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Original Article

Embolization of arterial gastrointestinal hemorrhage with Fuaile medical adhesive

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Abstract

Background: To investigate the safety and effectiveness of Fuaile medical adhesive (FAL) with superselective catheterization in endovascular embolotherapy for the treatment of gastrointestinal hemorrhage (GIH) that was unresponsive to internal medicine treatment and gastroscopy management.

Methods: A total of 25 patients with GIH, confirmed using angiography but with failed results after internal medicine treatment or gastroscopy were retrospectively analyzed. A mixture of lipiodol and FAL (1:1) was used to embolize the bleeding vessels. In the follow-up, the operation time, FAL amount, technical success rate, clinical success rate, postoperative complications, and survival conditions were compared and analyzed.

Results: Among the 25 patients with GIH, FAL was applied alone in 23 patients and microcoil combined with FAL was applied in two patients. Hemostasis was successfully achieved in all patients. Two patients treated with embolotherapy experienced relapse of bleeding within 30 days but achieved successful hemostasis with FAL. Four patients died during follow-up: three patients died of advanced cancer and one patient died of severe infection induced by necrotizing pancreatitis. Three patients developed postoperative intestinal ischemic symptoms, which resolved spontaneously in two patients. In one patient, abdominal pain progressively aggravated. This patient underwent surgical resection, which confirmed the presence of colonic neoplasms. The intraoperative view revealed obvious ischemia of the local normal bowel near the tumor; however, the patient finally recovered and was discharged after surgery. The remaining patients exhibited good survival during the postoperative follow-up.

Conclusion: FAL embolotherapy has a high success rate for arterial GIH that was unresponsive to internal medicine treatment and gastroscopy management, with low postoperative rates of bleeding and complications; thus, this method has a high cost-efficacy.

Keywords: Complications; Embolism; Fuaile medical adhesive; Gastrointestinal hemorrhage

1. Introduction

Gastrointestinal hemorrhage (GIH) is a common medical emergency, and can be categorized into upper GIH (UGIH) and lower GIH (LGIH) based on the distance of the bleeding tract from the Treitz ligament. Studies have shown that the annual incidence of UGIH is 40−150 per 100,00 persons,[1] and the annual mortality rate is 10%−35%.[2] Of patients with LGIH, 25% may experience relapse of hemorrhage after

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internal medicine treatment, among whom 1%−10% die.[3] The treatment methods for GIH can be divided into three categories, namely, conservative and endoscopic therapy, surgery, and endovascular embolization. Conservative and endoscopic therapies are still the first-line treatment methods.[4] Patients with GIH have high surgical risks, including postoperative complications and mortality.[5] Thus, interventions that can resolve the problem with a higher success rate and lower mortality are desired.[6,7] Although endoscopy can clearly identify the location, nature, and cause of the lesion and stop the bleeding, there is a 30% probability of recurrent bleeding after endoscopic treatment.[8] The mortality rate of endoscopic treatment for acute UGIH is about 10%,[9,10] and the mortality rate in patients converted to surgical treatment after the failure of conservative or endoscopic treatment is about 20%−40%.[5] LGIH accounts for 20%−30% of the total GIH cases,[11−14] and the mortality rate of surgery can be as high as 30%.[15] Since Rösch et al.[16] successfully used transcatheter arterial embolization (TAE) for the treatment of UGIH in 1972, TAE has been widely applied in the treatment of nonvenous bleeding that was unresponsive to endoscopic therapy, especially in high-risk patients. TAE has more advantages over surgical treatment[17−21]; therefore, many medical centers consider TAE as the first-line treatment of GIH after the failure of endoscopic treatment.[5,22,23]

Currently, various types of embolic agents are available. Solid embolic agents have less efficacy when used in conditions such as complex collateral vessels, tortuous vessels, vasospasm, or coagulation disorders.[24] For such conditions, n-butyl cyanoacrylate (NBCA) can compensate for the insufficiencies solid embolic agents and be a good choice as a liquid embolic agent.[3,22] Our medical center (located in Beijing, China) uses Fuaile medical adhesive (FAL), which has similar embolization characteristics to NBCA, as a liquid embolic agent without the need for a specific catheter. Moreover, FAL is cheaper than NBCA. In this study, we retrospectively analyzed the clinical data of patients who received FAL embolotherapy for arterial GIH that was unresponsive to internal medicine treatment and gastroscopy management, and preliminarily investigated the efficacy and safety of this treatment method.

2. Methods

2.1. Background

The data of patients with GIH, who underwent interventional embolotherapy at our hospital, were collected. Interventional embolotherapy was administered to patients who met the certain criteria: (i) failed results after conservative or endoscopic therapy; (ii) inability to tolerate surgery; (iii) refusal of open surgery by the patient or family members; (iv) GIH due to rupture of the artery, not the vein. The criteria for study inclusion were: (i) presence of direct signs of GIH on intraoperative angiography, and (ii) simple application of FAL for embolotherapy or supplementary embolotherapy. The conditions in which FAL was selected as the embolic agent were: (i) the bleeding vessel was tortuous or slim, making it difficult for the surgeon to decide whether microcoil or gelatin sponge can achieve effective embolization; (ii) the patient had coexisting coagulation abnormalities; (iii) the patient showed unstable vital signs and needed immediate hemostasis; (iv) the patient needed medical adhesive application for supplementary embolization; (v) the patient or the family members were willing to adopt FAL as the first step of treatment after receiving an explanation of the method.

2.2. Patient information

A total of 25 patients treated between October 2012 and May 2015, who met the above criteria, were included in this retrospective study. The included patients comprised 17 men and eight women, aged 26−75 years (mean age, 53.5 years). According to the anatomical localizations, 19 patients had UGIH and six patients had LGIH. Etiological analysis revealed five patients had gastric ulcer, seven had duodenal ulcer, six had tumorous bleeding, four had postoperative bleeding, one had severe pancreatitis-induced vascular hemorrhage, and two had bleeding due to unknown causes. Eighteen patients exhibited various degrees of intraoperative blood coagulation abnormality, and only seven patients exhibited normal blood coagulation function.

2.3. Procedure of embolotherapy

All patients first underwent angiography with 5F catheters (Terumo, Japan) targeting the celiac trunk, as well as the superior and inferior mesenteric arteries. After identifying the bleeding vessels, coaxial catheterization was performed with a micro-catheter (2.7F; Terumo, Japan) combined with a microguidewire (0.014 in; Terumo, Japan), for superselective catheterization of the bleeding vessels. Thereafter, the target vessels were subjected to microcatheter-based uniform angiography to sufficiently reveal the lesions. If the target vessels cannot be effectively reached, the catheter tip was placed as close as possible to the target vessels. When the microcatheter has reached the target site as confirmed with angiography, 5% glucose solution was used to repeatedly wash the catheter, in order to maintain a non-ionic state inside the microcatheter. This was done to avoid embolization failure induced by intra-catheter medical adhesive polymerization during the injection. Before injection, FAL was mixed with lipiodol (Laboratoires Andre Guerbet, Aulnay-sous-Bois, France) in a 1:1 ratio for good visibility and polymerization time. When reflux signs appeared, embolization was immediately stopped and the catheter was quickly withdrawn. The entire injection procedure was monitored under fluoroscopy to ensure the safety of embolotherapy. After the microcatheter and the 5F catheter were withdrawn from the vessels, 5% glucose was applied in vitro for repeated washing to maintain catheter patency. Target artery angiography was later performed to confirm the embolization results, and if the results were poor, the above steps can be repeated for supplementary embolization.

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