

# Developing a computer model of the Arabin cerclage pessary in the prevention of spontaneous preterm birth

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## **Description:**

This project aims to develop a computational modelling framework in order to study the mechanical interaction between the Arabin cerclage pessary and the cervix during pregnancy. The Arabin cerclage pessary has been frequently used in different countries (including UK and EU) to treat women who are at risk of spontaneous preterm birth. The framework was developed based on 2 patient data, where the lower part of the uterus and cervix were segmented to create finite element models. Simulations were then conducted to predict the cervix deformation after insertion of the cerclage pessary. The model was validated by comparing the predicted cervical deformation and displacement against measurements taken from the MRI before and after the procedure. The validated model was then used to study the effect of several parameters, including the increase in abdominal pressure during pregnancy (from second to third trimester) and the locations of the cerclage pessary (loose, medium, tight and upside down). It was found that any current position of the pessary would provide support to the short cervix. However, an upside down pessary must be avoided as it exacerbated cervix funnelling. This work has been published in the *Ultrasound in Obstetrics & Gynecology* ([doi.org/10.1002/uog.20375](https://doi.org/10.1002/uog.20375)) and presented at the BioMedEng and CompBioMed Conferences in London 2019.

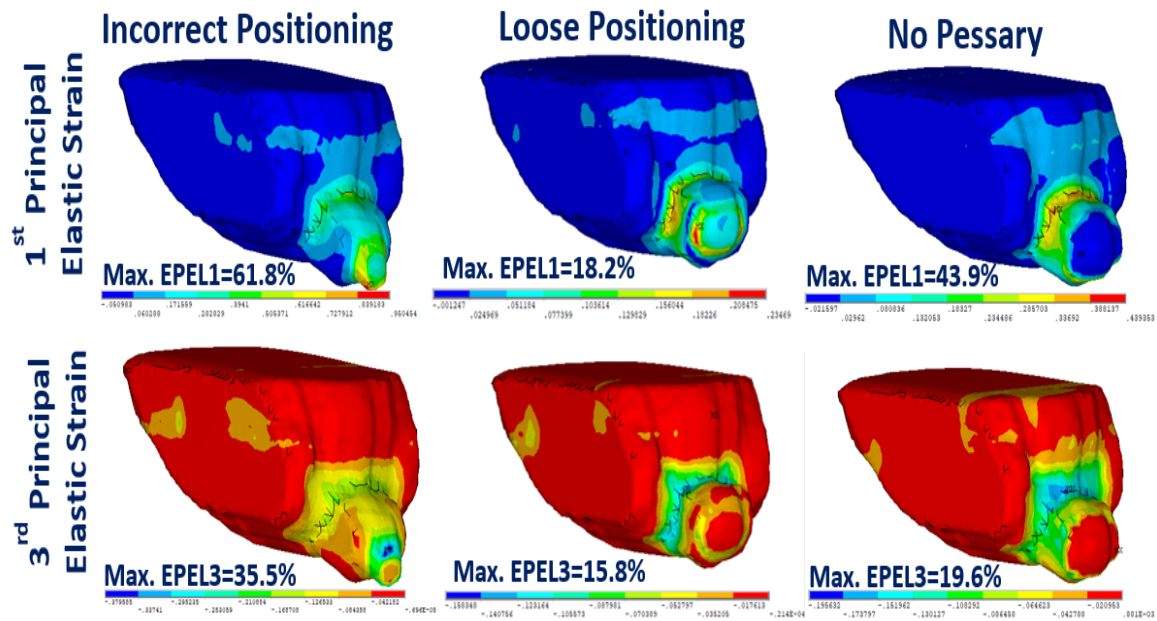


Figure 1: The first and third principal strain distribution of the uterine cervix of one patient with an upside down pessary (left column), loosely positioned pessary (middle column), and no pessary (right column). The cervix is shown to be more distally displaced with an incorrectly positioned pessary, and higher localised strains. Images reproduced from UOG ([doi.org/10.1002/uog.20375](https://doi.org/10.1002/uog.20375))



Figure 2: (Left) Dr Birgit Arabin, clinical lead; (right) Dr Xinshan Li, engineering research lead.

## References:

Barbone S A, Li X, Arabin B, Kira Y, Jani C J, Cannie M M: A preliminary modelling study related to the effective positioning of Arabin cerclage pessary in women at high risk of preterm birth. UOG. 2019, doi: 10.1002/uog.20375