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FEASABILITY OF A MECHANICAL COMPUTED MODEL OF THE VAGINAL CAVITY

<u>Hypothesis / aims of study</u>

Genital prolapse exhibit various anatomical shapes, and its physiopathology and its etiology are still not well known. In order to better understand them, we suggest a biomechanical computed model of the pelvic cavity. It must permit us to outline distortions appearing under various constraints and formulate hypothesis of surgical treatment.

<u>Study design, materials and methods</u>

We built this first model of the pelvic cavity, restricted to the vaginal cavity, the bladder and the rectum, from the own data of every patient. The MRI permitted us to build the 3D geometric model. The mechanical properties, of the vaginal tissue of each patients, were measured on preoperative samples. The abdominal thrust constraints undergone by the vaginal cavity (loading's conditions of the model) are measured in vivo by means of a vaginal manometric probe with 8 sensors. The limit's conditions and the mechanical hypothesis of the computed model take into account the anatomical, physiological and numeric requirements. Calculations of the gravitational loads and of the abdominal thrusts are made on the model of every patient, results are expressed in term of deformations and numbered mode.

<u>Results</u>

The MRI gives a satisfactory anatomical description of areas of contact and of application of the constraints, this type of imaging respect anatomic contract. Results reveal an elastoplastic and discontinuous behavior of the vaginal tissue with a big ability of distortion to 250%. There is a variability in transmissions of vaginal pressure measured by our device, probably owed to the location of the sensors and to the types of the encountered prolapses.
We verified that this model is numerically stable. The quantitative results are few but seem to be in accordance with clinical situations. Their deepened analysis must bring us some precious information for the carrying on this work; it specially remains to check their reproducibility and validity. This survey, first of the kind to our knowledge, leads us to ask a lot of fundamental questions. The analysis of the sensitivity of this model to the various constitutive parameters will permit to enrich the model and to answer to these questions.

<u>Interpretation of results / Concluding message</u>

The aim of this computed model of the vaginale cavity is to elaborated a device to have a better evaluation pré and post operatively of the prolapse and urinary incontinence. It may help us formulated hypothesis of treatment and surgical technics evaluation.