Zurich Microsurgery Lab

- Flow-Augmentation Bypass Surgery: Indications and Decision-Making
- Microneurosurgical Training on Simulators: The Zurich Microsurgery Lab Experience
- The LYMPH trial: comparing microsurgical with conservative treatment for chronic breast cancer-associated lymphoedema - study protocol of a pragmatic randomised international multicentre superiority trial
- Microsurgical versus complex physical decongestive therapy for chronic breast cancer-related lymphoedema
- How we do it: the Zurich Microsurgery Lab technique for placenta preparation
- Steerable acoustically powered starfish-inspired microrobot
- 3D Motion Manipulation for Micro- and Nanomachines: Progress and Future Directions
- Trends in Micro-/Nanorobotics: Materials Development, Actuation, Localization, and System Integration for Biomedical Applications

https://microsurgerylab.com/

A simulation and research center for training in microvascular surgery, neurosurgery and neuroanatomy.

They provide innovative training possibilities and equipment and offer trainees the possibility to perform a great variety of simulation scenarios allowing many repetitive exercises and improvement of surgical skills.

The Zurich Microsurgery Lab is affiliated with the Department of Neurosurgery and the Clinical Neuroscience Center at the University Hospital Zurich.

The Lab Directors Giuseppe Esposito & Luca Regli

Collaborations

Department of Physiology – University of Irchel

Department of Obstetrics – University Zurich Hospital

Department of Neurology – University Zurich Hospital

Augmedit

UpSurgeon

B.Braun Aesculap

Zeiss

Medtronic

In a conference paper Elisa Colombo et al. from the Zurich Microsurgery Lab, Department of Neurosurgery, University Hospital Zurich, Zurich, Switzerland; Utrecht, Netherlands (Van Doormaal) published in the Acta Neurochirurgica Supplement to present and evaluate a progressive, multimodal simulator-based microneurosurgical training curriculum developed in the Zurich Microsurgery Lab, spanning from basic skills to advanced cerebrovascular techniques using synthetic tubes, placenta models, 3D skulls, mixed reality, and cadaver specimens.

Conclusions: The curriculum offers a seamless, stage-wise skill acquisition pathway:

- **Phase 1:** Si- and silicon vessels on 1–2 mm tubes + UpSurgeOn 3D models.

- **Phase 2:** Perfused human placenta for vessel dissection, microanastomosis, aneurysm clipping simulation.

- **Phase 3:** Hyper-realistic 3D skull craniotomies, dura closure under microscope.

- **Phase 4:** VR/MxR anatomy via Augmedit.

- **Phase 5:** Advanced cadaver work—cadaver craniotomies + placenta perfusion for aneurysm clipping training :contentReference[oaicite:2]{index=2}.

All stages reported to build muscle memory, surgical confidence, and reduce risk in clinical settings [1)].

Critical Review:

- **Strengths:** Well-structured progressive curriculum, innovative use of placenta perfusion, ethically sound (animal-free after placenta), incorporation of modern simulation tech (3D models, VR/MxR).

- **Weaknesses:** Lacks quantitative assessment data (e.g. objective performance metrics, skills retention measures). No formal validation or comparative outcomes vs. traditional training recorded.

- **External Comparisons:** Aligns with broader literature endorsing placenta and synthetic simulators as effective in microvascular training. However, lacks evidence of transfer to operating-room performance or direct comparisons (e.g. GEARS, time, error rates).

- **Novelty:** Unique combination of simulators staged by training level, especially Zürich's placenta protocol previously described

Final Verdict: A well-designed practical training framework, but limited by its purely descriptive nature and absence of validated outcome assessments.

Score: 6/10 – solid educational design, pending data-driven validation.

Takeaway for Practicing Neurosurgeons:

Consider implementing a staged simulator curriculum using silicon tubes, perfused placenta models, 3D skulls, VR/MxR, and cadaver work to build microsurgical skills gradually. However, institution of objective assessment tools is recommended for tracking competence and outcomes.

Bottom Line:

Zurich's multimodal simulator curriculum is a promising and ethically robust approach to microneurosurgical training, but demonstration of measured skill improvement and OR transfer is needed to confirm efficacy.

Citation: *Microneurosurgical Training on Simulators: The Zurich Microsurgery Lab Experience.* Colombo E et al. Acta Neurochir Suppl. 2025;136:173–176. doi:10.1007/978-3-031-89844-0_22. Published online 10 July 2025. Corresponding author: elisa.colombo@usz.ch.

Blog Integration

Categories: Microsurgery Training, Simulation, Medical Education **Tags:** Zurich Microsurgery Lab, simulator curriculum, placenta perfusion, 3D models, mixed reality, neurosurgical training

In a Conference article Esposito *et al. from the University Hospital Zurich, Zurich published in the Acta Neurochirurgica Supplement 136 (2025), pp 113–118 to delineate current indications and decision-making pathways for flow-augmentation EC–IC bypass in steno-occlusive cerebrovascular disease.

- Indicated in symptomatic ischemic and hemorrhagic moyamoya vasculopathy, and selected chronic steno-occlusive or acute ischemic stroke patients. - Established evidence from RCTs (EC–IC bypass, COSS, JAM, CMOSS). - Advanced imaging (BOLD-CVR, NOVA-qMRA) guides individualized surgical decision-making [2)].

Critical appraisal

- **Strengths:**

1. Thorough synthesis of RCTs and observational data.
2. Highlights role of modern hemodynamic imaging in patient stratification.
3. Practice-relevant decision flowchart.

- **Weaknesses:**

1. Lacks original data—primary manuscript is narrative conference supplement.
2. Reliance on imaging tools not universally available.
3. Discussion on CMOSS lacks post-2020 published outcome data. :contentReference[oaicite:2]{index=2}

Final verdict (0–10) 7.0

Well-structured update with practical framework, but limited by lack of novel data and dependence on high-end imaging.

Takeaway for practicing neurosurgeons

Flow-augmentation bypass remains a viable option for:

1. Symptomatic moyamoya (ischemic/hemorrhagic).
2. Chronic carotid/MCA occlusion or acute stroke with persistent hypoperfusion—if advanced imaging (BOLD-CVR/NOVA) confirms hemodynamic failure.

Stratified imaging-based decision-making is key; randomized data (CMOSS, COSS) show mixed results, so careful patient selection is essential.

Bottom line:

EC–IC flow-augmentation bypass is justified in well-selected patients with confirmed hemodynamic impairment, guided by advanced cerebral flow imaging. Universal application is not supported; RCTs show neutral outcomes in broader cohorts.

Rating: 7.0/10

Citation & metadata

Title: Flow-Augmentation Bypass Surgery: Indications and Decision-Making **Full citation:** Esposito G, Sebök M, Fierstra J, Regli L, Flow-Augmentation Bypass Surgery: Indications and Decision-Making. *Acta Neurochir Suppl*. 2025;136:113-118. doi:10.1007/978-3-031-89844-0_14 **Publication date:** July 10, 2025 **Corresponding author:** giuseppe.esposito@usz.ch

WordPress blog categories:

Neurosurgery, Cerebrovascular, Revascularization

Tags:

flow-augmentation bypass, EC–IC, moyamoya, BOLD-CVR, qMRA-NOVA, COSS, CMOSS, cerebrovascular imaging

1)
Colombo E, Höbner L, Sebök M, van Doormaal T, Regli L, Esposito G. Microneurosurgical Training on Simulators: The Zurich Microsurgery Lab Experience. Acta Neurochir Suppl. 2025;136:173-176. doi: 10.1007/978-3-031-89844-0_22. PMID: 40632269.
2)
Esposito G, Sebök M, Fierstra J, Regli L. Flow-Augmentation Bypass Surgery: Indications and Decision-Making. Acta Neurochir Suppl. 2025;136:113-118. doi: 10.1007/978-3-031-89844-0_14. PMID: 40632261.