available at www.sciencedirect.com
journal homepage: www.europeanurology.com

European Association of Urology

Platinum Priority – Endo-urology

Editorial by Mihir M. Desai and Inderbir S. Gill on pp. 1006–1007 of this issue

Laparoendoscopic Single-site Surgery in Urology: Worldwide Multi-institutional Analysis of 1076 Cases

Jihad H. Kaouk [a], Riccardo Autorino [a,], Fernando J. Kim [b], Deok Hyun Han [c], Seung Wook Lee [d], Sun Yinghao [e], Jeffrey A. Cadeddu [f], Ithaar H. Derweesh [g], Lee Richstone [h], Luca Cindolo [i], Anibal Branco [j], Francesco Greco [k], Mohamad Allaf [l], René Sotelo [m], Evangelos Liatsikos [n], Jens-Uwe Stolzenburg [o], Abhay Rane [p], Wesley M. White [q], Woong Kyu Han [r], Georges-Pascal Haber [a], Michael A. White [a], Wilson R. Molina [b], Byong Chang Jeong [c], Joo Yong Lee [d], Wang Linhui [e], Sara Best [f], Sean P. Stroup [g], Soroush Rais-Bahrami [h], Luigi Schips [i], Paolo Fornara [k], Phillip Pierorazio [l], Camilo Giedelman [m], Jae Won Lee [r], Robert J. Stein [a], Koon Ho Rha [r]*

[a] *Glickman Urological & Kidney Institute, Cleveland Clinic, Cleveland, OH, USA;* [b] *Denver Health Medical Center, University of Colorado Health Science Center, Denver, CO, USA;* [c] *Samsung Medical Center, Sungkyunkwan University School of Medicine, Seoul, South Korea;* [d] *Department of Urology, Hanyang University College of Medicine, Seoul, South Korea;* [e] *Department of Urology, Changhai Hospital, Shanghai, China;* [f] *Department of Urology, University of Texas Southwestern Medical Center, Dallas, TX, USA;* [g] *Division of Urology, University of California San Diego, La Jolla, CA, USA;* [h] *Smith Institute for Urology, The Hofstra-North Shore-LIJ School of Medicine, New Hyde Park, NY, USA;* [i] *Urology Unit, S. Pio da Pietralcina Hospital, Vasto, Italy;* [j] *Department of Urology, Cruz Vermelha Hospital, Curitiba, Parana, Brazil;* [k] *Department of Urology and Kidney Transplantation, Martin-Luther-University, Halle/Saale, Germany;* [l] *James Buchanan Brady Urological Institute, Johns Hopkins Medical Institutions, Baltimore, MD, USA;* [m] *Unidad de Urología, Instituto Médico La Floresta, Venezuela;* [n] *Department of Urology, University of Patras, School of Medicine, Patras, Greece;* [o] *Department of Urology, University of Leipzig, Leipzig, Germany;* [p] *Department of Urology, East Surrey Hospital, Redhill, Surrey, UK;* [q] *Urology Cancer Center, University of Tennessee Medical Center, Knoxville, TN, USA;* [r] *Department of Urology, Yonsei University College of Medicine, Seoul, South Korea*

Article info

Article history:
Accepted June 3, 2011
Published online ahead of print on June 12, 2011

Keywords:
Laparoendoscopic single-site surgery
Multi-institutional
Single-port laparoscopy
LESS
Robotics
Scarless surgery
Urology

Abstract

Background: Laparoendoscopic single-site surgery (LESS) has gained popularity in urology over the last few years.
Objective: To report a large multi-institutional worldwide series of LESS in urology.
Design, setting, and participants: Consecutive cases of LESS done between August 2007 and November 2010 at 18 participating institutions were included in this retrospective analysis.
Intervention: Each group performed a variety of LESS procedures according to its own protocols, entry criteria, and techniques.
Measurements: Demographic data, main perioperative outcome parameters, and information related to the surgical technique were gathered and analyzed. Conversions to *reduced-port* laparoscopy, conventional laparoscopy, or open surgery were evaluated, as were intraoperative and postoperative complications.
Results and limitations: Overall, 1076 patients were included in the analysis. The most common procedures were extirpative or ablative operations in the upper urinary tract. The da Vinci robot was used to operate on 143 patients (13%). A single-port technique was most commonly used and the umbilicus represented the most common access site. Overall, operative time was 160 ± 93 min and estimated blood loss was 148 ± 234 ml. Skin incision length at closure was 3.5 ± 1.5 cm. Mean hospital stay was 3.6 ± 2.7 d with a visual

* Corresponding author. Glickman Urological & Kidney Institute, Cleveland Clinic, 9500 Euclid Avenue, 44195 Q10, Cleveland, OH, USA. Tel. +1 216 444 1047.
E-mail address: ricautor@tin.it, autorir@ccf.org (R. Autorino).

0302-2838/$ – see back matter doi:10.1016/j.eururo.2011.06.002

analog pain score at discharge of 1.5 ± 1.4. An additional port was used in 23% of cases. The overall conversion rate was 20.8%; 15.8% of patients were converted to reduced-port laparoscopy, 4% to conventional laparoscopy/robotic surgery, and 1% to open surgery. The intraoperative complication rate was 3.3%. Postoperative complications, mostly low grade, were encountered in 9.5% of cases.

Conclusions: This study provides a global view of the evolution of LESS in the field of minimally invasive urologic surgery. A broad range of procedures have been effectively performed, primarily in the academic setting, within diverse health care systems around the world. Since LESS is performed by experienced laparoscopic surgeons, the risk of complications remains low when stringent patient-selection criteria are applied.

1. Introduction

Laparoendoscopic single-site surgery (LESS) has been proposed as an evolutionary step beyond standard laparoscopy and has been increasingly adopted by urologists worldwide since its introduction [1,2]. Conceptually, it is driven by the hypothesis that minimization of skin incision to gain access to the abdominal or pelvic cavities may benefit patients in terms of port-related complications, recovery time, pain, and cosmesis [3,4].

Over the last few years, many standard laparoscopic operations in urology have been successfully performed using LESS. However, the actual role of LESS in the field of minimally invasive urologic surgery remains to be determined [5,6].

Evidence supporting LESS has been limited to small case series or case-control studies from selected centers [5]. One multi-institutional study including >100 patients was recently reported [7]. Comparative studies have shown that LESS is at least comparable to standard laparoscopy [8,9]. Thus, more robust analyses of larger samples are desirable to corroborate positive findings from early series.

This study was initiated as a collaborative effort with the purpose of reporting the contemporary practice of LESS at institutions pioneering the development of this technique in urology. The aim was to provide an analytical overview of indications, techniques, and outcomes of urologic LESS in various hospital settings worldwide.

2. Methods

2.1. Study design

Our cohort consisted of consecutive patients treated with LESS between August 2007 and December 2010 at 18 participating institutions. Groups at medical centers worldwide with reported experience in urologic LESS were identified by searching available literature and invited to participate in the study. Each group performed the procedures according to its own protocols, entry criteria, and techniques. All patients consented specifically for LESS. Raw data without any identifier were retrospectively collected and gathered into a standardized datasheet, which was specifically built for study purpose.

2.2. Outcomes

Demographic data included age, gender, race, body mass index (BMI), past history of previous abdominal/pelvic surgery, American Society of Anesthesiologists (ASA) score, comorbidities, and indication for LESS.

Procedures were categorized as *extirpative/ablative* or *reconstructive* and as *upper urinary tract* or *pelvic*. Moreover, they were scored based on a Likert-type scale (1, slightly difficult; 5, extremely difficult) [10].

The following outcome parameters were analyzed: operative time, estimated blood loss, intraoperative adverse events, transfusions, length of stay, and visual analog pain score (VAS).

Relevant operative data related to the surgical procedure were recorded, including access technique (single-port or single-incision/single-site), access site (umbilical or extraumbilical), approach (transperitoneal or retroperitoneal), use of articulating or prebent laparoscopic instruments, use of the da Vinci robot, type of single-port device, and use of ancillary needlescopic or minilaparoscopic ports [11].

Addition of one extra trocar was considered as conversion to reduced-port laparoscopy [12], whereas conversion from LESS to laparoscopic surgery was defined as unplanned installation of more than one trocar to complete the procedure. Conversion to open surgery was defined as an unplanned abdominal incision to perform the operation.

Postoperative complications were scored according to the standardized Clavien-Dindo system [13].

Two periods were arbitrarily defined: one including years 2007–2008 and the other including years 2009–2010. A comparative analysis between these periods was conducted.

2.3. Statistical analysis

All patient data were collected in an Excel spreadsheet (Microsoft Corp., Redmond, WA, USA). Data of continuous variables are expressed as mean plus or minus standard deviation. Binary and categorical variables are reported as counts and percentages. Standard statistical tests were applied for comparison as appropriate. Values of $p < 0.05$ were considered statistically significant.

3. Results

3.1. Patient demographics

Overall, 1076 patients underwent urologic LESS during the study period (Table 1), comprising, on average, 15% (range: 4–59%) of the overall laparoscopic or robotic procedures performed at the participating institutions during the same time frame.

3.2. Procedures, techniques, and instrumentation

Most procedures (86%) were done in the upper urinary tract, with most of these being extirpative or ablative (84%). A transperitoneal access was preferentially adopted in 92% of cases. The da Vinci robot was used in 143 cases (13%).