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Accordion phenomenon of the hepatic artery: mimicker of vasospasm or intimal injury

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Abstract

The accordion phenomenon occurs because of mechanical distortion of a straightened vessel during coronary and vascular interventions. To date, however, this phenomenon has not been reported in vessels of the upper abdomen. We therefore describe the accordion phenomenon of the hepatic artery during transarterial chemoembolization seen while treating a liver tumor. As the accordion phenomenon is now known to involve hepatic arteries, it should be differentiated from vascular complications such as vasospasm or intimal injury.

Keywords

Accordion phenomenon, hepatic artery, complications, angiography, catheterization, chemoembolization

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Introduction

The term ''accordion phenomenon'' is used to describe mechanical distortion of a tortuous artery. This phenomenon has been reported in patients undergoing percutaneous coronary intervention (PCI), carotid artery stenting, and endovascular aneurysm repair (1–3). The accordion phenomenon has also been called ''pseudo-narrowing'' and ''pseudo-stenosis'' in patients undergoing PCI (2,4–6). As these designations imply, discrimination of the accordion phenomenon is often difficult. It is clinically necessary, however, to differentiate it from both vasospasm and intimal injury.

Transarterial chemoembolization (TACE) is the most frequently used treatment for hepatocellular carcinoma (HCC) that is unresectable or cannot be treated using percutaneous ablation. Vasospasm and intimal injury of the hepatic arteries occasionally occur during TACE, causing flow limitation and subsequent difficulty with the diagnosis or treatment. We describe a case involving an accordion phenomenon that mimicked vasospasm and intimal injury of the hepatic artery.

Case report

Informed consent was obtained from the patient described herein. A 70-year-old woman with liver cirrhosis caused by hepatitis C virus was admitted for HCC treatment. The tumor, measuring 5.1 cm at the largest diameter, was located in segment eight, adjacent to the diaphragm on contrast-enhanced computed tomography (CT). Surgical resection was avoided because of the patient's poor liver function. Because of its size and location, the tumor was not suitable for local ablation therapy. Thus, TACE was performed.

Transfemoral access was established with a 5-Fr sheath. Diagnostic angiography was performed with a 5-Fr shepherd's hook catheter (Fansac; Terumo Clinical Supply, Gifu, Japan). Digital subtraction angiography revealed a hypervascular tumor supplied by the anterior branch of the right hepatic artery. We exchanged the 5-Fr shepherd's hook catheter for a 5-Fr Cobra catheter (Selecon SNCC; Terumo Clinical Supply) for selective catheterization of the hepatic artery. This maneuver allowed us to establish stable backup and obtain a

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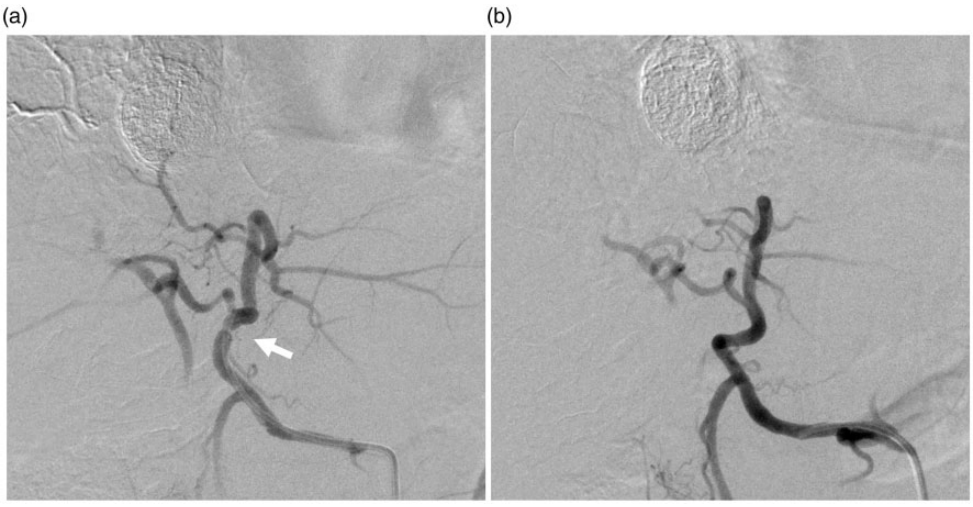

Fig. 1. Accordion phenomenon in the hepatic artery. (a) A 5-Fr Cobra catheter was advanced into the distal end of the proper hepatic artery. The post-TACE angiogram of the hepatic artery showed the stenosis-like lesion (white arrows) in the proper hepatic artery. (b) Angiogram of the hepatic artery immediately after the 5-Fr catheter was retracted into the common hepatic artery. The stenosis-like lesion in the proper hepatic artery has disappeared.

high-quality angiogram. The hepatic artery was tortuous, but we were able to advance the parent catheter into the right hepatic artery through the common and proper hepatic arteries, thus accomplishing selective TACE for treating the HCC. The post-TACE angiogram showed a stenosis-like lesion at the proper hepatic artery without flow limitation (Fig. 1a). Immediately after the catheter was retracted to the common hepatic artery, the prior vascular abnormality had completely disappeared from the angiogram (Fig. 1b).

Discussion

The accordion phenomenon is primarily reported as an iatrogenic event during coronary PCI (5,6), but it may also be observed during endovascular aortic repair (1). It frequently occurs when a tortuous, elongated vascular segment of the external iliac artery is artificially straightened and shortened by a stent graft delivery system. It has also been reported during percutaneous transluminal angioplasty of the iliac artery and during carotid artery stenting (3,7). To the best of the authors' knowledge, however, no reports have described this phenomenon in association with abdominal vessels.

TACE for hepatic tumors has been performed as long as PCI. Although TACE is one of the most common procedures performed at our institution to treat hepatic tumors, this is the first case in which we identified an associated accordion phenomenon. Considering that the accordion phenomenon is commonly observed in other vessels, its occurrence in the hepatic artery should not be surprising. Thus, it is possible that many cases of this phenomenon have been misdiagnosed as vasospasm or vascular injury.

The correct diagnosis of the accordion phenomenon is important if we are to avoid unnecessary interruption of the procedure as well as the occurrence of true vasospasm or a worse complication such as dissection. Although no flow limitations were associated with the accordion phenomenon in the present case, the accordion phenomenon of the coronary arteries is potentially a flow-limiting complication that could cause ischemic changes in the myocardium during PCI. Therefore, it might be difficult to differentiate "pseudo-stenosis" caused by the accordion phenomenon from stenosis due to vasospasm or vascular injury based on the presence or absence of slow flow. It is therefore important to remember the possibility of the accordion phenomenon when a catheter or guide wire straightens a tortuous artery—keeping in mind that many earlier cases of the accordion phenomenon may have been misdiagnosed.

Careful comparison between the angiograms acquired before and during the problem is helpful for distinguishing the accordion phenomenon from other complications. Also, infusing a vasodilator (e.g. lidocaine, nitroglycerin) sometimes relieves the vasospasm, which would help exclude its presence. There is currently, however, no way to distinguish reliably the accordion phenomenon from true stenosis. Thus, in uncertain cases, it seems better to retract the catheter and evaluate the situation using a contrast injection while leaving the floppy guidewire in the accordion-like lesion.

Although the accordion phenomenon in the hepatic artery is usually reversible and not harmful to most patients—so long as the situation is correctly interpreted—using a softer catheter is thought to be effective

to avoid the phenomenon. We usually use a 5-Fr catheter to obtain stable backup during TACE, but the use of 4-Fr catheter should be considered in cases where deep cannulation of the tortuous artery is required. Using softer catheters and guide wires may also reduce the risk of more serious complications such as vascular injury.

In conclusion, we experienced the accordion phenomenon in a hepatic artery during TACE applied to treat a hepatic malignancy. The accordion phenomenon should be included in the differential diagnosis of a stenosis-like lesion mimicking vasospasm or intimal injury if a catheter or guide wire straightened a tortuous hepatic artery.

Declaration of conflicting interests

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References

1. Quinn SF, Kim J, Sheley RC, et al. ''Accordion'' deformity of a tortuous external iliac artery after stent-graft placement. J Endovasc Ther 2001;8:93–98.
2. Tomai F, Sciarra L, Gioffrè PA. Accordion effect of left anterior descending coronary artery after successful stent implantation. G Ital Cardiol 1999;29:803–804.
3. Tsutsumi M, Kazekawa K, Onizuka M, et al. Accordion effect during carotid artery stenting: report of two cases and review of the literature. Neuroradiology 2007;49:567–570.
4. Dahdouh ZS, Abdel-Massih T, Sarkis A, et al. Accordion phenomenon in the radial artery: should we treat the radial as a coronary artery? Sultan Qaboos Univ Med J 2014;14: e139–141.
5. Chalet Y, Chevalier B, Hadad S, et al. ''Pseudo-narrowing'' during right coronary angioplasty: how to diagnose correctly without withdrawing the guidewire. Cathet Cardiovasc Diagn 1994;31:37–40.
6. Tenaglia AN, Tcheng JE, Phillips HR, et al. Creation of pseudo narrowing during coronary angioplasty. Am J Cardiol 1991;67:658–659.
7. Joseph D, Idris M. Catheter-induced ''accordion effect'' in tortuous right external iliac artery during peripheral angiography. Cathet Cardiovasc Diagn 1995;34:318–320.