Brief communication - Coronary
To-and-fro pattern: an indication of flow competition or a sign of incompetent coronary anastomosis?

Takeshi Shimamoto*, Akira Marui, Takeshi Nishina, Masashi Komeda

Department of Cardiovascular Surgery, Kyoto University Graduate School of Medicine, 54 Shogoin Kawahara, Sakyo, Kyoto 606-8507, Japan

Department of Cardiovascular Surgery, Toyohashi Heart Center, Toyohashi, Japan

Department of Cardiovascular Surgery, Yamato Seiwa Hospital, Yamato, Japan

Received 14 July 2008; accepted 13 September 2008

Abstract

To-and-fro pattern in pulse Doppler wave form has been considered a sign of flow competition at the coronary anastomosis. However, this flow pattern is not sufficient to judge whether there is no construction errors in the anastomosis itself. We report a usefulness of the high-frequency ultralinear transducer when used with pulse Doppler because it allows the visualization of the shapes of the anastomosis and each vessel, quantification of the flow, and elucidation of flow characteristics. This transducer can be applied to the management of suspected flow competition because, with pulse Doppler waveforms of graft flow and color Doppler images, it allows the detection of the diastolic-dominant flow pattern, good anastomotic shape, and smooth flow in the graft and the target vessel after the native vessel is clamped.

Keywords: Coronary disease; Imaging; Echocardiography

1. Case report

A 78-year-old male presented with triple-vessel disease with 75% stenosis of the left anterior descending artery (LAD). Off-pump coronary artery bypass grafting was performed through a median sternotomy. The left internal thoracic artery (LIMA) was anastomosed to the LAD with a 7-0 polypropylene suture. Subsequently, the shape of anastomosis and the graft flow were determined by epicardial echocardiography with a high-frequency (15 MHz) ultralinear transducer (Philips Medical Systems, Best, The Netherlands). Pulse Doppler assessment revealed a to-and-fro flow pattern in the graft near the anastomotic site (Fig. 1a; Video 1). Color Doppler echocardiography showed a good shape of the anastomosis and adequate flow in the anastomosed vessels in both the long and short axes views (Fig. 1b; Video 1). Flow competition was suspected based on the moderate stenosis in the native target vessel. Therefore, the native vessel was gently clamped, which normalized the flow pattern to diastolic-dominant one. A smooth flow in the LIMA and LAD distal to the anastomosis without any construction errors was confirmed by color Doppler (Fig. 2; Video 1). Postoperative LITA angiogram confirmed the presence of the flow competition (Video 1).

2. Comment

Currently, transit-time flow measurement (TTMF) is the most widely used intraoperative graft flow assessment method wherein the presence of a diastolic-dominant flow pattern is considered a sign of good anastomosis [1]. However, TTMF has limited application because its flow...
pattern data are influenced by several hemodynamic variables, e.g. blood pressure and vascular resistance [2]. Moreover, there are reports of cases wherein TTMF showed acceptable flow despite construction errors in anastomosis [2]. To-and-fro flow pattern, which was observed in our case, indicates flow competition between the native vessel and graft [1]. However, this sign is not sufficient to judge whether it is due to flow competition or construction errors in the anastomosis itself. A high-frequency ultralinear transducer when used with pulse Doppler is advantageous because it allows the visualization of the shapes of the anastomosis and each vessel, quantification of the flow, and elucidation of flow characteristics (e.g. turbulence). This transducer can be applied to the management of suspected flow competition because, with pulse Doppler waveforms of graft flow and color Doppler images, it allows the detection of the diastolic-dominant flow pattern, good anastomotic shape, and smooth flow in the graft and the target vessel after the native vessel is clamped.

References
