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Evaluation of 2,590 urological laparoscopic surgeries undertaken by urological surgeons accredited by an endoscopic surgical skill qualification system in urological laparoscopy in Japan

Tomonori Habuchi · Toshiro Terachi · Hiromitsu Mimata · Yukihiro Kondo · Hiroomi Kanayama · Tomohiko Ichikawa · Kikuo Nutahara · Tsuneharu Miki · Yoshinari Ono · Shiro Baba · Seiji Naito · Tadashi Matsuda

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Abstract
Background In 2003, the Japanese Urological Association (JUA) and Japanese Society of Endourology (JSE) established a urological laparoscopic skill qualification system, called the Endoscopic Surgical Skill Qualification System in Urological Laparoscopy of JUA and JSE (ESSQSJJ). The main goal of the system is to decrease the prevalence of complications associated with laparoscopic surgery. To validate the qualification system, perioperative outcome and the prevalence of complications in different types of urological laparoscopic surgery performed by accredited surgeons were evaluated.

Methods One hundred thirty-six surgeons who obtained the qualification in 2004 were prospectively asked to submit intraoperative and postoperative data of their latest 20 cases at the end of 2009, along with the number of laparoscopic urological surgeries performed in each year for a 5-year period (2004–2009). Intraoperative and postoperative complications were graded according to the Satava classification and modified Clavien classification, respectively.
Results Data of 2,590 urological laparoscopic surgeries of 130 surgeons, including 904 laparoscopic radical nephrectomies, 430 laparoscopic nephroureterectomies, 390 laparoscopic adrenalectomies, 320 laparoscopic radical prostatectomies, and 170 laparoscopic partial nephrectomies, were analyzed. Complications were noted in 97 (3.7%) patients. Major intraoperative complications (grade II or III) occurred in 32 (1.2%) patients, and major postoperative

This study was conducted on behalf of the Endoscopic Surgical Skill Qualification System Committee in Urological Laparoscopy, Japanese Urological Association and Japanese Society of Endourology.

T. Habuchi
Department of Urology, Akita University Graduate School of Medicine, 1-1-1 Hondo, Akita 010-8543, Japan
e-mail: thabuchi@doc.med.akita-u.ac.jp

T. Terachi
Department of Urology, Tokai University School of Medicine, Isehara, Kanagawa, Japan
e-mail: terachit@is.icc.u-tokai.ac.jp

H. Mimata
Department of Urology, Oita University, Oita, Japan
e-mail: mimata@med.oita-u.ac.jp

Y. Kondo
Department of Urology, Nippon Medical School, Tokyo, Japan
e-mail: kondoy@nms.ac.jp

H. Kanayama
Department of Urology, Tokushima University of Graduate School, Tokushima, Japan
e-mail: kanahiro@clin.med.tokushima-u.ac.jp

T. Ichikawa
Department of Urology, Graduate School of Medicine, Chiba University, Chiba, Japan
e-mail: Tomohiko_ichikawa@faculty.chiba-u.jp

K. Nutahara
Department of Urology, The University of Kyorin, Mitaka, Tokyo, Japan
e-mail: kinuta@kyorin-u.ac.jp

T. Miki
Department of Urology, Kyoto Prefectural University of Medicine, Kyoto, Japan
e-mail: tmiki@koto.kpu-m.ac.jp

Y. Ono
Department of Health and Medical Science, School of Medical Welfare, Aichi-Shukutoku University, Nagakute, Aichi, Japan
e-mail: onoy@asu.aasa.ac.jp

complications (grade III or higher) occurred in 24 (0.9%) patients. The prevalence of conversion to open surgery, allogeneic transfusion, and perioperative mortality was 2.5%, 1.6%, and 0%, respectively. The number of surgeries performed by each qualified surgeon or the role of the surgeon (main operator vs. mentor/instructor) in the surgery did not affect the prevalence of intraoperative complications or postoperative complications. The open conversion rate was significantly higher in surgeons with a low surgical volume. *Conclusions* ESSQSJJ can ensure urological laparoscopic surgeons who can perform various types of urological laparoscopic surgeries with a low prevalence of perioperative complications and reasonable outcomes.

Keywords Urological laparoscopy · Complication · Mortality · Surgical skill

Urological laparoscopic surgery has evolved greatly since the introduction of laparoscopic nephrectomies (LNs). Today, various types of laparoscopic urological surgeries, such as laparoscopic adrenalectomy (LAd), radical nephrectomy (LRN), nephroureterectomy (LNU), donor nephrectomy (LDN), partial nephrectomy (LPN), radical prostatectomy (LRP), and pyeloplasty (LPyP), are performed daily by an increasing number of urologists in certain hospitals and medical centers. Despite the reported advantages regarding minimal invasiveness and efficacies compared with open surgery, laparoscopic surgeries are associated with unique and serious complications and a relatively long learning curve. There has been great concern among patients, their families, doctors, healthcare workers, and the public about the competence of laparoscopic surgeons.

In Japan, under regulations set by the Japan Society for Endoscopic Surgery, the Japanese Urological Association (JUA) and Japanese Society of Endourology (JSE) established a urological laparoscopic skill qualification system in 2003. This is called the Endoscopic Surgical Skill Qualification System in Urological Laparoscopy of JUA and JSE (ESSQSJJ) [1]. The main goal of the system is to decrease the prevalence of complications associated with laparoscopic surgery by evaluating and qualifying the laparoscopic surgical skills of each applicant and certifying urologists with sufficient laparoscopic skills. Urological laparoscopic skills are assessed by evaluating an unedited video of each surgeon completing the entire procedure of LAd or LN in a double-blinded fashion [1].

Whereas several merits of ESSQSJJ are expected, it remains to be seen whether the laparoscopic urological surgeries performed by surgeons accredited under this system are associated with a low prevalence of complications or achieve good outcomes. In the present study, to validate the qualification system, outcomes and the prevalence of complications of surgeries undertaken by accredited surgeons were evaluated.

Materials and methods

Outline of ESSQSJJ

The details of ESSQSJJ have been described previously [1]. In brief, this system was designed to certify urologists who can complete LAd or LN safely and appropriately by their own efforts. Before the application, candidates must perform 20 or more cases of LAds or LNs as the chief surgeon and attend a laparoscopy training course approved officially by JUA and JSE. Each applicant is requested to submit an unedited video(s) showing the entire laparoscopic procedure of one surgery (LAd or LN) performed independently as the chief surgeon. Applicant skills are assessed on the unedited video(s) according to the guidelines established by the ESSQSJJ Committee [1]. Video assessment is performed by two randomly selected referees blinded to the applicant's name and institution. The scoring of each video is performed using a formal standard scoring sheet based on the Video Assessment Guidelines of JSE [1]. The final judgment is made according to consensus by the Referee Committee. Unqualified surgeons can apply the qualification in the next year after participating in the laparoscopic video-educational course organized by JSE. This system was started in 2004, and first-year applicants were recruited from April to July 2004. In the first year, submitted videos were assessed and judged from the beginning of October to the end of March 2005, and 136 of 205 applicants (66.3%) qualified under this system. Since then, 686 urologists have qualified until May 2011. In this system, each qualified surgeon must renew the qualification every 5 years if he or she wishes.

Study design

We evaluated the safety and applicability of urological surgeries performed by 136 qualified surgeons who

S. Baba
Department of Urology, Kitasato University School of Medicine, Kanagawa, Japan
e-mail: sbaba@med.kitasato-u.ac.jp

S. Naito
Department of Urology, Graduate School of Medical Sciences, Kyushu University, Fukuoka, Japan
e-mail: naito@uro.med.kyushu-u.ac.jp

T. Matsuda (✉)
Department of Urology and Andrology, Kansai Medical University, 2-3-1 Shinmachi, Hirakata, Osaka 573-1191, Japan
e-mail: matsudat@takii.kmu.ac.jp

received the qualification in the first year of ESSQSJJ (2004). In applying for the extension of the qualification, each surgeon was asked to submit the laparoscopic surgical logs of the latest 20 cases just before the application. The surgeons also were prospectively asked to submit the perioperative data of the latest 20 cases. The requested data were as follows: month and year of surgery, type of surgery, role of the surgeon (main surgeon or main mentor/instructor), operating time, volume of intraoperative bleeding, need for intraoperative or postoperative allogeneic blood transfusion, need for conversion to open surgery, and all intraoperative and postoperative complication(s). In addition, each qualified surgeon was asked to submit the number of laparoscopic urological surgeries in which he/she was involved as a main surgeon or main instructor/mentor in each year for a 5-year period. The study protocol was approved by the ethical committee and Board of JSE.

Data analyses

With regard to the latest 20 cases, the type of surgery was categorized into the following: (1) LAd; (2) LRN (for renal tumors); (3) LNU; (4) LN for benign diseases (LNBD); (5) LDN; (6) LPN; (7) LRP; (8) LPyP; and (9) others. Intraoperative and postoperative complications were graded according to the Satava classification and modified Clavien classification, respectively [2, 3]. Furthermore, we defined major intraoperative complications as grade II or III according to the Satava classification and major postoperative complications as grade III–V according to the modified Clavien classification. To evaluate the relationship between the number of laparoscopic surgeries performed during the 5 years since qualification and the intraoperative and perioperative outcomes, surgeons were categorized into three groups according the number of cases experienced in each type of surgery. Among the three groups, outcomes, such as the prevalence of perioperative complications and intraoperative parameters, were compared.

Statistical evaluation was performed using the Chi-square test or Fisher's exact test for the contingency tables. For the comparison of operating time, the two-tailed Student's t test or ANOVA was applied. In the case of 2×3 data, Tukey's HSD test was applied for multiple comparisons. All statistical analysis was performed using the IBM SPSS Statistics (ver. 19; IBM, Armonk, NY, USA) or StatMate IV (ATMS, Tokyo, Japan).

Results

Of the 136 surgeons who qualified in 2004, we obtained data from 130 surgeons (95.6%). The number of urological laparoscopic surgeries performed or mainly mentored by the 130 surgeons from 2005 to 2009 is shown in Table 1. LNs included LRN, LNU, LNBD, and LDN. The number of LRPs and LPNs increased steadily, whereas the number of other types of surgery was stable (Table 1).

We analyzed the surgical data of the latest 20 cases from 129 of the 130 surgeons who completed the questionnaire. One surgeon performed only 10 urological laparoscopic surgeries in the 5 years, and the data of 10 patients were entered. The data of 2,590 laparoscopic urological surgeries were analyzed.

The intraoperative and postoperative data of 2,590 patients are shown according to the type of surgery in Table 2. Conversion to open surgery was most frequently required in LPN (4.8%), whereas it was less than 2% in LAd, LNBD, LDN, and LPyP. Intraoperative bleeding of more than 500 mL was encountered in more than 50% of patients who underwent LRP. However, the volume of intraoperative bleeding contained urine in most cases and

Table 1 Number of laparoscopic surgeries performed during 5 years by 130 surgeons who qualified by the Endoscopic Surgical Skill Qualification System

	2005	2006	2007	2008	2009	Total	Mean no. during 5 years per surgeon	Median no. during 5 years per surgeon	Range
LAd	608	593	628	603	638	3070	23.6	12.5	0–108
LN	2042	2128	2238	2250	2160	10818	83.2	64.5	4–403
LPN	235	244	300	359	397	1535	11.8	5	0–89
LPyP	135	167	183	213	173	871	6.7	3	0–66
LRP	420	543	719	754	928	3364	25.9	0	0–292
Other[a]	235	280	293	269	303	1380	9.7	4	0–133
Total	3675	3955	4361	4448	4599	21038	161.8	121.5	10–732

LAd laparoscopic adrenalectomy; *LN* laparoscopic nephrectomy, including radical nephrectomy, nephroureterectomy, simple nephrectomy, and donor nephrectomy; *LPN* laparoscopic partial nephrectomy; *LPyP* laparoscopic pyeloplasty; *LRP* laparoscopic radical prostatectomy

[a] Main other types of laparoscopic surgeries are as follows: varicocele high ligation, retroperitoneal tumorectomy, excision of urachal lesion, vesicoureteral neostomy, total cystectomy, pyelo- or ureterolithotomy, retroperitoneal lymph node dissection

Table 2 Intraoperative and postoperative data of 2590 laparoscopic surgeries performed by 130 qualified surgeons

	No. of surgeries	Mean operating time (min)	No. of conversions to open surgery (%)	No. of bleeding >500 mL (%)	No. of blood transfusions (%)	No. of major intraoperative complications (%)[a]	No. of major postoperative complications (%)[b]	Total no. of complications (%)[c]
LAd	390	182	5 (1.3)	4 (1)	2 (0.5)	4 (1.0)	0 (0)	7 (1.8)
LRN	904	238	28 (3.1)[d]	41 (4.5)[d]	14 (1.5)	13 (1.4)	5 (0.6)	32 (3.5)
LNU	430	289	13 (3)[d]	40 (9.3)[d]	11 (2.6)	2 (0.5)	7 (1.6)	17 (4)
LNBD	57	248	1 (1.8)	6 (10.7)[d]	0 (0)	2 (3.5)	0 (0)	3 (5.3)
LDN	122	260	1 (0.8)	5 (4.1)	1 (0.8)	1 (0.8)	2 (1.6)	3 (2.5)
LPN	170	247	8 (4.8)[d]	14 (8.2)	0 (0)	3 (1.8)	5 (2.9)	13 (7.6)
LPyP	69	238	0 (0)	0 (0)	0 (0)	1 (1.4)	1 (1.4)	3 (4.3)
LRP	320	273	4 (1.3)[d]	163 (50.9)	13 (4.1)[d]	4 (1.3)	4 (1.3)	13 (4.1)
Other	128	(–)	5 (3.9)	11 (8.6)[d]	1 (0.8)	2 (1.6)	0 (0)	6 (4.7)
Total	2590		65 (2.5)	284 (11.0)	42 (1.6)	32 (1.2)	24 (0.9)	97 (3.7)

[a] Grade II or III by the Satava classification; [b] grade III or higher by the Clavien classification; [c] all complications reported; [d] one to five data are missing

Table 3 Intraoperative complications according to the Satava classification, () = **number**

	IIa	IIb
LAd	Vena cava injury (1), tumor injury (1), kidney injury (1)	Splenic injury → splenectomy (1)
LRN	Renal vein injury (3), bleeding (3), bowel injury (3), vena cava injury (2), liver injury (1)	Splenic injury → splenectomy (1)
LNU	Bowel injury (1), arrhythmia (1)	
LNBD	Renal vein injury (1), bowel injury (1)	
LDN		Vena cava injury → conversion to open surgery and reconstruction (1)
LPN	Bleeding (1), ureteral injury (1)	Bleeding → nephrectomy (1)
LPyP	Bleeding (1)	
LRP	Rectal injury (2), bladder injury (1), bleeding (1)	
Other		Renal vein injury → nephrectomy (1)[b], rectal injury → colostomy (1)[c]

No patients had Satava grade-III intraoperative complications

[a] Retroperitoneal tumorectomy

[b] Laparoscopic radical cystectomy

therefore may not be accurate. Perioperative blood transfusion was required in 1.6% of patients, most frequently in LRP (4.1%) followed by LNU (2.6%). Major intraoperative complications (grade II or III) occurred in 1.2% of patients, most frequently in LNBDs (3.5%) followed by LPN (1.8%). Major postoperative complications (grade III or higher) were encountered in 0.9% of patients, most frequently in LPN. In total, complications occurred in 3.7% of patients. The highest prevalence of complications was found in LPN (7.6%; Table 2).

The details of intraoperative and postoperative complications are shown in Tables 3 and 4, respectively. With regard to intraoperative complications, bowel injuries were most frequently encountered, followed by vascular injuries. Splenic injuries that required splenectomy occurred in one LAd and one LRN. With respect to grade II/III postoperative complications, postoperative bleeding was most frequently observed (n = 10; Table 4). In LPNs, three cases with pseudoaneurysms managed by intravascular intervention were reported. All grade VI postoperative complications were considered not to have been caused directly by laparoscopic surgical procedures but were presumably based on medical conditions.

We compared the outcomes and prevalence of complications between surgeries mainly performed by qualified surgeons and those performed by other surgeons while qualified surgeons were involved as the main mentor/instructor (Table 5). There was no significant difference in the prevalence of conversion to open surgery, bleeding volume more than 500 mL, and the need for blood

Table 4 Postoperative complications according to the modified Clavien classification () = number

	I/II	III	IV
LAd	Vomiting (1), pneumonia (1), postoperative bleeding (1)		
LRN	Chylorrhea (3), low oxygen saturation (2), atelectasis (1), wound infection (1), delayed wound healing (1), hematoma (1), delayed fever (1), pneumonia (1), postoperative bleeding (1), deep vein thrombosis (1), anemia (1)	Atelectasis (1), postoperative bleeding (1), drain-tube dislodgement (1)	Clostridium difficile enteritis, and renal failure (1)
LNU	Chylorrhea (2), atelectasis (1), delayed recovery from anesthesia (1), wound infection (1), ileus (1), hematoma (1), anemia (1)	Postoperative bleeding (3), gastrointestinal perforation (1), wound infection (1), late wound healing (1)	Sepsis (1)
LNBD	Abscess formation (1)		
LDN		Postoperative bleeding (2)	
LPN	Urine leakage (2), pyelonephritis (1), hematoma and respiratory dysfunction (1), liver dysfunction (1)	Pseudoaneurysm (3), postoperative bleeding (1), urine leakage (1)	
LPyP	Postoperative bleeding (1)	Ureteral stenosis (1)	
LRP	Urine leakage (2), lymphorrhea (1), wound infection (1), epididymitis (1)	Lymphorrhea (2), urethral stenosis (1)	Respiratory failure (1)
Others	Urine leakage (1)[a], chylorrhea (3)[b]		

[a] Laparoscopic radical cystectomy, [b] laparoscopic retroperitoneal lymph node dissection

Table 5 Intraoperative and postoperative data according to the role of the 130 surgeons; main operator vs. main mentor/instructor

	Main operator	Main mentor/instructor	*p*
No. of conversions to open surgery (%)	32 (2.6)	29 (2.3)	0.642
No. of episodes of bleeding >500 mL (%)	51(5.1)	60 (5.0)	0.873
No. of allogeneic blood transfusions (%)	24 (1.9)	16 (1.3)	0.174
No. of major intraoperative complications (%)[a]	13 (1.0)	16 (1.3)	0.623
No. of major postoperative complications (%)[b]	13 (1)	11(0.9)	0.636
Total no. of complications (%)	49 (4)	43 (3.4)	0.446
Mean operating time (min)			
LAd	160	192	<0.001
LRN	217	250	<0.001
LNU	259	304	<0.001
LNBD	208	274	0.017
LDN	255	268	0.266
LPN	225	275	<0.001
LPyP	230	266	0.124
LRP	281	236	<0.001

[a] Grade II or III by the Satava classification; [b] grade III or higher by the Clavien classification

transfusion between the two groups. Furthermore, there was no difference in the prevalence of major intraoperative or postoperative complications, and all complications. Operating time was significantly shorter if performed by a qualified surgeon in LAd, LRN, LNU, LNBd, and LPN (Table 5). In the case of LRP, the operating time was significantly longer when it was performed by a qualified surgeon.

To evaluate the relationship between the number of laparoscopic surgeries experienced during the 5 years since qualification and intraoperative and perioperative outcomes, surgeons were categorized into three groups according to the number of cases experienced in each type of surgery: I (most inexperienced), II (intermediate experience), and III (most experienced). Table 6 shows the relationship between the number of all laparoscopic surgeries during 5 years and the outcomes. Regarding the prevalence of conversion to open surgery between the three groups, the most inexperienced group (I) had a significantly higher prevalence of conversion to open surgery than the other two more experienced groups (I vs. II: $p = 0.047$; I vs. III: $p = 0.013$). There was a significant difference in the prevalence of bleeding of more than 500 mL, prevalence of blood transfusion, and total prevalence of intraoperative and postoperative complications between the three groups, but the intermediately experienced group (II)

Table 6 Intraoperative and postoperative data by surgeons classified by the number of urological laparoscopic surgeries completed during 5 years (2005–2009)

Group by no. of surgeries experienced No. of surgeries performed (median)	Low volume (I) 10–85 (59.5)	Intermediate volume (II) 86–176 (123)	High volume (III) 176–732 (249)	*p*	Total
% Participation as main surgeon	46.2	49.4	48	0.408	47.9
No. of conversions to open surgery (%)	32 (3.7)	18 (2.1)	15 (1.8)	0.023	65 (2.5)
No. of bleeding episodes >500 mL (%)	59 (7.0)	28 (3.7)	34 (5.1)	0.013	121 (5.3)
No. of allogeneic blood transfusions (%)	18 (2.1)	5 (0.6)	19 (2.2)	0.012	42 (1.6)
No. of major intraoperative complications (%)[a]	12 (1.4)	6 (0.7)	14 (1.6)	0.195	32 (1.2)
No. of major postoperative complications (%)[b]	8 (0.9)	7 (0.8)	9 (1)	0.881	24 (0.9)
Total no. of complications (%)	30 (3.4)	22 (2.6)	45 (5.2)	0.012	97 (3.7)
No. of surgeries	870	860	860		2,590

[a] Grade II or III by the Satava classification, [b] grade III or higher by the Clavien classification

had the lowest prevalence (Table 6). This suggested that there was no relationship between the number of surgeries performed and these outcomes.

Next, we evaluated the relationship between outcome and prevalence of complications and number of procedures of each type of surgery. In LAd, there was no significant difference in the parameters analyzed among the three groups. Similarly, in LRN, there was no significant difference in the parameters analyzed among the three groups classified by the number of LNs experienced. These indicated that the number of LAds or LRNs experienced by these surgeons did not affect the outcome and prevalence of complications. In LPN, the prevalence of conversion to open surgery was significantly different among the three groups as classified by the number of LPNs experienced (I = 5.3%, II = 9.1%, III = 0%, $p = 0.034$). In LRP, there was a significant difference in the mean operating time among the three groups as classified by the number of LRPs experienced (I = 321 min, II = 259 min, III = 242 min, $p < 0.001$). There also was a significant difference in the blood transfusion rate in LRP (I = 12.5%, II = 0%, III = 0%, $p < 0.001$). With respect to the prevalence of complications and other surgical parameters, there was no significant difference among the three groups in LPN and LRP.

Discussion

In the present study, after establishment of ESSQSJJ for 5 years, we tried to validate and evaluate the system by collecting intraoperative and postoperative surgical data of 136 qualified surgeons. We evaluated the data of 2,590 urological laparoscopic surgeries from these 130 surgeons.

Although quality assessment in surgery is paramount for patients, their families, healthcare providers, and the public, there is no consensus about which criteria should be used for collecting data for surgical complications and adverse events [4]. We used the Satava classification for intraoperative complications [2] and the modified Clavien classification for postoperative complications [3] according to the literature [5, 6]. The total prevalence of perioperative complications was 3.7%, with a prevalence of 1.2% of major intraoperative complications and 0.9% major postoperative complications. Compared with the prevalence of complications reported from high-volume centers of urological laparoscopy (4.4% to 22.1%), the value in the present study was low [7–10]. However, complications were reported by qualified surgeons, and the recording of surgical outcome by physicians may show considerable variance compared with that recorded by specially trained personnel [12]. The 0% prevalence of perioperative mortality in the present survey 2,590 may be considered to be low in view of reported prevalence of 0.07% to 0.4% in high-volume centers [7, 9–11]. It should be noted that reporting perioperative mortality may be more objective and unbiased than reporting perioperative complications. Regarding the relationship between the surgical volume and the outcome and complication rate, there was no significant relationship except for the open conversion rate (Table 6). However, because the most experienced surgeons might care for the highest surgical risk patients or tackle more difficult disease conditions, biased or unadjusted higher complication rate might be present in surgeries performed by well-experienced surgeons.

As an indicator of the safety and integrity of surgery, we collected the data of conversion to open surgery, allogeneic blood transfusion, and intraoperative blood loss. Regarding conversion to open surgery, the overall prevalence and the prevalence in each surgical type was mostly comparable with those recorded in the high-volume centers [7, 9] or higher [11]. For example, in LAd, LRN, and LRP, the prevalence of conversion in our series (1.3%, 3.1%, and 1.3%, respectively) was comparable to the reported data of highly experienced surgeons (0–3.6% for LAd [7, 9, 13, 14], 0–4% for LRN [7, 15–17], and 0–2.4% for LRP

[7, 18, 19]). In PN, the prevalence of conversion (4.8%) was higher than the reported data of highly experienced surgeons (0.8–3.5% [7, 20, 21]). With regard to blood transfusion, the prevalence in each type of surgery was lower than reported series from high-volume centers or highly experienced surgeons, except LRP. For example, the prevalence of transfusion in LAd (0.5%), LRN (1.5%), LNU (2.6%), and LPN (0%) was lower than recently reported data of a high number of cases (1.8–3.5% for LAd [7, 14, 22], 2.5–3.8% for LRN [7, 17, 23], 7.1–14.3% for LNU [7, 14], and 6–12.8% for LPN [7, 14]). Conversely, in LRP, the prevalence of transfusion was 4.1%, which was the highest in the present study (Table 2), whereas the recently reported prevalence from a high-volume center was 1.2–2.8% [7, 24]. Furthermore, the prevalence of transfusion in LRP was as high as 12.5% in the inexperienced group. These results indicated that LRP was associated with a high prevalence of transfusion if performed by surgeons with little experience of LRN, even if they had substantial experience of other types of urological laparoscopy.

Regarding surgeries mainly performed by qualified surgeons and those performed by other surgeons while qualified surgeons were involved as the main mentor/instructor, there was no significant difference between the two groups regarding the prevalence of conversion to open surgery, blood transfusion, blood loss of more than 500 mL, major complications, and total prevalence of complications (Table 5). Conversely, operating time was significantly longer in several types of surgeries if qualified surgeons participated as the instructor/mentor (Table 5). These results indicated that urological laparoscopic surgeries performed by qualified surgeons or by novice surgeons under the mentorship of qualified surgeons were safely performed, although the operating time was expected to be shorter if surgery was performed by qualified surgeons.

The present study had limitations. First, complications and outcomes were self-reported by surgeons without any auditing system. Hence, reports on complications may have been underrepresented and associated with bias and considerable variance, as pointed out by Dindo et al. [12]. The prevalence and severity of complications in the reported surgeries are not included as a condition for requalification in the ESSQSJJ system, and thus, we believe that surgeons did not hesitate to report the prevalence and severity of complications. Second, this study was designed mainly to evaluate complications and intraoperative outcome, not functional and disease outcomes. Therefore, evaluation of the quality of the surgeries performed by accredited surgeons may be an important area in future evaluations. Third, the surgeons were prospectively asked to submit the perioperative data of the latest 20 cases, because we had expected the accuracy of the self-reported data by limiting the required number of the cases. However, it should be noted that the present survey does not cover the outcome of a large number of other surgeries that were performed earlier than the latest 20 cases. Finally, because we did not compare the outcome and complication rate in surgeries performed by surgeons who failed the accreditation with those performed by surgeons who qualified in the accreditation, the true effectiveness of the ESSQSJJ system may remain unknown. Furthermore, the comparison between before and after the ESSQSJJ system has not been performed.

In conclusion, the results of this survey of 2,590 urological laparoscopic surgeries indicated that the surgeons who qualified by the ESSQSJJ system performed the various types of urological laparoscopic surgeries with a reasonably low prevalence of complications. Furthermore, the prevalence of complications, blood transfusion, and conversion to open surgery were not significantly influenced by the number of cases experienced after qualification or by the role of the surgeon (major surgeon vs mentor/instructor) in total and in most types of procedure. Therefore, the ESSQSJJ system may ensure urological laparoscopic surgeons with reasonable laparoscopic competency.

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