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Preliminary Evaluation of the endogo HD Portable Cystoscopic Camera

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Abstract

Introduction: During office cystoscopy and hospital consultations urologists may only have direct visualization cystoscopy available. Field of view and usability are often characterized as suboptimal compared to video tower based camera models. The endogo® HD, a portable, battery powered cystoscopic camera that attaches to a standard cystoscope, was created to more closely mimic the usability of the normal cystoscopic camera that connects to the video tower. We objectively evaluated the usefulness of this new device.

Methods: A total of 30 urology fellows, residents and students were consented and randomized to perform standard video tower cystoscopy, direct cystoscopy without a camera and cystoscopy with the endogo HD on a previously used Uro-Scopic Trainer bladder model (Limbs & Things USA, Savannah, Georgia). Participants were timed and evaluated using the previously validated OSATS (Objective Structured Assessment of Technical Skills). Each participant then rated the usability of and preferences for each of the 3 systems. All participants completed the 3 types of cystoscopy.

Results: Users found the field of view to be significantly better for the endogo HD than for direct cystoscopy ($p = 0.03$) and similar for the endogo HD and the tower ($p = 0.7$). Time needed to perform cystoscopy was significantly longer for endogo HD than for tower and direct cystoscopy (71.9 vs 43.3 and 46.8 seconds, respectively, $p = 0.01$). When comparing novices to experts (greater than 200 cases), experts completed all procedures more quickly regardless of camera type. Tower cystoscopy was significantly less difficult and more comfortable, and it was preferred by most participants.

Conclusions: On objective and subjective measures the endogo HD portable cystoscopic camera received marks similar to those of other types of cystoscopy that are currently widely available. It required an average of a half minute longer to set up and overall participants preferred standard video tower cystoscopy. The endogo HD may be useful in the emergency department or office setting where no video tower is available. Further study of its usefulness as a teaching tool and the learning curve associated with its use will be performed in the future.

Key Words: urinary bladder; cystoscopy; electrical equipment and supplies; technology assessment, biomedical; diagnosis

Abbreviations and Acronyms

OSATS = Objective Structured Assessment of Technical Skills

Cystoscopy has long been a mainstay for urologists needing to evaluate the bladder with minimal patient morbidity. Rigid cystoscopy was used exclusively until 1984, when the flexible cystoscope entered the operative tool set.[1] Additionally, the introduction of the video camera tower greatly enhanced procedure visualization and comfort for the patient, urologist and resident trainee. These video camera towers are almost ubiquitous in the urologist operating theater and office. However, there are instances when a video tower is unavailable, such as inpatient or emergency department consultations and at certain satellite offices. For patients who require cystoscopy in these settings the urologist must use direct visualization cystoscopy, placing the eye directly over the cystoscope lens to view the urethra and bladder. This field of view is often suboptimal, particularly compared to that of the video tower based camera model.

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The endogo HD is a new, portable, battery powered cystoscopic camera with a 3.5-inch LCD (liquid crystal display) touchscreen video monitor mounted on the end of the cystoscope. It can record high definition still pictures or video to more closely approximate the visualization of the video tower monitor. It has the ability to archive images and transfer them via a flash drive or USB (universal serial bus) connection. We objectively evaluated the usefulness of this new urological device.

Materials and Methods

We performed a Columbia University Medical Center institutional review board approved, prospective evaluation of the EndoGo HD portable cystoscopic camera. All attending physicians, urology residents, medical students and urology staff were invited to participate. The recruitment goal was 15 advanced users (greater than 200 cystoscopic procedures) and 15 novice users. Each participant regardless of experience viewed a demonstration of the assembly of a flexible cystoscope and how to perform 3 methods of cystoscopy using direct visualization, the video camera tower and the endogo HD, respectively (fig. 1).

Participants were then randomized to 1 of 3 equal groups (5 novice and 5 experienced users per group) to perform flexible cystoscopy using the same cystoscope for all procedures. Group 1 first performed direct vision cystoscopy, then tower camera cystoscopy and finally endogo HD cystoscopy. Group 2 started with video tower cystoscopy, then the endogo HD and then direct visualization. Group 3 used the endogo HD first, then direct visualization and finally the camera tower. Each procedure was repeated 3 times for a total of 9 cystoscopic examinations to minimize sampling error. All cystoscopic examinations were performed using a standardized bladder training model of the bladder (Uro-Scopic Trainer). Each examination was required to consist of cystoscope assembly and thorough cystoscopic urethra and bladder examination. The entire procedure was divided into evaluable points, including time to set up the flexible cystoscope with or without the endogo HD, elapsed time to navigate the urethra into the bladder, number of attempts to pass the flexible cystoscope to access the bladder, elapsed time to identify the 2 ureteral orifices as well as the bladder dome, anterior and posterior, and each lateral wall, and whether the device operator required additional assistance from the supervising urologist.

At the conclusion of the study each participant was asked to complete a questionnaire evaluating each type of cystoscopy. Categories included ease of flexible cystoscope insertion, optical quality, cystoscopy handling, irrigation setup/handling and instrument passage. Cystoscopic examination quality was evaluated by an independent evaluator based on OSATS.[2]

Results were evaluated using ANOVA to detect differences between groups, followed by pairwise comparisons using the Student t-test and chi-square analysis as appropriate. Differences in the mean time for each step of the procedure between each group were assessed. Furthermore, in each group participants were categorized as novice (no prior cystoscopic experience), minor experience (fewer than 200 cystoscopies performed) and expert experience (greater than 200 cystoscopies performed), and respective results were compared.

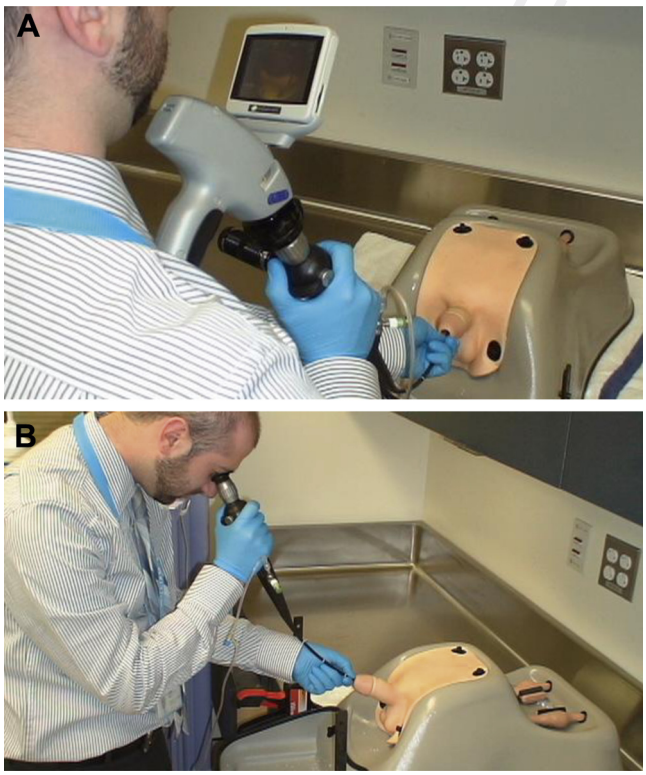

Figure 1. *A*, cystoscopy with endogo HD camera device attached to cystoscope. *B*, direct cystoscopy.

Results

All urology residents and fellows in our training program participated in this study. Of the study participants 15 had completed at least 200 prior cystoscopies and were classified as expert while 15 participants were novices. Using OSATS scores for device assembly and procedure performance were similar across the 3 devices. Participants took significantly longer to assemble the endogo HD device than for the video tower or direct cystoscopy (67 vs 28 and 11 seconds, respectively, $p < 0.001$). Although times to complete the cystoscopic examination were similar for the tower and direct methods, users needed more time with the endogo HD (43 and 46 seconds, respectively, vs 71, $p = 0.012$). When stratified by experience level, experts completed all cystoscopic examinations more quickly than novices using all 3 methods (see table). When examined by randomization group, time was only significantly different for the group that performed cystoscopic examination with the endogo HD first and only for the endogo HD itself.

Participants rated tower cystoscopy as most comfortable to perform ($p < 0.001$). Tower and endogo HD fields of view were rated similarly ($p = 0.07$) and each was better than for direct vision cystoscopy ($p = 0.03$, fig. 1). Participants preferred the