



# Live surgery in reconstructive urology: evaluation of the surgical outcome and educational benefit of the international meeting on reconstructive urology (IMORU)

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## Abstract

**Purpose** The international meeting on reconstructive Urology (IMORU) is a live surgery event (LSE) where expert surgeons perform various reconstructive surgeries. To evaluate patient safety, an extended follow-up of the complications of two subsequent IMORU meetings were gathered. Also, a detailed survey concerning the participant's assessment of the educational benefit was performed.

**Methods** All patients that were operated during the IMORU V and VI were included. Primary endpoint was the analysis of complications. Outcome was reviewed 36 months postoperatively via telephone survey and clinical database assessment, registering any complications. At IMORU VII all participants were able to participate in a survey using a standardized, not-validated questionnaire concerning the learning effect and the quality of the surgeries.

**Results** 57 operations by 32 different surgeons were reviewed. The total number of any complications (peri- or postoperative) was  $n=9$  (15.8%) with three major complications. Four (7%) perioperative complications and five (8.8%) postoperative complications were noted. The Charlson score proved to be the only significant recorded predictor of the incidence of any complication ( $p=0.019$ ; univariate logistic regression analysis). Participant survey showed that the surgeons, surgical technique, and surgical presentation were perceived as excellent. Improvement of knowledge and of the surgical armamentarium both received positive ratings.

**Conclusions** This is to our knowledge the first follow-up of LSE in the field of reconstructive urology. Rate of complications in general was acceptable. The performed survey showed participants value the quality and the educational benefit. Further studies are needed to improve learning possibilities.

**Keywords** Live surgery events · Surgical education · IMORU · Reconstructive urology

## Abbreviations

LSE	Live surgery event
LBS	Live broadcasted surgeries
IMORU	International meeting on reconstructive urology
EAU	European Association of Urology
AAGUS	American Association of Genitourinary Surgeons
UKE	University Medical Center Hamburg-Eppendorf

## Introduction

The international meeting on reconstructive urology (IMORU) is a triennial live surgery event (LSE), which has been hosted by the Department of Urology of the University Medical Center Hamburg-Eppendorf (UKE) since 2010. Internationally renowned urologic reconstructive experts perform various urologic reconstructive procedures, which are featured in simultaneous live surgeries from multiple on campus operating theaters as well as live broadcasted surgeries (LBS) performed in other countries.

There is an ongoing discussion about the benefit and safety of LSEs, yet there is little actual data fueling this debate. This is specifically true in the field of reconstructive urology. In 2013, the European Association of Urology

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(EAU) published a statement on LSEs, mentioning several aspects that should be respected when conducting a LSE [1]. Despite measures like these, many arguments have been against LSEs, with some surgical societies even banning LSEs [2, 3]. Nevertheless, LSEs are a traditionally accepted option for the dissemination of knowledge and well-known tool to teach new surgical techniques [4–6]. Still, LSEs may pose a number of serious threats to patient safety, as there are aspects, which might decrease the chances for optimal treatment. This is specifically significant for oncological procedures. To evaluate the benefit of LSEs, we aimed to answer two questions. First: Do LSEs compromise patient safety? and second: Is it worth the it? Our hypothesis is that with careful patient selection, acceptable complication rates can be achieved and that participants of LSEs value the learning benefit despite many complicating factors.

To answer these questions, we performed an evaluation of the complications of two subsequent IMORU meetings. An extended, long-term follow-up of the complications of the 2010 and 2013 IMORU meetings (V and VI) was performed to evaluate the safety of LSEs in urology. Also, a detailed survey concerning participant's assessment of the educational benefit was performed at the IMORU VII to evaluate the educational benefit of the participants.

## Materials and methods

### General patient selection and structure of the IMORU meetings

Patients eligible for surgery were recruited at the UKE and had confirmed indications for the planned procedures. The only exceptions were patients that were part of the live transmission program, as for each IMORU a small number of surgeries are live broadcasted. Surgery was indicated regardless of the patient's participation in the LSE and optimal treatment was highest priority in all cases. No oncological or emergency treatment was delayed because of the LSE. Almost all procedures were of highly elective nature. Critically ill patients were excluded from the LSE, to avoid any additional risk. Moreover, patient selection was based on the ethical rules as published by the EAU [1]. Extensive patient education about the procedure, as well as the participation in the LSE was given preoperatively, with ample time for consenting. All patients agreed to participate in the LSE and gave written consent for both surgery and the transmission and recording of the surgical procedures. Every patient was informed about the right to withdraw the given consent and have the operation rescheduled. There were no financial or other benefits for the patients. Presentation of all patient data and all video transmissions were strictly confidential.

All participating surgeons were internationally renowned experts in the field of reconstructive urology. Detailed patient information (medical history, radiographic images, etc.) were sent to all surgeons prior to the procedure to guarantee appropriate preparation. Postoperative treatment in general was determined by the surgeon. Complications were documented in digital clinical charts (Soarian<sup>®</sup> Clinicals).

There were no known conflicts of interests of the surgeons and the panel. All sponsoring companies had no influence whatsoever on the LSE or the evaluation of the results within this study. None of the people accountable for the IMORU and none of the authors had any kind of financial benefit.

### Evaluation of postoperative complication rates

All patients that were operated at the IMORU V and VI were included. Primary endpoint was the incidence of perioperative complications. Complication rates were reviewed 36 months after surgery via telephone survey. Patients who were part of the live transmission program, and that were not operated in Hamburg, were not included to the analysis. Furthermore, we conducted an in-depth assessment of our digital clinical charts to review any perioperative complications (complications registered during the hospital stay). Any complications or deviation of the planned treatment course were documented using the Clavien–Dindo classification [7]. Risk factor analysis was performed univariate regression analysis. Due to the vast amount of different types of surgery, an in-depth analysis of success rates was not feasible, given that comparison and definition of treatment success could not be standardized.

### Evaluation of educational benefit

At the IMORU VII, all participants were offered to participate in a survey using a standardized, not-validated questionnaire, in which several parameters concerning the educational benefit and the quality of the meeting and the procedures could be rated using a Likert scale [from excellent (1) to bad (5)]. Survey participants had the possibility to evaluate the surgeon, the surgical technique and the surgical presentation individually for each procedure. Additionally, the scientific program, faculty, presentations, poster sessions, the contact with the colleagues, and the video transmission were to be rated on a daily basis. To assess the participants' perception of an educational benefit, we asked to rate the improvement of professional knowledge and the improvement of surgical armamentarium over the days.

Statistical analyses were performed using SPSS 20.0 (SPSS Inc.) with significance level set at  $p < 0.05$ . An institutional review board waiver was obtained before conducting this study.

## Results

### Patient characteristics

At IMORU V and VI, at total of 57 operations by 32 different surgeons were performed. Most patients were male (84.2%). A summary of patient characteristics is depicted in Table 1. Median patient age was 51 years with a low median Charlson score of 2.

### Surgeries performed

The surgeries performed were quite diverse and covered the whole range of reconstructive urology. Table 2 shows

**Table 1** Baseline characteristics of 57 patients participating at the IMORU VI and VII (2010 and 2013)

	<i>n</i>	Median	IQR
Age (years)	57	51	25.75
Height (cm)	46	176.50	12
Weight (kg)	46	80.85	20.25
BMI	46	26.07	5.38
Charlson Comorbidity Score	57	2.00	2.25

an overview of the procedures performed at both IMORU V and VI meetings. Four surgeons performed more than four operations (experienced live surgeons), while most surgeons performed once or twice (median 2).

### Complications

Overall, complications occurred in 9 of 57 patients (15.8%; Table 3). Of those, there were one (11.1%), five (55.5%), and three (33.3%) patients with Clavien–Dindo grade I, II, and III complications, respectively. At total of four (7.0%) perioperative complications were noted (two at IMORU V, two at IMORU VI). Rate of long-term complications was 8.8%. Revision surgery was necessary in two cases (3.5%). However, only minor revisions were needed. In the urethroplasty subgroup ( $N=23$ ), we noted one perioperative (4.3%) and three long-term (13%) complications, the overall rate was 17%.

### Risk factor analysis

In univariate logistic regression analysis, the Charlson score was the only significant predictor of the incidence of any complication ( $p=0.019$ ). Patient age, the numbers of

**Table 2** Summary of procedures performed at the IMORU VI and VII (2010 and 2013)

Type of procedure	Number of procedures performed	%	Detailed description
All procedures	57	100	Performed by 32 different surgeons
Urethroplasty	23	40.4	Including buccal mucosa plasty, meshgraft urethroplasty, excision and primary anastomosis, transperineal reanastomosis, perineal urethrotomy, epispadias and hypospadias, fistula repair
Artificial urinary sphincter implantation	7	12.3	Including bladder neck cuff, bulbar single cuff and distal double cuff implantation
Corporoplasty	5	8.8	Including SIS patch grafting and <i>V. saphena</i> patch grafting
Anderson-Hynes pyeloplasty	3	5.3	Open, laparoscopic and robot-assisted procedure
Partial nephrectomy	2	3.5	Laparoscopic and robot-assisted procedure
Partial ureterectomy	2	3.5	Including end-to-end anastomosis combined with stone removal and anastomosis using a ileal transplant
Penile prosthesis implantation	2	3.5	AMS 700 implantation
Bladder diverticulectomy	2	3.5	Laparoscopic and robot-assisted procedure
Ureterocystoneostomy (Psoas Hitch)	2	3.5	Open and robot-assisted procedure
Sling implantation	2	3.5	Pubovaginal sling procedure and Advance band implantation
Anti reflux procedure	1	1.8	Robot-assisted procedure
Cystectomy with an orthotopic ileal neobladder	1	1.8	Robot-assisted procedure
Mitrofanoff procedure	1	1.8	Combined with bladder augmentation
Penile skin plasty	1	1.8	
Radical nephrectomy	1	1.8	Open surgery
Tined lead electrode implantation	1	1.8	
Transvaginal repair of vesicovaginal fistula	1	1.8	Using an omental flap

**Table 3** Overview and in-depth assessment of perioperative and long-term complications

Perioperative complications ( <i>n</i> = 4; 7%)	Clavien–Dindo Class.	Revision necessary	Long-term complications ( <i>n</i> = 5; 8.8%)	Clavien–Dindo Class.	Revision necessary
Red blood cell infusion necessary after partial nephrectomy	2	No	Extravasation of urine was noted 3 weeks after buccal mucosa urethroplasty, prolonged time of catheterization necessary (for 2 more weeks) after that no further sign of extravasation	2	No
Postoperative pneumonia, after penile prosthesis implantation, antibiotic therapy necessary	2	No	Patient developed intrasphincteric stricture after AUS Implantation, however, no further treatment necessary	2	No
Respiratory failure and pleural effusion after partial ureter resection, chest tube necessary	3	No	Resection of granulomas tissue of the urosoma necessary (after Mitrofanoff procedure)	3	Yes
Large scrotal hematoma after urethroplasty (3 cm buccal mucosa), no treatment necessary	1	No	Revision of pump necessary after penile prosthesis implantation as pump was not reachable for the patient	3	Yes
			Extravasation of urine and formation fistula was noted 3 weeks after urethroplasty using a MukoCell Patch grafting, prolonged time of catheterization necessary (for 2 more weeks) after that no further sign of extravasation or fistula	2	No

**Table 4** Risk factor analysis (univariate logistic regression analysis predicting any complications)

Risk factor	<i>p</i> value	Odds ratio	95% CI	
			Lower	Upper
Charlson Score	0.019	1.647	1.087	2.495
Age	0.275	1.023	0.982	1.065
BMI	0.437	1.068	0.905	1.259
Number of surgeries performed by surgeon at IMORU	0.338	0.835	0.576	1.208

surgeries performed by the individual surgeon at IMORU, and BMI proved to be non significant (Table 4).

## Survey

Table 5 shows the results of the survey conducted at the IMORU VII. Total response rate was 16% (28/180 participants). All of the participants were urologist with a special interest in reconstructive urology. All of them were member of at least one urological association (74% EAU, 23% German societies of urology, 37% SIU, 24% AUA).

**Table 5** Overview results (Likert scale from excellent to bad; 1–5)

	Day 1			Day 2			Day 3			Overall		
	Rating	SD	<i>N</i>	Rating	SD	<i>N</i>	Rating	SD	<i>N</i>	Rating	SD	<i>N</i>
Improvement of knowledge	1.67	0.92	27	1.67	0.92	27	1.83	0.70	24	1.80	0.84	24.3
Improvement of surgical armamentarium	1.96	1.06	25	2.15	1.17	22	2.08	0.88	24	2.06	1.04	23.67
Surgeon	1.32	0.52	24	1.54	0.89	19	1.17	0.43	22	1.34	0.61	22.91
Surgical technique	1.47	0.59	23	1.69	0.95	17	1.28	0.54	18	1.48	0.69	17.61
Surgical presentation	1.62	0.71	20	1.82	1.05	21	1.22	0.47	18	1.55	0.74	19.82
Scientific program	1.38	0.57	26	1.37	0.56	23	1.35	0.57	23	1.35	0.58	24
Faculty	1.44	0.51	27	1.33	0.68	22	1.35	0.49	23	1.38	0.56	24
Presentation	1.69	0.72	27	1.56	0.58	22	1.41	0.73	22	1.55	0.68	23.67
Poster session	1.92	0.83	24	2.07	0.96	22	1.47	0.61	19	1.82	0.80	21.67
Video session	1.35	0.56	26	1.69	0.79	22	1.25	0.44	20	1.43	0.60	22.67
Technique	1.48	0.58	27	1.52	0.58	22	1.19	0.40	21	1.40	0.52	23.34
Contact with colleagues	2.35	1.35	26	1.85	0.99	22	2.13	1.08	24	2.11	1.14	24

Overall, 87% stated that they would attend the meeting again. Participant survey at the IMORU VII showed that on all days the surgeons (1.34,  $n=22.91$ ), the surgical technique (1.48,  $n=17.61$ ) and the surgical presentation (1.55,  $n=19.82$ ) were perceived as excellent. Improvement of knowledge (1.8,  $n=24.34$ ) and surgical armamentarium (2.06,  $n=23.67$ ) both received positive ratings, suggesting that most participants value the educational benefit.

## Discussion

To our knowledge, the current study represents the first evaluation of a LSE in the field of reconstructive urology. With respect to patient safety, we were able to show that for highly elective surgeries performed by expert surgeons, patient safety seems to be ensured. For the IMORU VI and VII we were able to show that even in case of complex procedures, acceptable complication rates may be achieved. These results are in line with other retrospective assessments of LSEs in the field of urology [5, 8, 9]. Rate of perioperative and long-term complications were equally distributed across the meeting years 2010 and 2013. Due to the vast spectrum of procedures performed, a comparison with outcomes with a control group or other series available in the literature was not feasible, except for the large subgroup of patients who underwent urethroplasty. In this subgroup, the perioperative and long-term complication rates were 4.3% and 13%, respectively. These results are also in line with other assessments of perioperative and long-term complication rates following urethroplasty [10–12]. The Charlson score was a significant risk factor of perioperative or long-term complications. This seems intuitive and suggests that critically ill patients should be evaluated meticulously prior to inclusion in a LSE. Due to the variety of procedures performed, there is no possibility to compare all results of the postoperative follow-up or the success rates with regular performed surgeries, but we feel there is little difference. We, therefore, believe that participating at a LSE in the field of reconstructive urology may be considered safe for the patients, as long as the right criteria for patient selection are met and if the surgeon is well trained and experienced.

Despite showing comparable complications rate, we still acknowledge the fact that LSE pose a lot of risks. Among many other factors, they pose stress for surgeon and for the patient. Still, the very positive feedback from the survey lets us believe that LSE are still worth conducting and attending. The vast majority of all respondents stated that they would attend the meeting again and reported an improvement of knowledge and surgical armamentarium. This suggests that most participants value the educational benefit of the IMORU meetings. International conferences of surgeons are universally accepted as means

of increasing the general quality of surgery. An anonymous survey of urologists who performed and/or moderated live surgery at the World Congress of Endourology showed that 90.5% perceived a LSE as a “beneficial” and “great way” to educate [13]. However, opponents of LSEs often mention the potential risks regarding patient safety, and there are multiple pre-, peri-, and postoperative factors that may compromise surgical outcome. There is a higher level of distraction for the surgeon, either from the audience or from the unfamiliar staff or other personnel. Unfamiliarity with the operating setting, jetlag or other obstacles such as a potential language barrier may additionally cause sub-optimal working conditions [14]. In an anonymous survey on live surgery conducted by the American Association of Genitourinary Surgeons (AAGUS), excessive conversation was perceived as a major distraction by 41.3% of the respondents [15]. Other possible factors that may negatively influence the outcome could be possible distractions from the audience, the necessity to comment or increased nervousness. These factors can increase the risk of perioperative complications. In a anonymous survey of the participants of the EAU’s Robotic Urology Society (ERUS) in 2012, 23.9% of the surveyed surgeons described a “slightly worse” performance and 3.3% reported a “significantly worse” performance in a foreign environment [16].

Other aspects can also influence the outcome of a LSE. In oncological cases, LSE may cause treatment delay. Organizational factors may lead to impaired patient selection. Also, it may not always be possible for the surgeon to supervise the postoperative care, which may increase the risk of postoperative complications.

During the IMORU we are trying to minimize these risks by nearly exclusively performing surgeries of highly elective nature and only rarely with an oncological background. Therefore, delay of treatment is not an issue. The surgeon is encouraged to arrive as early as possible, to minimize potential jetlag, and is invited to visit the operating room before surgery to meet the personnel and check the instruments. Foreign surgeons are invited to bring their own staff and instruments, to minimize stress in the operating room. To ensure proper patient selection, case presentations are held, and surgeons are informed as soon as possible about the specifics of the cases. All surgeons are asked to lay down their postoperative treatment plan, which is then followed by accordingly.

An interesting survey among members of the AAGUS revealed that only 28% would approve to live surgery on a family member. Still about 70% stated that LSEs are morally ethical, while the vast majority recognized that they should not continue indefinitely in the current form [15]. The survey at the IMORU VII showed that the majority of our participants does value LSEs and the educational benefit. We, therefore, believe that given the acceptable complication

rates, LSEs are ethically justifiable and do provide significant contribution to surgical quality improvement. The EAU also acknowledges the important role of LSEs for educational purposes [1]. We, therefore, believe that the mentioned possible risks of live surgery are worth the risk considering the teaching effect.

Still, new technological advances are emerging. The presentation of pre-recorded videos instead of live surgeries (semi-live presentations) as well as LBSs are claimed to be superior [17]. The surgeon can perform in a familiar setting, without any language barrier and the postoperative care can be provided by the surgeon himself. The presentation of semi-live surgeries can be upgraded by editing the video and by being able to revise key steps. However, like LSE, semi-live meetings have to face similar concerns that can alter the surgical outcome. The surgeon can still be under more stress, knowing that he is being filmed. There still may be issues related to patient selection. Also there could be possible speculation about alteration of the video itself, as of the outcome of the procedure. Semi-live meetings may not have the same learning benefit as LSEs, as complications or surgeries with difficulties might not be shown, and, therefore, the audience may not have the chance to see how an expert surgeon might handle a precarious situation. Ultimately, these concerns do not apply to live broadcasted surgeries. The IMORU, therefore, features a growing number of LBSs and the general response and acceptance has been very good.

This study is the first to report complications and evaluation of a LSE in the field of reconstructive urology. We feel that we can contribute to the ongoing discussion about these sense and purpose of these events. The limitations of this study include the retrospective design, lack of data on functional outcomes, and limited comparability due to the broad spectrum of different surgeries performed. Also, not all postoperative complications may have been mentioned by the patients during the telephone survey. Another limitation is relatively low survey response rate of 16%. Prospective data from larger cohorts to determine comparative effectiveness, safety, and the educational effect of LSEs versus standard surgery are eagerly needed. Of special interest should be a comparison between semi-live and live surgeries with respect the educational value.

LSEs remain a valuable tool transfer knowledge and innovation. Still, there is little doubt that LSEs may have a negative impact on surgical outcomes. It is of utmost importance to always put patient safety first and to do everything possible to maximize transparency. During the IMORU, highest standards are set to ensure both optimal patient treatment and educational benefit. Given the low complication rates and the positive feedback we feel vindicated in our work and are glad to host the IMORU meetings.

## Conclusion

This study represents the first systematic evaluation of a LSE in the field of reconstructive urology providing long-term data of 57 patients. We were able to demonstrate acceptable complications rate and our survey suggests that LSEs are still highly valued as a tool with great educational benefit.

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## Compliance with ethical standards

**Conflict of interest** All authors have nothing to disclose. The authors declare that they have no conflict of interest. While the IMORU meeting itself was sponsored by different companies, none of the authors received any kind of compensation.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

**Human and animal rights** This article does not contain any studies with animals performed by any of the authors.

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