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An unusual complication of carotid stenting: spontaneous rectus sheath hematoma and its endovascular management

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ABSTRACT
Carotid stenting has recently emerged as a potential alternative to surgical treatment. We report a case of a spontaneous rectus sheath hematoma in a patient who underwent anticoagulation therapy following carotid stenting. Computed tomography findings were consistent with active bleeding within the hematoma, and this was confirmed with selective angiography via right deep circumflex iliac artery injection. Transcatheter embolization of the right deep circumflex iliac artery with n-butyl 2-cyanoacrylate was successfully performed. To the best of our knowledge, spontaneous anterior abdominal wall hemorrhaging following carotid stenting has not been previously reported in the English language literature.

Key words: • *abdominal wall* • *hemorrhage* • *anticoagulation therapy*

Anticoagulant therapy is widely used for thromboembolic diseases, such as deep venous thrombosis, acute pulmonary thromboembolism, stroke, and ischemic heart disease (1, 2). Recently, anticoagulant medication has come into use as a prophylaxis against thrombosis in carotid stenting procedures. The major complication of anticoagulant therapy is bleeding, which may occur in different organs, and is referred to as major bleeding if it occurs intracranially or if it leads to hemodynamic instability, which may then result in prolonged hospitalization, transfusion, or death (3). Spontaneous hemorrhaging of the abdominal wall secondary to anticoagulant therapy could be a common and sometimes life-threatening condition in patients undergoing anticoagulation therapy (4). Herein, we report a case of spontaneous rectus sheath hematoma caused by anticoagulation therapy following carotid stenting which was treated by embolization of the deep circumflex iliac artery.

Case report

A 61-year-old man with a past medical history that included atherosclerosis and coronary artery disease was admitted with headache and syncope. Carotid Doppler examination and carotid angiography demonstrated total occlusion of the right internal carotid artery, and 80% stenosis in the proximal segment of the left internal carotid artery. A left internal carotid stenting procedure was successfully performed. Aspirin 300 mg/day and clopidogrel 75 mg/day were initiated 3 days before the procedure. During the procedure, intravenous heparin was administered to keep the activated clotting time around 300 seconds. One hour after the procedure, the patient complained of pain on the right side of his abdomen. Physical examination revealed a tender mass in the right lower abdominal wall. Laboratory studies showed a fall in hemoglobin from 12.7 g/dl to 9.3 g/dl. Ultrasound (US) examination demonstrated an 8 × 5 cm hematoma within the right rectus muscle. Follow-up US examination revealed that the hematoma had enlarged and a computed tomography (CT) examination of the lower abdomen was performed. CT showed a smooth-shaped mass within the layers of the anterolateral abdominal wall leading to enlargement of the right rectus abdominis muscle with signs of active bleeding (Fig. 1). The patient underwent angiography, which demonstrated direct signs of bleeding from the right deep circumflex iliac artery (RDCIA) (Fig. 2). The RDCIA was selectively catheterized with a microcatheter (Excelsior, Boston Scientific, Fremont, CA, USA) and embolized with 1 ml of 15% diluted n-butyl 2-cyanoacrylate (NBCA) (Histoacryl, B. Braun, Tuttlingen, Germany). The immediate postembolization angiogram showed the occlusion of the RDCIA without any active bleeding (Fig. 3). The clinical course was uneventful with a stable hemodynamic state. The patient was discharged 2 days later and was doing well at the first week follow-up.

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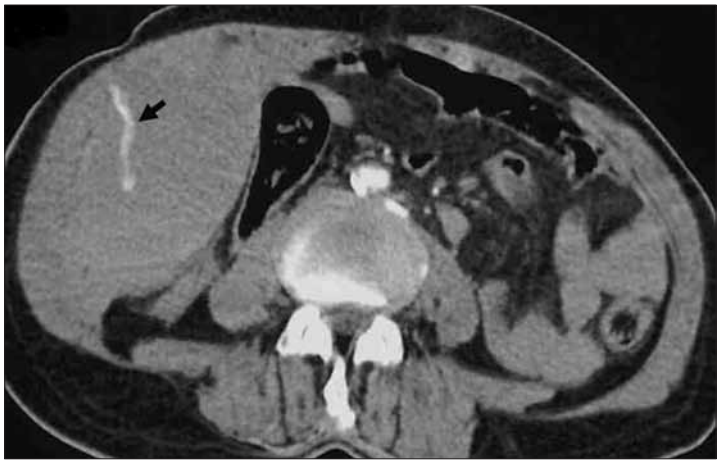

Figure 1. Contrast enhanced abdominal CT at the arterial phase shows the hematoma in the right anterior abdominal wall and extravasation of the contrast material *(arrow)*, which represents active bleeding.

Figure 2. Selective angiogram of the right deep circumflex iliac artery shows multiple active bleeding foci.

Figure 3. Postembolization selective angiogram of the right deep circumflex iliac artery shows total occlusion of the bleeding artery without any sign of extravasation.

Discussion

The widespread use of anticoagulant therapy increased the rate of spontaneous hemorrhage (5). The abdominal wall is a common site of spontaneous bleeding in patients undergoing anticoagulant therapy (4). Small vessel arteriosclerosis or heparin-induced immune microangiopathy are among the most accepted pathogenetic processes (6, 7). Overcontraction of the abdominal wall due to sneezing, coughing, and vomiting may also be regarded as precipitating factors (8, 9). The diagnosis of rectus sheath hematoma is usually difficult since it may mimic other pathologies leading to acute abdomen (10, 11). US and CT are diagnostic modalities for rectus sheath hematoma cases. Berna et al. proposed a method of classification for rectus sheath hematoma on the basis of CT findings (12). In type 1, the hematoma is intramuscular and an increase in muscle size is observed with focal or diffuse increased density; the hematoma is unilateral and does not dissect along fascial planes. In type 2, the hematoma is intramuscular, as it is in type 1, but blood is between the muscle and the fascia transversalis, the hematoma can be uni- or bilateral, no blood is seen prevesically, and a hematocrit effect (fluid-fluid level) can be seen. In type 3, the hematoma may or may not effect the muscle, the blood is between the muscle and the fascia transversalis, is in the peritoneum prevesical space, and a hematocrit effect can be seen. In hemodynamically stable conditions, conservative measures are the mainstay of treatment, whereas if the process is uncontrollable, surgical intervention can be considered, even though its ability to localize or control the bleeding is severely limited (9, 13). Recently, transcatheter embolization has emerged as an effective and less invasive alternative to surgical treatment in the management of spontaneous hemorrhages (8, 14–16).

NBCA has been documented as an effective embolization material. Moreover, in several studies, NBCA embolization was shown to be a feasible, effective, and time-efficient method for controlling different types of acute arterial hemorrhage (8, 17–20). NBCA is a fast-acting polymer chain that is initiated with the contact of anions present in the blood just after injection into the lesion (21). NBCA is usually diluted with iodized oil, in various ratios, in order to adjust polymerization time and to achieve proper radiopacity (19). Because these mixtures with various ratios differ in their adhesiveness, solidification time is critical for successful embolization with NBCA (19). Use of higher concentration ratios of NBCA results in quicker polymerization and lower visibility, and requires operator experience (19). To obtain permanent occlusion and to prevent recanalization, optimum glue concentration should be used; therefore, polymerization time of the material can be matched precisely to local flow velocity (19). In our case, we decided to perform the embolization with 15% diluted NBCA in order to obtain a guaranteed distal embolization.

In the presented case, we thought the spontaneous hemorrhage of the abdominal wall was caused by prophylactic anticoagulation therapy, which was initiated in order to provide patency of the implanted carotid stent. There have been only a few case reports of spontaneous hemorrhaging of the abdominal wall which were defined by diagnostic imaging modalities and were successfully treated by transcatheter embolization (8, 14–16). Additionally, to the best of our knowledge, this complication due to anticoagulation therapy following carotid stenting has not been

reported previously. As in most cases of active bleeding, transcatheter embolization is also an effective treatment option for spontaneous anterior abdominal wall hemorrhage since permanent occlusion of the bleeding artery can be achieved less invasively, which results in lower morbidity when compared to surgery.

In conclusion, interventional radiologists should be aware of the possibility of spontaneous anterior abdominal wall or retroperitoneal hematomas due to anticoagulation therapy. Prompt diagnosis and embolization is lifesaving in this unusual complication.

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