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Angiodysplasia of the Right Colon Treated by Embolization with Ivalon (Polyvinyl Alcohol)

S. Murthy Tadavarthy,[1] Wilfrido Castaneda-Zuniga,[2] C. Zollikofer,[2] Frederic Nemer,[3] Jesse Barron,[4] and Kurt Amplatz[2]

[1] Department of Radiology, Mount Sinai Hospital, Minneapolis, Minnesota,
[2] Department of Radiology, University of Minnesota Hospital, Minneapolis, Minnesota,
[3] Department of Surgery, Mount Sinai Hospital, Minneapolis, Minnesota, and
[4] Department of Internal Medicine, Mount Sinai Hospital, Minneapolis, Minnesota, USA

Abstract. Angiodysplasia of the colon is being recognized with increasing frequency as a source of lower gastrointestinal bleeding in the elderly. In one patient with colonic angiodysplasia, superselective segmental embolization of the ileo-colic artery with Ivalon resulted in the cessation of bleeding without causing bowel infarction. However, because of the development of collateral branches to the angiodysplastic malformation, bleeding recurred. While colectomy remains the treatment of choice in younger patients, in high risk patients embolization with a permanent embolic material, such as Ivalon, is an attractive alternative.

Key words: Colon, hemorrhage – Ivalon – Angiodysplasia – Arteries, therapeutic blockade – Catheters and catheterization.

Angiodysplasia of the colon is one of the commonest causes of lower gastrointestinal bleeding in the elderly population. The identification of this entity as the source of bleeding is greatly improved by selective arteriography. Temporary control of colonic hemorrhage has been accomplished by infusion of vasoconstrictors; more recently, embolic materials, such as Gelfoam, have been used with partial success to obliterate the angiodysplastic malformation.

It is the purpose of this communication to present a case wherein superselective occlusion of the feeding vessel of a colonic angiodysplasia was accomplished by delivery of compressed Ivalon[1] to an exact, preselected site. The selective placement of embolic material, which is crucial in order to avoid bowel infarction from stray emboli, was accomplished with a special delivery system.

Address reprint requests to: S. Murthy Tadavarthy, M.D., 2215 Park Avenue South, Minneapolis, MN 55404, USA

[1] Ivalon (polyvinyl alcohol), UniPoint Laboratories, High Point, North Carolina, USA

Case Report

A 92-year-old woman was admitted for evaluation of chronic lower gastrointestinal bleeding. She had had four episodes of brief, lower gastrointestinal bleeding within the preceiding two years. The significant past history included arteriosclerotic heart disease with atrial fibrillation and congestive heart failure; in addition, she had a cerebrovascular accident with left hemiplegia that resolved without neurologic deficits. The workup for chronic lower gastrointestinal bleeding consisted of an upper gastrointestinal series, barium enema, and colonoscopy. The colonoscopy showed a plaque-like erosion at the ileo-cecal valve; histologic examination of a biopsy specimen from this site showed only inflammation, however.

A superior mesenteric arteriogram revealed a vascular tuft and an early draining vein at the ileo-cecal region. For better demonstration, a selective injection into the ileo-colic artery was performed. Abnormal tortuous, dilated vessels were seen originating from the ileo-colic artery, with early venous opacification in the late arterial phase (Fig. 1).

Surgical resection was considered hazardous because of the patient's age and the history of atrial fibrillation with congestive heart failure. Two days after the angiogram, embolization with compressed Ivalon was undertaken. The patient's colon was prepared 24 hours before embolization with oral antibiotics to minimize the risk in case of bowel necrosis and subsequent surgery. The two segmental branches of the ileo-colic artery were selectively catheterized with a 6.5 French polyethylene catheter and occluded selectively with Ivalon. The technique of the selective placement of embolic material and the delivery system will be discussed in the section on material and methods.

Post-embolization ileo-colic arteriography demonstrated the selective occlusion of the two feeding branches of the ileocolic artery with no filling of the angiodysplastic malformation (Fig. 2). Following the embolization, the patient's temperature and leukocyte count remained normal. The guaiac test for occult blood was negative, and the patient made an uneventful recovery and was discharged.

Six weeks after embolization she had a brief episode of bright rectal bleeding, which was controlled by conservative management. A selective ileo-colic arteriogram was performed for possible reembolization. The arteriogram demonstrated persistent thrombosis

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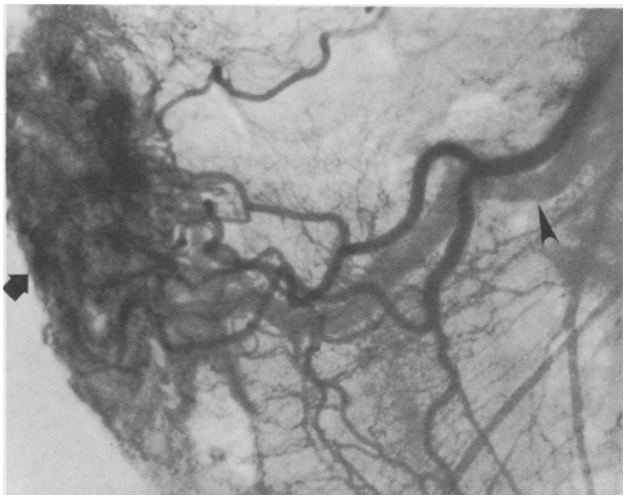

Fig. 1. Superselective right ileo-colic arteriogram demonstrates the abnormal, tortuous, dilated vessels of angiodysplasia (*arrow*) with early venous drainage (*arrowhead*).

Fig. 2. Post-embolization ileo-colic arteriogram demonstrates complete occulsions (*arrowheads*) of the two segmental branches that feed the angiodysplastic malformation.

of the segmental branches of the ileo-colic artery (Fig. 3). A superior mesenteric arteriogram revealed that the right colic artery, which had been small prior to embolization, had hypertrophied and now supplied the malformation (Fig. 4). Again, small vascular tufts and early venous drainage were demonstrated. However, a large segment of the angiodysplastic malformation remained thrombosed.

Several attempts were made to catheterize selectively the right colic artery with the intention of embolization. The guidewire could be passed selectively but the catheter could not be advanced over the guidewire. Selective embolization of the right colic artery could not be accomplished.

Following embolization the patient had four or five episodes of slow blood loss in a three-to-four month period as evidenced by low hemoglobin values and melena. Ultimately the patient underwent partial right colectomy with no untoward effects. Specimen radiography confirmed the removal of the angiodysplastic segment of colon.

Material and Method of Embolization

Ivalon, a polyvinyl alcohol sponge, has been employed as a permanent vascular embolic agent at our and other institutions [1, 2, 3]; in these studies it was injected as small plugs or as shavings through catheters. A system for safe and fast delivery, which was developed to position selectively the compressed Ivalon at a preselected site, has been described in detail elsewhere [4], we will give only a brief description of the method here.

A round cylindrical core of Ivalon 4 to 9 mm in diameter and about 4 mm long is cut out of a block of dry Ivalon. The plug is compressed around an introducing wire in a vise. The stainless steel introducing wire is 10 cm long (1/13,000 inch diameter) and has a small bead at its tip (Fig. 5). The other end is soldered to a 100-cm-long stainless steel wire of the same diameter. The spring wire that measures 100 cm long slips over the introducing wire in order to strip off the delivery plug. The Ivalon plug was coated with 75% dextran in order to prevent rapid swelling during the introduction of the Ivalon through the catheter. Depending on the diameter of the Ivalon plug, different size thinwall or regular catheters were

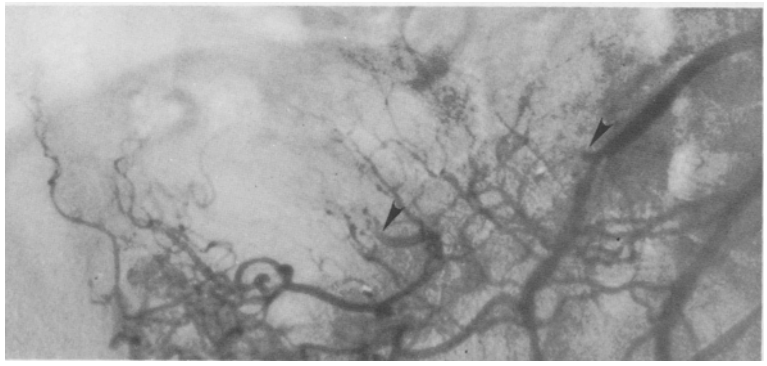

Fig. 3. Persistent thrombosis of the segmental branches (*arrowheads*) of the ileo-colic artery are evident six weeks following embolization.

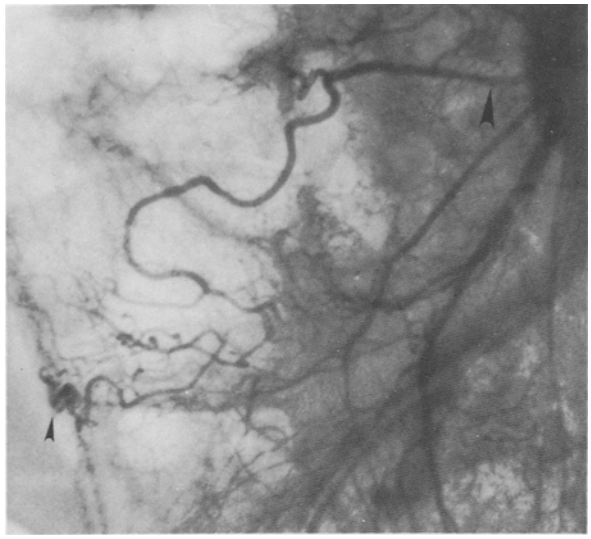

Fig. 4. The right colic artery is hyperthrophied (*large arrowhead*). A segment of the ileo-colic artery is reconstituted feeding the angiodysplastic malformation (*small arrowhead*).

used. A smaller size, 3 to 4 mm, plug can be introduced through 6.5 French polyethylene catheters.

After selective catheterization of the feeding artery, a "dummy wire" (wire without an attached plug) is introduced as a test for exact positioning. Then the wire with the plug is introduced and positioned beyond the catheter tip at the desired location. The metallic bead at the end of the wire facilitates fluoroscopic visualization. A special side-arm Clay-Adams adaptor with a rubber gasket is attached at the end of the catheter for flushing. The plug is exposed to the blood stream for five to eight minutes at which time the plug regains its original uncompressed diameter. In order to prevent distal embolization, plugs 2 mm larger than the vessel diameter are used.

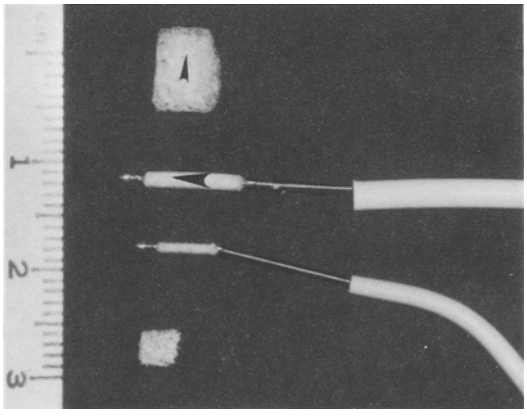

Fig. 5. The Ivalon plug (*large arrowhead*) is compressed around an introducing wire with a metallic bead to facilitate the fluoroscopic identification of the nonopaque Ivalon plug. The Ivalon plug, prior to its compression, is identified by the small arrowhead.

Discussion

Angiodysplasia of the colon as the source of lower gastrointestinal bleeding has been demonstrated with increasing frequency through use of selective visceral angiography [5–8]. In problematic cases, the angiodysplasia can be better demonstrated with magnification techniques [5]. Boley et al. believe that angiodysplasias represent a degenerative process occurring in elderly people rather than being congenital in origin [9, 10]. According to this theory, the angiodysplasia is secondary to chronic, intermittent, low-grade obstruction of submucosal veins, resulting in tortuosity and dilatation. The ultimate loss of the precapillary sphincter produces small arteriovenous communication.

Vasoconstrictors such as epinephrine or vasopressin have been used to control the hemorrhage in two cases of colonic angioma. This resulted in initial control of hemorrhage but bleeding recurred [11].

Surgical resection of the colon is the treatment of choice [12, 13]. However, in patients who represent a high surgical risk, embolization can be an alternative therapeutic modality. Selective segmental embolization of superior mesenteric artery branches has been performed to secure hemostasis in an abdominal abscess without bowel infarction [14]. Recently, Sinderman et al. have reported a case in which Gelfoam embolization was performed with no untoward effects in a bleeding cecal vascular ectasia [15]. This technique has two major disadvantages: (1) small emboli could pass beyond the marginal artery, resulting in bowel necrosis; and (2) the vascular occlusion is probably not permanent. We, therefore, elected to occlude a comparably larger feeding branch with a permanent Ivalon plug.

Other authors have also reported initial control of hemorrhage following embolization in angiodysplastic malformations of the colon; however bleeding recurred in these patients and hemicolectomy was ultimately necessary [16, 17].

We achieved the primary goal of embolization in this patient – reduction of the arterial pressure within the malformation without risk of bowel necrosis. In angiodysplasias a complete anatomic obliteration cannot be accomplished since the disease process involves arteries, capillaries, and submucosal venules as well as larger draining veins. Bleeding may recur as long as abnormal capillaries and veins remain patent. To prevent bowel necrosis, which would have been disastrous in this elderly patient, medium-sized segmental feeding branches were occluded. The follow-up angiogram indeed revealed persistent occlusions of the segmental branches of the ileo-colic artery but, as anticipated, the right colic artery underwent

hypertrophy and fed a small segment of the angiodysplasia. This collateralization of the angiodysplasia may well have been responsible for the post-embolization episode of lower gastrointestinal bleeding.

Because of the limited experience with this nonsurgical treatment, the long-term results of embolization are not known. One might anticipate further growth of the malformation from collateral branches and possibly recurrence of bleeding. The other complications from colonic embolization include: (1) stray emboli causing infarctions of bowel, viscera, or lower extremities; and (2) colon stricture, which has been seen following successful embolization in diverticular hemorrhage [18]. The treatment of choice, therefore, remains colectomy in younger patients. In high-risk patients, however, embolization with a permanent embolic material is an attractive alternative.

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