

3D-printing better urologists?

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In this edition of the *CUAJ*, Deyirmendjian et al describe their participant and proctor experience at a two-day anatomical endoscopic enucleation of the prostate (AEEP) masterclass, highlighting novel integration of 3D-printed prostate models.¹ Despite AEEP techniques demonstrating durable and effective outcomes for the past 20 years, the historically discouraging, “steep learning curve,” has only recently become an exciting area of training-focused research.

Various mentorship and masterclass programs, stepwise surgical techniques, and objective serial measurements, including enucleation efficiency (g/min), all aim to flatten the learning curve and safely disseminate the use of this guideline-recommended approach.^{2,3} The last five years has provided a collision of increased benign prostate hyperplasia (BPH) simulator interest with the rise in 3D-printing technologies used to create anatomic prostate models.⁴ Personal experience with three unique prostate enucleation models highlights a wide range in available products, with model improvements occurring efficiently and effectively through provider and laboratory collaboration.

Some models have focused on defining the plane between adenoma and capsule to guide trainees on staying within the correct plane, while others have focused on tissue consistency to mimic the true force required to make that difficult apical turn on a 300 mL gland. As highlighted in this publication, there remains significant room for improvement in BPH models’ ability to mimic clinical bleeding, although active bleeding and achieving hemostasis has been introduced in prostate cancer models used for radical prostatectomy training and could be adapted for AEEP models.⁴ To date, there is certainly no evidence to declare a winning prostate model over another, although continuing to seek improvements and correlation of model training outcomes to both clinical practice outcomes and AEEP provider uptake will help guide the way.

As touched upon, tracking objective measures, like enucleation and morcellation efficiency over time, has been correlated with surgeon enucleation experience, and further

studies are needed to observe these clinical outcome surrogates as they relate to trainee simulator use. Additionally, to further improve the transition from novice to AEEP provider, feedback from urologists that were not specifically seeking out simulation training on AEEP will help provide additional areas for improving uptake.

With several content and face validity publications examining individual prostate model use globally, there is a future role for comparing training outcomes between the various 3D-printed models to better understand the growing organ phantom market. One of the largest challenges in surgical simulation becomes the fine balance between being able to reproduce increasingly realistic models with the associated costs. Although most attendees at an AEEP masterclass would intuitively be interested in incorporating widespread organ phantom and AEEP training, the cost to create and transport models, along with access to available surgical equipment highlight real-world barriers for AEEP techniques, which rely heavily on surgical technologies (lasers, endoscopes, and morcellators). Despite these barriers, endourology has a celebrated history of embracing and adapting technology-based innovations to improve surgical management. Therefore, investigating the expansion of 3D-printed organ phantoms into AEEP surgical training is an exciting area for ongoing research.

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