*Original Article*

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# *Association of ASA Score with Postoperative Complications in Uro-oncological Surgeries: A Retrospective Comparative Analysis of ASA 1-2 and ASA 3-4 Patients*

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## Abstract

**Objective:** This study aims to compare perioperative adverse effects between patients classified as American Society of Anesthesiologists (ASA) 1-2 and ASA 3-4 undergoing major oncological urological surgeries. It also evaluates the impact of ASA classification on surgical outcomes.

**Materials and Methods:** A retrospective analysis was conducted on patients who underwent open, laparoscopic, or robotic surgery for bladder, kidney, ureter, and prostate cancer between 2022 and 2024. Patients were categorized into two groups: ASA 1-2 (group 1) and ASA 3-4 (group 2). Perioperative complications were classified using the Clavien-Dindo grading system, focusing on grade 4-5 complications. Statistical analyses were performed using chi-square and Mann-Whitney U tests, with $p<0.05$ considered statistically significant.

**Results:** A total of 367 patients were included in the study: 198 radical prostatectomy cases, 76 nephrectomy cases, 41 partial nephrectomy cases, 30 cystectomy cases, and 22 nephroureterectomy cases. Of these, 198 patients were classified as ASA 1-2, while 169 were ASA 3-4. Grade 4-5 complications included pulmonary embolism, sepsis, myocardial infarction, atrial fibrillation, disseminated intravascular coagulation, and death. However, there was no statistically significant difference in the incidence of major complications between ASA groups across different surgical procedures ($p>0.05$).

**Conclusion:** Despite the expectation of higher complication rates in ASA 3-4 patients, no significant difference was observed between ASA-groups in perioperative adverse effects. This finding suggests that optimized perioperative management and advanced surgical techniques may mitigate the impact of ASA classification on surgical outcomes in oncological urology.

**Keywords:** Bladder tumor, oncologic outcomes, prostate cancer

## Introduction

Perioperative adverse effects are critical determinants of surgical outcomes, particularly in oncological urology, where patient comorbidities significantly influence both immediate and long-term results (1). The American Society of Anesthesiologists (ASA) classification system provides a standardized method to assess the physical status of patients prior to surgery. ASA scores ranging from 1 to 2 indicate a low risk for surgical complications, while scores of 3 to 4 reflect moderate to severe systemic disease, suggesting a higher likelihood of perioperative challenges (2). Understanding how these classifications correlate with adverse effects is essential for improving patient safety and optimizing surgical protocols.

In oncological urology, where patients often present with complex medical histories and various comorbid conditions, the perioperative period is particularly vulnerable to complications such as infection, bleeding, and prolonged recovery times. Studies have shown that higher ASA scores are associated with increased rates of perioperative complications, which can impact not only the surgical outcome but also the overall survival and quality of life of cancer patients (3). In oncological urology, specifically, several studies have demonstrated that ASA classification is a significant predictor of morbidity and mortality following procedures such as radical cystectomy or nephroureterectomy (4,5). Therefore, it is imperative to investigate the differences in perioperative adverse effects between patients classified as ASA 1-2 and those classified as ASA 3-4.

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This study aims to conduct a comparative analysis of perioperative adverse effects experienced by ASA 1-2 and ASA 3-4 patients undergoing oncological urological surgeries.

## Materials and Methods

In this retrospective study, patients who underwent open, laparoscopic, or robotic surgery for urological oncological malignancies between 2022 and 2024 were evaluated. The ethics committee approval number was provided by the University of Health Sciences Türkiye, Etlik City Hospital Ethics Committee (approval no: AEŞH-BADEK-2024-1172, date: 11.12.2024).

All surgeries were performed by an experienced surgical team at our center, which has completed the learning curve, as evidenced by achieving the case volumes recommended in the literature to ensure procedural proficiency across various urological oncologic operations. Patients' decisions regarding open, laparoscopic, and robotic surgery were made based on the advantages and disadvantages of each approach, following a mutual exchange of information and a decision-making process, between the patients and the surgical team.

Patients with bladder, kidney, ureter, and prostate cancer in ASA 1-2-3, and 4 groups were included in the study. All collected data were analyzed to obtain demographic details, baseline tumor characteristics, perioperative surgical outcomes, perioperative and postoperative complications, and follow-up information. Patients with missing data and those whose follow-up was not conducted at our center were not included in the study. Each patient who underwent oncological surgery was categorized according to the ASA classification system, using the preoperative anesthesiologist evaluation form for this purpose (2).

### Preoperative Optimization and Perioperative Care Protocols

Additionally, preoperative optimization strategies were implemented for patients in higher ASA categories, including nutritional support, management of comorbidities, optimization of cardiovascular and respiratory function, and the use of thromboprophylaxis. We administered Clexane for one month, and determined its use based on the patient's comorbidities and specific condition through consultations with relevant specialists. These measures aimed to reduce perioperative complications and improve postoperative recovery. Postoperative care protocols focus on early mobilization, pain management, thrombosis prevention, and monitoring for potential complications to ensure optimal recovery and long-term outcomes.

### Evaluation of Adverse Events

To evaluate the safety of surgical procedures, perioperative complications were classified using the Clavien-Dindo grading system (6). The assessment of surgical safety focused primarily on complications graded as 3 or higher, which are considered major adverse events. In this classification, grade 1 complications include any deviation from the typical postoperative course that does not require therapeutic intervention, with the exception of certain medications (e.g., antiemetics, analgesics, and antipyretics). Grade 2 complications involve adverse events that necessitate pharmacological treatment or blood transfusion. Complications managed with interventions performed under anesthesia also fall under grade 3. More severe complications, such as those arising from pneumoperitoneum or the Trendelenburg position, are categorized as grade 4 or grade 5.

### Statistical Analysis

Statistical analyses were performed using SPSS version 25.0 for Windows. Categorical variables were evaluated using the chi-square ($\chi^2$) test, and Fisher's exact test was applied when small sample sizes were encountered. Statistical significance was defined as a p-value of less than 0.05.

## Results

A total of 30 cystectomy patients have been included in the study. Among these patients, 14 belong to ASA 1-2 (group 1), while the remaining 16 belong to ASA 3-4 (group 2). It consists entirely of patients who underwent open radical cystectomy.

A total of 76 patients who underwent nephrectomy were included in the study. Among these patients, 54 were classified as ASA 1-2 (group 1), while the remaining 22 were classified as ASA 3-4 (group 2). Out of the 76 patients, 52 underwent laparoscopic nephrectomy, and 24 underwent open nephrectomy.

A total of 41 patients who underwent partial nephrectomy were included in the study. Among these patients, 17 were classified as ASA 1-2 (group 1), while the remaining 24 were classified as ASA 3-4 (group 2). Among these 41 patients, 26 underwent open partial nephrectomy, and 15 underwent laparoscopic partial nephrectomy.

A total of 22 patients who underwent nephroureterectomy were included in the study. Among these patients, 9 were classified as ASA 1-2 (group 1), while the remaining 13 were classified as ASA 3-4 (group 2). Among these 22 patients, 16 underwent laparoscopic nephroureterectomy, and 6 underwent open nephroureterectomy.

A total of 198 patients who underwent radical prostatectomy were included in the study. Among these patients, 104 were classified as ASA 1-2 (group 1), while the remaining 94 were classified as ASA 3-4 (group 2). Among these 198 patients, 34 underwent open prostatectomy, and 164 underwent robotic prostatectomy.

### Grade 4-5 Complications

Grade 4 to 5 complications occurred among the patients who underwent cystectomy. One patient had a pulmonary embolism (PE), one developed sepsis, one had a myocardial infarction, and one experienced disseminated intravascular coagulation (DIC). The patient with DIC died due to the condition. The patient with DIC was in ASA 3-4 (group 2), while the remaining complications occurred in patients from group 1. There was no statistically significant difference between the two groups (p=0.74). The patient data are summarized in Table 1.

In the nephrectomy group, atrial fibrillation (AF) developed in one patient from ASA 1-2 and one patient from ASA 3-4. PE occurred in one patient from each group. Additionally,

one patient from the ASA 1-2 group developed sepsis due to pneumonia. There was no statistically significant difference between the two groups (p=0.81).

In the partial nephrectomy group, one patient in group 1 developed AF, another had a PE, and another experienced DIC. The patient with DIC, who belonged to the ASA 3-4 group, died due to the condition. There was no statistically significant difference between the two groups (p=0.67).

In the nephroureterectomy group, only one patient required three days of intensive care support due to desaturation. This patient belonged to the ASA 3-4 (group 2) category.

Among the patients who underwent radical prostatectomy, 2 developed PE, 1 had arterial thrombosis-related cerebrovascular occlusion, 1 developed sepsis, 1 had myocardial infarction, and 2 experienced new-onset AF. One patient with PE was from group 1, and the other was from group 2. Sepsis and myocardial infarction occurred in group 1, while both cases of AF were in group 2. There was no statistically significant difference between the two groups (p=0.68). Complications are summarized in Table 2.

## Discussion

Perioperative adverse effects are critical considerations in oncological urology, where surgical complexity and patient comorbidities significantly impact outcomes. Our study aimed to compare perioperative complications among patients with ASA 1-2 and ASA 3-4 classifications undergoing major urological cancer surgeries. Our findings indicate that higher ASA scores are not associated with a statistically significant increase in perioperative complications.

The ASA classification system is widely used to predict perioperative risk, with studies consistently demonstrating that patients with ASA 3-4 scores experience greater postoperative morbidity and mortality (2). However, in our study, while complications such as PE, sepsis, myocardial infarction, AF and DIC were observed, there was no significant difference between the two ASA groups in most surgical categories. This finding aligns with recent literature suggesting that surgical outcomes are influenced by a combination of factors beyond ASA classification alone, including surgical technique, intraoperative management, and perioperative care protocols.

Several studies have analyzed the impact of ASA scores on perioperative complications in various surgical disciplines.

**Table 1. Summary of patients undergoing urological oncological surgeries**

| Surgery | Total patients | ASA 1-2 (group 1) | ASA 3-4 (group 2) | Open surgery | Laparoscopic surgery | Robotic surgery |
|---|---|---|---|---|---|---|
| Radical cystectomy | 30 | 14 | 16 | 30 | 0 | 0 |
| Nephrectomy | 76 | 54 | 22 | 24 | 52 | 0 |
| Partial nephrectomy | 41 | 17 | 24 | 26 | 15 | 0 |
| Nephroureterectomy | 22 | 9 | 13 | 6 | 16 | 0 |
| Radical prostatectomy | 198 | 104 | 94 | 34 | 0 | 164 |

ASA: American Society of Anesthesiologists

**Table 2: Summary of grade 4-5 complications**

| Surgical procedure | Complication | ASA 1-2 (group 1) | ASA 3-4 (group 2) | p-value |
|---|---|---|---|---|
| **Cystectomy** | Pulmonary embolism | 1 | 0 | 0.74* |
| | Sepsis | 1 | 0 | |
| | Myocardial infarction | 1 | 0 | |
| | Disseminated intravascular coagulation (DIC) | 0 | 1 (exitus) | |
| **Nephrectomy** | Atrial fibrillation (AF) | 1 | 1 | 0.81* |
| | Pulmonary embolism | 1 | 1 | |
| | Sepsis (due to pneumonia) | 1 | 0 | |
| **Partial nephrectomy** | Atrial fibrillation (AF) | 1 | 0 | 0.67* |
| | Pulmonary embolism | 1 | 0 | |
| | Disseminated ıntravascular coagulation (DIC) | 0 | 1 (exitus) | |
| **Nephroureterectomy** | Intensive care support (desaturation) | 0 | 1 | - |
| **Radical prostatectomy** | Pulmonary embolism | 1 | 1 | 0.68* |
| | Arterial thrombosis-related CVO | 1 | 0 | |
| | Sepsis | 1 | 0 | |
| | Myocardial infarction | 1 | 0 | |
| | Newly onset atrial fibrillation (AF) | 0 | 2 | |

*chi-square ($\chi^2$) test, and Fisher's exact test, ASA: American Society of Anesthesiologists, CVO: Cerebrovascular occlusion

A meta-analysis found that ASA scores strongly correlated with postoperative morbidity and mortality across multiple surgical specialties (7). Specifically, in oncological urology, higher ASA scores have been linked to increased postoperative complications, prolonged hospital stays, and higher rates of intensive care unit admission. However, some studies suggest that with optimized perioperative management, even ASA 3-4 patients can achieve favorable surgical outcomes, which is in line with our findings (8).

In a study, the authors found that ASA classification alone was a moderate predictor of complications, with other factors such as intraoperative hemodynamic stability, blood loss, and anesthesia type playing equally important roles. In our study, despite the expectation of higher complication rates in the ASA 3-4 patients, the observed complication rates were not significantly different between groups (9). This may be due to the rigorous perioperative care protocols implemented at our center, which include preoperative optimization, intraoperative monitoring, and aggressive postoperative management.

One potential explanation for the lack of statistical significance in complication rates is the evolving nature of surgical techniques. With advancements in laparoscopic and robotic surgery, perioperative morbidity has been substantially reduced. In our study, the majority of radical prostatectomies were performed using a robotic approach, which is associated with lower blood loss, reduced complications, and shorter hospital stays compared to open surgery (10). Similarly, laparoscopic nephrectomy and nephroureterectomy have demonstrated superior perioperative outcomes in various studies, which may contribute to the relatively low complication rates in our cohort.

Several studies have highlighted the benefits of minimally invasive surgery in high-risk patients. A paper compared laparoscopic and open nephrectomy outcomes in patients with high ASA scores and found that laparoscopic surgery was associated with significantly lower rates of complications and faster recovery (11). The predominance of minimally invasive techniques in our study could explain the relatively comparable complication rates between ASA groups.

Despite the absence of statistically significant differences between groups, it is important to consider the impact of individual complications. PE was observed in multiple patients, with at least one case in each ASA group across different surgical procedures. Studies indicate that thromboembolic events are among the leading causes of postoperative morbidity in urological oncology (12). The use of perioperative thromboprophylaxis, early mobilization, and intraoperative monitoring is a crucial strategy to mitigate this risk. The relatively even distribution of PE across ASA groups in our study suggests that while baseline health status plays a role, intraoperative and postoperative factors such as anticoagulation protocols and patient mobilization are equally important.

Sepsis was observed in multiple cases, particularly in patients undergoing cystectomy and nephrectomy. The presence of pre-existing infections, prolonged surgical duration, and urinary tract instrumentation is a key risk factor. Our study supports previous findings that patients with ASA 3-4 scores are at an increased risk of severe infections due to immunosuppression and comorbidities, even though the overall incidence did not significantly differ between groups.

AF was recorded in both nephrectomy and radical prostatectomy patients, with a higher incidence in ASA 3-4 patients. New-onset AF is a well-recognized postoperative complication, particularly in elderly patients and those with pre-existing cardiovascular disease. While our findings suggest that ASA 3-4 patients may be more prone to AF, the lack of statistical significance may indicate that other perioperative factors, such as fluid management, electrolyte balance, and intraoperative anesthesia protocols, play a more significant role.

DIC was observed in the partial nephrectomy and cystectomy groups among patients classified as ASA 3-4, resulting in mortality. DIC is a severe and often fatal condition characterized by widespread activation of the coagulation cascade. Although rare, its occurrence underscores the importance of vigilant perioperative monitoring and early intervention in high-risk patients.

### Study Limitations

Despite its strengths, our study has some limitations. The retrospective nature of the analysis introduces potential biases, including selection bias and incomplete data collection. Additionally, the sample size in certain surgical subgroups is relatively small, which may limit the statistical power to detect differences between ASA groups. Future prospective studies with larger sample sizes are needed to further validate our findings. Another limitation is the lack of detailed intraoperative variables such as estimated blood loss, duration of surgery, and fluid balance, which could provide a more comprehensive understanding of perioperative risk factors. Additionally, long-term outcomes, including cancer-specific survival and overall survival, were not assessed in this study and should be considered in future research.

Our findings have important implications for perioperative management in urological oncology. While ASA classification remains a useful tool for preoperative risk stratification, it should not be the sole determinant of perioperative risk assessment. A comprehensive approach incorporating multimodal risk assessment tools, enhanced recovery after surgery protocols, and individualized perioperative care plans is essential to optimize outcomes.

Further studies are needed to explore additional factors influencing perioperative outcomes, including frailty indices, nutritional status, and prehabilitation strategies. The role of preoperative optimization programs, such as intensive cardiovascular and pulmonary assessments, in high-risk patients should also be investigated.

## Conclusion

While higher ASA scores are generally associated with increased perioperative risk, our study found no statistically significant difference in major complications between ASA 1-2 and ASA 3-4 patients undergoing oncological urological surgeries. This may be attributed to the advancements in surgical techniques, perioperative management strategies, and comprehensive patient care protocols. These findings suggest that with

proper preoperative optimization and careful perioperative management, even patients with higher ASA scores can undergo oncological urological surgeries with comparable outcomes. This may influence clinical decision-making by emphasizing the importance of individualized care rather than relying on ASA score alone. Future prospective studies with larger sample sizes and detailed intraoperative data are necessary to further elucidate the relationship between ASA classification and perioperative outcomes in urological oncology.

### Ethics

**Ethics Committee Approval:** The ethics committee approval number was provided by the, University of health Sciences Türkiye, Etlik City Hospital Ethics Committee (approval no: AEŞH-BADEK-2024-1172, date: 11.12.2024).

**Informed Consent:** A retrospective analysis was conducted on patients who underwent open, laparoscopic, or robotic surgery for bladder, kidney, ureter, and prostate cancer between 2022 and 2024.

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**Publication:** The results of the study were not published in full or in part in form of abstracts.

**Contribution:** There is not any contributors who may not be listed as authors.

### Footnotes

### Authorship Contributions

Surgical and Medical Practices: A.S., M.Y., K.S., A.L.S., A.N.K., Concept: A.L.S., A.N.K., Design: A.S., A.N.K., Data Collection or Processing: H.M.D., F.Ç., Analysis or Interpretation: K.S., A.N.K., Literature Search: A.S., Writing: A.S., H.M.D.

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