Team 9: Ureteroscope
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Background
• Given Ureteroscope by UCI Health Department for Reverse Engineering
• Device is used for non-invasive removal of kidney stones
• Proven 14 French is possible through 3 test-subjects to the right

Objectives
• Fabricate a ureteroscope with a larger diameter
• Achieve higher kidney stone removal
• Eliminate clogging
• Redesign and optimize area of the tip
• Redesign handle to create 4 channels for aspiration, irrigation, laser, and basket
• Reduce Price from $1000 per unit to only $500

Results

<table>
<thead>
<tr>
<th>5.33mm Diameter:</th>
<th>Case 1</th>
<th>Case 2</th>
<th>Case 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complications</td>
<td>Grade 0</td>
<td>Grade 1</td>
<td>Grade 0</td>
</tr>
<tr>
<td>Preoperative stone volume</td>
<td>7488 mm³</td>
<td>6900 mm³</td>
<td>462 mm³</td>
</tr>
<tr>
<td>Postoperative stone volume</td>
<td>588 mm³</td>
<td>63 mm³</td>
<td>0 mm³</td>
</tr>
<tr>
<td>Residual Stone Burden</td>
<td>7.8%</td>
<td>0.91%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Figure 1 – 3 Test Patients at 14 French with Aspiration Endoscope

Components and Materials
• Brass Links
• Steel mesh sheath
• Plastic handle + lever

Mechanics
Method: Reverse engineering
• Bi-radial actuation
• Jointless linkage
• Flexible metal sheath

Design Solution
• 3-D printing of linkages to reduce cost
• Use of fiber-optics to replace LED
• Replace 1mm camera with 0.8 mm camera

Future Considerations:
- Manufacturing of handle and linkages
- Material selection
- Redesign of lever mechanism

Acknowledgments (Calibri, 36 points, bold)
This is based on research by UCI Health. Reverse Engineering was conducted in UCI Microsystems Lab with oversight from Dr. Shkel.

References (Calibri, 36 points, bold)
R. Clayman, Z. Tano, “Aspiration Endoscope Introduction”
Karl Storz, “Flexible Video Uretero-renaloscope FLEX-XC1”