and MI. In this study, groups were divided into patients

presenting with upper GI bleed who then developed an MI (GI bleed group) and patients presenting with MI who subsequently developed upper GI bleed (MI group). The diagnostic yield of EGD in both groups was similar — 78% in the GI bleed group and 80% in the MI group (p = NS). The therapeutic efficacy of EGD was 41% in the GI bleed group and 17% in the MI group (p < 0.01). Only severe complication rates were reported and were 1% in each group.

Decision analysis. Yachimski et al. [7] created a decision analytic model from a hypothetical cohort of 10,000 patients. Using decision analysis, patients with upper gastrointestinal bleeding (UGIB) and acute MI were assigned to one of two strategies: (1) EGD prior to cardiac catheterization (EGD strategy) and (2) cardiac catheterization without EGD (CATH strategy). In patients with overt UGIB, the EGD strategy resulted in 97 deaths per 10,000 patients, compared with 600 deaths per 10,000 patients with the CATH strategy. The EGD strategy also resulted in fewer non-fatal complications (1,271 vs. 6,000 per 10,000 patients). Conversely, in patients with occult GI bleeding, the EGD strategy resulted in more deaths (59 vs. 16 per 10,000 patients) and more non-fatal complications (888 vs. 160 per 10,000 patients) than the CATH strategy. Patients were stratified by cardiac risk categories based on ejection fraction (normal, moderately depressed or severely depressed), the degree of troponin elevation and STEMI vs. NSTEMI. There was no statistically significant association of any of these categories with endoscopy-related complications.

Discussion

The mortality from acute coronary syndromes has significantly decreased in the last few decades [8–10]. Most of the improvement in the 30-day post MI mortality comes from increased use of fibrinolytic therapy and PCI. Anti-platelet agents (such as aspirin, clopidogrel, prasugrel), glycoprotein IIb/IIIa inhibitors, as well as anticoagulation with unfractionated or low molecular weight heparin play an important role in peri- and post-PCI therapy. The use of anti-platelet agents and heparin carries an increased risk of bleeding. The majority of bleeding occurs at the site of vascular access [11] but gastrointestinal bleeding also takes place. Approximately 2% of patients undergoing PCI experience GI bleeding [11, 12]. GI bleeding following PCI prolongs hospital stay and carries increased mortality risk [12].

Endoscopy plays a major role in the diagnosis and therapy of GI bleeding. Endoscopic procedures, in general, are considered to be very safe and well tolerated with a very low complication rate in general population [13–15]. Mild complications in the form of alterations in heart rate, blood pressure, oxygen saturation, as well as ST-segment changes are well known and documented in the literature [16–25]. Acute and severe cardiovascular complications in the form of MI, vasovagal reaction, arrhythmias, and congestive heart failure occur very infrequently during gastrointestinal endoscopy with an overall incidence of 0.14% [26]. Serious complications occur exclusively in the setting of known underlying heart disease. In patients with severe coronary artery disease peri-procedural ischemia occurs in 16% of patients [27].

To our knowledge, this is the first systematic review on the safety of endoscopic procedures after MI. Our results demonstrated that EGD is safe and beneficial within one month after MI in relatively stable patients with significant bleeding and should be performed in these patients without unnecessary delay. The complication rate of endoscopic procedures after MI ranged from 1–9% with 81% being considered minor by the original investigators. All endoscopic complications in patients with MI were cardiopulmonary. The predominance of cardiopulmonary complications, as suggested by Cappell and Iacovone [3], probably occurs because MI decreases cardiopulmonary reserve but is not likely to affect the risk of other complications, such as gastrointestinal perforation or hemorrhage. Cardiopulmonary complications may also depend more on general clinical status, whereas other complications are more affected by the skill of the operator and the patient's anatomy [28].

The timing of endoscopy in relation to MI is likely important in terms of risk. Depending on the clinical scenario (e.g., hemodynamically significant vs. non-hypotensive GI bleeding), it may be reasonable to wait upwards of a week after MI before performing the endoscopy. In the study by Spier et al. [6], the complication rate of endoscopy performed on hospital day 0 vs. > 24 h after MI was significantly higher (11.8% vs. 0%, respectively, p = 0.02). The overall 30 day risk was low. Unfortunately, sicker patients are likely to require endoscopy sooner rather than later.

The general consensus on transfusion strategy in patients with coronary artery disease has been to maintain the hemoglobin level > 10 g. A recently published randomized controlled trial was the first to compare transfusion strategies in patients with acute MI. This trial showed that a transfusion threshold of hemoglobin < 10 g was associated with a significantly increased risk of death, recurrent MI

or new or worsening congestive heart failure compared with a transfusion threshold of hemoglobin < 8 g [29]. Thus, the benefits of prompt transfusion and urgent diagnostic/therapeutic intervention should be carefully weighed against the risks.

Patients with MI who develop GI bleeding are often on antiplatelet agents for primary or secondary prophylaxis. Current guidelines state that the decision to discontinue antiplatelet agents in the setting of an acute GI bleed should be made on an individual basis, and these drugs should be restarted as soon as the risk for cardiac events is thought to outweigh the risk of bleeding [30].

A review of the safety of endoscopic procedures such endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound was beyond the scope of our review due to their elective nature and available alternatives which may be less invasive and risky. However, it has been shown in the literature that ERCP also carries acceptable risks when performed soon after acute coronary syndrome [31].

Our review is limited by the small number of included studies. We found no randomized controlled studies and the numbers of patients in the included studies are small. Future research should focus on larger cohort studies and possibly prospective, randomized controlled trials, although the latter may be difficult to perform.

Conclusions

Our review suggests that relatively stable patients with significant bleeding or other strong indications for endoscopy should undergo the procedure even in the event of a recent or active MI. Such patients should have the procedure performed with electrocardiographic, blood pressure, and pulse-oximetry monitoring. Clinically unstable patients with hypoxia, hypotension, life-threatening arrhythmias, or angina are at an increased risk of cardiovascular complications from endoscopic procedures. Such patients might also undergo the procedure in an intensive care setting and after clinical stabilization. This may require transfusion of red blood cells in the case of severe blood loss, treatment of underlying cardiac conditions (such as decompensated heart failure, arrythmias etc.) or endotracheal intubation with mechanical ventilation [3].

Conflict of interest: none declared

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