

Modelling the apparent optical birefringence of the female cervix

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Background

Preterm birth (PTB) is a worldwide problem, and about 13 billion babies are affected every year. Meanwhile, it is more serious in developing countries [1]. Premature cervical dilation (premature cervical remodelling) is widely believed to be the main reason of premature birth because the cervix has the function for load-bearing to cope with the tensile force in uterine walls [2] Mechanical strength in the cervix is related to the collagen content. However, collagen content is decreasing through the process of pregnancy. PSCOT can be used to determine the amount of collagen. As a result, using the PSCOT system is a method to predict PTB.

Aim: Doctors are trained to learn how to PSOCT images to help them identify abnormalities.

Methods

Firstly, using systematic review to find the papers related to 3D collagen fibre alignment in cervical tissue. As a result, a table is established to record the number of authors, funding resources, cited, applied methods, issuing dates, polar angle, azimuthal angle of three different areas (central, middle, outer), ordinary refractive index, extraordinary refractive index, dispersion of three different areas for nonpregnant and pregnant(central, middle, outer) for 33 relevant papers. In addition, the search platform is Google Scholar. Meanwhile, the search terms and corresponding result numbers were also recorded. Then discuss and confirm the data value with two supervisors.

Secondly, using Matlab to establish a three-dimensional cervix based on the collected data from the systematic review.

Finally, generate 100 random samples based on Dr Li Wei's code and put them into the same figure.

Results

Table 1: The confirmed parameter related to cervix

Parameter	Value
Inner dispersion (nonpregnant)	0.80
Middle dispersion (nonpregnant)	0.74
Outer dispersion (nonpregnant)	0.87
Inner dispersion (pregnant)	0.86
Middle dispersion (pregnant)	0.86
Outer dispersion (pregnant)	0.90
Biomolecules in cervix	23.13%

Table 1 shows the confirmed parameters of the cervix. There are several sources related to unconfirmed parameters also listed in the report.

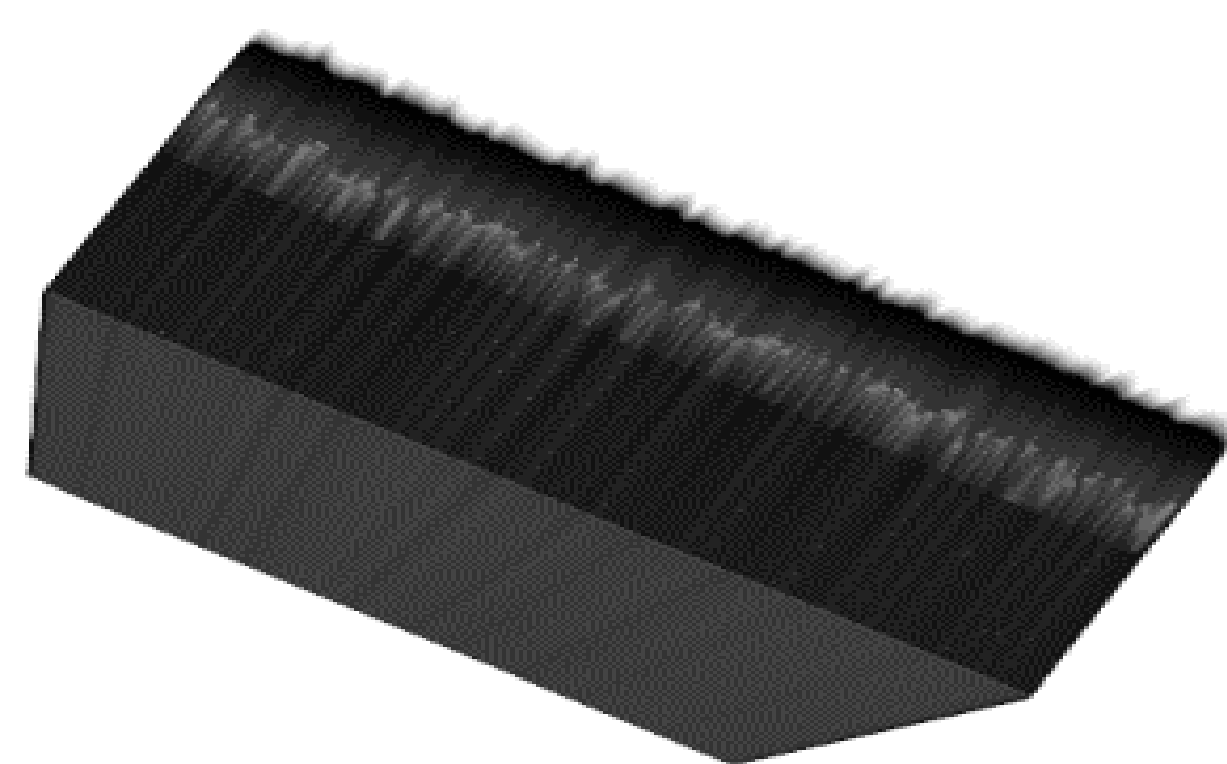
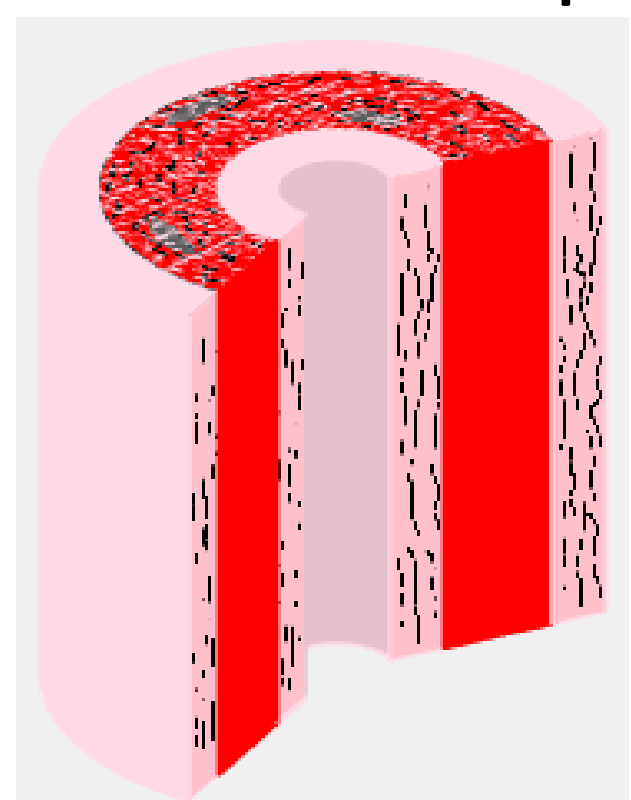


Figure 2: 100 samples of birefringence of cervix

Figure 1: Model of the cervix. Fig.1 shows the model of cervix with the characteristics of dispersion and biomolecules found in papers. Fig.2 shows a three-dimensional figure generated by Volume Viewer.

Conclusions

This research collects useful information about the cervix by the systematic review, the confirmed information is used to draw the model of the cervix. The unconfirmed information also listed the sources in the report. The 100 random samples are generated by 'clock' and put together by Volume Viewer. Meanwhile, there is another method that export and read each generated birefringence figure is introduced in the report.

Acknowledgements

This research is guided by Professor Stephen Matcher

This research is supported by the EPSRC grant (EP/V010581).

The original code for polarization-sensitive OCT image is provided by supervisor Dr Li Wei

References

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