Failed MILLER Banding Complicated by Pseudoaneurysm: Report of a Case

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ABSTRACT

We present a case in which Minimally Invasive Limited Ligation Endoluminal-assisted Revision (MILLER) banding was complicated by the development of a pseudoaneurysm at the site of attempted banding. A patient with a high-flow fistula and symptoms of distal arterial hypoperfusion underwent MILLER banding. Six weeks post-MILLER banding, the patient’s symptoms of hand pain returned gradually and a pseudoaneurysm appeared at the banding site. The remedial surgical procedure revealed a banding suture that had passed through one wall of the vessel and was floating in the pseudoaneurysm cavity. A primary lateral repair of the pseudoaneurysm was performed and the inflow was rebanded over a 4 mm balloon. The patient is now 51 months postpseudoaneurysm repair and the fistula continues to be used for dialysis access. Perforation of the fistula should be suspected when there is more bleeding than usual during the MILLER banding procedure.

The use of Minimally Invasive Limited Ligation Endoluminal-assisted Revision (MILLER) banding was first reported in 2006 (1). That study included 16 patients with dialysis-associated steal syndrome who had immediate improvement of symptoms and no recurrence of symptoms or thrombosis at a mean follow-up of 3 months. Subsequent studies report a high degree of technical success with the MILLER banding procedure (2,3).

The present report describes a case of MILLER banding complicated by the development of a pseudoaneurysm at the operative site.

Case Presentation

The patient is a 63-year-old woman with a left brachiocephalic fistula that had been functioning for 2 years. She began to experience the gradual and progressive onset of left hand pain at night as well as toward the end of her hemodialysis treatments. On examination, there was a left brachiocephalic fistula with a strong thrill and bruit. The left hand was tepid but the fingers were cool. The left axillary and brachial artery pulses were normal but the left distal radial and ulnar artery pulses were absent. Intra-access flows were 1330 ml/minute by duplex methodology.

She underwent attempted MILLER banding. Following retrograde puncture of the fistula, the distal brachial artery was catheterized selectively (Fig. 1). An incision was then made over the juxta-anastomotic fistula and it was encircled by a 2-0 silk suture. During the procedure, there was more bleeding than usual. We inflated a 4 mm angioplasty balloon (Fig. 2). After tying the suture over the balloon, the bleeding stopped. Figure 3 shows a postbanding contrast injection of the brachial artery.
In the first postoperative week, her symptoms were improved and the intra-access flow was 689 ml/minute by duplex methodology. However, over the next 6 weeks, her symptoms returned and the intra-access flow increased to 1855 ml/minute. A 2 cm pseudoaneurysm had formed at the site of banding. A remedial procedure was planned to salvage the fistula.

An injection of the brachial artery showed a pseudoaneurysm visible at the site of the banding (Fig. 4). After local anesthesia, the pseudoaneurysm was approached using a longitudinal incision, proximal and distal control was obtained, and the aneurysm was unroofed. Visual inspection found that the banding suture had passed through one wall of the vessel and was floating in the pseudoaneurysm cavity (Fig. 5). A primary lateral repair of the pseudoaneurysm was performed and the inflow was rebanded over a 4 mm balloon (Fig. 6). The patient is now 51 months post-pseudoaneurysm repair and the fistula continues to be used for hemodialysis.

Fig. 2. A 4 mm angioplasty balloon was inflated during the MILLER banding procedure.

Fig. 3. Postbanding contrast image of the brachial artery and the fistula.

Fig. 4. During the remedial procedure, an injection of the brachial artery showed a pseudoaneurysm at the site of the banding.

Fig. 5. The pseudoaneurysm has been opened showing the opening into the fistula on the left and the ineffective banding suture on the right.

Fig. 6. Brachial artery injection following primary lateral repair of the pseudoaneurysm and re-banding of the inflow over a 4 mm balloon.
Discussion

Previous reports of the MILLER banding procedure cite high rates of success and few complications (1,2). The first study consisted of 16 patients who all had immediate symptomatic and angiographic improvements with no complications and no aneurysms at a mean follow-up of 3 months (1). A study of 229 MILLER banding procedures (183 patients) reported a technical success rate of 98% at a mean follow-up of 11 months with no aneurysms (2). Two patients developed cellulitis that resulted in a protocol change to include prophylactic antibiotic therapy. There were three cases of intraoperative bleeding that were controlled by manual compression.

In this study, the most likely cause of pseudoaneurysm was an unrecognized perforation of the fistula by the operator using the right angle clamp while attempting to encircle the fistula with the banding suture (Fig. 7). Figure 8 depicts how the vein was transfixed by the banding suture. The transfixing suture created an obstruction that was sufficient to promote expansion of the pseudoaneurysm.

Perforation of the fistula should be suspected when there is more bleeding than usual during the MILLER banding procedure. Had the perforation been recognized, the simpler management would have been removal of the suture and application of direct pressure or, if necessary, balloon tamponade.

References

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