

Appropriateness of Gastrointestinal Endoscopy: Risk of Complications¹

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Introduction

An endoscopic procedure is considered appropriate if the benefit for the patient exceeds the risks by a sufficiently wide margin that endoscopy is worth performing.

In November 1998, a multidisciplinary European expert panel convened in Lausanne, Switzerland, to discuss and develop criteria for the appropriate use of gastrointestinal endoscopy, a widely-used procedure, regarded as highly accurate and safe. A detailed description of the RAND appropriateness method, including the literature search process [2], and of the whole process, as well as the global results of the panel [1], are published as separate articles in this issue of the Journal.

The present article on complications of gastrointestinal endoscopy summarises the risks associated with upper and lower gastrointestinal endoscopy. For this purpose, a literature review was conducted, based on a systematic search of Medline, Embase and the Cochrane Library conducted up to the end of 1997 and completed with some key articles published in 1998. Updating and revision of the literature review is currently ongoing.

Literature Review

Endoscopy has a small, but definite risk of complications, including death. Most data describing complications of endoscopy have been assembled by means of retrospective case reviews from centres performing a large volume of procedures. These studies generally reflect the complication rate recorded by endoscopists with substantial skill and experience, and the rates reported may, therefore, not reflect the experience of a "typical" patient who undergoes an endoscopic procedure performed by a "typical" community-based endoscopist. In addition, there may be a sub-

stantial reporting bias in retrospective series. There are, unfortunately, no formal reporting requirements regarding endoscopic complications. Recently, a new system for defining endoscopic complications, emphasising the measure of importance, has been proposed [3].

Cardio-respiratory Complications

More than 50% of the morbidity and mortality from diagnostic endoscopic procedures relate to cardio-respiratory complications [4]. Most of these complications are attributable to the use of intra-venous sedation as premedication for endoscopic procedures. Adverse outcomes of upper and lower gastrointestinal endoscopy caused by conscious sedation have been reported with an incidence rate of 0.54% [5] and fatalities with a rate of 0.03% [5]. The overall complication rate was 1.35%, including perforation and hemorrhage. Most complications of gastrointestinal endoscopy are of cardio-pulmonary origin as a consequence of hypoxemia which may be related to the procedure itself, to conscious sedation or to a combined effect of both of these [6]. Numerous studies have assessed cardio-respiratory parameters such as oxygen saturation and blood pressure during endoscopy. Significant oxygen desaturation (< 90%) has been found in 7 to 40% of gastroscopies [6] and in 13 to 81% of patients undergoing colonoscopy [7]. Common methodological limitations are, however, apparent in most of these studies, which were either not placebo-controlled, not performed in a double-blind fashion, or which used higher doses of benzodiazepines than is at present recommended. In the USA and the UK, monitoring of oxygen saturation by pulse oxymetry has become standard practice.

Procedure-related Complications of Upper and Lower GI Endoscopy

Table 1 summarises the aggregate complication rates from 32 studies prior to 1981 [8] and in series reported since 1981 [4,9–11]. Mortality rates ranged from 0 to 0.07%, with total morbidity rates from 0.14 to 0.20% of cases, perforation in 0.01 to 0.2% of cases, and bleeding in about 0.02% of cases.

Complication rates for diagnostic colonoscopy are summarised in Table 2 [8,9,12–15]. Reported mortality rates ranged from 0.02 to 0.06%, with morbidity rates of 0.14 to 0.25%. The most common serious complications of colonoscopy were perforation (up to 0.2%) and bleeding (up to 0.11%).

Complication rates for therapeutic colonoscopy are shown in Table 3 [8,9,13,15–17]. Mortality rate was up to 0.04%. Bleeding occurred in 0.4 to 3.3%, perforation in 0.04 to 0.5%, and surgery was required in up to 0.42%.

Bacteriemia Resulting from Endoscopy

About 4% of patients develop bacteriemia associated with endoscopy, but there have only been a few case reports of significant clinical sequelae [18–20]. The American Society for Gastrointestinal Endoscopy recommends antibiotic prophylaxis for ERCP, stricture dilation and varice sclerosis in patients with a history of endocarditis, prosthetic valve or systemic pulmonary shunt, but not unequivocally for other endoscopic procedures. In addition, antibiotic prophylaxis is clearly recommended for obstructed bile ducts and for endoscopic feeding tube placement [21].

Iatrogenic Infection

Transmission of infectious material via contaminated endoscopes can occur, usually resulting from improper cleaning and disinfection procedures, as well as problems related to equipment design. A review performed in 1993 located 281 reports of infections transmitted by endoscopy [22]. The authors point out that the reported number of cases

Table 1 Complication rates (%) in patients undergoing diagnostic UGI endoscopy

Reference	Number of procedures	Mortality (%)	Total (%)	Perforation (%)	Morbidity			
					Bleeding (%)	Drug (%)	Cardioresp. (%)	Other (%)
Kahn [8]	315 758	0.01	0.20	0.04	0.02	0.10	0.05	0.01
Miller [11]	252 858	0.005		0.008			0.73	
Raiertsen [9]	7 314	0.04	0.14	0.01	0.06		0.06	
Rodney [10]	717	0	0.14					

Table 2 Complication rates (%) in patients undergoing diagnostic colonoscopy

Reference	Number of procedures	Mortality (%)	Total (%)	Bleeding (%)	Morbidity		
					Perforation (%)	Other (%)	Surgery (%)
Kahn [8]	85 545	0.02	0.25	0.03	0.20	0.03	0.05
Macrae [14]	5 000	0.06		0.02	0.06		
Gilbert [12]	4 713	0		0.11	0.17		
Hahr-Gama [13]	3 256	0		0	0.06		
Reiertsen [9]	3 538	0	0.14	0.03		0.11	
Waye [15]	1 320	0	0	0	0	0.3	

Table 3 Complication rates (%) in patients undergoing therapeutic colonoscopy

Reference	Number of procedures	Mortality (%)	Total (%)	Bleeding (%)	Morbidity		
					Perforation (%)	Other (%)	Surgery (%)
Kahn [8]	25 558	0.04	2.16	1.67	0.46	0.07	0.32
Waye [15]	777	0	4.8	3.3	0.3		
Shiaya [16]	5 500	0		0.4	0.04		
Hahr-Gama [13]	911	0	0.99	0.66	0.33		
Reiertsen [9]	952	0	7.2	1.2	0.5	4.5	0.42
Nivatonga [17]	1 172	0	1.2	0.6		0.7	0.17

probably substantially underestimate the true transmission rate. There were no reports of transmission of HIV infection by endoscopy, although one case of hepatitis B virus transmission was documented. A case of transmission of hepatitis C virus during colonoscopy was reported very recently [23].

Summary

The balance between risks and benefits of gastrointestinal endoscopy for a given patient is essential in defining the appropriate use of endoscopic procedures. The current literature suggests that gastrointestinal endoscopy infrequently results in major procedure-related morbidity and mortality, while cardio-respiratory events occur commonly. However, true complication rates may be underestimated due to inconsistencies in the types of complications reported. No formal reporting requirements exist, and most of the published studies on complications come from centres with highly-skilled endoscopists.

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