Seminar Presentation

Validation of a Task-Specific Scoring System for a Microvascular Surgery Simulation Model

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Group 3: Surgical Instruments for Robotic Microsurgery

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Overview

- Project overview
- Background information
- *Validation of a Task-Specific Scoring System for a Microvascular Surgery Simulation Model*
  - Methods
  - Results
- Application of paper to our project
Project Overview

• Integrating novel surgical instruments into the REMS for robot assisted microvascular anastomosis

• Analysis of effectiveness of tools by testing with both novice and experienced surgeons
Background: Microvascular Anastomosis

• Process of surgically connecting two structures, in this case two micro-scale blood vessels

• Typically 8 – 10 loops around the circumference of the vessels
Validation of a Task-Specific Scoring System for a Microvascular Surgery Simulation Model


- Validation paper on use of OSATS and chicken thigh model for evaluation of microvascular surgical technique
Motivation

• Microvascular surgery requires a technically advanced skill set
  • Vessels have diameter on the scale of 2 – 3 mm
  • Require eye-microscope-hand coordination
  • High dexterity for delicate tissues and fine, fluid motions

• Assessment of skills requires a uniform and objective assessment method

• Current available biologic training models require the use of live rats
Methods: Subjects

- 20 subjects of varying experience:
  - 1st to 5th year residents: Novice – Intermediate
  - Surgical fellows
  - Staff: Expert

Figure 1: Self reported experience level
Methods: Evaluation

- OSATS: Objective Structured Assessment of Technical Skill

<table>
<thead>
<tr>
<th>TABLE I. Microvascular Objective Structured Assessment of Technical Skills (OSATS)-Task Specific Score.</th>
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<tbody>
<tr>
<td>Correct</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>Passing needle through tissue:</td>
</tr>
<tr>
<td>1. Loads needle in drive 1/2 to 2/3 from needle tip</td>
</tr>
<tr>
<td>2. Needle does not wobble in driver</td>
</tr>
<tr>
<td>3. Needle enters tissue perpendicularly</td>
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<tr>
<td>4. Forceps handle vessel adventitia to provide counter traction</td>
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<tr>
<td>5. Dilator is appropriately used</td>
</tr>
<tr>
<td>6. Needle is pulled through tissue following its curve</td>
</tr>
<tr>
<td>7. Suture is pulled out parallel to the tissue</td>
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<tr>
<td>8. Suture tails are left at the correct length</td>
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<tr>
<td>9. Appropriate depth tissue bite on each side</td>
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<tr>
<td>10. Sutures are spaced appropriately</td>
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**Knot tying**

| 11. Three or more square throws are tied |  |
| 12. Efficient handling of suture while tying |  |
| 13. Appropriate tension on suture while tying |  |
| 14. Tissue well-approximated but not strangulated |  |

| Total correct | /14 |

<table>
<thead>
<tr>
<th>TABLE II. Microvascular OSATS-Global Rating Scale.</th>
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<tbody>
<tr>
<td>Worst</td>
</tr>
<tr>
<td>Economy of motion</td>
</tr>
<tr>
<td>Instrument handling</td>
</tr>
<tr>
<td>Respect for tissue</td>
</tr>
<tr>
<td>Flow of operation</td>
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<tr>
<td>Overall result</td>
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</tbody>
</table>
Methods: Simulation Model

- Used ischiatic neurovascular bundle in chicken thigh
- Chicken thigh model provides similar structures to those in free flaps
- Veins and arteries were skeletonized

Figure 2: Ischiatic neurovascular bundle
Methods

Figure 3: Intraoperative pictures recorded from microscope

Figure 4: Excision of results for analysis
Results: Task Specific Scores

**Figure 5**: Mean total task specific scores ±1 standard deviation

**Figure 6**: Mean task specific scores
Results: Global Rating Scores

Figure 7: Mean global rating scores by experience
Results: Scoring

Figure 8: Correlation between scores of both graders

Task specific: 0.69
Global: 0.72
Results: Task Time

**Figure 9:** Task time with respect to experience level

- Exhibits a logarithmic relationship
- Time plateaus at 18 minutes
Conclusions

• Positive correlation between experience and scores, both task specific and global
• Experience level was logarithmically related to task time
• Validates the use of the chicken thigh model and OSATS as effective methods to teach and evaluate microvascular anastomosis
• Immediate feedback is not present
Strengths

• Detailed description of methods
• Detailed analysis of results, both statistically and qualitatively
• Procedure is very similar to our own

Shortcomings

• Relied on self-evaluation of experience in microsurgery
Relevance to our project

• Similar procedure to what is being used to evaluate the REMS

• Differences:
  • Complete vs. abbreviated anastomosis
  • All subjects are assumed to be novices at task
  • Varying operation method, not experience level
Relevance to our project

- Validates use of ischiatic neurovascular bundle in chicken thigh as a model
- Provides objective criteria for procedure analysis

- Expecting:
  - Task specific scores to be low
  - Global scores will show improvement from manual to robotic surgery
Seminar Presentation

Analysis of Techniques in Microvascular Anastomosis

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