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ORIGINAL ARTICLE

Complications of urologic laparoscopic surgery in the elderly. Preliminary report

Complicaciones de la cirugía laparoscópica urológica en el adulto mayor. Informe preliminar

María Elena Suárez-Marcillán[1], Tania González-León[2], Deysi Blanco-Borrero[1] Yaimara Cuza-Herrera [1], Maricela Morera-Pérez [2]

[1] Hospital Universitario "Calixto García". La Habana, Cuba.
[2] Centro Nacional de Cirugía de Mínimo Acceso. La Habana, Cuba.

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ABSTRACT

Introduction: the benefit of urological laparoscopic surgery in the elderly is controversial due to the complications attributed to it.
Objective: to describe the complications of the laparoscopic approach in urological entities in the elderly.
Methods: descriptive, retrospective, cross-sectional study in 185 patients ≥60 years old operated by urological laparoscopic surgery at the National Center for Minimal Access Surgery, January 2010-June 2021. Descriptive statistics, Chi-square and Student's t ($p \leq 0,05$) were used, age and other variables were associated with the occurrence of complications.
Results: 32 patients were complicated (17,30 %), the mean age was 68.6 years, in the groups between 60-69 and 70-79 years were complicated more frequently ($p=0,37$), not so with the longest-lived (≥80 years). Most of the complicated patients were ASA-2 (11,3 %) and this variable was significantly associated ($p=0,004$); they had some comorbidity (14,6 %), among those complicated 11,9 % received highly complex surgery and 12,4 % required prolonged surgical times, $p=0,32$; $p=0,002$; $p=0,036$, respectively. The predominant intraoperative complication was bleeding (Satava II-2,7 %), associated with partial nephrectomy; the most frequent postoperative complications were infection (8,1 %) and bleeding (5,1 %), classified Clavien Dindo II, IIIb, IVa-IVb, IVb, respectively.
Conclusions: laparoscopic urologic surgery in elderly patients is safe. Complications are usually of low severity, related to increased ASA, operative time and complexity of surgery.

Keywords: Older Adult; Laparoscopic Surgery; Comorbidity; Complications; Surgical Risk.

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RESUMEN

Introducción: el beneficio de la cirugía laparoscópica urológica en los adultos mayores es controversial por las complicaciones que le son atribuidas.
Objetivo: describir las complicaciones del abordaje laparoscópico en entidades urológicas en el adulto mayor.
Métodos: estudio descriptivo, retrospectivo, transversal en 185 pacientes ≥60 años intervenidos por cirugía laparoscópica urológica en el Centro Nacional de Cirugía de Mínimo Acceso, enero 2010-junio 2021. Se empleó estadística descriptiva, Chi-cuadrado y t de student (p≤0,05), se asoció la edad y otras variables con la ocurrencia de complicaciones.
Resultados: se complicaron 32 pacientes (17,30 %), la edad media fue 68,6 años, en los grupos entre 60-69 y 70-79 años se complicaron con mayor frecuencia (p=0.37), no ocurrió así con los más longevos (≥80 años). La mayoría de los pacientes complicados eran ASA-2 (11,3 %) y esta variable se asoció significativamente (p=0,004); presentaban alguna comorbilidad (14,6 %), entre los complicados 11,9 % recibieron una cirugía de alta complejidad y 12,4 % requirieron tiempos quirúrgicos prolongados, p=0,32; p=0,002; p=0,036, respectivamente. La complicación intraoperatoria predominante fue el sangrado (Satava II-2,7 %), asociado a nefrectomía parcial; las posoperatorias más frecuentes fueron la infección (8,1 %) y el sangrado (5,1 %), clasificadas Clavien Dindo II, IIIb, IVa-IVb, IVb, respectivamente.
Conclusiones: La cirugía laparoscópica urológica en los pacientes ancianos es segura. Las complicaciones suelen ser de baja gravedad, relacionadas con el aumento del ASA, el tiempo quirúrgico y la complejidad de la cirugía.

Palabras Clave: Adulto Mayor; Cirugía Laparoscópica; Comorbilidad; Complicaciones; Riesgo Quirúrgico.

INTRODUCTION

The increase in the number of older adults undergoing surgery globally represents a health problem in routine surgical practice, especially at the time of decision-making. Over the past 25 years, a large increase was observed in the United States, which was 12,8 % in 1995; and 15 % in 2020. Adults over 65 years of age represent more than 40 % of all surgeries performed.[1,2,3]

In the Cuban context, population aging is a reality. Older adults represented 9,0 % in 1970. The 2022 Statistical Health Yearbook recorded 21,07 %. It is estimated that Cuba will be one of the most aged countries in the region in 2050, which will impose new challenges for Cuban society and public health.[4]

The benefits of laparoscopy are well documented: it reduces postoperative pain, hospital stay, patient recovery time and return to daily activities, among others. However, its use in the elderly poses risks due to the increase in physiological demands due to pneumoperitoneum in a population with usually decreased cardiopulmonary reserve, secondary to the comorbidity and frailty usually present. Added to this are the depressing effects of general anesthesia, the anti-physiological positions required during surgery (Trendelemburg and Sims), as well as prolonged surgical times in complex surgeries. [1,5,6,7]

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A better understanding of the physiology of pneumoperitoneum, the improvement of surgical techniques and technological improvements in the instruments used, together with the expertise of surgeons, have led to an increase in the opinion in the literature that age alone is not a contraindication for elderly patients to benefit from the advantages offered by laparoscopy. The decision to indicate this approach in this population will depend on the functional and physiological reserves that the patient presents before surgery.[5,6,7]

Comprehensive preoperative assessment of surgical risk in the elderly using different tools has become a worldwide trend and an important predictor of intra- and postoperative complications, compared to other conventional assessment methods.[5,7,8]

The behavior of complications in laparoscopic urological surgery in the elderly has not yet been sufficiently documented, especially in the surgical treatment of oncological diseases, which have a high incidence and prevalence at this stage of life, which further affect their quality of life and postoperative survival.[9,10]

The objective of this research is to describe the complications of the laparoscopic approach in urological entities in the elderly.

METHODS

A descriptive, retrospective, cross-sectional study was conducted in 185 patients ≥60 years of age who underwent laparoscopic surgery for a urological disease at the National Center for Minimal Access Surgery (CNCMA) between January 2010 and June 2021.

Clinical variables were considered to describe the preoperative physical status of the patients (age, *American Society of Anesthesiologists score -HANDLE*, comorbidity, body mass index), surgical variables (degree of complexity of surgery according to the European Scoring System for Laparoscopic Operations in Urology, surgical time, complicated patients, complications, need for conversion to open surgery, re-interventions and hospital readmission). Complications were classified as intraoperative and their severity classified in grades according to Satava: I, II, III,[1,8] and postoperative according to Clavien Dindo in degrees:I, II, III (IIIa, IIIb), IV (IVa, IVb), V.[6,10] The age of the older adults was stratified into three groups.

For statistical analysis, IBM-SPSS, version 21 for Windows, was used. Absolute and relative frequencies were determined as summary measures of qualitative variables, and the mean and standard deviation (SD) for quantitative variables. Student's t test and Chi square were used to associate variables, respectively. A confidence level of 95 % was considered; a level of statistical significance was set for tests <0,05.

The research was approved by the CNCMA Research Ethics Committee and Scientific Council, respecting the bioethical principles governing biomedical research with human beings contained in the Declaration of Helsinki of the World Medical Association.[11]

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RESULTS

17,3 % of the elderly presented complications related to laparoscopic surgery; 2,7 % were intraoperative: Satava II; 16,2 % were postoperative. The most common complications were grade II (10,3 %) and infectious (8,1%). (Table 1).

Intraoperative complications occurred in one nephrectomy for lithiasis (intestinal injury); bleeding occurred in two nephroureterectomies; in one partial nephrectomy and one radical nephrectomy, which triggered cardiovascular events. Three of these patients also presented grade II postoperative complications. (Table 1)

Table 1. Distribution of elderly patients operated on by Urological Laparoscopic Surgery according to complications and severity**.**

Variables		No.	%
Patients with complications		**32**	**17,29**
Intraoperative complications		**5**	**2,7**
• **Satava II**	Bleeding Cardiovascular disorders (hypertension, hypotension and cardiac arrhythmia)	4	2,2
	Bowel injury	1	0,5
Postoperative complications		**30**	**16,2**
Bleeding		10	5,4
Infectious		15	8,1
Others		5	2,7
Gravity according to Clavien Dindo			
Yo		1	0,5
II		19	10,3
III b		6	3,3
IV a		1	0.5
IV b		3	1,6

* Three patients presented intra- and postoperative complications

The youngest elderly were the ones who most frequently suffered complications, as were men, without statistical significance (p>0,05). The oldest ones did not suffer complications. Table 2.

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Table 2. Distribution of elderly patients undergoing urological laparoscopic surgery according to age, sex and presence of complications.

Variables	Not complicated		C Complicated		Total		P
	No.	%	No.	%	No.	%	
Age (years)							0,374
60 - 69	87	47,03	16	8,65	103	55,7	
70 – 79	60	32,43	16	8,65	76	41,1	
≥ 80	6	3,24	0	0	6	3,2	
Middle Ages (DE)	68,4 (±5,8)		69,3 (±4,8)		68,6 (±5,6)		
Range	60 - 86		60 - 79		60 - 86		
Sex							0,542
Female	76	41,08	14	7,57	90	48,6	
Male	77	41,62	18	9,73	95	51,4	

Source: Medical history

It was significant (p=0,00) that most of the patients who presented complications had an ASA II physical status (11,3 %). 23 of the complicated patients had comorbidities, the majority (7,6 %) suffered from at least one comorbidity, but no statistical association was found between this variable and the presence of complications, as well as for the BMI, which when analyzed, it was observed that most of the complicated patients had a normal weight (8,1 %; p=0,55). Table 3

Table 3. Distribution of elderly patients undergoing laparoscopic urological surgery according to ASA, comorbidity, body mass index and the presence of complications.

Variables	Not complicated		Complicated		Total		p
	No.	%	No.	%	No.	%	
ASA Classification							
1	76	41,1	7	3,8	83	44,8	**0,004**
2	72	38,9	21	11,3	93	50,3	
3	5	2,7	4	2,2	9	4,9	
Comorbidity							
No comorbidity	35	18,9	5	2,7	40	21,6	0,32
A	90	48,6	14	7,6	104	56,2	
Two	24	13,0	8	4,3	32	17,3	
+3	4	2,2	5	2,7	9	4,9	
BMI (Kg/m²)							
Normal weight (22 – 26.9)	94	50,8	15	8,1	109	58,9	0,55
Overweight(27 – 29.9)	40	21,6	7	3,8	47	25,4	
Obese≥30	19	10,3	10	5,4	29	15,7	

Source: History clunique

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11,9 % of the patients with complications had undergone highly complex surgery. The occurrence of complications increased proportionally to the greater complexity of the surgery and the longer surgical time. For both variables, this association was statistically significant (p>0,05). Table 4

Table 4. Distribution of elderly patients undergoing urological laparoscopic surgery according to perioperative variables and the presence of complications.

Variables	Not complicated		Complicated		Total		P
	No.	%	No.	%	No.	%	
Complexity of surgery							
Low	57	30,8	4	2,2	61	33.0	**0.002**
Moderate	36	19,5	6	3,2	42	22.7	
High	60	32,4	22	11,9	82	44,3	
Surgical time (minutes)							
< 60	15	8,1	2	1.1	17	9.2	**0,036**
60 a 120	53	28.6	7	3,8	60	32.4	
≥120	85	46,0	23	12.4	108	58,4	

Table 5 presents the percentage of conversion, re-admission and re-intervention in complicated patients.

Table 5. Distribution of elderly patients operated on using urological laparoscopic surgery and other postoperative variables.

Variables	Complicated	
	No.	%
Conversion		
Yeah	1	0,5
No	31	16,8
Re-intervention		
Yeah	5	2,7
No	27	14,6
Re-entry		
Yeah	12	6,5
No	20	10,8

Source: History clunique

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DISCUSSION

The safety of laparoscopic urologic surgery in the elderly is controversial. Some authors associate it with serious and complex complications, while others report that it is safe with a low rate of morbidity and mortality.[1,2,5,8]

Most of the urological surgeries performed in this series of patients were simple, radical, partial nephrectomy, and nephroureterectomy, which are classified as complex surgeries. The literature reports a significant association between the occurrence of intraoperative complications and the degree of difficulty of the surgery ($p<0,05$). In recent years this trend has decreased due to better knowledge of surgical anatomy, standardization of the technique, as well as surgical experience.[8,12]

Laparoscopic surgery referral centers report an intraoperative complication rate of 2 % and non-referral centers report a rate of 6,75 % -8,2 %. The results of this series are within these ranges.[8]

Ingels et al.,[11] they reported a percentage of intraoperative complications (9 %) in 122 patients operated on by laparoscopic partial nephrectomy (bleeding: 3,8 %; digestive and vascular injury: 1,9 %; pleural injury: 1,6 %; conversion: 1,7 %; in addition to requiring intraoperative transfusion: 3,7 %).

Yoshino et al.,[13] they described 14,5 % of complications in 96 patients operated on for nephropathy simple by approach retroperitoneal laparoscopic surgery consisting of: peritoneal injuries: 7,8 %; renal vascular injury: 4,6 %; renal capsule injury: 2,1 %; considered minor by the authors. Geiger y col.,[12] They documented 17 % of complications during radical cystectomies and bleeding was the most frequent complication. Territory and col.,[8] reported 8,09 % during renal surgeries (hollow viscera injuries and vascular injuries). All authors agree that age is not an independent risk factor for the occurrence of the complication.

Postoperative complications significantly affect health costs, such as length of hospital stay and readmission, significantly increasing health care costs by 33,3 % when one complication occurs and 84% when two or more complications occur.[2,10,14]

In the series, postoperative complications predominated, and infection was the most frequent, including urinary tract infection and surgical site infection classified as Clavien Dindo II. The frequency of complications did not increase with the complexity of the surgery, but their severity did. One patient developed retroperitoneal hematoma and septic shock, which required transfusion and life support with amines, and another developed perirenal hematoma, pneumonia, and heart failure classified as Clavien Dindo IVb.

Akkoçand col.,[6] In their series of 114 patients, operated on by laparoscopic decortication of simple renal cysts, they reported a 7 % of Clavien Dindo I complications. It is striking that, in the series, the same surgical technique was performed and similar complications occurred, however, they were classified as Clavien Dindo II, which shows the non-uniformity in the classification between authors that can generate different interpretations in future surgical conduct.

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The results of the present investigation show a lower frequency and severity of complications than those documented by Ingels et al.[11] who reported 19 % of medical postoperative complications including renal failure, pneumonia, delirium, paralytic ileus, urinary tract infection, sepsis, acute urinary retention and 10,5 % surgical complications such as urinary fistulas, perirenal hematoma, wall hematoma, arteriovenous fistula and death, classified Clavien Dindo III-V (OR = 0,31, 95 % CI 0,12-0,80; p = 0,01).

Lowranceand col.,[1] In their comparative study they found that laparoscopic partial nephrectomy was complicated but not associated with the occurrence of death that occurred in radical nephrectomy.

In the bivariate analysis performed, age did not show a statistical association with the occurrence of complications. The authors of this research consider that these were related to other risk factors independent of age such as ASA and type of surgery. (See Table 2)

Akkoçand col.,[6] documented that the mean age of their series was 73,8 ±8,2 years, and the female sex was more complicated (7 %). Sirithanaphol et al.[3] They investigated 101 patients who had undergone surgery for kidney cancer and observed that those aged ≥65 years had complications more frequently (22 %). Both authors reported, as in this study, that complications were related to other risk factors such as: higher ASA, anemia, higher percentage of comorbidities, independent of age.

For Lowrance et al.,[1] age was statistically associated with the presence of complications in patients undergoing laparoscopic partial and radical nephrectomy (OR: 1,16; 95 % CI, 1,05-1,29; p=0,005) regardless of the type of surgery; however, when including the age term in the multivariate analysis with the type of surgery and complications, it was not significant (OR: 0,98; p=0,09), that is, there was no evidence that the risk of complications increased with increasing age.

Many of the studies that relate age with a higher occurrence of complications are in complex radical surgeries such as laparoscopic radical and partial nephrectomy, laparoscopic radical cystectomy and laparoscopic radical prostatectomy; the last two were not performed in this research.[1,5,8,10]

In itBivariate analysis of this study the anesthetic classification was statistically associated with the occurrence of complications (p=0,004). Sirithanaphol et al.,[3] report they found that in ASA III patients (18,5 %) who underwent renal cancer surgery using LRN, more complications occurred in the older group. For Lowrance et al.,[1] ASA score was found to be a determining factor when deciding on a therapeutic option; patients with a higher ASA score were offered LRN rather than LPN to avoid the complications of conservative technique (12 % vs 22 %). In high-risk patients investigated by Akkoç et al.[6] Only 7% presented a minor complication unrelated to this status. While, for Ingels et al.[11] ASA II was a significant independent factor for postoperative complications (60 %). However, Geiger et al.,[12] In 596 patients undergoing laparoscopic nephroureterectomy, this association was not demonstrated (OR=1,05, 95 % CI 0,92-1,22; p=0,76).

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The differences in the reports have led to the advocacy of prospective research that includes comprehensive preoperative evaluation of older adults as a tool for predicting the risk of complications, which allows for personalized risk assessment, given the heterogeneity in the health status that characterizes this population group, and to incorporate enhanced recovery after surgery (ERAS) programs, implemented and standardized in different specialties, with more evidence of their cost-effectiveness and faster recovery, without increased hospital readmissions or mortality.[5,15,16]

Another important element in predicting surgical risk in the elderly is comorbidity and frailty. Frailty was not assessed due to the retrospective nature of the research and the lack of inclusion of all data for its measurement. The association of arterial hypertension (AH) with diabetes mellitus (DM) predominated. There was no association of comorbidity with complications, but they were more serious as they increased in number, although no significant association was demonstrated (p=0,32).

Sirithanaphol et al.,[3] They reported greater comorbidity in older patients with complications (HT, DM, kidney disease)chronic, cardiac and lower basal gromerular filtration rate), compared to younger older adults (22 % versus 12 %). Bombaci et al.[2] They failed to demonstrate an association between the number of comorbidities (39,5 % had one comorbidity, 35 % had two, 16 % had three, and 3 % had four) and the frequency of complications, but did show an association with longer hospital stays. They believed that the multidisciplinary approach can prevent adverse events and determine which surgery and anesthetic method is most appropriate. Wunderleand col.[7]They demonstrated the association of greater morbidity with a higher risk of developing major postoperative complications, in their bivariate analysis (OR=4.76, p=0,014), and multivariate analysis (OR =4,30, p=0,029).

There is controversy over whether obesity itself is an independent risk factor for surgical complications; this issue has not been sufficiently addressed in Urology in older adults operated on by laparoscopic approach. Obesity can pose perioperative challenges related to comorbidities and associated technical factors. Initially, it represented a contraindication in obese patients, however recent studies report that it remains difficult, but is safe and provides the patient with benefits over open surgery.[3,7,17]

In the study, normal weight and complicated obese patients were associated with complex oncological surgeries and overweight patients with surgeries for urinary lithiasis; in all three groups, minor postoperative adverse events predominated, except for one overweight patient who needed re-intervention; one obese patient had an acute coronary syndrome (serious cardiac complication) and another had bleeding, but with no other repercussions. BMI was not statistically associated with the occurrence of complications (p=0,55).

Similar to this research Sirithanaphol et al.,[3]reported more complications in patients with lower BMI, mainly respiratory, and they relate it to the high pre-surgical risk that, associated with a low BMI, increased the risk of frailty and sarcopenia. Gu et al.,[18] conclude that BMI influenced the surgical time and hospital stay (p=0.001) in patients who underwent renal cyst surgery by retroperitoneoscopy. While Arfi et al.[14] They reported that in obese patients undergoing NSL and NRL surgery, surgical time was significantly longer (216 vs 244 minutes; p=0,003) and explained this by difficulties in dissection; this was not the case for hospital stay, surgical conversion, estimated blood loss and complications. They concluded that surgery is safe in obese patients and attributed a higher risk of complications to the abdominal wall, but without statistical significance.

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Advances in technology and the incorporation of new surgical instruments allow for the performance of difficult dissections in complex urinary tract surgeries such as LPN, LPN, nephroureterectomy, laparoscopic cystectomies and prostatectomies, with proven evidence of long-term oncological results similar to open surgery.[1,3,7]

The higher complexity of the surgeries performed was directly related to prolonged surgical times and the occurrence of complications. The surgical technique that caused the highest number of complications was renal tumor enucleation (a variant of NP). In the bivariate analysis, the probability of complications was higher in patients with highly complex surgeries (p=0,002). For surgical time, the probability of complications was higher in patients with surgical times greater than 120 minutes (p=0,036). (See Table 4)

The literature reports the direct relationship between the complexity of surgeries and the occurrence of complications. For Song et al.,[16] Cao et al.[9] This relationship increases in complex oncological surgeries in fragile patients and those with comorbidity, the latter suggesting that, in laparoscopic radical prostatectomy, the risk is 12 times higher.

With prolonged surgical times, there is an increase in coagulation, blood stasis, and endothelial damage, resulting in an increased risk of venous thromboembolism. Surgical team fatigue and extended duration of anesthesia promote other types of complications. Complications may prolong surgery and contribute to the positive association between operative duration and risk of complications.[12,14,17]

PN is underused in elderly patients to avoid exposing the elderly to prolonged surgical times. We believe that this approach does not analyze the significant and harmful effects of iatrogenic renal loss, since it is known that NPL is associated with a 10 % loss of global glomerular filtration rate, while in NRL it is reduced to 30 %. Oncological control is similar at five years between NPL and NRL for tumors up to 7 cm.[1,3,19]

The literature reports a conversion rate from laparoscopic to open surgery between 4 % and 14 %.[5,12,17]

One patient required conversion to open surgery due to a complication (bowel injury), and in three patients, conversion was due to difficulty in tissue dissection due to perinephritis in the case of simple nephrectomy. In this surgical scenario, many authors consider this to be an acceptable medical judgment to prevent the occurrence of a more consequential adverse event. [10,12,17]

Maintaining the principle of minimal invasion, five patients were re-intervened: by percutaneous access (puncture and drainage of perirenal collection), endoscopic (cystoscopy to evacuate clots; placement of JJ ureteral catheter due to renocutaneous fistula secondary to lumboscopic resection of renal cyst), laparoscopic (exploratory laparoscopy after enucleation of renal tumor, bleeding and NRL was performed).The postoperative period after hospital discharge was favorable, only 6,5 % required readmission. The most frequent cause was urinary tract infection and surgical site infection after nephrectomies due to lithiasis; after NPL due to cardiac arrhythmia; four patients after renal tumor enucleation (NP) due to bleeding.

Guo et al.,[18] reported four conversions (significant intra-abdominal adhesions, bleeding from vascular injury, splenic laceration, duodenal perforation). While Territo et al.[8] They reported 16, with a predictive factor for conversion being those patients with higher TNM, less surgeon experience and prolonged surgical time, p=0,001 and p=0,019, p<0,001, respectively.

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It coincides with the criterion of Akkoçy et al.,[6] that in low complexity surgeries the reintervention rate either it is usually low, when this occurs the hospital stay and readmission increases either in hospital, as it happened either in both investigations with the fystulas reno cutaneous posterior to decortication either in laparoscopic renal cysts.

Studies report conversions, reinterventions and readmissions are generally associated with complications arising from complex surgeries and frequently in co-morbid patients.[7,20]

The authors consider that comprehensive, personalized preoperative evaluation of the elderly should include two or more tools for predicting the risk of complications (Charlson comorbidity index, Goldman cardiac risk index, frailty index, etc.) to increase its predictive value and make urological laparoscopic surgery in this population group a feasible and safe surgery.

CONCLUSIONS

Urological laparoscopic surgery in elderly patients is safe. Complications are usually of low severity, related to the increase in ASA, surgical time and the complexity of the surgery.

Conflict of interest
The authors declare that there are no conflicts of interest.

Authors' contribution
MESM: Conceptualization, Formal Analysis, Research, Methodology, Resources, Visualization, Writing - original draft, Writing - review and editing.
TGL: Conceptualization, Methodology, Project Management, Resources, Supervision, Validation - Verification, Visualization, Writing - review and editing.
DBB: Data Curation.
YCH: Data Curation.
MMP: Formal Analysis, Resources.

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