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The First Robotic-assisted DIEP Flap Breast Reconstruction in Eastern Europe: A National Milestone in Reconstructive Surgery

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Rezumat

Prima reconstrucție mamară cu lambou DIEP asistată robotic în Europa de Est: un reper național în chirurgia reconstructivă

Acest articol prezintă prima reconstrucție mamară asistată robotic cu lambou liber DIEP din Europa de Est, efectuată la Institutul Regional de Oncologie Iaşi, România. O pacientă de 48 de ani, la 3 ani post-mastectomie Madden, a beneficiat de reconstrucție mamară autologă cu lambou liber DIEP bi-pediculat. Procedura a utilizat sistemul robotic da Vinci Xi® pentru disecția precisă a pediculilor vasculari prin abord transabdominal. Disecția robotică a fost realizată în siguranță, cu incizii fasciale minime, iar durata totală a intervenției a fost de 11 ore, cu 104 de minute de timp robotic. Evoluția postoperatorie favorabilă a permis externarea în ziua 4 postoperator. Acest caz reprezintă un reper tehnologic pentru România şi demonstrează fezabilitatea chirurgiei robotice în reconstrucția mamară autologă. Implementarea cu succes a acestei tehnici deschide calea pentru o adoptare mai largă în Europa de Est, oferind potențialul de a reduce morbiditatea sitului donator abdominal şi de a îmbunătăți recuperarea postoperatorie.

Cuvinte cheie: chirurgie robotică, lambou liber DIEP, reconstrucție mamară, microchirurgie, România

Abstract

This article presents the first robotic-assisted DIEP flap breast reconstruction in Eastern Europe, performed at the Regional Institute of Oncology Iaşi, Romania. A 48-year-old female, three years post-Madden mastectomy, underwent autologous breast reconstruction with a bi-pedicled DIEP flap. The procedure utilized the da Vinci Xi® robotic system for precise dissection of the vascular pedicles via a transabdominal preperitoneal approach. Robotic dissection was completed safely, with minimal fascial incisions, and totaling

104 minutes (out of total operative time of 11 hours). The uneventful post-operative course allowed patient discharge on postoperative day 4. This case marks a technological milestone for Romania and demonstrates the feasibility of robotic surgery in autologous breast reconstruction. The successful implementation of this technique opens the door for wider adoption in Eastern Europe, offering the potential for reduced donor site morbidity and improved recovery.

Keywords: robotic surgery, DIEP flap, breast reconstruction, microsurgery, Romania

Introduction

Autologous breast reconstruction with perforator flaps is the gold standard for restoring breast volume and contour after mastectomy. The DIEP (Deep Inferior Epigastric Perforator) flap allows for abdominal tissue transfer without sacrificing the rectus abdominis muscle, thus achieving maximum aesthetic benefit both in the donor and recipient areas. Conventional harvesting involves extensive dissections resulting in 10.5% cases with morbidity of the abdominal wall (7.0% weakness, 2.2% bulge, 1.3% hernia)(1).

Robotic surgery enables dissection of the pedicle along its intramuscular course through minimal fascial incisions (2,3), reducing the chances of muscular atrophy or postoperative hernias. This article reports the first robotic-assisted DIEP flap breast reconstruction in Eastern Europe, (to the best of our knowledge, as no other reports of such cases were found), performed at the Regional Institute of Oncology Iaşi, Romania.

Case Report

A 48-year-old female was diagnosed in 2022 with invasive ductal carcinoma of the right breast and underwent neoadjuvant chemotherapy (4 cycles of EC protocol and 12 Paclitaxel), followed by subcutaneous mastectomy with excision of the areolar-nipple complex and two axillary sentinel lymph nodes. The final pathological result revealed invasive ductal carcinoma NOS, multicentric G2, with extensive intraductal component, pT3(m,4) N0(sn) L0V0Pn0. ER, PR - strongly positive (>90%), HER2 1 (negative), Ki67 40%. The patient received adjuvant external radiotherapy through the IMRT technique on the Varian Clinac iX® linear accelerator, with 6 MV photons, a dose of 50 Gy/25 fractions/33 days, targeting the right thoracic wall and supra-, infraclavicular, axillary, and internal mammary lymph node regions, followed by Tamoxifen therapy.

The patient had attempted breast reconstruction one year post-mastectomy with autologous fat transfer from the thighs. Three years post-mastectomy, she consulted the Plastic Surgery Department at the Regional Institute of Oncology Iaşi for further breast reconstruction, with the desire to perform it with autologous tissues. Because the patient had enough abdominal skin laxity and adiposity she was deemed a good candidate for a DIEP flap.

Preoperative angio-CT identified a perforator from the lateral branch of the deep inferior epigastric artery on the right and two perforators from the lateral branch on the left. Given this configuration and the tissue required for the desired volume, a bi-pedicled DIEP flap was planned.

After superficial dissection, isolation of the perforators and dissection of their intramuscular course up to the posterior rectus abdominis sheath, the robotic system was docked. Insuflation was performed after placing a Veress needle in Palmer's point. Three 8 mm robotic trocars were placed: supraumbilically on the left side for the endoscope and the two dissection arms about 5-7 cm on either side. A fourth trocar (12 mm) was placed in the lower right abdominal quadrant connected to AirSeal and used as assistant port by the bedside surgeon for clip application and retraction (*Fig. 1*). The da Vinci Xi® system was used for robotic dissection of the vascular pedicles (Prograsp® for the left hand; scissors, VesselSealer® and needle driver for the right hand) up to their origin, where they were clipped using HemoLock® via the assistant port (*Fig. 2*). After the vascular pedicles have been retrieved by the bedside assistant, the peritoneum was sutured with Quill® 2/0.

Resulting anterior rectus fascial defects measured 1.8 cm on the right side (1 perforator) and 3.6 cm on the left (2 perforators) (*Fig. 3*). These, along with the trocar ports, were sutured with Vicry l 0.

The flap was transferred and anastomosed to

Figure 1. Robotic platform set-up

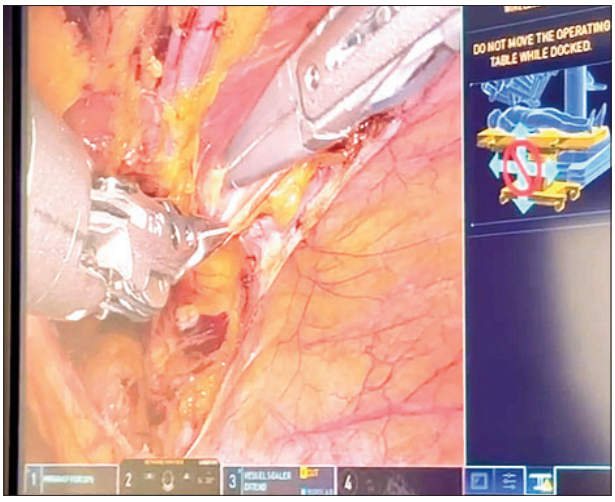

Figure 2. Robotic-assisted dissection of the pedicles

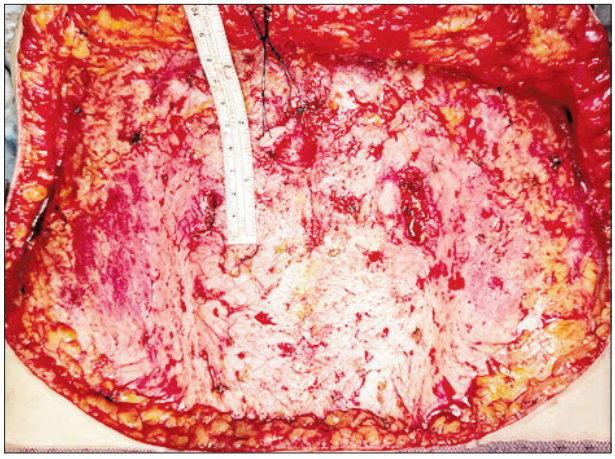

Figure 3. Fascial dissection lengths: 1.8 cm right side and 3.6 cm left side

the right internal mammary vessels using 4.3x surgical loupes, as follows: left DIEA to the retrograde IMA and right DIEA to the anterograde IMA using 8/0 running sutures for the arteries; both flap veins were coupled anterograde to the two IMVs using 3 mm couplers. After anastomosing the first pedicle the clamps were removed, allowing for an ischemia time of 67 minutes. Anastomosis of the second pedicle was performed in 35 minutes with total microvascular time amounting for 102 minutes. Total estimated blood loss was 200 ml.

Results

Robotic time (trocar insertion, robot docking, pedicle dissection, peritoneal closure, undocking) lasted 104 minutes, the ischemia time was 67 minutes, and the total operative time was 11 hours. The patient spent 24 hours in the intensive care unit, did not require analgesics after transfer to floor and a favorable postoperative evolution allowed for patient discharge on postoperative day 4 (*Fig. 4*) with the breast drain removed. The abdominal drains were removed on postoperative day 8.

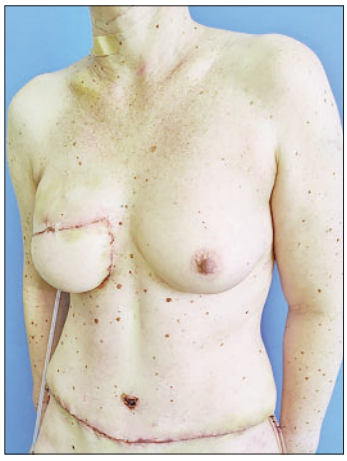

Figure 4. Patient at discharge on POD 4

Discussion

This procedure represents the first documented case of robotic-assisted DIEP flap harvest in Romania. The technique allowed for minimizing the fascial incisions, preservation of the rectus abdominis muscle and a significant reduction of the potential morbidity at the donor site.

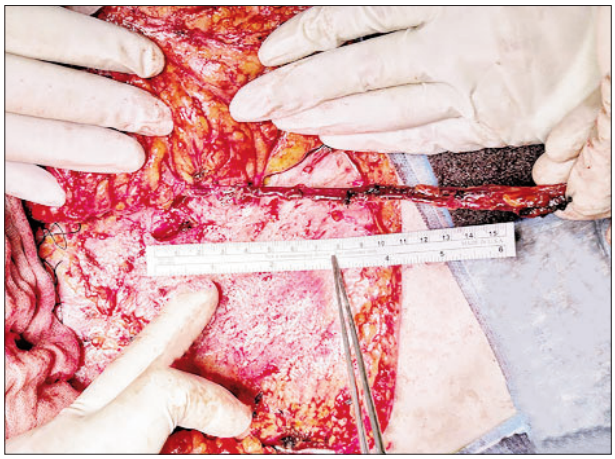

Figure 5. Fascial incision with robotic technique (1.8 cm) vs pedicle length (14 cm)

Dissecting the vascular pedicles according to the classical technique would have resulted in 14 cm on the right side (7.7 times longer for this single-perforator side)(*Fig. 5*) and 15 cm on the left side (4.1 times longer for this 2-perforator side).

Total surgery time of 11 hours is well within normal duration for a bipedicled DIEP flap. Robotic time did not alter duration but offered, besides already discussed advantages of reduced fascial defect, a safe dissection through improved 3D visualization, tremor reduction compared to classical setting, as well as more ergonomic for the surgeon while sitting at the console.

Current barriers to wide adoption are availability of equipment, the cost of the surgical robot (4) and consumables, as well as surgeon training in using the robot (5). However, the implementation of this case demonstrates the feasibility of using robotic technology in health-care systems with moderate resources, paving the way for future applications.

Conclusions

Robotic DIEP flap harvest is feasible and safe in Romania. This case opens the path for expanding robotic reconstructive surgery use in Eastern Europe, aiming to benefit from the reduction in morbidity, optimization of patient recovery and surgeon ergonomics that this technology offers.

Conflict of Interests

The authors declared no potential conflicts of interest.

Funding

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Informed consent

The patient was informed in detail about the surgical procedure, including the use of robotic technology, and gave written consent for the intervention. She also consented to the use of intra-operative images for scientific and educational purposes, respecting confidentiality.

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