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REVERSIBLE VISCERAL ISCHEMIA DETECTED BY TRANSESOPHAGEAL ECHOCARDIOGRAPHY AND NEAR-INFRARED SPECTROSCOPY

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Visceral ischemia in aortic dissection leads to a poor prognosis if diagnosis and treatment are delayed. However, neither angiography nor computed tomography (CT) is feasible when the patient needs immediate surgery and is in unstable hemodynamic condition.

Recently we reported a technique of visualizing visceral arteries with the use of transesophageal echocardiography (TEE).[1,2] Meanwhile, near-infrared spectroscopy (NIRS) has been introduced for noninvasively monitoring regional oxygen saturation (rSO_2) in the brain.[3-5]

We report a case of transient visceral ischemia caused by aortic dissection in which use of TEE and NIRS for diagnosis was suggested.

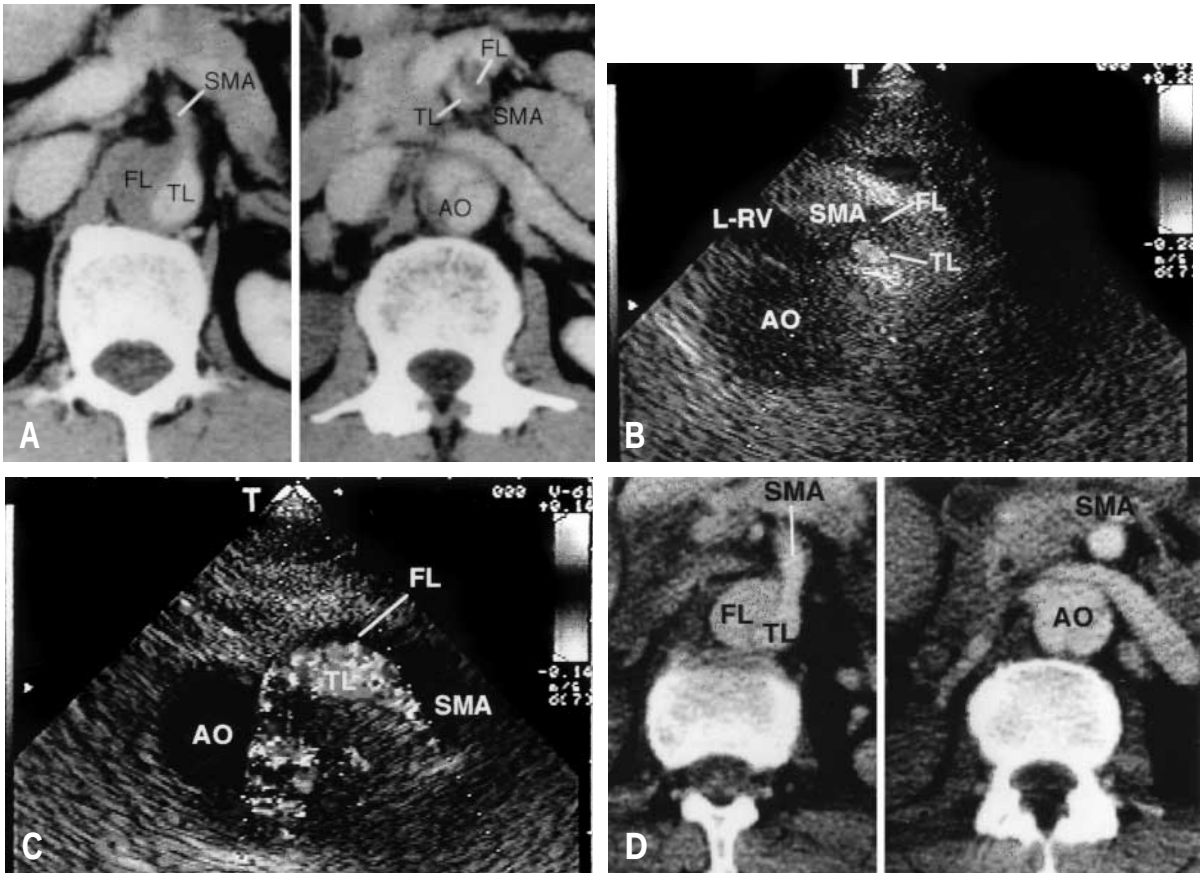

Fig 1. Changes of CT and TEE findings. CTs on the first day **(A)** and fourth day **(D)**; TEE on the second day **(B)** and third day **(C)**. The true lumen *(TL)* of the superior mesenteric artery *(SMA)* was narrowed by thrombosed false lumen *(FL)* in **(A)** and **(B),** then improved (**C** and **D**). *AO,* Aorta; *L-RV,* left renal vein.

Table I. *Changes of rSO_2 with laboratory data*

	Time from onset				
	3 h	*16 h*	*1 day*	*2 d*	*7 d*
Epigastrium (left lobe)	75	75	69	67	73
Liver (right intercostal)	70	70	69	70	72
Above navel	73	75	66	70	71
Below navel		**64**	67	70	69
Right lower quadrant	**64**	**61**	64	69	71
Left lower quadrant	**62**	**64**	61	70	68
Right thigh	**62**	66	64	62	78
Left thigh	76	75	66	61	71
	Arterial oxygen saturation (%)				
	98	*98*	*91*	*95*	*96*
pH	7.302	7.264	7.342	7.392	7.426
Base excess (mEq/L)	–1.5	–5.2	1.2	0.2	1.1
LDH	474		7335	6210	1818
CK	67		409	676	366
Lactate	10.6	21.7	7.69	3.81	4.94
Dorsalis pedis artery	R < L	R = L	R = L	R = L	R = L
Coldness of leg	R > L	R > L	—	—	—

LDH, Lactic dehydrogenase; *CK,* creatine kinase; *R,* right; *L,* left. The rSO_2 was lower by more than 10% at lower abdomen and right thigh (boldface numbers) than at the epigastrium. One day later the difference became less than 10%. The rSO_2 is influenced by arterial oxygen saturation.

Clinical summary. A 61-year-old man was admitted after an acute onset of back pain with a blood pressure 221/67 mm Hg. Pulsation was noted at the left femoral artery but not at the right. He also had pain of the right lower extremity. CT revealed DeBakey type IIIb aortic dissection with thrombosed false lumen or intramural hematoma, which led to occlusion of the right renal and right common iliac arteries. The celiac and left renal arteries were intact. Incomplete filling was noted at the proximal portion of superior mesenteric artery (Fig 1, *A*).

A 40-mm sensor of TOS-96 (TOSTEC Co Ltd, Tokyo, Japan), an NIRS system that provides rSO_2 at 2 to 3 cm depth, was placed on multiple sites of the abdominal wall and thighs. The rSO_2 was recorded when the value became stable after 1 minute (Table I). It was lower at the right and left lower quadrants and right leg than at the epigastric region by more than 10%. Sixteen hours from onset, the rSO_2 remained low. The patient still had abdominal pain and also had metabolic acidosis (pH 7.26) with a base excess of –5.2 mEq/L.

TEE showed an aortic dissection that extended into the superior mesenteric artery, narrowing its lumen to smaller than 50% because of the thrombosed false lumen (Fig 1, *B*). During medical therapy, the rSO_2 gradually improved.

On the second day, TEE revealed that the true lumen had become larger (Fig 1, *C*). The rSO_2 became equal at every site, associated with improved laboratory data. CT on the fourth day showed that the superior mesenteric and right iliac arteries had no filling defects (Fig 1, *D*). The patient had no pain. His course thereafter was uneventful.

Discussion. Both TEE findings and NIRS data were totally compatible with symptoms, laboratory data, and CT findings. This case suggests possible application of TEE and NIRS for diagnosing and monitoring visceral ischemia.

TEE detects dissection into the visceral arteries, as well as impaired perfusion. The superior mesenteric artery can be visualized with TEE by means of a specific technique in more than 95% of patients having cardiovascular surgery.[1,2] Visualization is not disturbed by gas in the intestines and is applicable repeatedly at the bed side, providing real-time information. Drawbacks include possible invasiveness for conscious patients and nonvisualization of iliac arteries.

The merits of NIRS are that rSO_2 in the body can be obtained continuously and noninvasively with minimal influence of oxygenation in the tissue adjacent to the sensor. However, no data are available regarding the normal range and critical value of rSO_2 for visceral ischemia. Because the rSO_2 can vary among individuals and be affected by hemoglobin level, arterial oxygenation, and other factors, we assessed the relative decrease of rSO_2 compared with rSO_2 at the epigastric region. Ultrasonography showed that the left lobe of the liver was at the sampling region. The rSO_2 was assumed to be normal at the liver since the celiac artery was intact. The rSO_2 at the right and left lower quadrants should reflect oxygenation in the intestinal wall unless bleeding occurs in the peritoneal cavity or intestinal tract. However, a false negative result is probable when ischemia is not diffuse but regional.

This case suggested that TEE and NIRS enable noninvasive diagnosis of visceral ischemia. However, further investigation is mandatory for evaluating its accuracy in a larger series and in regional necrosis of the intestine.

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