

## BRIEF COMMUNICATIONS

### ABDOMINAL AORTA AND VISCERAL ARTERIES VISUALIZED WITH TRANSESOPHAGEAL ECHOCARDIOGRAPHY DURING OPERATIONS ON THE AORTA

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Despite possible complications of the abdominal aorta and visceral arteries during operations on the aorta, there has not been a satisfactory imaging modality of these arteries. We evaluated the feasibility and drawbacks of transesophageal echocardiography (TEE) for visualizing these vessels.

**Methods.** The 12 consecutive patients undergoing operations on the aorta (7 men and 5 women, ages ranging from 28 to 82) were examined. A 5 MHz biplane TEE system (EUB-555, EUP-ES322, Hitachi Co. Inc., Tokyo, Japan) was used. The incidence of successful visualization of the celiac artery (CEA), superior mesenteric artery

(SMA), and right and left renal artery (RRA and LRA), as well as to the distance from the transducer to the artery and the angle of correction were examined.

As the probe was advanced into the stomach, an appropriate rotation and upward flexion was applied to keep the image of aorta on the screen. CEA and SMA serially appeared at the 1 to 3 o'clock position of the aorta (Fig. 1). The former soon divided into branches and moved away from the aorta, whereas the latter stayed adjacent to the aorta. As the probe was further advanced, the left renal vein appeared between the SMA and the aorta. At this level, the RRA and LRA appeared at approximately the 4 and 10 o'clock positions, respectively (Fig. 1). A lateral flexion of the probe was helpful for minimizing the angle of correction. In the longitudinal scan, the long-axis view of the aorta, CEA, and SMA was depicted.

**Results.** The CEA and SMA were visualized in every case before bypass. Both LRA and RRA could be seen in 7 and 10 cases (59.3% and 83.3%), respectively. With further attempts, they were visualized in 11 (91.7%) and 12 cases (100%), respectively, by the end of the operation. The angle correction was within 30 degrees in 12 cases (100%), 11 cases (91.7%), 9 cases (75.0%), and 8 cases

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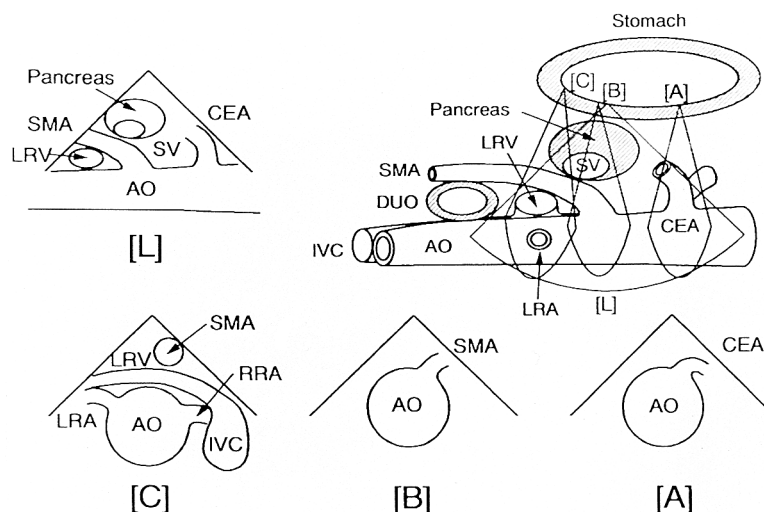
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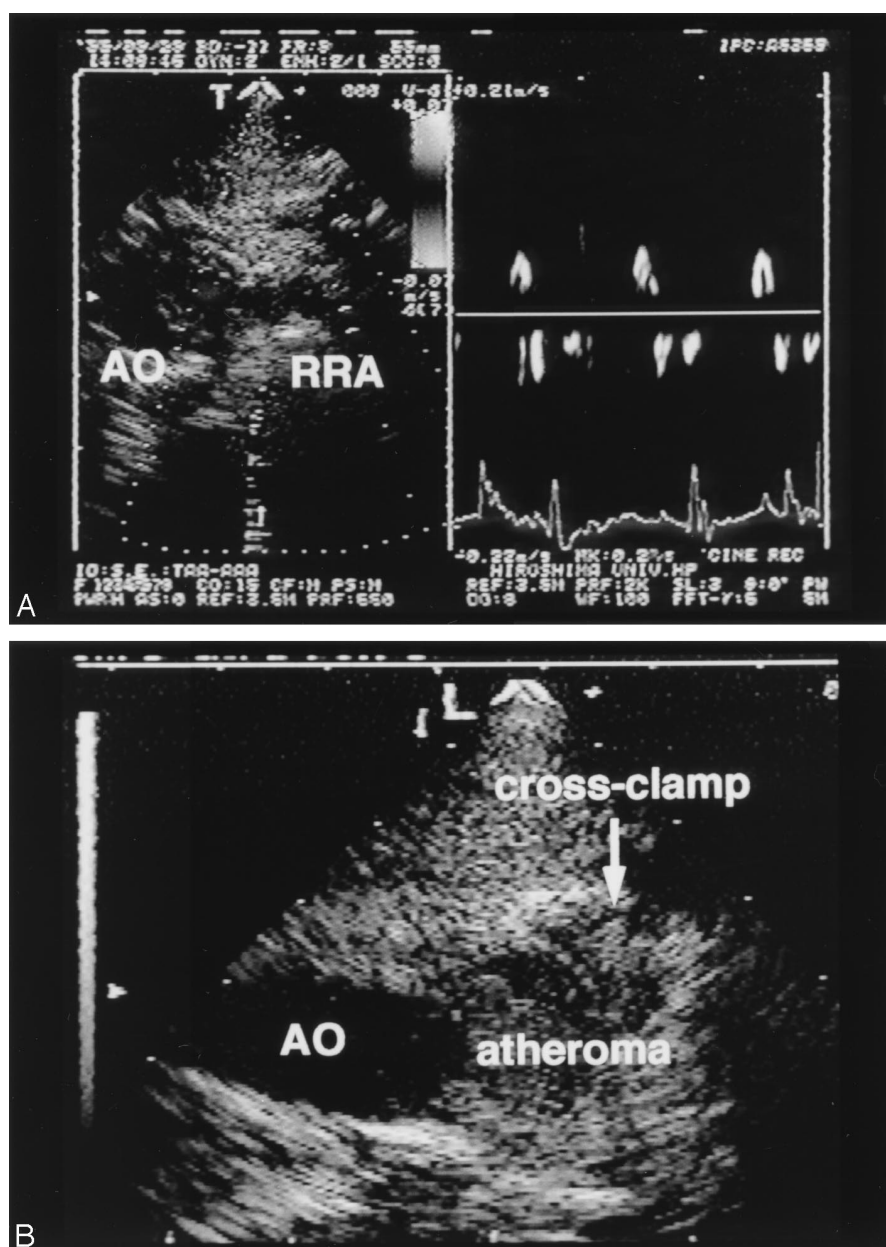
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**Fig. 1.** Scanning planes and images at the level of (A) celiac artery (CEA), (B) superior mesenteric artery (SMA), (C) right and left renal arteries (RRA and LRA), and (L) in the longitudinal scan. AO, Aorta, LRV, left renal vein; IVC, inferior vena cava; SV, splenic vein; DUO, duodenum.



**Fig. 2.** Echocardiograms demonstrating (A) to-and-fro pattern of blood flow in the right renal artery after crossclamping of the aorta and (B) atheroma that fills the aortic lumen in case 7. AO, Aorta; RRA, right renal artery.

(72.7%), respectively. Whereas the CEA and the SMA were near the transducer (24.6 and 27.6 mm on average, respectively), the LRA and RRA were farther away (44.3 and 43.9 mm on average, respectively). Specific findings obtained by TEE included (1) occlusion of the CEA orifice after an aortic anastomosis, (2) reduced CEA flow caused by a narrowed orifice from an aortic dissection and improved flow after construction with a saphenous vein graft, and (3) an altered perfusion pattern in the SMA

with dissection after surgical repair (false lumen dominant compared to true lumen). In case 7, TEE showed a thickened aortic wall below the SMA. After crossclamping of the aorta below the SMA, forward flow in the renal arteries showed a to-and-fro pattern (Fig. 2, A), followed by a marked decrease in urinary output. TEE showed an atheroma-like echo at the orifice of the renal artery (Fig. 2, B). Aortotomy revealed the squeezed atheroma at the orifice.

**Discussion.** Several modalities have been used for visualizing the abdominal vessels. Surface ultrasonography<sup>1</sup> provides an excellent image but necessitates an exposure of the abdominal aorta and thus was feasible in only 5 cases (41.7%) in our series. Frazin and colleagues<sup>2</sup> first reported use of TEE for visualizing abdominal vessels, in which the probe in the stomach was manipulated by the surgeon. Although laparotomy is mandatory with this method, this report encouraged us to use TEE as "trans-gastric echoangiography" without manipulation by the surgeon. Intravascular ultrasonography<sup>3</sup> is invasive and necessitates another system and operator in the operative field. TEE visualizes abdominal vessels in nearly every case, is noninvasive, and necessitates no additional system; thus it saves both cost and space. Although no gastric complications developed in this series, manipulation of the probe against resistance may cause mucosal damage. Further investigation in a larger series is mandatory for

evaluating the safety and clinical significance of this method.

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## DELAYED IATROGENIC AORTIC DISSECTION FROM CORONARY BYPASS MANAGED WITH EXTRAANATOMIC BYPASS

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Perioperative iatrogenic dissection originating in the ascending aorta is a rare but devastating complication of cardiac operations, which occurs with an incidence of 0.16% to 0.6%.<sup>1</sup> The literature recommends urgent, definitive repair of perioperative aortic dissections.<sup>1,2</sup> However, in certain circumstances the risk of definitive repair may be greater than that of a more conservative approach.<sup>3</sup> Multiple series quote a mortality associated with definitive repair (interposition graft or patch) of 20% to 50%.<sup>1,2</sup> In two patients we managed iatrogenic aortic dissections after cardiac operations with extraanatomic bypass of the lower extremities, and the results were excellent.

**PATIENT 1.** A 57-year-old man had a 1-week history of exertional chest pain and underwent a six-vessel coronary artery bypass without any noticeable complications. No significant aortic disease was noted. The patient was extubated early in the postoperative period and was in hemodynamically stable condition in the intensive care

unit. Vague bilateral leg pain developed late in the evening on the operative day, and by the morning on postoperative day (POD) 1 neither femoral pulse was palpable. He had considerable bilateral leg pain with early onset of motor and sensory loss as well as cool lower extremities. Although the patient had no other manifestations of a dissection, such as metabolic acidosis, increase in lactic acid, abdominal pain, central neurologic deficits, or evidence of renal compromise, we believed that a dissection was the most likely diagnosis. Upper extremity pressures were 140/70 mm Hg bilaterally. In the operating room an intraoperative transesophageal echocardiogram confirmed our diagnosis. A large false lumen originating from a point just distal to the aortic cannulation site, down to a point below the diaphragm, was documented. We performed an axillo-bifemoral bypass, which required 3 hours of operative time. Postoperatively, perfusion of the lower extremities was restored with palpable femoral, posterior tibial, and dorsalis pedis pulses bilaterally, as well as near normal motor and sensory function. A postoperative magnetic resonance imaging scan showed no evidence of brain or spinal cord ischemic lesions. A postoperative computed tomographic scan showed a false lumen, as previously identified by intraoperative transesophageal echocardiography, and no evidence of central nervous system lesions (Fig. 1). By POD 7, the patient was walking approximately 150 feet with minor residual motor dysfunction and was subsequently discharged to a rehabilitation facility.

**PATIENT 2.** A 68-year-old man underwent an eventful five-vessel coronary bypass. In the postoperative period he

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