Gastroduodenal major haemorrhages in critical patients
An original surgical technique

Francesco Cortese, Sara Colozzi, Roberto Marcello*, Irnerio Angelo Muttillo, Francesco Giacovazzo, Matteo Nardi, Alessandro Mero

A.C.O. “San Filippo Neri”, Rome, Italy
U.O.C. di chirurgia d’urgenza (Chair: dr. A. Mero)
*U.O.C. di radiologia (Chair: f.f. dr A. Perozzi)

Gastrointestinal major haemorrhages in critical patients. An original surgical technique

AIM: Upper gastrointestinal bleeding represents today a serious pathology with two important problems: mortality and correct management. Our study is a review of recent and past literature about causes, diagnosis and treatment of upper gastrointestinal bleeding.

PERSONAL EXPERIENCE: The Authors describe an original surgical technique in treating patients with gastroduodenal haemorrhages and critical circulatory-coagulative conditions. Any surgical resective procedure could be absolutely unacceptable for the rates in morbidity and mortality in these absolutely unstable patients. We approached the problem with a control damage surgery by endoluminal packing of the stomach or the duodenum.

KEY WORDS: Damage control surgery, Endoluminal packing, Gastroduodenal haemorrhages, Haemorrhagic shock, Nonvariceal upper gastrointestinal bleeding.

Introduction

Nonvariceal upper gastrointestinal bleeding (NVUGIB) has a major impact on daily clinical practice, and is one of the most common reasons for urgent surgical consultation with an incidence in the western countries estimated to be 50-150 cases per 100.000 persons. NVUGIB, although less critical than variceal hemorrhage, is nevertheless a very serious condition with mortality rates ranging from 6-11%. The most common causes of NVUGIB, occurring in patients of all ages, are peptic ulcer disease (35-50%) and/or erosive gastroduodenitis (8-15%), neoplasia (1%), Mallory Weiss Syndrome (15%), aortoenteric fistulae (5%), gastric and duodenal diverticulae (5%), the latter being especially serious, sequelae of bariatric surgery (3%), angiodysplasia (10,20). Other causes include Dieulafoy’s disease (2%), cytomegalovirus (27,30), helicobacter pylori or human herpes virus (6,31-36), changes in coagulation status either due to pathology or specific therapy, steroids, nonsteroidal anti-inflammatory drugs (NSAIDS), the sequelae, even late sequelae, of surgery (37,38), Dengue virus (39) and the GAVE (40).

Treatment of NVUGIB in patients with important comorbidities (cardiac, respiratory and metabolic) is especially complicated. Due partly to the aging of the population the number of patients with chronic diseases has
increased with the result that there are many patients receiving chronic and complex medical treatment. According to the Italian Drug Regulation Agency (Agenzia Italiana del Farmaco - AIFA) 55-60% of patients are not on “me-too” drugs. The Italian Federation of Centers for the Surveillance of Anticoagulant Therapy (Federazione Centri Sorveglianza Anticoagulant) reports that there are 1.000.000 - 1.500.000 patients treated with oral anticoagulants, but there are no exact data on patients taking platelet aggregation inhibitors, whether clopidogrel or ticlopidine/ salsalates. The management of these patients is fraught with problems due to the characteristics of NVUGIB. The basic treatment algorithm for NVUGIB has been well described in the literature and angiography which, due to success rates of 80% and 95% respectively, are first-line treatment either singly or combined. In our opinion this algorithm has a grey zone: the clinical and logistic approach to patients who are hemodynamically unstable, who have blood-clotting abnormalities, who are in hospitals where neither operative endoscopy nor interventional radiology are available, or have already been treated unsuccessfully with both methods and therefore require surgery. For this reason at our unit of emergency surgery we have developed the technique of “endoluminal packing”. This technique, associated with primary control of bleeding, has enabled us to treat patients in severe hemorrhagic shock, who could not be treated with any type of surgical resection due to absolute severe clinical instability.

**Methods**

In the period from February 2010 to December 2011 5 patients were treated with this technique at our unit. There were 2 males and 3 females, with an average age of 74.8 years (RANGE:64-86 YEARS). All 5 patients were in a state of severe hemodynamic instability with an average hemoglobin level of 6.5 g/dl and an average international normalized ratio (INR) of 3. One patient (20%) had alcholol-related cirrhosis of the liver and full-blowed portal hypertension, 3 patients (60%) were on vitamin K antagonists because of chronic atrial fibrilla- tion, 1 patient (20%) had a history of pulmonary embolism, 4 patients (80%) had arterial hypertension, 1 patient (20%) had an abdominal aortic aneurysm, 2 patients (40%) had chronic obstructive pulmonary disease, 1 patient(20%) had mitral regurgitation, and one (20%) had a history of stroke.

Two patients were transferred to our unit from another hospital for an EGD, 2 patients were transferred from the emergency department after resuscitation of hemorrhagic shock, and 1 patient had been admitted to the gastroenterology unit for recurrent melena. All patients underwent esophagogastroduodenoscopy (EGD) and 2 patients also underwent arteriography. The

<table>
<thead>
<tr>
<th>Name</th>
<th>Age (years)</th>
<th>Sex</th>
<th>BMI (kg/m²)</th>
<th>Transferred from</th>
<th>Comorbidity</th>
<th>Prognosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GT</td>
<td>86</td>
<td>F</td>
<td>27</td>
<td>Intensive care</td>
<td>HTN, MR, history of PE</td>
<td>Discharge on PO day XV</td>
</tr>
<tr>
<td>GG</td>
<td>71</td>
<td>M</td>
<td>32</td>
<td>Gastroenterology</td>
<td>HTN, AAA, history of stroke</td>
<td>Death on PO day I</td>
</tr>
<tr>
<td>AT</td>
<td>64</td>
<td>M</td>
<td>26</td>
<td>Other hospital for EGD</td>
<td>Alcoho-related cirrhosis, portal hypertension</td>
<td>Death on PO day XXX</td>
</tr>
<tr>
<td>AMG</td>
<td>81</td>
<td>F</td>
<td>28</td>
<td>Other hospital for EGD</td>
<td>HTN, COPD (pulmonary emphysema)</td>
<td>Discharge on PO day XXVI</td>
</tr>
<tr>
<td>CG</td>
<td>72</td>
<td>F</td>
<td>26</td>
<td>Intensive care</td>
<td>HTN / COPD Treated with steroids and ASA</td>
<td>Discharge on PO day XXIII</td>
</tr>
</tbody>
</table>

Legend: PE: pulmonary embolism; HTN: arterial hypertension; MR: mitral regurgitation; AAA: abdominal aortic aneurysm; ASA: acetylsalicylate; COPD: chronic obstructive pulmonary disease; BMI: body mass index; EGD. Esophagoduodenoscopy; PO: postoperative.
following surgical procedures were performed: gastroto-
ymy (n=2), duodenotomy (n=3). In 4 cases primary con-
trol of bleeding was performed, suturing an ulcer in 3
cases and resection of a polyp in 1, followed by endo-
luminal packing with laparotomy gauzes without any ves-
se ligation. In 2 patients a Petzer tube was left in the
duodenum. Due to the extremely serious clinical condi-
tion of the remaining patient and inability to identify
the source of bleeding, only endoluminal packing of seg-
ments 2-4 of the duodenum was performed with prox-
imal and distal ligation of this section of the intestine.

Results
Satisfactory hemostasis was obtained in all cases. One
patient died of acute myocardial infarction 19 hours after
surgery (Fig. 1). In the other 4 cases relaparotomy for
de-packing was programmed and performed 48-72 hours
after primary surgery with all patients in good clinical
conditions with coagulative and haemodynamic stable
parameters. No resection or improvement of haemosta-
sis was necessary. No vascular ligation was performed. A
right hemicolectomy was required in only one patient
due to neoplastic stenosis. This patient, who also had
alcohol-related cirrhosis of the liver and portal hyper-
tension, died of liver failure due to cirrhosis on post-
operative day 30.

Patient characteristics and diagnostic/therapeutic pro-
du res are shown in Tables I, II, III.

Discussion
NVUGIB is well-known to be an extremely serious con-
dition. Despite the worldwide available well structured
clinical algorithms they seems not applicable because not all institutions provide operative endoscopy
and angiography. The seriousness of NVUGIB stems


TABLE II - Diagnostic and treatment pathways

<table>
<thead>
<tr>
<th>N</th>
<th>Patient</th>
<th>Forrest class</th>
<th>HB/INR on admission</th>
<th>Diagnostic EGD</th>
<th>Operative EGD</th>
<th>Diagnostic arteriography</th>
<th>Operative arteriography</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GT</td>
<td>1 A</td>
<td>7,3/3,2</td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>2</td>
<td>GG</td>
<td>III 4th part of duodenum</td>
<td>7,1/3</td>
<td>YES</td>
<td>NO</td>
<td>YES/+</td>
<td>NO</td>
</tr>
<tr>
<td>3</td>
<td>AT</td>
<td>1 A</td>
<td>Yes</td>
<td>YES</td>
<td>NO</td>
<td>YES/-</td>
<td>NO</td>
</tr>
<tr>
<td>4</td>
<td>AMG</td>
<td>1 A</td>
<td>7/4</td>
<td>YES 2</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>5</td>
<td>CG</td>
<td>1 A</td>
<td>5/3</td>
<td>YES 2</td>
<td>NO</td>
<td>YES/-</td>
<td>NO</td>
</tr>
</tbody>
</table>

Legend: HB: hemoglobin; INR: International normalized ratio.

TABLE III - Transfusions: Blood/Plasma

<table>
<thead>
<tr>
<th>N</th>
<th>Patient</th>
<th>Pre</th>
<th>Intra</th>
<th>Peri</th>
<th>Post</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GT</td>
<td>4/4</td>
<td>2/2</td>
<td>1/1</td>
<td>1/3</td>
</tr>
<tr>
<td>2</td>
<td>GG</td>
<td>3/4</td>
<td>3/2</td>
<td>2/2</td>
<td>Death 20 hours after surgery</td>
</tr>
<tr>
<td>3</td>
<td>AT</td>
<td>4/4</td>
<td>3/0</td>
<td>2/1</td>
<td>Death on PO day XXX *</td>
</tr>
<tr>
<td>4</td>
<td>AMG</td>
<td>2/1</td>
<td>4/5</td>
<td>3/5</td>
<td>2/1</td>
</tr>
<tr>
<td>5</td>
<td>CG</td>
<td>7/10</td>
<td>4/1</td>
<td>4/9</td>
<td>1/1</td>
</tr>
</tbody>
</table>

*Further transfusions in postoperative period; PO: postoperative

Published online 21 November 2012 - Ann. Ital. Chir., 84, 6, 2013 673
A global evaluation of NVUGIB patients, more than the bleeding lesion itself, must be made immediately. It is of the utmost importance to consider both the morphology of the disease (Forrest classification) and the patient-specific factors used for specific risk scoring systems. In the case of NVUGIB patients, as other surgical patients, general clinical conditions are currently the essential considerations in determining the most appropriate clinical approach. An Acute Physiology and Chronic Health Evaluation (APACHE) score >11, signs of recent bleeding, the presence/absence of cirrhosis, INR >1.3, serum creatinine >1.5 mg/dl, albumin <2.5 mg/dl and BUN >50 mg/dl are of primary clinical importance. These clinical and metabolic data are at least, if not more important than correct surgical management, and the experience and specialized training of the operating surgeon. Although the classification systems and clinical protocols are standardized and widely used, the timing and performance of the procedures (as the number of transfusions, time until the procedure and operative time, flexible or rigorous application of management algorithms, presence/absence of the surgeon at the individual procedures) varies from one hospital to another.

The priority in clinical treatment pathways in clinical practice is often transferring the patient, when hemodynamic and metabolic stabilization of the patient should take precedence over any diagnostic and treatment maneuvers. There is agreement in the literature that early, intensive stabilization reduces mortality. A blood transfusion policy is required for otherwise healthy NVUGIB patients with a hemoglobin level <7 g/dl and for cardiopathic and/or elderly patients with a hemoglobin level of <10 g/dl. However transfusion alone, without endoscopical, angiographic or surgical treatment is useless and dangerous. Therapy with proton pump inhibitors and antibiotics, standardized and universally accepted in elective surgery, does not have a key role in NVUGIB patients, although it should be started early and continued throughout diagnosis and treatment. There should be such close collaboration between endoscopists, interventional radiologists, and surgeons that a gastrointestinal bleeding unit is formed and fast-track clinical pathways adapted to each individual hospital setting, and widely accepted are implemented.

The introduction into clinical practice of first of H2 blockers and then of proton pump inhibitors, has notably reduced the incidence of peptic ulcer disease and the main associated complications (perforation and bleeding). In particular, according to Sreedharan and colleagues, therapy with proton pump inhibitors reduces

---

**Table VI - The Blatchford Scoring System**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUN (mmol/l)</td>
<td></td>
</tr>
<tr>
<td>&gt; 6.5 &lt; 8.0</td>
<td>2</td>
</tr>
<tr>
<td>&gt; 8 &lt; 10</td>
<td>3</td>
</tr>
<tr>
<td>&gt; 10 &lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>&gt; 25</td>
<td>6</td>
</tr>
<tr>
<td>Hemoglobin (g/dl)</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 &lt; 13</td>
<td>1</td>
</tr>
<tr>
<td>&gt; 10 &lt; 12</td>
<td>3</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>6</td>
</tr>
<tr>
<td>Women</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 &lt; 13</td>
<td>1</td>
</tr>
<tr>
<td>&lt; 10</td>
<td>6</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td></td>
</tr>
<tr>
<td>100–109</td>
<td>1</td>
</tr>
<tr>
<td>90–99</td>
<td>2</td>
</tr>
<tr>
<td>&lt; 90</td>
<td>3</td>
</tr>
<tr>
<td>HR &gt; 100</td>
<td>1</td>
</tr>
<tr>
<td>Melena</td>
<td>1</td>
</tr>
<tr>
<td>Syncope</td>
<td>2</td>
</tr>
<tr>
<td>Liver disease</td>
<td>2</td>
</tr>
<tr>
<td>Heart failure</td>
<td>2</td>
</tr>
</tbody>
</table>

Legend: BUN: Blood urea nitrogen; BP: blood pressure; HR=heart rate.

---

**Table V - The Rockall Scoring System (Definitive score)**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Score 0</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Score 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosis</td>
<td>No</td>
<td>—</td>
<td>Gastric/ esophageal cancer</td>
<td>—</td>
</tr>
<tr>
<td>Age</td>
<td>&lt;60</td>
<td>60 – 79</td>
<td>Average BP &lt;100 mmHg</td>
<td>—</td>
</tr>
<tr>
<td>Shock</td>
<td>No</td>
<td>HR &gt; 100'</td>
<td>Cardiac comorbidity or other major pathology</td>
<td>—</td>
</tr>
<tr>
<td>Comorbidity</td>
<td>No</td>
<td>—</td>
<td>Liver or kidney failure</td>
<td>Advanced cancer</td>
</tr>
<tr>
<td>No signs of recent bleeding MALLORY–WEISS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Signs of recent bleeding</td>
<td>No</td>
<td>—</td>
<td>Blood in the lumen Clot</td>
<td>—</td>
</tr>
<tr>
<td>Black spots</td>
<td></td>
<td></td>
<td>Non-bleeding visible vessel</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Active bleeding</td>
<td></td>
</tr>
</tbody>
</table>

Legend: Liver HR= heart rate; BP: blood pressure.
the incidence of recurrent bleeding by 13.9%, which is similar to the results of Leontidas who reported 10% recurrent bleeding. In contrast to this overall reduction in rebleeding, the incidence of complications and of hemorrhage in particular, has not been reduced. This means that surgery for perforation and bleeding of the stomach and duodenum, except for cancer surgery, is almost exclusively in the hands of the emergency department. In fact, a Finnish study from 2009 showed that between 1987 and 1999 the number of patients undergoing elective surgery of the stomach and duodenum decreased while the number of patients undergoing emergency procedures increased from 25% to 90%.

The reason for this is that although drugs for treating peptic ulcers are now available, there has not been a reduction in the incidence of complications (i.e. bleeding) associated with the disease and not-responders are at risk of more severe complications.

It is necessary to establish simple key clinical points such as the number of units of blood to be transfused before proceeding to the next step. In the search for optimal clinical management of NVUGIB patients it becomes clear that at times for clinical and logistical reasons surgery is the default approach if operative endoscopy is not available 24 hours a day, 365 days a year, if there is no interventional radiology on hand and, last but not least, when the clinical condition of the patient is such that surgical management is unavoidable. This modification of the standard algorithm is then the best possible treatment. The inter-hospital transfer of a patient with massive gastroduodenal hemorrhage so that he/she can undergo operative endoscopy or arteriography is an immoral practice. Surgical control of the hemorrhage needs to be facilitated as soon as possible. Transfusing 5 units of blood as a preliminary to an inter-hospital transfer results in delayed treatment and thus puts the patient at very great risk of a catastrophic outcome. Transfers, if insisted upon by obstinate consultants, must be organized without any loss of time, with clinical and haematological parameters stable.

First-line treatment, endoscopy, whether diagnostic or operative, must be performed early not too. The diagnosis must include Forrest classification of the lesion, as the starting point of the clinical algorithm. The literature unequivocally links prognosis to the quality rather than the quantity of treatment measures. Laine et al. describe the efficacy of endoscopic treatment of both active bleeding and non-bleeding visible vessels. They also report that outcome was significantly better if endoscopy was associated with a continuous infusion of proton pump inhibitors than if patients received a placebo/had no therapy (RR:0.40). The rate of recurrent bleeding is not significantly reduced by any other monotherapy (RR:0.058), epinephrine followed by other therapy (RR:0.34), heat probe coagulation (RR:0.44), or sclerotherapy (RR:0.56). Hemoclips are more effective than epinephrine (RR:0.22).

As regards the timing of endoscopy, the literature indicates that the procedure should not be performed too early. The Odds Ratio of mortality and surgical option in patients with endoscopy performed before <6 hours vs >24 hours is 3.6, in patients with endoscopy >6hrs/<24hrs is 2.8. Same Authors describe the hypotension state period, haemoglobin levels and the endoscopy time <6 hours or 6/24 hours the risk factors for the prognosis. The second option, angiographic management, is less invasive and makes it possible to significantly reduce gastroduodenal vascularization and to control bleeding with results almost as good as those obtained with surgery. In the literature the efficacy of angiographic treatment in controlling bleeding is reported to be 48%-90% and the incidence of recurrent bleeding 0%-40%.

Surgery is indicated when:

1) Failure of endoscopic treatment;
2) Recurrent hemorrhage after 2 attempts at endoscopic hemostasis;
3) Shock associated with recurrent hemorrhage;
4) Patient unstable after rapid transfusion of at least 5 units of blood or blood loss >2500 ml in 24 hours;
5) Continuous bleeding requiring the transfusion of more than 3 units of blood per day.

The standardized surgical procedures used for patients with NVUGIB are gastroduodenal and gastroepiploic arteries ligation, vagotomy, duodenotomy with placement of hemostatic sutures, excision of the ulcer and suturing, and gastric resection. It is important to note that the reduction in the risk of rebleeding after ligation of the gastroduodenal and gastroepiploic arteries is about the same as after gastrectomy. Total or subtotal gastrectomy is the surgical procedure of choice in patients with NVUGIB when the double parasurgical treatment has failed. The indications for gastrectomy must be related to the hemodynamic status of the patient. It should always be kept in mind that patients who have undergone gastrectomy to remove the ulcer followed by...
Billroth I or II reconstruction the risk of bleeding is lower than in patients who undergo a conservative procedure, even though the former is associated with a greater risk of bile reflux. During gastric resection haemostatic agents and tissue sealants can be used to better control the bleeding. Vagotomy (truncal, selective or superselective) can be combined with placement of drains or resection. De la Fuente and colleagues compared the two procedures in a retrospective study. The postoperative mortality, morbidity and bleeding rates were similar while the patients who underwent resection had a longer postoperative hospital stay. If NVUIGB is known or suspected to be due to cancer, the surgical procedure of choice is partial or total gastrectomy.

Conclusions

In view of what is mentioned above our method must not be considered a standard approach to all patients with gastroduodenal bleeding but an emergency option for treating patients in extremely critical condition for whom Damage Control Surgery, in which less is more, is currently the procedure of choice. Performing more or less extensive gastroduodenal resections on patients in hemorrhagic shock would have led to unacceptably high morbidity and mortality rates without any real increase in curative potential. Our approach with treatment kept to a minimum, rapid and effective, allowed complete control of bleeding and clinical stabilization of the patient. Essential to our treatment method and absolutely indicated were:

1. Extensive use of endoluminal drains (i.e. Petzer catheter, urinary catheter, gastrostomy kit);
2. Open abdomen or closure only of the skin layer.

The latter served both to prevent the development of compartment syndrome and to permit rapid reaccessing of the abdominal cavity if necessary which was never the case in our experience. None of the patients had particular surgical problems, bleeding was controlled in all cases, and depacking was almost always performed as an elective procedure.

This suggests that the clinical rationale and indications for our approach were correct.

Riassunto

Le emorragie non varicose del tratto gastrointestinale alto rappresentano ancora oggi una patologia importante, gravata da mortalità e morbilità elevate e di non sempre facile gestione. In particolare il verificarsi di questi eventi in pazienti anziani, con comorbilità importanti e con alterazioni della coagulazione sia per terapie sia da scompenso metabolico-ematologico, pone problemi di gestione clinica non facili. In quest'ottica abbiamo ideato una tecnica chirurgica, modulata dal concetto della Control Damage Surgery, di packing endoluminale che qui descriviamo insieme ad una revisione della letteratura riguardo le cause ed i protocolli clinico gestionali.

References

Caso clinico e revisione della letteratura

Dieulafoy vascular malformation


