Team 9: Ureteroscope

Abir Albazian, Raymond Rojas, Samantha Perkin
Department of Mechanical and Aerospace Engineering
UC Irvine

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

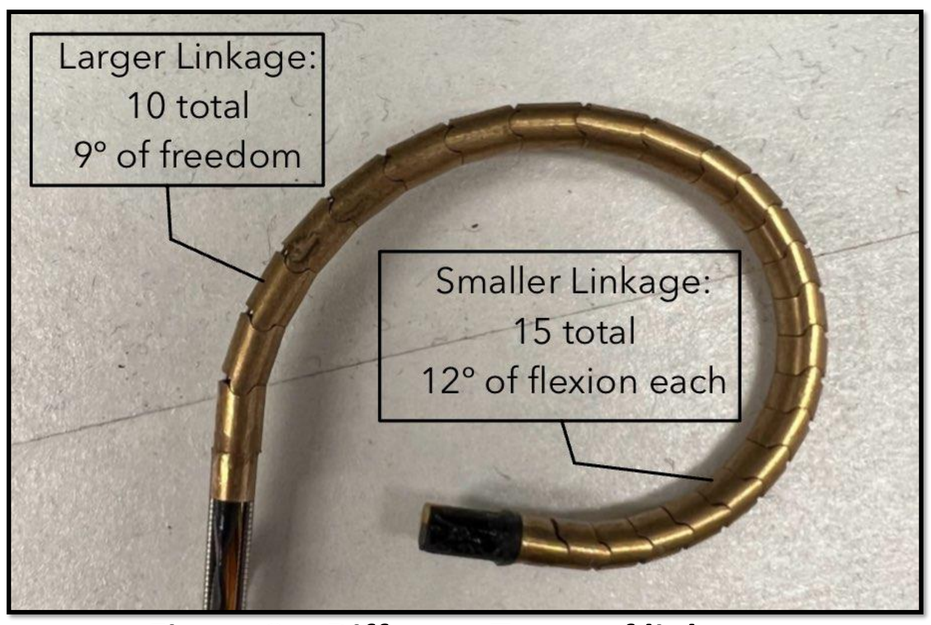

Figure 2 – Different Types of linkages

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

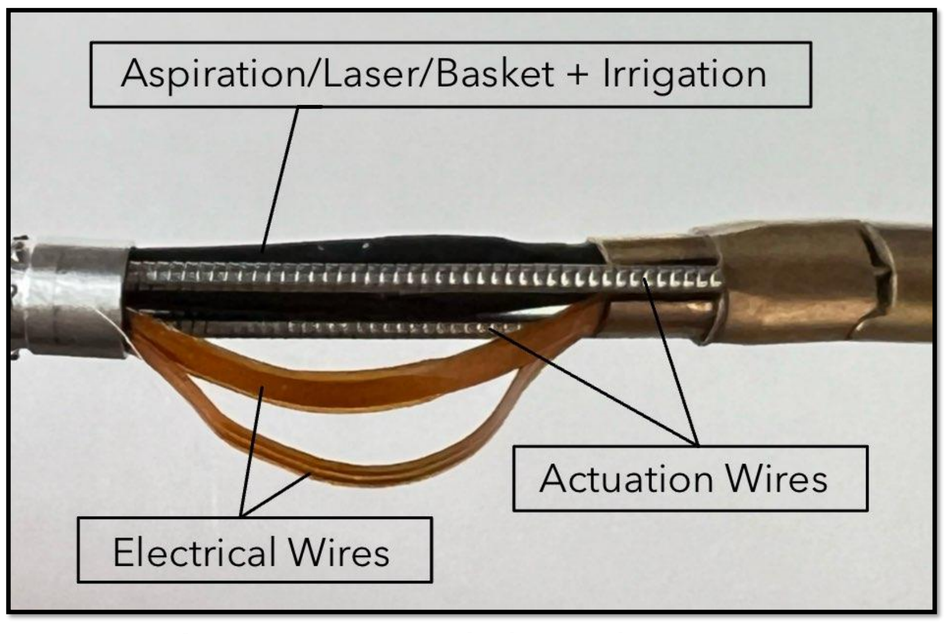

Figure 5 – Internal Channel Components

Future Considerations:

- Manufacturing of handle and linkages
- Material selection
- Redesign of lever mechanism

Results

5.33mm Diameter:	Case 1	Case 2	Case 3
Complications (Clavien-Dindo)	Grade 0	Grade 1	Grade 0
Preoperative stone volume	7488 mm^3	6900 mm^3	462 mm^3
Postoperative stone volume	588 mm^3	63 mm^3	0 mm^3
Residual Stone Burden	7.8%	0.91%	0%

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

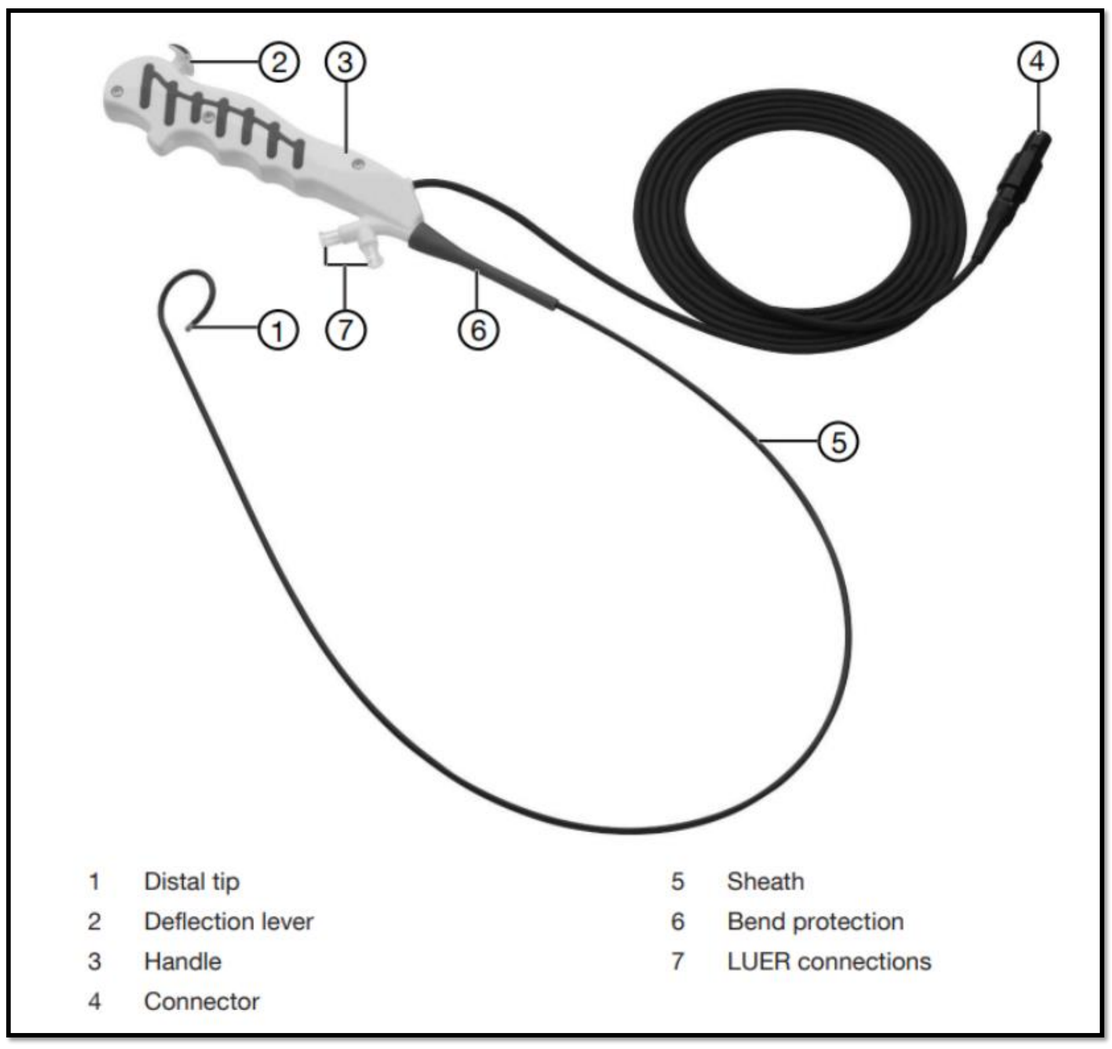

Figure 3 – Critical Component Layout

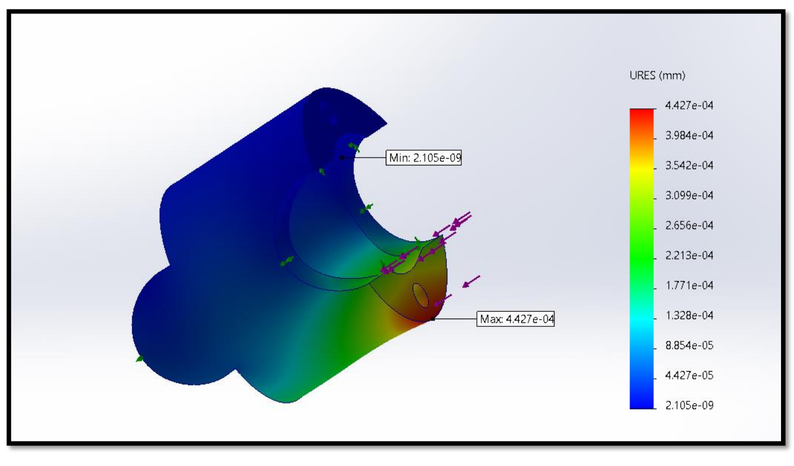

Figure 4 – FEA Analysis of Individual Larger Link

Acknowledgments (Calibri, 36 points, bold)

This is based on research by UCI Health. Reverse Engineering was conducted in UCI Microsystems Lab with oversite from Dr. Shkel.

References (Calibri, 36 points, bold)

R. Clayman, Z. Tano, “Aspiration Endoscope Introduction”

Karl Storz, “Flexible Video Uretero-renoscope FLEX-XC1"