PERFUSED HUMAN THIEL CADAVERIC MODEL FOR PRE CLINICAL ENDOVASCULAR DEVICE TESTING

Poster • June 2017

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**Aim:**
The aim of this project was to develop a protocol for imaging and measuring deformations of the superficial femoral artery (SFA) and popliteal artery using fluoroscopic images and to further develop the Thiel cadaveric model for the testing of below the knee stents.

**Background:**
Clinically, poor prognosis is linked to the use of below the knee stents as they often prevent the arteries from lengthening and widening as they would do normally during everyday movement. Failure of these stents may result in stent fracturing or kinks in the artery.

A model is being developed to measure arterial deformations from data obtained from CT scans. While this is an excellent method for measuring these arterial deformations, it is not possible to take CT scans of Cadavers in certain extreme knee bend positions due to the size limitation of the CT scanner bore. Therefore another method is required to measure these deformations.

**Method:**

Human Thiel embalmed cadaveric model was prepared by placing robust connections into the SFA in each leg of the cadaver. A Maquet HL30 heart lung bypass machine was used to deliver flow to the arteries.

A CORDIS 110 cm SF FIG 038° catheter with 20 markers 10 mm apart was inserted into the SFA and Digital Subtracted Angiography (DSA) images of the native artery with 10 ml bolus of Omnipaque 300 contrast were obtained in five different knee bend positions:

- 1) Supine
- 2) 20 degrees Hip flexion, 50 degrees knee bend (20:50)
- 3) 20 degrees Hip flexion, 70 degrees knee bend (20:70)
- 4) 90 degrees Hip flexion, 90 degrees knee bend (90:90)
- 5) Crossed

Further fluoroscopic images were taken at several different angles in the five different positions. These angles included AP, 20 degrees LAO, 20 degrees RAO and Lateral.

**Results:**
Width measurements for the left leg supine position were taken by three different researchers. The mean % variation between the three researchers for section 1 was 5.17% and for section 2 was 13.9%.

Templates of the excel spreadsheets used to analyse data obtained using ImageJ have been written along with a user guide to assist with the measurement and analysis of these arterial deformations in future experiments.

**Discussion:**

Initial results show that the inter-person variability is sufficiently small to validate the protocol for width measurements. A summary of the main advantages and disadvantages of the method are shown in the table below:

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
<tbody>
<tr>
<td>Can obtain measurements in positions such as 90/90</td>
<td>Need to take several images which results in contrast build up</td>
</tr>
<tr>
<td>Consistent results</td>
<td>Time consuming</td>
</tr>
<tr>
<td>Inter-person variation small</td>
<td>Not as much information compared to CT</td>
</tr>
</tbody>
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This method will be used in a study looking at a new type of below the knee stents. The objective is to take measurements in several different extreme positions and compare them to the supine allowing us to know how much the artery may deform in everyday life.

Measurements will then be taken with added pressure, slents or balloons so that we can determine how much the stents will change the arteries ability to deform and the likelihood of a kink in the artery or stent fracture.