Prevalence and Outcome of Upper Gastrointestinal Bleeding Post-coronary Artery Bypass Graft

Badr Aljarallah[1], Winnie Wong[1], Dennis Modry[2] and Richard Fedorak[1]
Departments of Medicine[1] and Surgery[2], University of Alberta

Abstract:

Background: Upper gastrointestinal bleeding (UGIB), a potentially fatal occurrence, can sometimes follow coronary artery bypass graft (CABG) surgery. However, little has been published about its prevalence, risk factors, and outcomes.

Aim: This study aimed to determine the rate, etiologies, predisposing factors, and outcomes of UGIB following CABG.

Method: The authors conducted a retrospective chart review of all UGIBs which followed CABGs performed at the University of Alberta Hospital from January 1, 1998 to December 31, 2002.

Results: During the study period, 4,502 CABGs were performed at the UAH. Eighteen patients (0.4%) had a documented major UGIB (defined as evidence of melena, red or coffee-grounds emesis, blood per NG tube, or a decrease of Hgb by > 20 g/l and requiring a confirmation by endoscopy or radiological study). Two of these 18 patients (11%) had a past history of peptic ulcer disease, and one of these patients had had previous UGIB. Three patients (17%) had been taking proton pump inhibitors (PPI) before the UGIB occurred. At the time of UGIB, PPIs were prescribed for 16 patients (89%), and the PPIs achieved effective hemostasis as a single agent for 10 (62.5%). Of the 18 patients, 16 (89%) underwent upper GI endoscopy. Bleeding was found to be due to duodenal ulceration in 9 (56%), esophagitis in 4 (22%) and gastritis in 6 cases (33%); fifty percent of these patients had multiple sites of bleeding. Endoscopic therapeutic intervention was needed by 6 patients (37.5%), and successful hemostasis was achieved for 5 of these patients (83%). One patient had a recurrence of bleeding and required surgery. One patient underwent surgery as the primary hemostatic therapy after a diagnostic endoscopy. The overall surgical rate was 11.1% for this patient cohort. In this cohort, three patients died, two from multi-organ failure, and the third, a surgically managed patient, had a cardiac arrest 72 hours post-surgery. The number of complication increased as both cardiopulmonary bypass and cross clamp time increased. There were no endoscopy-related complications.

Conclusions: UGI bleeding following CABGs is relatively infrequent, occurring at a rate of 0.4% in this study. Upper gastrointestinal bleeding post-CABG is most frequently related to a duodenal ulcer, though 50% of the patients had multiple bleeding sites. prolonged bypass and cross clamp time associated with more complications.

Keywords: Upper gastrointestinal bleeding, Coronary artery bypass surgery, Post-operative complications.

Correspondence:
Badr aljarallah
Department of Medicine
Qassim University
E-mail: bmj@qumedicine.org

Introduction

Significant upper gastrointestinal (UGI) hemorrhage is an infrequent but potentially lethal complication associated with coronary artery bypass grafting (CABG). This operation has now become one of the most common major procedures done in many hospitals; hence, the numerical importance of this significant complication is also rising. At present, however, there is no truly recent data available related to the incidence or outcome of UGI bleeds in North America, and no Canadian data has been published at all. Table 1 outlines the published studies which have addressed gastrointestinal bleeding post-CABG during the last 35 years. These studies report the frequency of UGI bleeding following CABGs to lie somewhere between nil and 11%. The studies with the highest reported rates of bleeding post-surgeries are those conducted in the 1970s and 1980s, prior to the implementation of what are now routine preventive measures and to the use of interventional endoscopic therapy.

Table 1. Previous Reports

Study	Total Cohart	UGI Bleed(%)	Mortality%	Gender%
Mead [1]	246	5 (2%)	-	-
Lebovics[13]	4892	18 (0.4)	11.1	89% M
Norton[25]	10,573	55 (.5)	1.8	91%M
Welsh[3]	7,333	16 (.22)	81	50%M
Katz[2]	100	8 (8)	-	73%M
Rosen[18]	9,199	25 (.27)	28	65.4%M
Hanks[5]	5080	19 (.37)	38 M -33 S	74%M
Welling[9]	1596	1 (.06)	0	100%M
Spotnitz[23]	1831	16 (1)	31	
Moneta[8]	2,428	2 (.08)	-	86%
Ohri[14]	4629	20 (.4)	20	75%M
Huddy[16]	4473	20 (.45)	55	80%Ma
Christenson[19]	3493	13 (.4)	7.7	85%Ma
Taylor[4]	5000	38 (.76)	23.60	76%Ma
Egleston[20]	8559	22 (.26)	22.7	57%Ma
Johnston[17]	5438	36 (.66)	16.6	71%Ma
Tsiotos[21]	19,246	44 (.23)	20	74%Ma
Perugini[24]	1477	20 (1.35)	15	68.4%Ma
Krasna[12]	1279	5 (.39)	33	60%M
Pinson[6]	5682	NIL		
Heikkinen[11]	1686	17 (.976)	53	79%Ma
Aranha[7]	5719	24 (.42)	0	72.6%Ma
Mercado [22]	4923	26 (.52)	50M-67S	64% Ma
Leitman[10]	6,4 52	20(.3)	45	53%M
Jayaprakash[27]	2274	20(0.9%)	15%	70%M
Simic[26]	4288	10(0.2%)	10%	56%M

UGI upper gastrointestinal
M Male
Ma Gender percent for the whole study

Methods

The University of Alberta Hospital is a university teaching center and a tertiary care referral hospital located in Edmonton, Alberta. It serves a catchment area of over 1.8 million people from central and northern Alberta, northwestern Saskatchewan, northern British Columbia and the Northwest Territories. CABGs required by those in this catchment area are only performed at the University Hospital in Edmonton, where there are six cardiac surgeons who specialize in adult care. Approximately 800-1000 of these CABGs are performed annually. All CABGs performed at the University Hospital between January 1, 1998 and December 31, 2002 were evaluated. The University of Alberta Hospital uses the international classification of disease (ICD) coding, on a prospective basis, to identify procedures and diagnoses for all patients encountered. Previous reports have shown that most gastrointestinal bleeding associated with CABGs occurs within 40 days of the CABG procedure [5-26]. All incidents of gastrointestinal bleeding within 40 days post-CABG were therefore isolated using the code descriptions listed in Table 2.

Table 2. ICD Code descriptions

Procedures
Bypass coronary artery one vessel
Bypass coronary artery two vessels
Bypass coronary artery three vessels
Bypass coronary artery four vessels
Endoscopy esophagus
Endoscopy jejunum
Endoscopy stomach
Biopsy gastroesophageal junction
Biopsy duodenum endscopic
Biopsy duodenum brush
Biopsy esophagus
Biopsy jejunum closed
Biopsy stomach closed
Diagnosis
Unspecified esophagitis
Other esophagitis
Ulcer of esophagitis
Esophageal haemorrhage
Mallory Weiss syndrome
Acute gastric ulcer with haemorrhage +/- perforation
Chronic or unspecified gastric ulcer with haemorrhage +/- perforation
Acute duodenal ulcer with haemorrhage +/- perforation
Chroni/unspecified duodenal ulcer with haemorrhage +/- perforation
Acute peptic ulcer with haemorrhage +/- perforation
Chronic/unspecified peptic ulcer with haemorrhage +/- perforation
Acute gastroesophageal ulcer with haemorrhage +/- perforation
Chronic/unspecified gastroesophageal ulcer with haemorrhage +/- perforation
Acute gastritis/duodenitis
Unspecified gastric and duodenitis
Dieulafoy's lesion

The appropriate patient records were then retrieved and hand-searched to confirm major gastrointestinal bleeding according to the following criteria: a) One or more of the following events: bright red hematemesis, malena, coffee-grounds emesis or an acute decrease in the hemoglobin level by >20 g/l, and b) Confirmation by endoscopy or radiological study. The data was extracted to identify patient demographics, including types of bypass procedures, cardiac bypass times, cross-clamp times, nature of the surgery (emergency or elective), comorbidity, ASA or NASIDs use, use of anticoagulants, evidence of previous peptic ulcer disease, previous bleeding, previous endoscopies and other investigations and therapies, smoking histories, and time intervals between the procedure and the bleeding incident. Diagnoses, as well as medical, surgical, and endoscopic therapies, were recorded. Finally, the outcome, including mortality, was noted. The medical therapy included IV proton pump inhibitors (omeprazole, pentaprazole, lanzoprazole). Therapeutic endoscopy includes the injection of adrenaline or cautery therapy. The average time between surgery and discharge for this patient's cohort was 5-15 days, but all patients who were still in the hospital and experienced a UGI bleed up to 40 days post-op were included in the study.

Results

As shown in Table 3, a total of 4,502 CABGs were performed in the 5 years between January 1998 and December 2002. Fifty-six records were initially isolated for review based on the search criteria outlined above. After a hand-search through all 56 retrieved cases, 18 of these records were found to belong to patients who had had upper gastrointestinal bleeding post-CABG. This number represents 0.4% of the total number of patients who underwent CABGs in the same period. On average, the bleeding occurred 13 days after the bypass surgery. Part of the routine protocol at the University Hospital is to give patients Aspirin (81 mg 6 hours post-surgery) and Ranitidine (150 mg 1 day before surgery and again after surgery). Four patients were fully anticoagulated at the time of haemorrhage (22%).

Table 3. Number of upper gastrointestinal bleeds

Procedures	Patients
Total coronary bypass surgeries	4,502
Upper gastrointestinal bleeding post-CABG	18
Total deaths	3
Medical management	16
Surgical management	2

CABG: Coronary Artery Bypass Surgery.

Table 4 outlines the results which show that 11% of 18 patients (n2) had been previously diagnosed with peptic ulcer disease, and 3 patients (16%) were taking proton pump inhibitors.

Four patients (22%) were being treated with NSAIDs. Fifty percent of these patients (n9) had a bleed caused by duodenal ulceration. Six patients bled due to gastritis (33%), six patients (33%) from gastric ulcer, and four from esophagitis (22%). These numbers add up to more than 100% because 50% of these patients (n9) received more than one diagnosis. At the time of bleeding, proton pump inhibitors were prescribed for 16 patients (89%), and this treatment achieved effective homeostasis as a single agent for 10 patients (62.5%). Eighty–nine percent of the 18 patients (n16) underwent endoscopy. Two patients did not undergo endoscopy because their conditions suddenly deteriorated. Therapeutic endoscopy was needed by six patients (37.5%), and successful homeostasis was achieved for five patients (83%). Endoscopy was repeated (as a second look) for seven patients out of 16 (43.7%), and one of these endoscopies was therapeutic. There were no endoscopy–related complications. In this group of patients, two required surgery: one patient had a recurrence of bleeding and required surgery, and one patient underwent surgery as primary haemostatic therapy after diagnostic endoscopy. The average ICU stay for this group was 9.7 days. In this cohort, 3 patients died (16.6%), two from multi-organ failure and the third patient from a cardiac arrest 72 hours post-surgery.

Discussion

These results indicate that UGI haemorrhage is a relatively infrequent complication of CABG surgery, occurring in 0.4% of this patient group. The last investigation in North America to address this subject took place in 1997 by Perugini et al. with an incidence of 1.3% .

Table 4. Patient characteristics

Cases	Age (Years)	CPT Min	CCT Min	P OP Days	Diagnosis	Method	Endosc1	Endosc2	Therapy	ICU	Compli	Disch
1	58	120	83	17	Esophagitis, gastritis	Melena	Diagnostic		Medical	48	146	Died
2	71	230	113	7	GU, esophagitis	Melena	Diagnostic		Medical	3	1	Discharged
3	65	78	50	3		Hematemesis				1	7	Died
4	69	240	63	8		Hematemesis			Medical	13	1,345	Died
5	66	111	69	9	DU	Drop of Hgb	Therapeutic		Medical & surgical	5	6	Discharged
6	68	137	46	26	GU, esophagitis, gastritis	Coffee-ground emesis & drop of Hgb	Therapeutic	Therapeutic	Medical	30	145	Discharged
7	67	86	55	8	DU	Drop of Hgb	Therapeutic		Medical	1		Discharged
8	68	237	188	14	Gastritis	Drop of Hgb	Diagnostic	Diagnostic	Medical	18	156	Discharged
9	58	90	51	6	DU	Drop of Hgb	Diagnostic		Medical	5		Discharged
10	71	127	72	4	GU, esophagitis	Melena	Diagnostic		Medical	1		Discharged
11	73	131	61	26	DU	Melena & drop of Hgb	Diagnostic	Diagnostic	Medical & surgical	1	46	Discharged
12	79	196	172	5	DU, GU	Hematemesis, melena & drop of Hgb	Therapeutic	Diagnostic	Medical	4		Discharged
13	49	52	28	21	DU, gastritis	Hematemesis, melena & drop of Hgb	Diagnostic		Medical	1		Discharged
14	77	100	54	1	DU, GU	Hematemesis	Therapeutic	Diagnostic	Medical	1	456	Discharged
15	71	79	44	5	Gastritis	Melena & drop of Hgb	Diagnostic		Medical	1		Discharged
16	78	80	47	10	DU	Melena & drop of Hgb	Therapeutic	Diagnostic	Medical	30	6	Discharged
17	71	155	100	29	Mucosal oozing	Melena & drop of Hgb	Diagnostic		Medical	2	56	Discharged
18	78	234	200	40	DU, GU	Hematemesis	Diagnostic	Diagnostic	Medical	11	46	Discharged

A few reports from Europe have recently come out with similar results to ours. Most of the studies on CABGs and UGI bleeding, however, were carried out in the 1970s and 1980s before the invention of new treatment modalities. These studies were also usually undertaken as investigations of whole GI complications [1-27]. The reported frequency of significant UGI bleeding post-CABG ranges from zero to 11.1% (Table 1) and mortality in this small group is reported to be as high as 81%. The incidence of milder UGI bleeding that does not require transfusion or intervention may be much higher [24]. Upper gastrointestinal heamorrhage due to stress ulceration is the most commonly identified mechanism [27]. Stress ulceration has been attributed to ischemia and/or reperfusion injury of the splanchnic territory and endotoxemia leading to the impairment of gastric and duodenal mucosal defense mechanisms [19, 27-34]. According to previous cohort studies, several factors increase the risk of bleeding in this setting, including the duration of the cardiopulmonary bypass time, cross clamp time, and the need for iontropes [22]. Prolonged mechanical ventilation is an independent risk factor [27, 35]. Our study showed a clear correlation between complications and prolonged cross clamp and cardiopulmonary bypass times (Figs. 1 and 2).

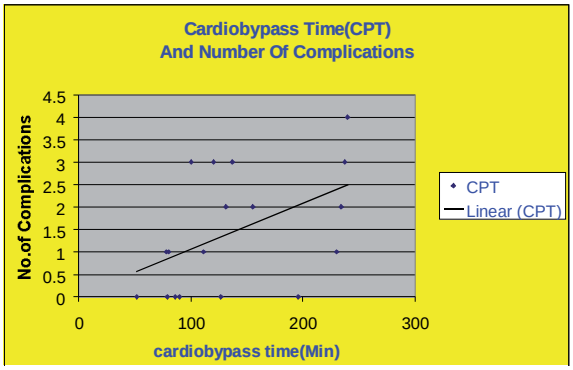

Fig. 1. Cardio bypass time and number of complications.

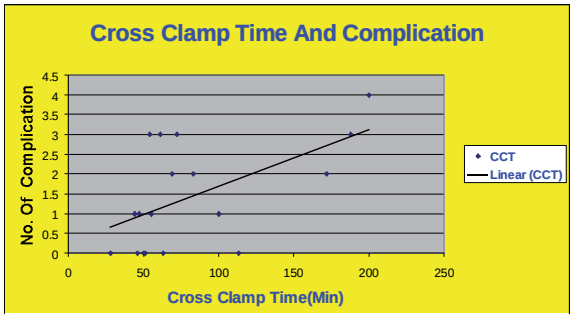

Fig. 2. Cross clamp time and complications.

According to Halm et al. [27], Helicobacter pylori does not appear to be associated with stress ulceration in critically ill patients. Proton pump inhibitors were the main agent used to achieve effective homeostasis as a single agent for 62% of those concerned, and the PPIs had a good safety profile. We are unable to comment on the specific drug efficacy of proton pump inhibitors as a class due to the small number of patients with UGI bleeding, and we could not compare the doses and methods of delivery due to the multiplicity of regimens. For this cohort, endoscopy was a safe procedure associated with a lack of complications, as has been previously reported [4, 12]. Interestingly, the need for surgery was very low, lower than the numbers reported in most studies [2, 18]. Because of the small number of therapeutic endoscopies (n6), we were unable to compare the two modalities of therapy (PPI and endoscopy).

Conclusion

UGI bleeding following CABGs is a relatively infrequent complication, occurring at a rate of 0.4% in this cohort of patients. Upper gastrointestinal bleeding post-CABG most frequently related to duodenal ulceration, though multiple sites of bleeding are reasonably common prolonged bypass and cross clamp time associated with more complications.

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