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THE NEW SIMULATOR OF PELVIC ORGAN PROLAPSE

Hypothesis / aims of study

In clinical sites, we explain various kinds of pathological conditions to patients, and obtain their informed consent. Some explanations are given orally, and others are with figures and models. The problem is that, especially when the patients' conditions are complicated, it is very difficult for us to let them understand their conditions, since there is a big difference between our medical knowledge and theirs. A study suggests that three-dimensional anatomical structure helps patients to understand their complex conditions, and we expect that 3-D models using computer graphics, which can create a detailed image of a diseased part, will enable us to better explain their conditions. The followings are the two typical situations in which we believe the 3-D models will be of great use.

(1)POP (Pelvic Organ Prolapse) is one of the complex diseases, whose conditions before and after the operation are difficult to explain to patients. POP involves various abnormal conditions, which result from a correlation among organs and ligaments. Because the process of developing POP is so complicated and each patient has a different level of severity, it's difficult for us to describe POP simply and quickly, especially when we have only little time, to a patient with little knowledge about anatomy. (2)TVM (Tension-free Vaginal Mesh) is one of the surgical treatments for POP. This treatment is also hard to understand without knowledge of 3-D anatomy of pelvis.

We believe that VR (the technique of virtual reality) can make it easy for patients to understand POP and TVM, and can give doctors a helpful environment for obtaining informed consent. The aim of this study is to make a new VR simulator for better explanations of POP and TVM operations, and to create a good environment for informed consent.

Study design, materials and methods

POP usually results from a correlation among many organs and ligaments. So when we try to describe all of them in one figure, it becomes so crowded that patients can hardly understand their conditions. Therefore, we need a new system in which we can select and display organs and ligaments that have to be shown. We also need to make those organs and figures shown in simple and miniature models for easy visualization.

Flexible and detailed imaging is also required according to each patient's condition. However, if there are too many operating procedures to follow, it might become very difficult for doctors to control the simulator. Therefore, controllability should be given top priority in order to describe the image of an important etiology of POP with a simple procedure.

Working speed is also important in order that busy doctors can use this system within a limited clinical time. It is ideal that the system can provide visible information within 5 minutes.

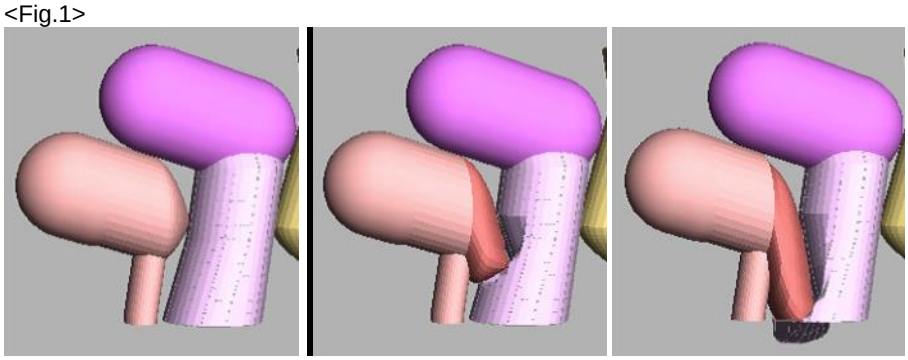
Considering the above mentioned points, a new VR simulator should meet three requirements as below.

a) Miniature 3-D organ models that are understandable for patients
b) Easy operating procedure for transforming the models
c) Quick imaging of the 3-D models

Results

We have made a VR simulator which meets these three requirements. See Fig.1. This simulator depicts the changing process of POP sterically, and it will give patients a lot of advantages to understand their conditions. In general, there are three typical conditions, bladder prolapse, uterine prolapse, and rectal prolapse. With this simulator, we can describe each of the conditions by inputting some parameters. We can also show the severity of the patients' conditions and the concurrence on this simulator. In addition, we can sterically describe the mesh allowing the organ not to nutate on the vaginal wall.

<Fig.1>



Interpretation of results

When we explain a disease condition to patients with little medical knowledge, this simulator can be very useful in that we can show the process of the development of the disease sterically to them. This simulator also works quickly enough during consulting, for it takes only 6.6 sec. to create the image of bladder prolapse, 13.3 sec. for uterine prolapse, and 6.9sec. for rectum prolapse. In addition, the image of TVM (translucent pelvic bone) operations make it possible for us to understand not only the whole anatomical structure, but also where the mesh is and how the mesh holds the organ.

Although the images created by the simulator might not be 100% accurate because the influence of vesicouterine ligament or abdominal muscle pressure is not taken into consideration, we believe that an understandable explanation of the disease is more necessary than the exact explanation of it for the patients to understand their conditions.

Concluding message

We have made a VR simulator for clarifying the conditions of POP patients. We will use this simulator in clinical sites, and hope to have feedback on patients' understanding and satisfaction in order to review the usability.

References

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