Apprentissage de la microchirurgie par immersion

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Leaning of the microsurgery

• Microsurgery technique
  • Surgery of hand, Plastic surgery, Neurosurgery, Vascular surgery, Ophthalmology...
  • Difficulties
    • Vision disconnection / hand control
    • Optical magnification / Concentration
    • Tremor management
    • Finger gesture

• University Degrees
  • 100 hours (45 - 120)
  • 1 session per week = 6 months
Objectives

- Instruments / techniques / ergonomics specific to microsurgery.
- Microsurgical dissection and preparation of the vessels for sutures.
- Performing an end-to-end anastomosis (artery and vein).
- Performing a venous bypass

- Self-evaluation capacity
Challenges

- Preservation of achievements
- Long
- Weariness (teachers / students)
- unmotivating
- Cost

- Learning / Training
Angers University Degrees

- Training in « fast-tracking »
- Condensed in 2 consecutive weeks - Since 2016
- Evaluation Period: U.D. 2019
- Continuous evaluation: teacher and student
- Progression of learning
### Evaluation Questionnaire

#### Self-assessment: students

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. NAME OF THE STUDENT</td>
<td></td>
</tr>
<tr>
<td>2. DATE</td>
<td>[ ] END OF THE SESSION</td>
</tr>
<tr>
<td>3. TP</td>
<td>( ) TURNOVER</td>
</tr>
<tr>
<td>4. Dexterity: stability and fluidity of the movement</td>
<td>[ ] Tense, occasional tremors</td>
</tr>
<tr>
<td>5. Dexterity: manipulation of instruments</td>
<td>[ ] Difficult to position the needle on the port</td>
</tr>
<tr>
<td>6. Dexterity: sutures</td>
<td>[ ] Incorrect points</td>
</tr>
<tr>
<td>7. Preparation of vessels: dissection</td>
<td>[ ] Incorrect area with adjacent tissue damage</td>
</tr>
<tr>
<td>8. Preparation of vessels: nailing of the clamp</td>
<td>[ ] Improper placement (too close to the lumina...)</td>
</tr>
</tbody>
</table>

#### Assessment: teachers

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Anastomosis: sutures</td>
<td>[ ] Incorrect points</td>
</tr>
<tr>
<td>11. Analysis: control before release of the clamp</td>
<td>[ ] Poor verification of the sutures</td>
</tr>
<tr>
<td>12. Analysis: permeability at the release of the clamp</td>
<td>[ ] Poor permeability</td>
</tr>
<tr>
<td>13. Additional comments</td>
<td></td>
</tr>
</tbody>
</table>

#### Blinded

- Evaluation criteria:
  - Dexterity
  - Vessel preparation
  - Anastomosis
  - Analysis
Program

**Week 1**
Day 1: inert material: Ethiloop + Shirataki
Day 2: dissection of the rat
Day 3: rat uterus and aorta
Day 4: aorta and sciatic nerve
Day 5: 2 carotid arteries

**Week 2**
Day 6: carotid with and without vein conduit
Day 7: Renal graft (artery + renal) and carotid
Day 8: Jugular graft on aorta + carotid artery
Day 9: Renal Artery + Carotid +/- Bypass (jugular vein) on aorta

**Exam**
Day 10: Aorta and carotid suture +/- Artery and renal vein
Day 11: catch up exam
Program

• Students divided into 2 groups
• Alternating morning / afternoon

• Teachers: Experienced seniors
• Permanent presence - binocular loupe (x4)
• **Personalized teaching** adapted to progression

• Debriefing
• Briefing with commented video of the next day
Progression

![Graph showing progression over days for different categories: Dexterity, Preparation of Vessel, Anastomosis, and Analysis.]

**Day 1 - Day 9 Progression**
- Dexterity
- Preparation of Vessel
- Anastomosis
- Analysis

**Students**
- Permeability test
- Stability
- Manipulation des instruments
- Needles
- Dissection
- Clamping
- Suture
- Control before declamping
- Permeability test

**Teachers**
- Permeability test
- Stability
- Manipulation des instruments
- Needles
- Dissection
- Clamping
- Suture
- Control before declamping
- Permeability test
Level group

Division 3 level groups

1: Good level
2: Average level
3: Beginner level
Progression

<table>
<thead>
<tr>
<th></th>
<th>Day 3</th>
<th>Day 6</th>
<th>Day 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1/2</td>
<td>p = 0.002</td>
<td>p = 0.75</td>
<td>p = 0.52</td>
</tr>
<tr>
<td>Group 1/3</td>
<td>p = 0.0012</td>
<td>p = 0.029</td>
<td>p = 0.16</td>
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<tr>
<td>Group 2/3</td>
<td>p = 0.19</td>
<td>p = 0.012</td>
<td>p = 0.27</td>
</tr>
</tbody>
</table>
## Reproductibility

<table>
<thead>
<tr>
<th>Group</th>
<th>Name</th>
<th>Week 1</th>
<th>Week 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>BLA</td>
<td>$p = 0.043$</td>
<td>$p = 0.002$</td>
</tr>
<tr>
<td></td>
<td>DEL</td>
<td>$p = 0.013$</td>
<td>$p = 0.19$</td>
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<tr>
<td></td>
<td>GOM</td>
<td>$p = 0.025$</td>
<td>$p = 0.10$</td>
</tr>
<tr>
<td></td>
<td>NIC</td>
<td>$p = 9,06.10^{-9}$</td>
<td>$p = 6,94.10^{-6}$</td>
</tr>
<tr>
<td>Group 2</td>
<td>DEJ</td>
<td>$p = 0.008$</td>
<td>$p = 0.29$</td>
</tr>
<tr>
<td></td>
<td>GAL</td>
<td>$p = 0.018$</td>
<td>$p = 0.16$</td>
</tr>
<tr>
<td></td>
<td>VER</td>
<td>$p = 0.00013$</td>
<td>$p = 0.0021$</td>
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<tr>
<td>Group 3</td>
<td>BAL</td>
<td>$p = 0.037$</td>
<td>$p = 0.29$</td>
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<tr>
<td></td>
<td>BOU</td>
<td>$p = 0.53$</td>
<td>$p = 0.57$</td>
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<tr>
<td></td>
<td>MET</td>
<td>$p = 0.85$</td>
<td>$p = 0.19$</td>
</tr>
</tbody>
</table>

![Graph showing the comparison of Students and Teachers over TP 1 to TP 9](image)
Satisfaction

- The course corresponds to my expectations
  3.5/4 (3-4)
- Organization in 2 weeks is satisfactory
  3.9/4 (3-4)
- The learning time is sufficient
  3.5/4 (2-4)
- Expert course : 7/10
Discussion

- Continuous progression
- Close learning
- Repetitive steps
- Act more and more complex

- Supervision ++
- Personalized support +++

- Proficiency-based training

Curve of experience
Hermann Ebbinghaus (1885)
Limitations

- Reduced number of students
- Evaluation by different teachers
- Curve of forgetting
Conclusion: Challenge?

- Preservation of achievements
- Long
- Weariness (teachers / students)
- Unmotivating
- Cost
- Objectives of learning