CASE 9.3 Robotic Harvest of the Rectus Abdominis Muscle (Fig. 9.7)

DM is a 62-year-old man with a history of high-risk prostate cancer. He received preoperative radiotherapy. During his prostatectomy, the rectum was injured due to proximity of the tumor, and a robotic imbricating repair was performed by a GI surgeon. In order to prevent recto-vesicular fistula a robotic rectus abdominis flap was harvested to interpose between the colo-anal anastomosis and uretero-vesicostomy. An umbilical hernia repair was also performed robotically using biologic mesh. The robot was re-docked to the prostate ports and the muscle was sutured to the pelvic floor between the rectum and the bladder. The uretero-vesicostomy was then performed robotically and an ileostomy was brought up laparoscopically to protect the rectal repair.

CASE 9.4 Robotic-Assisted Lymphaticovenous Bypass for Lymphedema

MS is a 54-year-old female with a history of breast cancer, mastectomy, lymphadenectomy, and breast and axillary radiation. She underwent successful free flap breast reconstruction, but 1 year later developed symptomatic lymphedema of the ipsilateral extremity. Her axilla was relatively soft, and her lymphedema was mild to moderate with a 10% volumetric increase from the normal side and no chronic tissue changes. She was deemed a reasonable candidate for lymphovenous bypass. Intraoperatively, indocyanine green was used to identify open lymphatic channels on the dorsal and ventral surfaces of the forearm. Isosulfan blue was then injected proximal to three small dermal incisions to identify dermal lymphatics and accompanying venules. The surgical robot was used to perform the lymphovenous anastomoses using 11-0 nylon (Fig. 9.9). Patency was confirmed by visualizing dye passing across the anastomosis (Video 9.6).

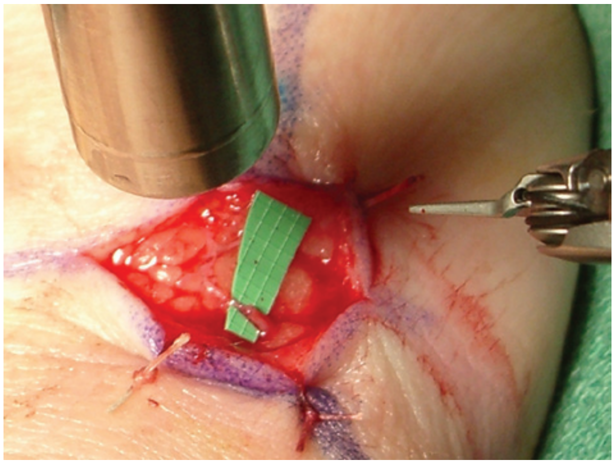

Figure 9.9 In lymphaticovenous bypass, candidate lymphatics are identified using ICG-9 mapping. A small incision is made and dermal lymphatics and venules are identified. The robotic endoscope (1 cm in diameter) is shown here hovering over the lymphatic and venule, both of which are considerably smaller than the 1 mm registry marks on the green background. A 2 cm incision is held open using 3.0 Vicryl. A Black Diamond microneedle driver is seen on the right of the image.

Expert Commentary

Philippe Liverneaux, MD, PhD

Microsurgical techniques have not changed since the 1960s. Instruments are always the same, from the watchmaker's techniques. The microscope has not changed significantly, although it is now equipped with a digital video camera. Robotics is probably the safest way to make a technological leap in microsurgery. It has many advantages, including the filtration of tremor and motion scaling.

To be accepted, robotic microsurgery must make significant improvements to microsurgeons. Reducing the size of the skin incision is the most important property of robotics to improve microsurgery. Microsurgical gesture, typically a vascular anastomosis, nerve, or lymphatic, requires a large incision to expose the target in conventional microsurgery. Robotics, through instrumental arms of several tens of centimeters, and micro-instruments capable of evolving in the three planes of space in a volume 10 times smaller than the human hand, can work inside the body through small incisions.

Clinical experiments have already been reported, and our team specializes in nerve endoscopic microsurgery robot-assisted: minimally invasive intrathoracic harvesting of intercostal nerves, neurolysis of the long thoracic nerve, neurotizations within the brachial plexus for palsy.

Overall, endoscopic robot-assisted microsurgery is only just beginning, but the first results are already promising in plastic and reconstructive surgery.

Video 9.1 External view of robotic LD.
Video 9.2 Robotic harvest of rectus abdominis.
Video 9.3 Robotic microvascular anastomosis.
Video 9.4 Transoral robotic surgery.
Video 9.5 Robotic harvest of latissimus dorsi.
Video 9.6 Robotic lymphaticovenous bypass.

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