

## CATHETER MANIPULATION IN NAVIGATING BIFURCATIONS IN A TRANSPARENT VASCULAR MODEL

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**Introduction:** Since the first modern endovascular procedure was performed by Dotter in 1964, more and more vascular diseases are being treated. As other minimally invasive techniques, endovascular procedures presents many advantages for the patients but are more difficult to perform for the interventionist and takes a relatively longer learning curve to be fully mastered. One of the key issues is the manipulation of catheters and guidewires for navigating in specific branches of the vasculature. In the current study we investigate the relation between the geometry and dimensions of bifurcations and the time taken to perform specific steps in navigating commonly used endovascular instruments.

**Methods:** A transparent model of typical vascular geometry and dimensions was developed. This acrylic glass model, placed in water, holds 38 vessels with a diameter between 5mm and 20mm and a total of 35 bifurcations. Nine subjects (25-32 year-old), all novices, were asked to manipulate five widely used 5Fr selective catheters together with a 0.035" guidewire. Four bifurcations of various diameters and angles were selected for inclusion in the experiment. Each bifurcation was approached six time with two different catheters. The subjects had no direct vision of the model but navigated the instruments using the images that were captured by a camera and displayed on a screen.

**Results:** Detailed analysis of the recorded images revealed that it took on average 28s to pass a bifurcation, although a learning effect was present.: 38s was taken for the two first bifurcation, 30s for the third and 21s to 25s for the five last ones. Furthermore differences were found between the bifurcations. When the ratio ( $rD$ ) between the diameter of the main and side branch is high, the average time ( $t$ ) increase ( $rD=4$ ,  $29s < t < 43s$ ;  $rD < 4$ ,  $18s < t < 22s$ ). In total, 64% of the time was spent on the manipulation of the catheter, 29% on the guidewire, 7% concerned waiting and mistakes.

**Discussion:** Withdrawing and orienting the catheter tip in front of the entrance of a bifurcations makes up about half of the time spend on navigating the instruments. Clear differences were found between the four selected bifurcations. This vascular model can be used for further testings of catheters.

This project is part of the European Union initial training network IIIOS (Integrated Interventional Imaging Operating System).