Plastic Surgery, Cantonal Hospital Aarau

Bioengineered Collagen Scaffolds (BioBridge™) for Lymphatic Reconstruction: A Case Report

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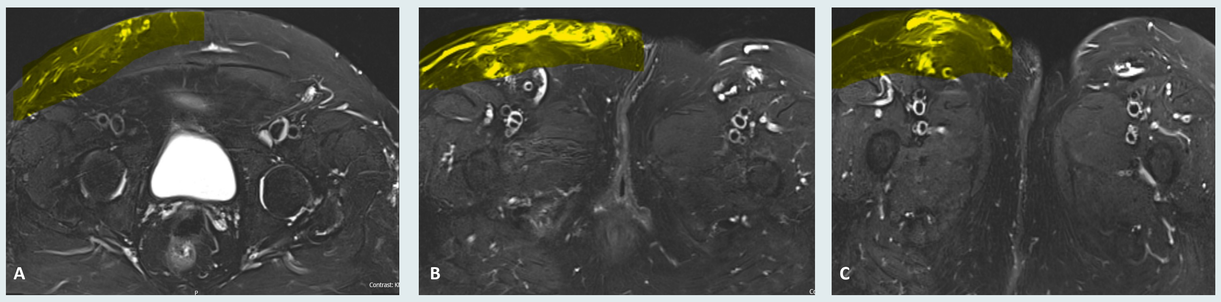
Background

Lymphedema (LE) is a chronic disorder due to imbalance between lymphatic fluid production and clearance. It leads to protein-rich interstitial fluid accumulation, swelling, fibrosis, and irreversible tissue changes. Conservative treatments include compression therapy and physiotherapy. Microsurgical options, such as vascularized lymph node transfer (VLNT) and lymphovenous anastomosis (LVA), aim to improve lymphatic drainage, but effectiveness depends on disease stage and patient-specific factors. BioBridge™ (Fibralign Corp., USA) is a nanofibrillar collagen scaffold supporting lymphangiogenesis. It provides a biomimetic structure for endothelial migration, promotes unidirectional lymphatic flow, and integrates into host tissue. We report its use as surgical adjunct in therapy-refractory secondary LE.

Case presentation

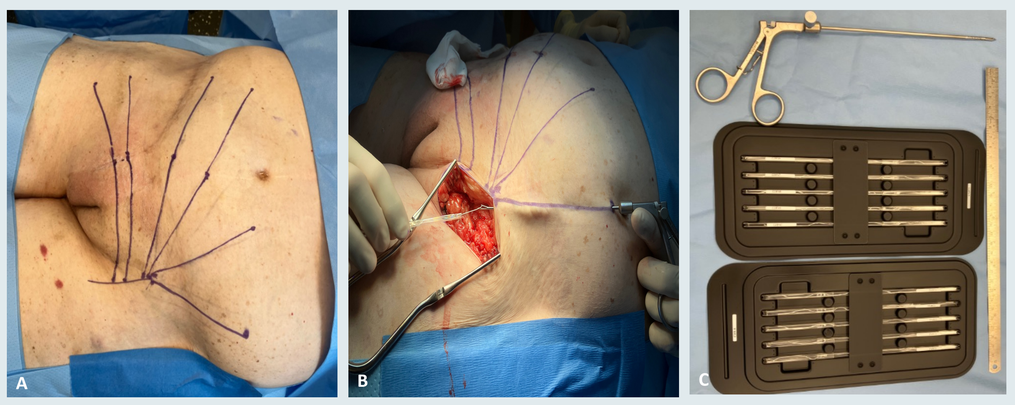
A 64-year-old woman (BMI 66→50.6 kg/m² post-gastric bypass) developed chronic lower abdominal and pubic LE after panniculectomy (2002). From 2018–2023, she had 21 erysipelas/cellulitis episodes, 10 requiring hospitalization (mean 3.2 days), treated with i.v. then oral Co-amoxicillin (10–15 days); outpatient episodes received oral Co-amoxicillin. Blood cultures were negative except for S. hominis (01/2023). In 11/2022, she underwent monsplasty with resection/liposuction, complicated by wound infection. Conservative therapy (early 2023) included compression garment, lymphatic drainage, Hibiscrub® washes, and clindamycin prophylaxis. In 01/2024, ten BioBridge™ nanoscaffolds were implanted to bypass obstructed lymphatic pathways. Microsurgery was not the primary option, as the aim was to bridge a segmental interruption rather than address intrinsic dysfunction. Postoperatively, three further episodes occurred: one mild (oral Co-amoxicillin), one febrile (i.v. → oral Co-amoxicillin, then prophylaxis), and one severe with S. dysgalactiae bacteremia (treated with Piperacillin/Tazobactam, Penicillin G, and Amoxicillin).



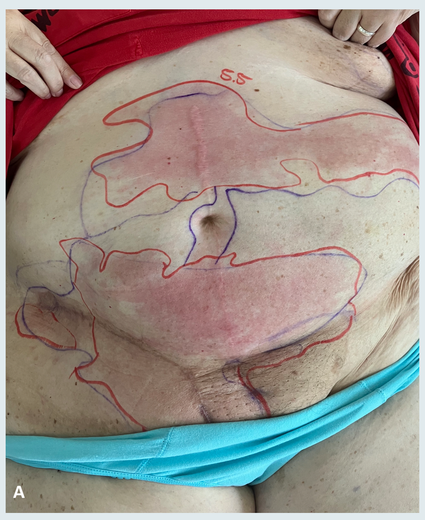
MRI images obtained prior to BioBridge™ implantation showing lymphatic stasis. A) Lower abdominal region, B) Pubic region, C) Groin region.

Methods

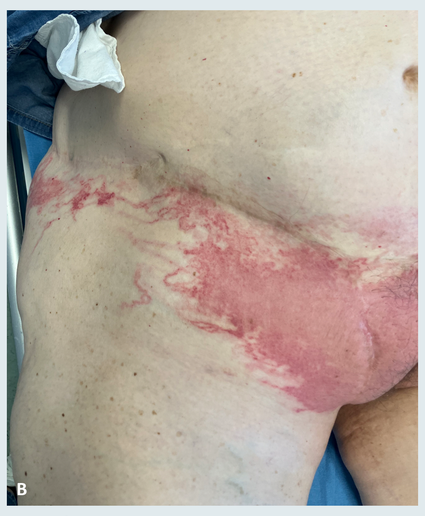
- The procedure aimed to bypass fibrotic interruption of lymphatic flow and restore continuity with contralateral functional inguinal nodes.
- Ten BioBridge™ filaments (Fibralign Corp., USA), flexible nanofibrillar collagen scaffolds were implanted subcutaneously.
- Filaments were tunneled from the right inguinal region across the lower abdomen into the left inguinal region, following a superficial trajectory within subcutaneous fat.
- Implantation was performed through small skin incisions spaced along the path using a dedicated tunneler (Surge Passer).



A) Planning of the direction and positioning of BioBridge filaments. B) Subcutaneous tunneling and placement of the filaments. C) BioBridge filaments and the Surge Passer (tunneler)



A) Pre-op erysipelas manifestation.



B) Post-op erysipelas with limited extension.

Outcomes

Postoperative recovery was uneventful. At 3 months, ICG lymphography showed early lymphatic rerouting to the contralateral groin, with improved abdominal edema and residual LE confined to the pubic/inguinal region. Clinical improvement persisted at 6 months.

Infection episodes decreased:

- Pre-op: 21 episodes in 5.5 yrs (3.8/y), abdomen, upper thigh, mons pubis (3 regions)
- Post-op: 3 episodes in 1.3 yrs (2.3/y), mons pubis only (1 region)

Antibiotic exposure was reduced, although one post-op episode involved S. dysgalactiae bacteremia, successfully treated with sequential i.v. therapy.

Conclusions

This case illustrates the potential of BioBridge™ implantation in reducing infection burden in secondary LE. Postoperative anatomical improvements and redistribution of infection sites support its functional efficacy. BioBridge™ may represent a valuable option when microsurgical approaches are limited, while in well-selected patients, combining both strategies could further enhance outcomes. Further studies are needed to confirm long-term effectiveness.