and it was doubtful whether an existing expandable prosthesis could be useful to fill the shape and volume. There was also a risk of damaging the prosthesis by contact with the incised ribs' edges, so we made a specially shaped expandable prosthesis without the upper part of the right thorax. The prosthesis was made egg-shell or ball-shaped to equalize the pressure of the internal wall of the silicone bag. Because it is important that the prosthesis not be able to move in the thoracic space and not collapse as the result of a leak caused by overinflation and injury, the shape and volume must be determined carefully. Two cases have been reported in which the prosthesis collapsed because of a leak. One was a valve set-type, and the prosthesis leaked near 1 of the fixation points.⁵ The other was a 5 month-old infant, and the device developed a leak 8 months after the operation.⁴ It may be necessary to improve the intensity of the bag's wall in the future.

In conclusion, our new expandable prosthesis is characterized by the proper thoracic shape, a subcutaneous remote injection port, and the advantage of easy volume management. The insertion of a new expandable prosthesis can improve the clinical symptoms of

postpneumonectomy syndrome, even with a deformed thorax.

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MINIMALLY INVASIVE LEFT ANTERIOR DESCENDING CORONARY ARTERY BYPASS WITH RIGHT GASTROEPIPLOIC ARTERY GRAFT

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In minimally invasive coronary artery bypass grafting (MICABG) to the left anterior descending artery (LAD), the left internal thoracic artery (LITA) cannot be used in some patients. LITAs have already been used in the most of the redo cases. The harvested LITA grafts may be short or may have insufficient flow for coronary anastomoses. In these circumstances, the right gastroepiploic artery (GEA) can be an alternative graft.

In this communication, we report our clinical experience with MICABG to the LAD with GEA grafts.

Patients. The GEAs were used for MICABG to the LAD in 5 patients. There were 4 redo cases. In 3 of them, the LITAs had already been used for grafting. In 1 redo case, the LITA was left, but the GEA was selected for

anastomosis to the distal LAD. In 1 primary case, the LITA graft had unsatisfactory flow, and the GEA was used instead.

Operation and follow-up. A left small anterior thoracotomy was placed at the anterior fourth or fifth intercostal space, and the LAD was identified. A small median laparotomy was made underneath the xiphoid process, and the GEA was pedicled as far as the pylorus ring with an ultrasonic device, Harmonic Scalpel with LCS (Ethicon Endo-Surgery, Inc., Cincinnati, Ohio).¹ A small hole was created in the left hemidiaphragm, and the GEA pedicle was advanced to the heart through this hole, passing anterior to the stomach and the left hepatic lobe. Coronary anastomosis to the LAD was performed on the beating heart with a mechanical stabilizer.

In each case, angiography was carried out for the GEA 1 week after surgery, and a transcatheter Doppler graft-flow velocity study was performed at the time of discharge. At the outpatient clinic, this Doppler study was performed 2 weeks after discharge and was repeated every 3 months.

Results. The mean total operation time and GEA harvest time were 145 ± 35 minutes and 16 ± 4 minutes, respectively. The branches from the GEA and its accompanying vein were divided with excellent hemostasis with only the Harmonic scalpel. Each GEA pedicle reached

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Received for publication April 21, 1998; accepted for publication April 24, 1998.

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J Thorac Cardiovasc Surg 1998;116:528-9

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0022-5223/98 \$5.00 + 0 12/54/91373

Fig. 1. Intraoperative view of pedicled GEA (arrows). Anastomosis to the LAD (arrowhead) and intra-abdominal pathway overlying left hepatic lobe (*) can be seen via 5 cm-long anterior thoracotomy (right top) and 6 cm-long median laparotomy (left bottom). N, Left nipple.

the mid-LAD or higher and had no tension after anastomosis (Fig. 1).

There were no deaths, and all patients have been angina-free after surgery. Follow-up, ranging from 1 to 7 months, is complete in all patients. Postoperative angiography revealed a patent GEA graft in each case. It was possible to assess each GEA graft repeatedly by Doppler study at the subxiphoid, and this showed a biphasic flow velocity pattern with diastolic augmentation (Fig. 2).

Comments. The GEA has been used in conventional CABG.² In our experience with MICABG, the GEA-to-LAD bypass through the pregastric, prehepatic, and transdiaphragmatic route was feasible via a small thoracotomy and laparotomy with satisfactory results. The Harmonic scalpel facilitated the formation of a GEA pedicle and reduced the harvest time by eliminating tying maneuvers.

In MICABG, long-term graft patency is a controversial issue; therefore patients should be closely observed.^{3,4} In

Fig. 2. Transcutaneous Doppler flow velocity study for GEA at subxiphoid performed 7 months after the operation, demonstrating biphasic pattern with diastolic augmentation (arrows).

the technique reported here, the GEA graft passed just beneath the abdominal wall overlying the left hepatic lobe, and a Doppler probe placed at the subxiphoid was able to detect the graft flow reliably and repeatedly. The diastolic flow through the graft to the LAD could also be detected with a Doppler stethoscope. A high-pitched, continuous diastolic sound in each graft was distinctly audible at the subxiphoid. This is not measurable, but it is the easiest and the least expensive method for checking the graft patency.

In conclusion, MICABG to the LAD is feasible with a GEA graft by the pregastric, prehepatic, and transdiaphragmatic route via a small thoracotomy and laparotomy, and Doppler study can be reached at the subxiphoid for follow-up of graft patency.

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