Introduction

Upper gastrointestinal bleeding (UGIB) is the most common gastrointestinal emergency, with peptic ulcer bleeding (PUB) responsible for 31% to 67% of all cases, followed by erosive disease and variceal bleeding. Less frequent causes are oesophagitis, Mallory Weiss tears, neoplasm and vascular lesions.

Endoscopy has clearly defined its role in the primary management of acute UGIB. Clinician can predict the outcomes and risk stratify by using clinical and endoscopic information. The aim of therapeutic endoscopy is to stop any ongoing bleeding and prevent rebleeding. Several techniques, including injection therapy, ablative therapy and mechanical therapy have been studied over recent decades. Depending on the appearance of the bleeding focus and specific characteristics of each lesion, a suitable technique should be chosen. Related risk and history for persistent or recurrent bleeding can be a deciding factor to choose endoscopic hemostasis method.

I want to review the various endoscopic tools and materials which is suitable application to maximize skills for nonvariceal UGIB in this seminar.

Indication of endoscopic hemostasis

The Endoscopic haemostatic therapy is indicated for patients with high risk ulcers including active bleeding stigmata and nonbleeding visible vessel, while patients with low-risk stigmata can be treated with pharmacotherapy alone. Endoscopist can choose endoscopic hemostasis according to type, size, base and location of lesion. Recently, pre-endoscopy proton pump inhibitor can lower stage of bleeding stigmata and increase clinical final outcome. Early endoscopy (within 24 hours of presentation) is recommended for most patients with acute upper gastrointestinal bleeding. Emergent endoscopy had controversial datas.

The optimal management of bleeding peptic ulcers with adherent clot remains controversial. Two meta-analyses have addressed this issue. One result report a significantly lower risk of rebleeding in the patients who underwent endoscopic therapy compared with the medical therapy group (8 vs. 25%, P=0.01). Other report show no significant benefit of endoscopic therapy in patients with ulcers with adherent clots. So far, endoscopic therapy should be considered, although intensive PPI therapy may be sufficient among patients with adherent clots resistant to vigorous irrigation.
Tools and material for Endoscopic hemostasis

1. Injection Therapy

This form of therapy aims at controlling bleeding by means of hydrostatic tamponading pressure, vasoconstriction, and/or possibly a secondary inflammatory reaction. It is the simplest and most economic technique. The advantages of this technique are easiness to learn and economic merit of very small equipment such as sclerotherapy needle. The disadvantages are that missed injection can mask the visible area for treatment. And the effects are short lasting, as the injected fluid gradually dissipates.

Commonly used forms of injection therapy include: (1) Epinephrine, this is diluted (1:10,000) and administered through a 25-gauge retractable sclerotherapy needle. Volumes of up to 35-45 ml may be given in increments of 0.5 to 1.5 ml targeting four quadrants of the ulcer. There are no clear guidelines as to the ideal volume required between 10 ml and 45 ml. (2) Non-constrictive agents such as distilled water, normal or hypertonic saline, 50% dextrose. Studies show an initial hemostasis rate comparable to epinephrine; however, when compared to hemoclips the recurrent bleeding rates are generally higher in the injection group. These agents work by their local compressive action. (3) Other agents which include sclerosants such as ethanol and polidocanol have been used but side effects such as tissue necrosis have resulted in complications including even perforation. Tissue adhesives (cyanoacrylate) and fibrin glue are other injectable solutions which have yielded variable results.

2. Thermal Coagulation

Contact thermal therapies ensure appositional pressure resulting in a heat-sink effect in addition to tissue coagulation with contraction of blood vessels. These include the bipolar probe or the HP which can weld arteries (coaptive coagulation) as large as 2.5 mm in diameter in controlled laboratory conditions.

The two available bipolar probes include the Gold Probe (Microinvasive, Boston Scientific Corp., Natick, Mass., USA) and the BICAP or bipolar circumactive probe (Circon-ACMI, Stamford, Conn., USA). The probes are available in diameters of 2.4-3.2 mm and have alternating positive and negative electrodes which concentrate diathermic coagulation concentrated around the tip providing lesser depth of tissue injury and lower risk for perforation. The HP (Olympus, Tokyo, Japan) uses a simple heating device in a Teflon-coated hollow aluminum cylinder with an inner coil rather than electric current. The heat generated can be given directly or tangentially by the distal tip. Probes are available in diameters of 2.3-3.2 mm. The probe temperature can rise up to 250°C (482°F). Four to five bursts of energy of 30 J/pulse are applied for adequate coagulation.

Non-Contact Therapies includes Nd:YAG laser and argon plasma coagulation(APC). The use of Nd:YAG laser for endotherapy is rarely used today primarily owing to the increased depth of coagulation resulting in high rates of perforation as well as the excessive maintenance costs. The underlying mechanism of action is the conversion of light to heat energy by the directed beam which coagulates the bleeding site.

APC as a non-contact thermoblate technique is now available at many endoscopic units. It has advantages of being safe given the depth of penetration (<1 mm) and relative ease of use. There are disadvantages though of providing only superficial coagulation which may thus miss larger deeper vessels.

In specific situations, eg difficult-to-approach or indirectly visualized bleeding sites, heater probe therapy can be superior to hemoclip placement.
3. Mechanical Therapies

The endoscopic mechanical modality currently available is the hemoclip which are metallic devices designed to grasp the mucosa, seal and approximate vessels without interfering with underlying mucosal regeneration and healing. They need precise deployment since inadvertent clipping of only the tip of the vessel can result in potentiating or initiating vigorous bleeding. End on clipping with axial push of surrounding tissue results in better anchoring is preferred over tangential clipping slipping on fibrotic ulcer bases. Difficult areas such as the gastric fundus, lesser curve and posterior duodenal bulb present challenging territories for effective application. Similarly, clipping in the setting of underlying coagulopathy can also aggravate bleeding. Most clips slough off within days or weeks of deployment and may vary based upon the type of clip.

Current available hemoclips available are (a) QuickClip 2, Olympus USA, Corp. which is a rotatable clip device produced in two sizes (opening width of 8 or 12 mm), (b) Resolution Clip, Boston Scientific, Inc. which cannot be rotated but can be reopened after closure if repositioning is required (opening width of 11 mm), (c) TriClip, Wilson Cook, Inc. is a three-pronged endoclip (opening width of 12 mm) and (d) Inscope (Ethicon Endosurgery Inc.) multilple applicator with four endoclips opening width of 14 mm).

Band ligation method are useful in case of Dieulafoy like ulcer or angiodysplastic lesions, its role is same as mechanical ligation of hemocipping

Chiu et al studied the endoscopic plication when using Eagle Claw VII in a porcine bleeding ulcer model and showed success of endoscopic stitching, it needs human studies

Endoscopic hemostasis using the combined method of detachable snares with hemocips. The success rate of endoscopic hemostasis with CDS was 86%. Rescue endoscopic bleeding control by means of CDS is an option for controlling nonvariceal UGI bleeding when no other method of endoscopic treatment for recurrent bleeding and primary hemostatic failure is possible.

The over-the-scope clip (OTSC) could overcome the limitations of through-the-scope clips by allowing compression of larger amounts of tissue, allowing a more efficient hemostasis. Bleeding lesions unresponsive to conventional endoscopic treatment (saline/adrenaline injection and through-the-scope clipping) were located in the upper and lower GI tract in 23 and 7 cases, respectively. Primary hemostasis was achieved in 29 of 30 cases (97%). OTSC is an effective and safe therapeutic option for severe acute GI bleeding when conventional endoscopic treatment modalities fail.

Endoscopic Combination Therapy

Endoscopic therapy using a combination of the above-discussed methods is favored to monotherapy alone considering the theoretical additive effect of each modality and given the different mechanisms of action of each technique. The benefits of dual therapy have been studied in several trials with most studies offering an additional hemostatic therapy to epinephrine injection. A second procedure reduced further the bleeding rate from 18.8 to 10.4% (OR 0.51), and need for emergency surgery from 10.8 to 7.1% (OR 0.63). The mortality fell by half from 5 to 2.5% (OR 0.50). Another study by Marmo et al. addressing dual vs. monotherapy in high-risk ulcers suggested that single endoscopic treatment by means of thermal probes or clips (non-injection-based monotherapies) is as effective as dual treatments and probably safer. These results encourage the endoscopist to
use more than one modality other than injection alone especially in high-risk ulcer bleeds.

**Endoscopic spray method**

A new promising endoscopic application is the use of a chemical compound which, when sprayed as nanopowder on active bleeding, can lead to immediate hemostasis, with coverage of the bleeding ulcer with a powder layer. When sprayed on a bleeding site, the powder becomes cohesive and adhesive, and forms a stable mechanical barrier, covering the bleeding site. In a pilot study of 15 patients with active ulcer bleeding treated with this nanopowder, immediate hemostasis was achieved in 93%, and one patient had recurrent bleeding. No adverse events were reported during the 30-d follow-up. Further studies with this product or other hemostatic material are ongoing and will elucidate if application is also beneficial for other causes of nonvariceal UGIB.

1. **The use of inverted overtube**

During endoscopic hemostatic procedures performed in the emergency room, where pretreatment is not performed, the presence of blood clots and food residue makes obtaining a clear view of the bleeding vessel difficult. Emergent situation, the use of gastric suction and/or grasping forceps currently requires a great deal of time. Thus, endoscopists have adopted a procedure in which the patient’s posture is rotated to the right lateral decubitus position to dislodge the blood clots and enable the identification of the bleeding vessel.

Use of the inverted overtube is the best method to help endoscopists perform an emergency endoscopy with less stress because they are in their conventional standing position relative to patients who are rotated to the right lateral decubitus position, without changing the positions of the endoscopy unit and light source. This technique is the most effective way to dislodge blood clots and food residue by gravity in these patients. The present technique dramatically improved the clarity of the endoscopic views and enabled the endoscopist to perform the hemostatic procedures from the conventional standing position while freely and easily changing the patient’s position. This set-up significantly shortened the procedure time.

2. **New methods and trials for bleeding during endoscopic submucosal resection**

Snare tip soft coagulation achieves effective and safe endoscopic hemostasis during wide-field endoscopic resection of large colonic lesions. This method was performed by using the tip of the polypectomy snare to apply soft coagulation (80 W) to sites of intraprocedural bleeding, which method achieved effective hemostasis in 40 of 44 cases of IPB (91%).

Use of a spray-type medical adhesive can prevent complications of ESD, especially delayed bleeding. Application of a spray-type medical adhesive can reduce the average length of hospital stay, thereby avoiding additional health care expenditures.

A new polysaccharide hemostatic system (EndoClot™) was recently developed for bleeding control in gastrointestinal tract endoscopy. EndoClot™ was applied immediately to mucosal defects after resection whether or not there was post-resection bleeding. Polysaccharide hemostatic system effectively achieves hemostasis in controlling and preventing EMR-related bleeding with the advantage of simple application; thus it might be a useful alternative in treating bleeding endoscopically.
Conclusions

Nonvariceal UGIB is the most common gastrointestinal emergency. Appropriate resuscitation followed by early endoscopy for diagnosis and treatment are of major importance in these patients. Endoscopic therapy is indicated for patients with high-risk stigmata, in particular those with active bleeding and visible vessels. Ablative or mechanical therapies are superior to epinephrine injection alone in terms of prevention of rebleeding. The application of an ulcer-covering hemospray and endoscopic suturing are new promising tools. Various new technique for prevent or managing bleeding associated with endoscopic submucosal resection. Various hemostatic method can be selected optimally in each specific situation of nonvariceal UGIB.

References

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