FIELD OF VISION

Transcatheter embolization as the new reference standard for endoscopically unmanageable upper gastrointestinal bleeding

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Abstract

Acute nonvariceal upper gastrointestinal bleeding (UGIB) is a major medical emergency problem associated with significant morbidity and mortality. Endoscopy is considered the first method of choice to detect and treat UGIB. Endoscopic therapy usually achieves primary hemostasis, but 10%-30% of these patients have repeat bleeding. In patients in whom hemostasis is not achieved with endoscopic techniques, treatment with transcatheter angiographic embolization (TAE) or surgery is needed. Surgical intervention is usually an expeditious and gratifying endeavor, but it can be associated with high operative mortality rates. A large number of studies support the use of TAE as salvage therapy as an alternative to surgery. However, few studies have compared the results of TAE with that of emergency surgery in terms of efficiency, the frequency of repeat bleeding, and complications. Recently, Ang *et al* retrospectively compared the outcome of TAE and surgery as salvage therapy of UGIB after failed endoscopic treatment. There were no significant differences in 30 d mortality, complication rates and length of stay although higher rebleeding rates were observed after TAE compared with surgery. In this commentary, we discuss the advantages and drawbacks of these two therapeutic strategies for UGIB. We also attempt to define the exact role of TAE for acute nonvariceal UGIB.

INVITED COMMENTARY ON HOT ARTICLES

We read with great interest the recent article by Ang *et al*[1] comparing surgery *vs* transcatheter angiographic embolization (TAE) in the treatment of nonvariceal upper gastrointestinal bleeding (UGIB) uncontrolled by endoscopy and strongly recommend it to readers. Massive hemorrhage continues to be a major problem in the manage-

ment of UGIB because of its relatively high incidence and its recently confirmed high mortality rate of approximately 10%[2-4]. Before the development of therapeutic endoscopy, 35%-55% of patients with massive UGIB required emergency surgery, which was associated with a 20% mortality rate[2,5] that reached 50% in older patients with underlying conditions. With the development of therapeutic endoscopy, emergency surgery is actually needed in only 5% of cases[6] because of massive hemorrhage or recurrent bleeding in the setting of endoscopic failure. Many of these patients may have underlying conditions that can contribute to a poor outcome. Before the advent of interventional endoscopy, TAE was proposed as an alternative to surgery for the treatment of massive UGIB in patients at high surgical risk[7]. Since its introduction[8], some authors have suggested this technique as rescue therapy after endoscopic treatment failure[9-11]. The introduction and further development of endovascular interventional therapies has significantly changed the treatment of patients with acute hemorrhage, especially those with unknown bleeding sources. However, to be able to recommend TAE as the first method of choice in the treatment of severe UGIB, it is important to compare it with surgery in terms of efficiency, the frequency of repeat bleeding, and complications.

Now, there is only little data confirming the value of TAE compared to surgery in nonvariceal bleeding of the upper gastrointestinal tract[12-15], particularly in emergency settings. Indeed, this approach has never been compared prospectively to emergency surgery for the management of massive UGIB after endoscopic failure, probably because of the intrinsic difficulties in performing a controlled trial in this emergency setting and the lack of data to provide a rationale to support it. However, the use of TAE is supported by the high technical and clinical success rates in main published case series over the past decade[16,17]. Indeed, outcomes after TAE have compared favorably with those of surgery thanks to enormous advances in endovascular device development in the recent years, including essentially lower-profile catheter systems and newer embolic agents, such as detachable microcoils, resorbable particles and cyanoacrylate glues[18,19]. The obvious advantage of TAE is avoidance of a laparotomy in a critically ill patient, decreasing postsurgical morbidity and infectious complications. Indeed, Chiu *et al*[20] recently reported high rates of complications and 30 d mortality whatever the surgical approach used, minimal (ulcer plication or ulcerectomy) or definitive (vagotomy or gastrectomy). The highest morbidity (47.6%) and mortality (40.5%) rates were reported in the cohort where minimal surgery was performed in the majority of cases, with a rebleeding rate of 38%. Then, the median length of hospital stay (20.3 d) correlated with these data. These results are difficult to accept. We recently reported our results obtained during nearly 10 years of experience with TAE used to treat refractory massive bleeding from the upper gastrointestinal tract[17]. We had 60 critically ill patients with a mean age of 69.4 years, the largest case series in

the literature. The complications and 1-month mortality rates were 10% and 26.7%, respectively, with a rebleeding rate of 28%. Only 7 (11.6%) of the 60 patients needed surgery after failure of embolization procedures. In most cases, embolization obviates the need for surgery in critically ill patients whose immediate survival depends on their underlying conditions. To date, no controlled trial has compared angiographic embolization with surgery as a salvage procedure for failed endoscopic therapy. The wide array of alternatives for the treatment of UGIB after endoscopic failure make the decision of when to resort to emergency surgery more difficult, especially in patients with risk factors for recurrent bleeding and death, which are also related to high surgical risk. Embolotherapy may be particularly attractive in such a setting because it is not as invasive as surgery and has few complications[17,18,21]. Another advantage of TAE is that most patients with recurrent bleeding after initial treatment with surgery or TAE can be effectively treated with TAE, thus avoiding a second surgical procedure[16].

Ang *et al*[1] reported results of a retrospective single-centre study of consecutive patients who underwent TAE compared with patients treated surgically. Patient demographics, comorbidities, rebleeding rates, length of stay and mortality were compared. Thirty and 63 patients underwent TAE and surgery for gastric ulcers (*n* = 28), duodenal ulcers (*n* = 53), small-bowel diverticula (*n* = 7), jejunal ulcer (*n* = 1) and gastric Dieulafoy's lesions (*n* = 2). Higher rebleeding rates were observed after TAE (46.7%) compared with surgery (12.7%). However, there were no significant differences in 30-d mortality, complication rates and length of stay. Rebleeding occurred in five out of seven patients (71%) who underwent TAE for small-bowel diverticular bleeding. Overall, TAE was significantly associated with increased rebleeding rates compared with surgery. Several factors may contribute to explain these findings. First, it is plausible that the use of single-agent embolotherapy in the earlier cases could have contributed to these high rebleeding rates. Indeed, because of the anatomy of the gastroduodenal complex and the presence of collateral branches, the use of dual agents (coils and gelfoam) in the sandwich technique would technically increase the success rates. Second, it could be possible that empiric embolization performed in two third of patients was suboptimum. Unfortunately, the rebleeding rate in the subgroup of patients who underwent empiric embolization was not mentioned. Lastly, another plausible explanation of a higher rebleeding rate is an increased consumption of aspirin and a higher acetylsalicylic acid level in the TAE group compared with the surgical group.

Despite the retrospective, observational design of this study, Ang *et al*[1] provide important, clinically relevant data that advances our knowledge in how we should be caring for patients with UGIB. The findings in this study appear to confirm previously published retrospective case series that support the role of TAE and show that it reduces the need for surgery, has a low complication

Table 1 Main results of reported series comparing embolization with surgery for upper gastrointestinal bleeding after failed endoscopic hemostasis (%)

Study	Clinical success			Complication			Mortality		
	TAE	Surgery	*P* value	TAE	Surgery	*P* value	TAE	Surgery	*P* value
Ripoll *et al*[12]	71	76.9	NS	0	17.9	NS	25.8	20.5	NS
Eriksson *et al*[13]	75	82	NS	20	37	NS	3	14	NS
Venclauskas *et al*[14]	20.8	22	NS	54.2	66.7	NS	20.8	22	NS
Wong *et al*[15]	65.6	87.5	< 0.05	40.6	67.9	< 0.05	25	30.4	NS
Ang *et al*[1]	53.3	87.3	< 0.05	46.7	60.3	NS	16.7	19	NS

TAE: Transcatheter arterial embolization; NS: Not significant.

rate, and does not increase mortality[15,22,23]. Indeed, four other retrospective studies compared the two techniques and showed at least similar efficacy in terms of rate of rebleeding, morbidity, and mortality, whereas there was a bias of selection since TAE was preferentially used for high surgical-risk patients[12-15] (Table 1). These data suggest that surgery would have probably been catastrophic in this patient population and that TAE offered better results. Ripoll *et al*[12] retrospectively analyzed the outcome of 70 patients with refractory peptic ulcer bleeding. Thirty-one patients underwent TAE, and 39 patients were managed with surgery. Although patients receiving TAE were 10 years older, and more patients had heart disease and coagulation disorders, the incidence of recurrent bleeding (29% *vs* 23%) and mortality was similar (26% *vs* 21%). Another retrospective comparison study by Eriksson *et al*[13] included 40 patients who underwent TAE and 51 patients who underwent surgery after failed endoscopic therapy. The TAE group was older and had more comorbidity. Thirty-day mortality was lower in the TAE group (3% *vs* 14%). More recently, Venclauskas *et al*[14] compared these two treatment strategies. Arterial embolization was performed in 24 patients and open surgery in 50 patients after unsuccessful endoscopic therapy for bleeding duodenal ulcers. The mean age and acute physiology and chronic health evaluation Ⅱ score were significantly higher in the embolization group. Only mortality in high-risk patients was significantly lower in the TAE group (23.1% *vs* 50%). In a retrospective comparative study by Wong *et al*[15], the 30 d mortality was high, 25% in the TAE cohort and 30.4% in the surgery cohort, yet these mortality rates were not statistically different. The majority of deaths in both cohorts were from nonbleeding related causes. In the TAE group, there were significantly fewer postprocedure complications, and no procedure-induced ischemic events. The rebleeding rate noted with TAE (34.4%) was not different from what has been reported elsewhere in the literature. Other measured patient outcomes including total length of hospital stay, length of hospital stay postprocedure, and units of blood transfused were no different between the TAE and surgery groups. These results are promising, and we are eagerly awaiting results of randomized controlled trials to prove the benefits of TAE, though they will be difficult to set up in the emergency setting.

So will TAE replace surgery in the management of UGIB? No, not exactly, because there will always be selected patients in whom endoscopic hemostasis therapy fails, who may not be candidates for embolization therapy or in whom it fails, or who may not have access to interventional radiology hemostasis techniques. But the role of the surgeon in this clinical sphere is certainly diminishing and will continue to diminish in ensuing years. Although hard evidence is lacking, we suggest that decision-making in refractory bleeding from the upper gastrointestinal tract could be based on endoscopy and patient's condition[19]. Negative or impractical endoscopy because of severe bleeding in hemodynamically unstable patients should prompt urgent angiography, whereas re-endoscopy should be first considered in stable patients. Continuing bleeding demands for emergency TAE, especially in high-operative-risk patients. On the other hand, some authors state a preference for surgery in young and healthy patients, especially with large and/or multiple peptic ulcers at endoscopy, without having proved the inferiority of TAE in such a setting. Thus, in our institution, surgery is typically reserved for those patients whose bleeding failed to respond all previous treatments.

According to the literature and our experience, several technical points may help maximize results and minimize recurrent bleeding when TAE is performed. First of all, some of the published data seem to confirm the fact that every effort should be made to perform embolization early after bleeding onset, before multisystem organ failure occurs, and to correct coagulation disorders before, during, and after intervention[17,21]. More controversial is the influence of the type of embolic agent on the clinical outcome. The choice of the best embolic agent is still debatable. In most series, this choice was at the discretion of the interventional radiologist, according to his own experience, material availibility, angiographic findings, and capability to perform superselective catheterization of the bleeding vessel. However, several authors reported a high rate of bleeding recurrence when gelfoam was used alone[24,25], whereas the clinical success was relatively high in recent series in which glue was used as the only embolic agent[26,27]. Two studies demonstrated a statistically significant association between the use of coils as the only embolic agent and greater rebleeding rates[17,28]. We do not recommend the use of coils alone but in com-

bination with gelfoam or glue, when using the sandwich technique in areas with rich collaterals like the gastroduodenal artery territory. In addition, the normal collateral pathways after a successful embolization should be systematically checked to avoid retrograde filling through anastomoses as the inferior pancreaticoduodenal artery from the superior mesenteric artery. On the other hand, glue should probably be used more often, especially in patients with coagulopathy, because it provides a better and faster hemostasis.

Lastly, data are missing in the literature regarding the role of prophylactic TAE or surgery in patients who achieve primary hemostasis by endoscopy but who are still at severe risk for rebleeding. In such a setting, our point of view is that TAE could be attempted safely based on endoscopic findings in selected patients. Considering surgery is more critical in this indication and should be preferred as a last resort, given the risk of complications.

In conclusion, massive bleeding from the upper gastrointestinal tract remains a challenge. Optimal management required a multidisciplinary team of skilled endoscopists, intensivists, experienced upper gastrointestinal surgeons, and interventional radiologists. Endoscopy is the first-line treatment. The role for early elective surgery or TAE in selected high-risk patients to prevent rebleeding remains controversial. However, technological advances will probably broaden the indications for endovascular treatment of UGIB after failed endoscopy. Although prospective studies are needed to compare these management strategies, the available data suggest that TAE is a good alternative to surgery and could be considered the salvage treatment of choice after failed endoscopic treatment. However, only high volume centers having access to sophisticated angiography rooms and skillful interventional radiologists have the opportunity to use this technique as an alternative treatment.

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