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Endoscopic treatments for gastrointestinal bleeding: a story of cleverness and success

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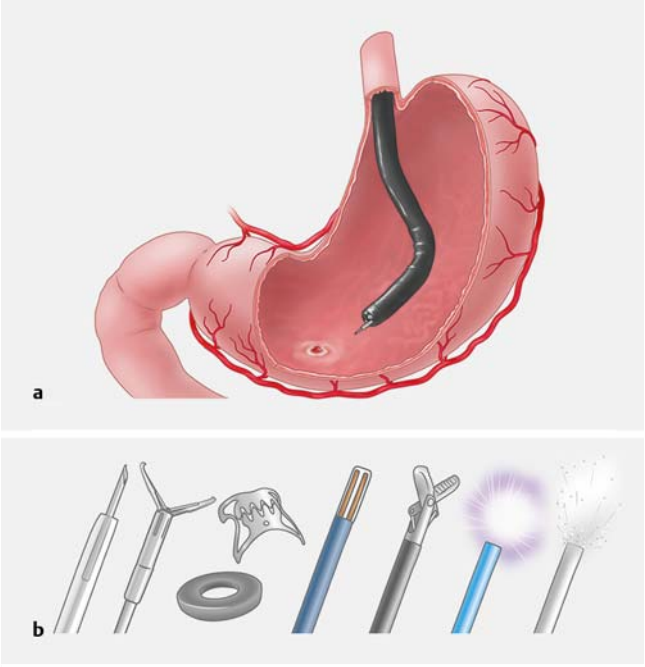
In the early 1970 s, various endoscopists in Germany and Japan began utilizing various through-the-scope utensils to treat gastrointestinal bleeding (GIB), including clips and electrocoagulation devices. In this editorial, we evaluate a landmark paper published in 1976 by Dr. Nib Soehendra, who had designed a new needle inserted through a simple polyvinyl chloride (PVC) sheath to treat bleeding gastric ulcers. The paper describes two patients with bleeding gastric ulcers [1]. The first patient was found to have a bleeding ulcer at the level of the cardia. The second patient was a patient who had undergone a Whipple's operation and presented with pulsating bleeding from an anastomotic ulcer. In the latter patient, therapy by electrocoagulation failed; in the first patient, electrocoagulation was deemed too dangerous because of the shape and location of the ulcer. Therefore, Soehendra proceeded to inject the ulcers with Ethoxysclerol using the new needle inside the PVC sheath, which led to rapid and successful hemostasis in both patients. He named the technique "transendoscopic submucous infiltration."

This paper is of perpetual value for the specialty of GI endoscopy for several reasons. First, it shows how a simple self-made device, consisting of a needle and a PVC sheet, revolutionized the field of endoscopy. Indeed, even now, the principal technique to achieve hemostasis for a myriad of lesions causing upper, middle, and lower GI bleeding remains needle injection of various substances, including saline epinephrine solution, fibrin glue, Ethoxysclerol, and Histoacryl, among others (▶ **Fig. 1**).

Second, the authors provided a detailed analysis of the bleeding lesions and recognized that bleeding arises from lesions with small arterial branches and seldom from main gastric arteries. Based on these characteristics, they hypothesized that their method of transendoscopic submucous infiltration would result in mechanical compression of the feeding arteries. The authors also implied that Ethoxysclerol might be more efficient than other liquid substances that produce compression, such as saline, because it results in the compression being maintained for a longer time. This concept of "submucosal injection" is not only useful for stopping hemorrhage, but is also essential in interventional chromoendoscopy, where creation of the submucosal cushion during resection of endoluminal GI lesions guarantees an R0 and safe endoscopic resection [2]. Therefore, the concept of needle injection had far reaching uses and positive consequences outside the stomach, and is now an essential component for all types of endoscopic interventions within the GI tract.

Third, as elegantly shown by the authors, interrogating bleeding lesions, defining their dangerous characteristics, and then applying directed therapy to interrupt the bleeding mechanism(s) remain essential for successfully treating GI hemorrhage throughout the entire GI tract. The endoscopist should know however that "one size does not fit all"; indeed, various other reports down the line, including studies by Soehendra and by our own group on clips, glues, argon plasma coagulation, and over-the-scope clips, have shown that treatment of different lesions requires an individualized approach [3–5]. Clips are more suited to the treatment of soft visible vessels, argon plasma coagulation will be more effective for diffusely bleeding lesions or angiodysplasia, injection of glue is known to be quite effective for gastric varices, Hemospray has been shown to be useful for oozing ulcers and diffusely bleeding lesions, and the over-the-scope clip has recently revolutionized the treatment of severe peptic ulcer hemorrhage and lesions with visible vessels [5].



▶ **Fig. 1** **a** Schematic of the endoscopic treatment of an acute bleeding gastric ulcer with injection needle. **b** Evolution of endoscopic therapies for gastrointestinal bleeding: these devices are divided into injection, mechanical, electrocoagulation, thermal, and surface therapies. The future devices are over-the-scope devices and those delivered through platforms (and overtubes) and with endoscopic ultrasound guidance. Illustration: Michal Rössler

Finally, we would like to point out that, although the key mechanisms of therapy are quite well established, such as (a) injection, (b) mechanical, (c) thermal, and (d) topical methods (▶ **Fig. 1**), there are various promising techniques that are still evolving. Through-the-scope devices, mainly keeping the concept of using a "tubing or catheter," such as argon plasma coagulation, injection-monopolar needles, clip radiofrequency ablation, cryotherapy, and more recently EndoClot, Hemospray, and Ankaferd, use the working channel in the scope. Additional advances are "over-the-scope" methods such as endoscopic variceal ligation, suturing devices, and over-the-scope clips [4, 5]. The concepts of combining endoscopic ultrasound (EUS) technology with angiographic methods, such as EUS-guided placement of coils and foam into the branches of bleeding arteries or large esophageal or gastric varices are rapidly entering practice.

We expect there to be further refinements of endoscopes that offer larger diameter working channels, which will allow for the use of utensils with bigger diameters, including needles capable of delivering thicker substances, such as gels and coils, under direct visual control. In addition, overtube- or platform-assisted delivery of hemostasis devices, such as oxidized cellulose, will allow the endoscopist to provide efficient hemostasis during advanced endoscopic resection and also during management of the traditional causes of GI bleeding [5]. Currently, stitching devices are mainly mounted on top of endoscopes, which limits their applicability to specific areas of the GI tract. In the future, through-the-scope stitching devices may also become a reality.

In summary, the self-made injection needle described by Nib Soehendra in 1976 ("cleverness") to efficiently treat bleeding gastric ulcers ("success") has shown us that the steps of (a) careful case description, (b) understanding of the anatomy and pathophysiology of bleeding lesions, and (c) lesion-focused therapy with (d) clever invention and adaptation of various utensils and devices remain the same now as they were then, ensuring that the present position of therapeutic endoscopy remains bright and that we will continue to progress towards the future, with clever minds and successful stories.

Acknowledgments

We want to acknowledge Prof. Nib Soehendra as the leading master endoscopist of the "Golden Era of GI Endoscopy," which started in the 1970s. This golden era of development, innovation, and mastery in endoscopy was primed by Prof. Soehendra's ingenuity. Prof. Soehendra was the director of the Department of Interdisciplinary Endoscopy at the University Medical Center, Hamburg-Eppendorf, Germany from 1981 until 2008, training leaders and master endoscopists from around the World. For decades, Prof. Nib Soehendra trained or shaped most leading GI endoscopists around the World, including the first author of this article. His innovations and inventions in GI endoscopy remain from accessories utilized for GI bleeding to those used in ERCP. The first biliary stent to drain the bile duct is another of his clever inventions. Even EUS was introduced to the GI world under his tutoring hand and bright mind. We want to say: Vielen Dank, obrigado, arigato, thank you, muchas gracias, lieber Herr Professor Soehendra for inventing and advancing GI endoscopy to a truly therapeutic specialty, which we devoutly follow, to treat our patients in the best possible way.

Competing interests

None

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