

Best Video Abstract

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DESIGN AND VALIDATION OF 3D PRINTED MODEL FOR BURCH COLPOSUSPENSION AND PARAVAGINAL REPAIR

Introduction

The current gold standard for stress urinary incontinence is the mid-urethral sling. However, according to a 2013 Cochrane review, the Burch colposuspension maintains a role if there is a contraindication to artificial sling such as patient refusal, mesh removal secondary to exposure, failure of mid-urethral sling and dyspareunia secondary to sling. The Burch colposuspension is occasionally associated with a paravaginal defect repair in order to correct anterior vaginal compartment prolapse. A laparoscopic approach to these techniques renders them acceptable minimally invasive alternatives to open technique. However, due to the relatively rare true indications for these procedures and the difficulty of the laparoscopic suturing, residents have limited exposure to laparoscopic Burch colposuspensions and paravaginal repairs. Therefore a surgical model would allow residents and urogynecology fellows to practice these procedures in a risk free environment.

Design

The complex anatomy of the space of Retzius, the difficult angle of suture placement and the need for tactile feedback render current laparoscopy models impractical for simulating Burch colposuspension. Therefore a novel approach was taken to obtain such a model. A virtual 3D computer model was initially designed based on MRI sections and cryosections of the Visible Human Project. The computer model was then measured in terms of pelvimetry measurements, the position of the bladder and the position of the rectum. These measurements were then compared and normalised according to a standard population published by Handa et al.

The virtual model was then manufactured using a commercial 3D printer using plastic for the bony pelvis and rubber for the ligaments, vagina and bladder.

Results

The model was initially evaluated by experts from the department of gynaecology of the McGill University and of the Cleveland Clinic. Several changes were made to the model including correcting the anatomical position of the Cooper's ligaments and manufacturing the ligaments and bladder from medical simulation silicone.

The model was then evaluated for face validity. The seven experts that answered the questionnaire have clinical experience ranging between 10 and 25 years in practice and have accomplished in average 50 open or laparoscopic Burch procedures.

Of 7 experts, 6 agreed or strongly agreed that: the anatomy of the model resembles reality; the texture of the tissues is realistic; and that the angle of suture placement is similar to the angle used in real surgery. Also, 5 experts strongly agreed that the model seems useful for learning laparoscopic Burch colposuspension and 5 experts agreed/strongly agreed that the model is useful for learning laparoscopic paravaginal repair.

The acceptable price range quoted by 4 of our 7 experts is 500\$ to 1000\$ with an actual cost of production of under 1000\$.

Conclusion

This model of Burch colposuspension and paravaginal repair is a realistic and cost effective means of practicing this procedure in a risk free environment. However, access to this model is limited to centers possessing a 3D printer. Also the model is limited to practice of the two above mentioned procedures. Further development of this model includes addition of a sacral colpopexy module and acquisition of construct validity.

References

1. E. Bakali, B. S. Buckley, P. Hilton, and D. G. Tincello, 'Treatment of Recurrent Stress Urinary Incontinence after Failed Minimally Invasive Synthetic Suburethral Tape Surgery in Women', *Cochrane Database Syst Rev*, 2 (2013), Cd009407
2. V. L. Handa, H. K. Pannu, S. Siddique, R. Gutman, J. VanRooyen, and G. Cundiff, 'Architectural Differences in the Bony Pelvis of Women with and without Pelvic Floor Disorders', *Obstet Gynecol*, 102 (2003), 1283-90H
3. J. Mischinger, B. Amend, C. Reisenauer, J. Bedke, G. Naumann, M. Germann, S. Kruck, L. F. Arenas Desilva, H. Wallwiener, H. Koelbl, V. Nitti, and K. D. Sievert, 'Different Surgical Approaches for Stress Urinary Incontinence in Women', *Minerva Ginecol*, 65 (2013), 21-8

Disclosures

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