**Hands-on Workshop 1: Minimally Invasive and Endoscopic Spine Surgery**

Friday, the 19th April 2024

15 participants in 3 groups of 5 participants, 15 workstations, 3 rotations  
**Time:** 14.00-18.00 (4 hours)

**Topics:** Unilateral biportal endoscopic surgery (UBE)/ Tubular surgery (TS)/ Augmented Reality (AR) for surgery of disc herniation

**Faculty:**

Directors: Stefan Motov, Michael Schwake, Giovanni Raffa  
Tutors: UBE: Stefan Motov, Martin Stienen, Maria Laura Giamundo  
Tubular: Michael Schwake, Claudius Thomè  
VR endoscopy: Marlies Bauer, Laura Lippa

**Description:**

The course is based on the basic knowledge for unilateral biportal endoscopic and tubular lumbar surgery. The participants are expected to learn the anatomical considerations, patient selection, instrument sets, technique performance and pitfalls for the daily practice. The main targeted pathologies would be disc mediolateral herniations and spinal canal stenosis. Participants will be able to perform all tasks at all workshops and switch every 1h 20 min to another course part from UBE to VR.

**Theory:**

The theoretical part of this course will be established through an adaptive learning platform by Area 9 based on predefined topics, figures, descriptions and case examples with imaging and video material. Course participants will be invited to complete the theoretical section one month before course beginning and evaluation forms before and after the course are going to be distributed for self- and course assessment. A brief description of the practical exercises will be performed at the beginning of the workshop.

**Practical course:**

UBE: The UBE course will be established on a stepwise increasing difficulty basis with three stages. Stage one (10 minutes) consists on boxes with different content, where the participants
should learn to work with an endoscope and instruments and perform different tasks – e.g. writing their initials with a pencil inside the box or strapping and tying a knot around small pins with a rongeur and a hook. Step Two (20 minutes) is the “King Euster” model where a mushroom model simulating the different layers of the epidural space is prepared for the participants to practice on. Further instruments e.g. scissors, Kerrison’s and “Indian knife” are presented and the technique of flavectomy and discectomy. In the third stage (50 minutes), the participants are exposed to a realistic spine model where they can use a high-speed drill and perform a spinal canal decompression and a discectomy.

**TS:** Tubular retractors will be introduced to the participants on Realist Spine models. Approaches will be demonstrated for 5 minutes by the faculty every 20 minutes of the course and afterwards participants will be able to practice them on the models. Three different tasks are going to be trained – the interlaminar approach for mediolateral disc herniations, the interlaminar approach for spinal canal stenosis with over-the-top decompression and the extraforaminal approach for disc herniations. The Realist spine models will be available with integrated navigation so no fluoroscopy will be needed to check for positioning of tubular systems. Orientation, preparation, drilling and punching through tubular retractors are the main skills provided during the course. For quick learners a durotomy with dura suturing will be simulated through the tubular retractor.

**VR:** Participants will be introduced to and will be enabled to practice basic endoscopic skills on an virtual reality simulator for 1 h 20 minutes. Bi- and monoportal techniques will be simulated and instruments for both techniques will be presented. Case examples might be demonstrated by the faculty.

**Scientific Programme:**

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<thead>
<tr>
<th>Time</th>
<th>Description</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>14.00-14.10</td>
<td>Description of UBE practical exercises</td>
<td>Stefan Motov</td>
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<tr>
<td>14.10-14.20</td>
<td>Description of Tubular practical exercises</td>
<td>Michael Schwake</td>
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<td>14.20-14.30</td>
<td>Description of VR practical exercises</td>
<td>Marlies Bauer</td>
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<td>14.30-15.40</td>
<td>First rotation</td>
<td>All tutors</td>
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<td>15.40-16.50</td>
<td>Second Rotation</td>
<td>All tutors</td>
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<tr>
<td>16.50-18.00</td>
<td>Third Rotation</td>
<td>All tutors</td>
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18.00 End of the course
Friday, the 19th April 2024

1) **Hands-on Workshop 2: Decompression, instrumentation, tumor removal and dural repair in spinal oncology** (20 participants in 2 main groups of 10 participants rotating between Part I and Part II of the workshop; each main group is divided in 5 subgroups of 2 participants rotating among 5 workstations in each Workshop Part; Total 10 workstations, 1 main rotation of the two groups. During each Workshop part, there will be 5 rotations among the 5 different workstations)
**Time: 14.00-18.00 (4 hours)**

**Topics:** Part I Navigated & Freehand instrumentation/Part II Decompression, tumor removal and dural repair

**Materials**
- Part I Navigated and open pedicle and lateral mass screw insertion: 5 x sawbone spine models (thoraco-lumbar and cervical) + Instruments + Navigation system + Intraoperative CT scan
- Part II Decompression, tumor removal and dural repair: 3x 3D printed Spine Models + Navigation system + instruments for laminectomy/corpectomy; 1 OR Microscope; 1 ultrasonic aspirator for simulating tumor removal on dedicated grafts; 1 simulator for application of dural sealants and dural repair.

**Faculty:**
Directors: Malte Mohme, Cesare Zoia, Giovanni Raffa
Part II: Decompression and corpectomy: Marisa Gandia, Vicki Buteschoen, Diogo Belo
Tumor removal and dural repair: Raffa, Zoia

**Description:**
This course should provide the participants with basic navigated and open cervical and thoracolumbar pedicle screw insertion techniques via sawbone models. Decompression, separation surgery and vertebrectomy in the context of metastatic spine disease will be further simulated on 3D-printed spine models with navigation. Participants will have the unique
possibility to train in the high-tech environment of Stryker training & education truck and with Brainlab Magic Leap augmented reality.

**Theory:**
The theoretical part will last no longer than 20 minutes in each course part. Basic principles for open free hand and navigated pedicle screw insertion will be demonstrated and explained in the instrumentation part I. Basics of navigation, anatomical considerations and surgical pitfalls will be indicated. In part II decompression, separation surgery and vertebrectomy - the techniques, indications and pitfalls will be discussed and displayed schematically. Case examples will be demonstrated for all techniques.

**Practical course:**
In part I the participants will be able to practice on sawbone models the technique of screw insertion in the cervical and thoracolumbar spine. Techniques for lateral mass screw insertion will be demonstrated and performed. Also pedicle awling and drilling will be demonstrated and performed by the participants. Rescue techniques and Iliac screws might be demonstrated for advanced learners.

In part II the participants will be introduced to the basics of laminectomy, pediculectomy, costotransversectomy and vertebrectomy for tumor surgery. Decompression procedures will be performed on 3D-printed models with simulated epidural masses or pathological fractures. Augmented reality will be applied on one model for teaching and demonstration purposes at the beginning of each task. Moreover, exercises for tumor removal by using ultrasonic aspirator on specific simulators will be performed. Finally, a dedicated simulator will be used to demonstrate and perform sealant application as well as to verify its performance for dural closure after surgery of intradural tumors.

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<tr>
<td>14.00-14.10</td>
<td>Description of screw insertion exercises</td>
<td>Felix Stengel</td>
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<tr>
<td>14.10-14.20</td>
<td>Description of decompression exercises</td>
<td>Vicki Buteschoen</td>
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<td>14.20-14.30</td>
<td>Description of tumor removal and dural repair</td>
<td>Cesare Zoia</td>
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<td>14.30-18.00</td>
<td>Part I</td>
<td>Felix Stengel, Malte Mohme, Stanislav Kaprovoy, Ilaria Ghetti, Alberto D'Amico</td>
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14.30-18.00 Part II  Marisa Gandia, Vicki Buteschoen, Diogo Belo, Giovanni Raffa, Cesare Zoia

16.15 Rotation of participant between Part I and Part II  All tutors

18.00 End of the course

**Logistic:** Workshop I: Nexon Stockli, J&J Depuy Spine, Realist Spine, Zeiss, Simulatory

Workshop II: Brainlab and Integra in the hotel room; Striker in the hotel parking