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Case Report:

Successful recanalization of chronic total occlusion of the superior mesenteric artery by transradial approach

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Abstract: It is a challenge to confirm chronic mesenteric ischemia (CMI) as a cause of gastrointestinal (GI) symptoms such as postprandial epigastric bloating, anorexia, and debilitating weight loss. Endovascular intervention for CMI has been gaining popularity because of the high morbidity associated with surgical revascularization. However, in EVI for superior mesenteric artery (SMA) occlusion, the transfemoral approach is limited by difficulty in coaxial alignment of the guiding catheter, which leads to insufficient back-up support. Herein, we report on a 58-year-old male patient with chronic total occlusion of the SMA, which was successfully revascularized by endovascular intervention via the left radial artery. Transradial endovascular therapy may be another treatment option for the treatment of CMI.

Key words: Transluminal angioplasty, Radial artery, Superior mesenteric artery, Chronic mesenteric ischemia
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1 Introduction

Diagnosing chronic mesenteric ischemia (CMI) is difficult because it is often asymptomatic in the elderly (Hansen *et al*., 2004), and routine gastrointestinal (GI) work-up, including endoscopic gastroduodenoscopy (EGD) and abdominal ultrasonography, does not provide any diagnostic clues for vague abdominal discomfort, especially after a meal. Surgical revascularization has a perioperative complication rate ranging between 33% and 47% and a 30-d mortality rate of 8% to 12% (Cunningham *et al*., 1991; Mateo *et al*., 1999), which underlies the increasing popularity of endovascular intervention for this condition (Silva *et al*., 2006; Fioole *et al*., 2010). We report here a successful endovascular recanalization of chronic total occlusion (CTO) of the superior mesenteric artery (SMA) using the left radial artery.

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2 Case report

A 58-year-old male patient with hypertension was admitted to our hospital because of postprandial abdominal pain, anorexia, and 4 kg of weight loss over one year. His EGD and abdominal ultrasonography were unremarkable. The abdominal computed tomogram angiography revealed an 8 mm-long CTO with heavy calcification at the SMA root and a significant stenosis of the ostium of the celiac artery. Contrast filling of the SMA artery following the obstructed segment was observed via the gastroduodenal collateral vessel (Fig. 1).

The patient refused surgical revascularization, and endovascular therapy was performed. The left radial artery was chosen for vascular access because proper alignment and strong back-up support by a guiding catheter was required for endovascular intervention of the calcified CTO at the SMA without a visualized ostial stump. A 6-Fr (1 Fr=0.33 mm)-long introducer sheath was inserted into the left radial artery, and a 5-Fr Pigtail catheter was used to obtain a descending artery aortogram. There was a total occlusion in the SMA with heavy calcification, and it was difficult to find the SMA stump (Fig. 2a). After changing the catheter to a 6-Fr multi-purpose angiographic 1 (MPA1) guiding catheter (Cordis®, USA), a Fielder XT (Asahi®, Japan) guidewire with a microcatheter, Finecross (Terumo®, Japan), was used to pass the lesion. Despite several attempts, the guidewire could not be passed through the lesion. When subintimal angioplasty was performed using a 0.035″ Radifocus guidewire (Terumo®, Japan), it was passed through the lesion with the support of a 4-Fr multi-purpose (MP) catheter (JSM®, Korea) (Fig. 2b), which was subsequently replaced with 300 cm of Whisper 0.014″ guidewire (Abbott®, Belgium), the microcatheter then being positioned beyond the lesion. A dye shot test through the microcatheter confirmed that the guidewire was in the true lumen. Iliocolic flow was restored after repeated ballooning with a 3.0 mm×15 mm Ryujin™ balloon (Terumo®, Japan) up to 20 atm (1 atm=101.325 kPa). A Genesis 6.0 mm×24 mm stent (Cordis®, USA) was deployed from the ostium of the SMA at 12 atm. The final angiogram showed full recovery of the flow through the SMA (Fig. 3a). Abdominal angina improved and the patient regained 3 kg of weight. The three-month follow-up computed tomography (CT) revealed good patency of the stent at the SMA (Fig. 3b).

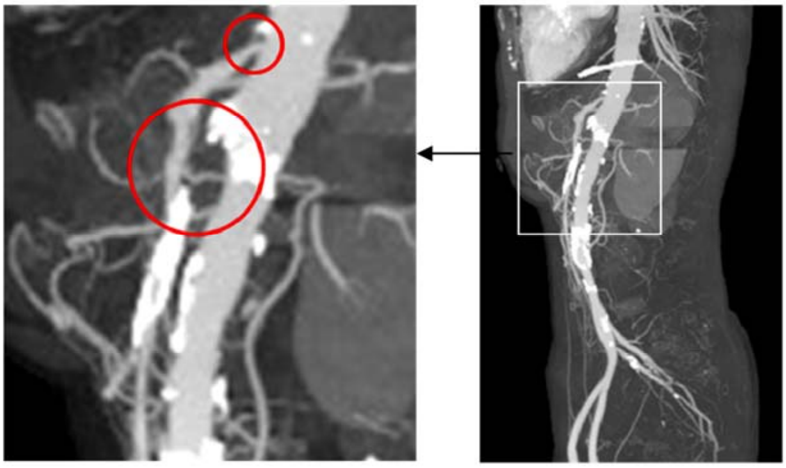

Fig. 1 Abdominal computed tomogram angiography showing the calcified total occlusion of the ostium of the superior mesenteric artery (large circle) and the significant stenosis of the ostium of the celiac trunk (small circle)

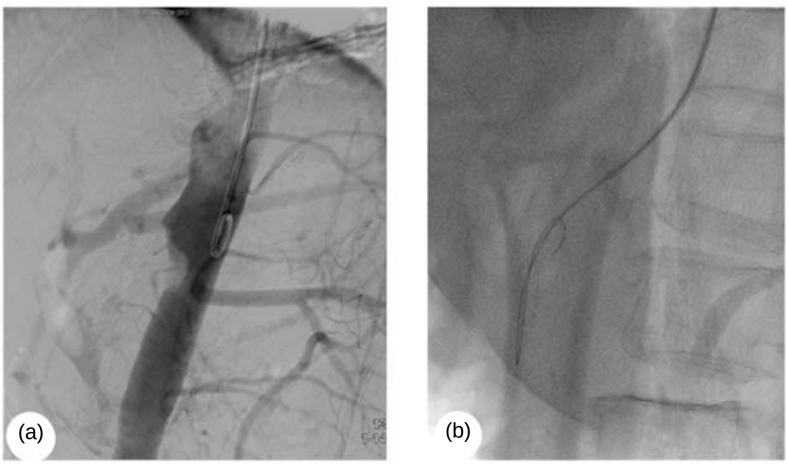

Fig. 2 Endovascular intervention for superior mesenteric artery (SMA) occlusion via the left radial artery
(a) Abdominal aortic angiography with a 5-Fr pigtail catheter revealed a total occlusion of the superior mesenteric artery without visualization of the ostial stump; (b) Subintimal angioplasty using the 0.035″ Radifocus guidewire (Terumo®, Japan). The guidewire crossed the lesion

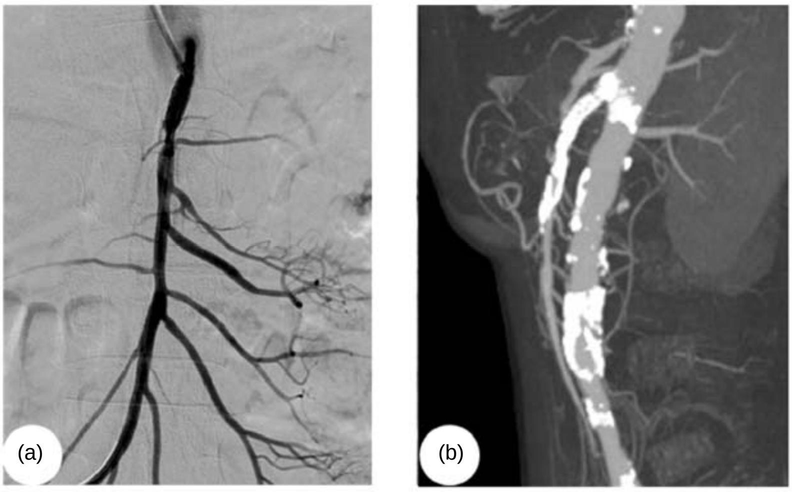

Fig. 3 Images following the procedure
(a) Final distal subtraction angiography showed good distal flow of the superior mesenteric artery (SMA) with minimal stenosis just distal to the stent edge; (b) Three-month follow-up computed tomography revealed good patency of the stent at the SMA root

3 Discussion

CMI is a rare disease defined as intestinal ischemia caused by stenosis or occlusion of one or more of the following three intestinal arteries: the celiac artery, the SMA, and the inferior mesenteric artery. Although surgical revascularization remains the gold standard for the treatment of CMI because of its longer durability, endovascular intervention has been gaining popularity because of the high complication rate of surgical revascularization and advances in new devices. Recent studies have shown that, compared to surgical treatment, endovascular therapy for CMI has a higher procedural success rate (up to 96%) and a lower complication rate with a comparable short-term patency rate (Silva *et al*., 2006; Fioole *et al*., 2010). Endovascular intervention for CMI has several advantages over surgical revascularization. First, the procedure is somewhat easy and feasible. Second, the complication rate of endovascular therapy is lower than that of surgical revascularization. Third, while the long-term patency rate is as low as 60% at two years, repeat revascularization can be done for restenosis following endovascular therapy (Fioole *et al*., 2010). As was the case with our patient, if the patient refuses surgery or when there is a high probability of surgical complications, endovascular intervention could be an alternative treatment option for CMI.

In general, individuals with CMI commonly have stenoses or occlusions of at least two or more mesenteric arteries, and complete revascularization therefore seems preferable. In this case, the celiac artery stenosis was not treated and only the SMA total occlusion was revascularized because of the uncertainty of whether the guidewire could be passed or not, and because of uncertainty as to which artery was the culprit for the patient's abdominal symptoms. As a result of the intervention, the patient's symptoms improved following the endovascular therapy of the SMA total occlusion, and no restenosis was found on the three-month follow-up CT scan.

In endovascular intervention for SMA occlusion, the transfemoral approach is limited by difficulty in coaxial alignment of the guiding catheter, which leads to insufficient back-up support. Frequently, associated heavy calcification also hampers the transfemoral approach. Therefore, approaches involving the arms may be appropriate because the SMA runs vertically along the abdominal aorta. The brachial artery was utilized for CMI treatment (Cohn *et al*., 1999; Soga *et al*., 2008) and, as yet, there has been no report on using the radial artery for the treatment of SMA occlusion. The radial artery lies in a constant position at the wrist, is superficial, and is readily palpated and compressed. Unlike the brachial artery, the radial artery is not usually an end artery and there are no important nerves adjacent to the vessel. The radial artery as a vascular access site has certain advantages over the brachial artery or the femoral artery in terms of hemostasis and less vascular access site complications (Jolly *et al*., 2009). For these reasons, the use of the radial artery has been expanding, even in primary percutaneous intervention, in addition to its use in elective procedures (Kim *et al*., 2005; 2006; Hetherington *et al*., 2009). Kessel *et al*. (2003) successfully treated renal artery stenosis (16 of 17 patients) via the radial artery. They suggested that the radial artery is a novel approach for renal artery stenting.

4 Conclusions

In summary, to our knowledge, this is the first reported case of endovascular therapy for CMI using the left radial artery. It illustrates that transradial endovascular therapy for SMA occlusion is feasible and may have beneficial effects on hemostasis following the procedure. The transradial approach may offer better coaxial alignment and strong back-up support of the guiding catheter for the SMA intervention. Thus, transradial endovascular therapy may be a good option for the treatment of SMA occlusion.

References

Cohn, J.M., Molavi, B., Collar, A., 1999. Stenting of a superior mesenteric artery lesion via the right arm approach. *The Journal of Invasive Cardiology*, **11**(8):503-505.

Cunningham, C.G., Reilly, L.M., Rapp, J.H., Schneider, P.A., Stoney, R.J., 1991. Chronic visceral ischemia. Three decades of progress. *Annals of Surgery*, **214**(3):276-288. [doi:10.1097/00000658-199109000-00010]

Fioole, B., van de Rest, H.J., Meijer, J.R., van Leersum, M., van Koeverden, S., Moll, F.L., van den Berg, J.C., de Vries, J.P., 2010. Percutaneous transluminal angioplasty and stenting as first-choice treatment in patients with chronic mesenteric ischemia. *Journal of Vascular Surgery*, **51**(2):386-391. [doi:10.1016/j.jvs.2009.08.055]

Hansen, K.J., Wilson, D.B., Craven, T.E., Pearce, J.D., English, W.P., Edwards, M.S., Ayerdi, J., Burke, G.L., 2004. Mesenteric artery disease in the elderly. *Journal of Vascular Surgery*, **40**(1):45-52. [doi:10.1016/j.jvs.2004.03.022]

Hetherington, S.L., Adam, Z., Morley, R., de Belder, M.A., Hall, J.A., Muir, D.F., Sutton, A.G., Swanson, N., Wright, R.A., 2009. Primary percutaneous coronary intervention for acute ST-segment elevation myocardial infarction: changing patterns of vascular access, radial versus femoral artery. *Heart*, **95**(19):1612-1618. [doi:10.1136/hrt.2009.170233]

Jolly, S.S., Amlani, S., Hamon, M., Yusuf, S., Mehta, S.R., 2009. Radial versus femoral access for coronary angiography or intervention and the impact on major bleeding and ischemic events: a systematic review and meta-analysis of randomized trials. *American Heart Journal*, **157**(1):132-140. [doi:10.1016/j.ahj.2008.08.023]

Kessel, D.O., Robertson, I., Taylor, E.J., Patel, J.V., 2003. Renal stenting from the radial artery: a novel approach. *Cardiovascular and Interventional Radiology*, **26**(2):146-149.

Kim, J.Y., Yoon, J., Jung, H.S., Ko, J.Y., Yoo, B.S., Hwang, S.O., Lee, S.H., Choe, K.H., 2005. Feasibility of the radial artery as a vascular access route in performing primary percutaneous coronary intervention. *Yonsei Medical Journal*, **46**(4):503-510. [doi:10.3349/ymj.2005.46.4.503]

Kim, J.Y., Lee, S.H., Choe, H.M., Yoo, B.S., Yoon, J., Choe, K.H., 2006. The feasibility of percutaneous transradial coronary intervention for chronic total occlusion. *Yonsei Medical Journal*, **47**(5):680-687. [doi:10.3349/ymj.2006.47.5.680]

Mateo, R.B., O′Hara, P.J., Hertzer, N.R., Mascha, E.J., Beven, E.G., Krajewski, L.P., 1999. Elective surgical treatment of symptomatic chronic mesenteric occlusive disease: early results and late outcomes. *Journal of Vascular Surgery*, **29**(5):821-832. [doi:10.1016/S0741-5214(99)70209-0]

Silva, J.A., White, C.J., Collins, T.J., Jenkins, J.S., Andry, M.E., Reilly, J.P., Ramee, S.R., 2006. Endovascular therapy for chronic mesenteric ischemia. *Journal of the American College of Cardiology*, **47**(5):944-950. [doi:10.1016/j.jacc.2005.10.056]

Soga, Y., Yokoi, H., Iwabuchi, M., Nobuyoshi, M., 2008. Endovascular treatment of chronic mesenteric ischemia. *Circulation Journal*, **72**(7):1198-1200. [doi:10.1253/circj.72.1198]