Patient No.	Registration Time (sec)	Registration Accuracy (mm)	Surgical Time (min)	Pre-op Volume (cc)	Pre-op MP (Upper/Lower)	Post-op Volume (cc)	Post-op MP Day 2 (Upper/Lower)	Aspiration Rate (%)
1	61	0.25	53	26.77	0/1	1.19	1/3	95.6%
2	56	0.08	64	16.48	0/0	0.74	0/2	95.5%
3	64	0.10	41	13.24	2/2	0.39	3/3	97.1%
4	70	0.25	51	20.16	2/2	0.52	4/4	97.4%
5	45	0.27	96	25.91	0/0	0.99	0/1	96.2%
6	46	0.34	72	20.60	0/0	10.43	0/2	62.5%
7	122	0.11	56	25.25	2/2	13.17	2/3	92.2%
8	162	0.13	51	14.52	1/1	12.13	1/1	73.3%
9	32	0.25	62	17.53	1/3	1.82	4/4	89.6%
10	28	0.24	31	12.59	2/2	0.77	4/4	93.9%

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Unblackboxing decision making behind artificial intelligence algorithms in intraoperative neurophysiologic monitoring

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Oral e-Poster Presentations - Booth 3: Neuro-Oncology 7 (Brain metastases), Neuro-Oncology 8 (Advanced Imaging and Monitoring of Cerebral Functions), October 16, 2024, 12:40 PM - 2:10 PM

Background: We elucidate the decision making that lies behind artificial intelligence (AI) algorithms in the example of muscle classification in intraoperative neurophysiological monitoring (IONM). The goal is to uncover decisive parameters in motor evoked potentials (MEP) to understand intraoperative changes and optimize AI decision making.

Methods: We classified MEP in supratentorial surgery in a bi-centric setup, training on 160 patients from one center and validating on 50 patients from an independent center. We trained random forests (RF), and 1D and 2D convolutional neural nets (CNN) on a total of 37'000 MEPs and uncovered the decision making by looking into the feature importance and gradient class activation maps (Grad-CAM).

Results: The RF achieved 89% test accuracy and 80% accuracy on the validation dataset from the independent center, whereas the 1D CNN achieved 85% test and 76% validation accuracy. Finally, the 2D CNN achieved 86% test and 81% valication accuracy. Inspecting the RF feature importance reveals that the algorithm focuses on the time interval where the potential has highest amplitude. On the other hand, the grad-CAM reveals that the CNNs might be focusing on the biggest slope of the potential.

Conclusions: Analyzing the decision making of artificial intelligence algorithms is an essential part of ensuring the quality and evidence behind the good performances of these methods. Understanding this rationale will be crucial when improving intraoperative MEP alarm criteria. We showed the key features during identification of MEPs and validated the results in a bicentric setup. To our knowledge, it is the first time an IONM machine learning classification task has been implemented in a multicenter set-up.

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Training for Microvascular Anastomoses on Perfused Human Placenta Model: Participants' Performance Time and Quality at Zurich Microsurgery Course

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Oral e-Poster Presentations - Booth 1: Vascular 5, October 16, 2024, 12:40 PM - 2:10 PM

Background: Microsurgery requires impressive expertise and precision. Placentas exhibit vascular networks and tissue layers similar to in vivo human settings, allowing surgeons to practice techniques under realistic conditions.
Herein we report on the preliminary results of the intensive two-day microsurgical training on end-to-end and end-to-side microvascular anastomoses (MVA) on perfused human placenta models offered by the Zurich Microsurgery Course (ZMC).

Methods: All participants who attended the ZMC in January 2024 were included. Participants were divided into two groups according to their surgical experience: Group 1, ≤5 years, and Group 2, >5 years. For each participant time and number of MVAs performed (end-to-side or end-to-end), were noted . The quality of MVAs was graded with the ZMC scoring system (Table 1). Besides single participant performance assessment, a comparative analysis of the performances of the two groups was also conducted.

Results: Thirty participants were included and 141 MVAs were analyzed. Group 1 amounted to 18 (60%) participants and Group 2 to 12 (40%). Both groups demonstrated a statistically significant reduction of the time needed to perform an end-to-side MVAs (Group 1, p=0.03236; Group 2, p=0.03). The overall time for performing an end-to-end MVA was shorter for Group 2 (p=0.02642). An improvement of the quality of MVAs was seen in both groups, nonetheless without reaching statistical significance.

Conclusions: The analysis documented a significant reduction of the time needed to perform an end-to-side MVAs during the training: this regardless of previous participants' microsurgical experience. A trend towards improvement of the quality of the performed MVAs was investigated as well . These preliminary data endorse the value of intensive two-day microsurgery training such the one promoted by ZMC as strategy suitable for surgeons at all levels of experience.

Optional Image

Parameter	Score type	Description
Borders' adaptation	Score 1-5	Borders' symmetry between donor and recipient arteries
Number of sutures	Score 1-5	Proper number of sutures (end-to-end: between 8 and 12 sutures; end-to-side: between 10 and 14 sutures)
Symmetry and regularity from outside	Score 1-5	Symmetrical distance from vessel border, use of vessel layers, evaluated from outside
Symmetry and regularity from inside	Score 1-5	Symmetrical distance from vessel border, use of vessel layers, evaluated from inside
Knots' precision	Score 1-5	Symmetry of knots placed on both sides
Threads' length	Score 1-5	Adequate length of cut threads
Patency/Stenosis	Score 1-5	Adequate patency and shape of the anastomosis after perfusion
Microvascular dissection	Score 1-5	Adequate dissection/preparation of vessels and tissue near the anastomosis
Presence of holes	Yes/No	Presence of hole found after perfusion
Endothelial damage	Yes/No	Presence of endothelial tears from inside

Table 1. Scoring system used for microvascular anastomosis (MVA) evaluation.

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FALCON Study – A Seamless Transition from Pre-operative Task-based fMRI to Intra-operative Direct Cortical Stimulation

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Oral e-Poster Presentations - Booth 3: Neuro-Oncology 7 (Brain metastases), Neuro-Oncology 8 (Advanced Imaging and Monitoring of Cerebral Functions), October 16, 2024, 12:40 PM - 2:10 PM

Background: The paradigm shift in management of brain tumours in eloquent cortex is maximizing the extent of resection whilst minimizing neurologic morbidity. Intra-operatively, using awake craniotomy for direct cortical stimulation (DCS) and testing of language production and comprehension has become the gold standard for testing to preserve functional outcomes. To circumvent the problems of awake craniotomy, pre-operative imaging using functional magnetic resonance imaging (fMRI) has been employed.
Current fMRI paradigms for presurgical language assessment are focussed on language lateralisation. There are significant differences in the tests that are