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Title: Modified Octopus Technique for Thoracoabdominal Aortic Aneurysm

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Author Questionnaire

1. **Microscopy**: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **No**

2. **Software:** Does the part of your protocol being filmed include step-by-step descriptions of software usage? **No**.

3. **Filming location:** Will the filming need to take place in multiple locations? **No**

Current Protocol Length
Number of Steps: 15
Number of Shots: 35

Introduction

Videographer: Obtain headshots for all authors available at the filming location.

1.1. **Tao Zhang:** We explore a modified octopus technique for endovascular repair of thoracoabdominal aortic aneurysms involving visceral artery reconstruction. We are testing if this technique effectively reduces endoleaks and stent compression, and whether it offers a simpler, safer alternative for complex TAAA cases unsuitable for open repair.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.2.1*

What technologies are currently used to advance research in your field?

1.2. **Zhaoyang Li:** We use advanced endovascular technologies such as fenestrated and branched stent grafts, physician-modified endografts, and parallel grafting techniques including the octopus method to reconstruct visceral branches.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 3.1.1*

What advantage does your protocol offer compared to other techniques?

1.3. **Weihao Li:** Our modified octopus technique minimizes gutter-related endoleaks, reduces stent compression, and enables visceral artery reconstruction through a single upper limb access.

1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera. *Suggested B-roll: 2.5.1*

Videographer: Obtain headshots for all authors available at the filming location.

Ethics Title Card

This research has been approved by the Institutional Review Board at the Peking University People's Hospital

Protocol

NOTE: Section 2 was filmed by the videographer

2. The Surgical Strategy to Address the Thoracoabdominal Aortic Aneurysm: Stent Graft Assembly

Demonstrator: Weihao Li

2.1. To begin, perform the surgical planning and obtain all the required measurements **[1]**. Extend the 30 to 200 millimeter thoracic aortic stent graft to establish the proximal anchoring zone **[2-TXT]**.

2.1.1. WIDE: Talent examining the graft.

2.1.2. Talent extending the 30 to 200 millimeter thoracic aortic stent graft. **TXT: Customize the stent graft dimensions according to the patient**

2.2. Take 4 stent graft segments of different lengths and suture branches to each segment accordingly **[1]**. Suture the branch for the celiac trunk at the bifurcation point of the abdominal aortic stent graft **[2]**.

2.2.1. Talent cutting the 6 to 150 millimeter stent graft into four segments.

2.2.2. Talent suturing a branch at the bifurcation site of the abdominal aortic stent graft for the celiac trunk.

2.3. Now, pair and securely suture the three branches designated for the superior mesenteric artery and the bilateral renal arteries **[1]**. To create a common seam, suture the junctions between the three stent grafts **[2]** and perform an end-to-end anastomosis at the short branch of the abdominal aortic stent graft **[3]**.

2.3.1. Talent grouping and suturing the three branches for the superior mesenteric artery and the renal arteries.

2.3.2. Talent aligning the three stent grafts, suturing the seams to form a single structure.

2.3.3. Talent performing end-to-end anastomosis at the short branch.

2.4. Use a modified stent graft, referred to as the "octopus" configuration, derived from an abdominal aortic stent for internal bridging **[1]** and adjust the release height of the branches to enable seamless bridging of the covered stent grafts **[2]**.

2.4.1. Talent showing "octopus" stent, explaining its origin from an abdominal aortic stent graft.

2.4.2. Talent manipulating the branch release mechanism and adjusting the heights to align the stent branches properly

3. Surgical Procedure to Introduce the Modified Stent

NOTE: This part was filmed by the authors

3.1. Now, puncture the right common femoral artery and insert a 9 French arterial sheath **[1]**. Advance a centimeter-sizing catheter to the aortic arch and visualize the descending aorta and thoracoabdominal aortic aneurysm **[2]**.

3.1.1. Talent performing a femoral artery puncture and inserting the 9 French sheath.
Video: 68211_screenshot_10.mp4 0:20–0:40

3.1.2. Talent advancing a centimeter-sizing catheter to the aortic arch and visualize the descending aorta and thoracoabdominal aortic aneurysm.
Video: 68211_screenshot_1.mp4 0:00–0:07

3.2. Bridge the proximal end first with a thoracic aortic stent graft main body **[1]**. Then place the modified octopus branch stent **[2]**.

3.2.1. Talent guiding the thoracic stent graft main body into place and initiating deployment.
Video: 68211_screenshot_2.mp4 0:05–0:25

3.2.2. Talent placing the modified octopus branch stent and adjusting its orientation.
TXT: Puncture the left brachial artery; Insert a 6F arterial sheath
Video: 68211_screenshot_3.mp4 0:05–0:28

3.3. ~~Now, puncture the left brachial artery and insert a 6 French arterial sheath **[1]**~~. Advance a guidewire and catheter to the main stent body and then replace the sheath with an 8 French, 90-centimeter long sheath **[1]**.

3.3.1. ~~Talent performing a puncture of the left brachial artery and inserting the 6 French sheath~~. **NOTE**: NOT filmed, VO moved as on-screen text to the previous shotThis part was filmed

3.3.2. Talent threading the guidewire, exchanging for the 8 French sheath, and fixing it in place. 68211_screenshot_11.mp4 01:00-01:10 and 03:58-04:05

3.4. Then, deploy 8 to 100-millimeter and 7 to 100-millimeter stent grafts to reconstruct the celiac trunk and the superior mesenteric artery, respectively **[1]**. Place a 6 to 100-millimeter stent graft for the right renal artery **[2]** and place the 6 to 100 millimeter graft in the right renal artery **[3]**.

3.4.1. Talent deploying the 8 to 100 millimeter stents into the celiac trunk.
Video: 68211_screenshot_4.mp4 0:00–0:02

3.4.2. Talent deploying the 7 to 100 millimeter stents into the superior mesenteric artery.
Video: 68211_screenshot_5.mp4 0:00–0:03

3.4.3. Talent placing the 6 to 100 millimeter graft in the right renal artery.
Video: 68211_screenshot_6.mp4 0:00–0:21

3.5. To address the acute angle of the left renal artery, deploy a 6 to 100-millimeter covered stent graft **[1]**. Release a long-leg side abdominal aortic covered stent graft extension with trumpet legs measuring 16-24-124 millimeters, anchoring it in the distal abdominal aorta **[2]**. Then, deploy the left renal artery stent graft and reinforce with a 6 to 60-millimeter bare metal stent **[3]**.

3.5.1. Talent placing a 6 to 100 millimeter covered stent in the sharply angled left renal artery.
Video: 68211_screenshot_7.mp4 0:05–0:30

3.5.2. Talent deploying the long-leg covered stent extension into the distal abdominal aorta.
Video: 68211_screenshot_8.mp4 0:00–0:14

3.5.3. Talent reinforcing the left renal artery graft with the 6 to 60 millimeter bare metal stent.
Video: 68211_screenshot_9.mp4 0:00–0:03

3.6. Once the angiographic results are confirmed as satisfactory, remove the catheter, guidewire, and sheath **[1]**. Tighten the pre-placed sutures at the right femoral artery puncture site **[2]**.

3.6.1. Talent withdrawing the catheter, guidewire, and sheath.

Video: 68211_screenshot_12.mp4 0:20-00:25 and 00:52–0:56

3.6.2. Talent pulling the suture threads and tying them to close the femoral artery site.
Video: 68211_screenshot_12.mp4 0:30–0:40

3.7. Finally, apply direct compression to the puncture site of the left brachial artery to achieve hemostasis **[1]** and place a compressive dressing over the site **[2]**.

3.7.1. Talent applying firm pressure over the brachial puncture site using sterile gauze.
Video: 68211_screenshot_13.mp4 0:00–0:17

3.7.2. Talent placing and taping a compressive dressing to secure the site.
Video: 68211_screenshot_14.mp4 0:50–1:00

Results

4. Results

4.1. The modified octopus technique closely aligns with the design concept of branched stents **[1]**.

4.1.1. LAB MEDIA: Figure 2

4.2. Postoperative aortic Computed Tomography Angiography demonstrated successful exclusion of the thoracoabdominal aortic aneurysm, with unobstructed blood flow within the stent and to the branch arteries **[1]**.

4.2.1. LAB MEDIA: Figure 3

Pronunciation guide

1. Thoracic Aorta

- **Pronunciation link**: https://www.merriam-webster.com/medical/thoracic%20aorta
- **IPA**: /θəˈræsɪk eɪˈɔːrtə/
- **Phonetic Spelling**: thuh-RASS-ik ay-OR-tuh

2. Stent

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/stent
- **IPA**: /stɛnt/
- **Phonetic Spelling**: stent

3. Celiac

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/celiac
- **IPA**: /ˈsiːliæk/

- **Phonetic Spelling**: SEE-lee-ak

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4. Mesenteric

- **Pronunciation link**: https://www.merriam-webster.com/medical/mesenteric%20artery
- **IPA**: /ˌmɛzənˈtɛrɪk/ or /ˌmɛsənˈtɛrɪk/
- **Phonetic Spelling**: MEZ-un-TER-ik or MES-un-TER-ik

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5. Anastomosis

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/anastomosis
- **IPA**: /əˌnæstəˈmoʊsɪs/
- **Phonetic Spelling**: uh-NAS-tuh-MOH-sis

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6. Femoral

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/femoral
- **IPA**: /ˈfɛmərəl/ or /ˈfiːmərəl/
- **Phonetic Spelling**: FEM-uh-ruhl or FEE-muh-ruhl

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7. Brachial

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/brachial
- **IPA**: /ˈbreɪkiəl/
- **Phonetic Spelling**: BRAY-kee-uhl

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8. Angiographic

- **Pronunciation link**: https://www.merriam-webster.com/dictionary/angiography
- **IPA**: /ˌæn.dʒi.oʊˈgræf.ɪk/
- **Phonetic Spelling**: an-jee-oh-GRAF-ik