

Method for Bench Testing Speculum and/or speculum-alternatives in a Vaginal Phantom

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Abstract

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Protocol

Background

Step 1.

The Synthetic vaginal organ is suspended in a tank. The organ without the muscular pressures that are found in vivo. To simulate vaginal pressures, the tank is filled with ultrasound gel (high viscosity, low density) to a corresponding height using the equation.

Pressure = density x acceleration due to gravity x height

Atmospheric pressure is considered negligible. The density of the gel is 1000 kg/m^3 , acceleration due to gravity is 10 m/s^2 . For instance if a pressure of 1500N is desired the corresponding height is calculated to be approximately 0.15m (15cm) of gel above the suspended vaginal organ.

Step 2.

Position the vaginal organ in retroverted (uterus angled downwards), anteverted (uterus angled upwards with), sideverted (organ angled sideways) or mid position (not angled). Angles are with reference to a woman lying on her back and were approximately 30 degrees.

Step 3.

Fill tank with gel up to height corresponding to pressure

Step 4.

Lubricate and insert the device being tested and open/manipulate the device to find the cervix with os as centered as possible, bearing in mind limitations in vivo

Step 5.

Insert mini 2MP camera and capture image of cervix

Step 6.

Remove camera and device.

Step 7.

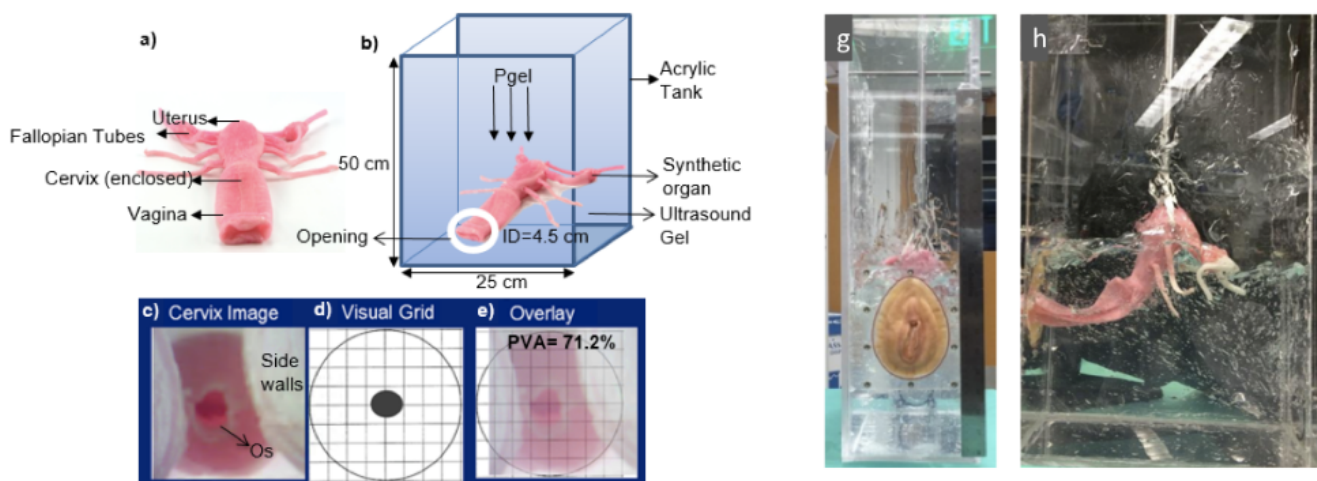
Overlay image on circular cervix grid with os centered

Step 8.

Calculate percent of visual area (PVA) by of dividing the number of squares withing the cervix by the total number of squares.

$$\text{PVA} = (\text{no. of squares within cervix region} / \text{total no. of squares}) \times 100$$

Step 9.



a) Synthetic vaginal organ. **b)** Phantom schematic. **c)** Image captured with a device and mini camera. **d)** Circular visual grid. **e)** overlay of grid over image with os centered. **f)** Front view of actual phantom showing outer genitalia with opening into the vaginal canal. **g)** Side view of phantom in anteverted position