Original Article

Perioperative morbidity and mortality of octogenarians treated by radical cystectomy—a multi-institutional retrospective study in Japan

Takashige Abe*, Norikata Takada, Hiroshi Kikuchi, Ryuji Matsumoto, Takahiro Osawa, Sachiyo Murai, Naoto Miyajima, Satoru Maruyama, and Nobuo Shinohara

Department of Urology, Hokkaido University Graduate School of Medicine, Sapporo, Japan

*For reprints and all correspondence: Takashige Abe, Department of Urology, Hokkaido University Graduate School of Medicine, North-15, West-7, North Ward, Sapporo 060-8638, Japan. E-mail: takataka@rf6.so-net.ne.jp

Received 20 February 2017; Editorial Decision 13 April 2017; Accepted 20 April 2017

Abstract

Objective: To determine the characteristics of 90-day morbidity and mortality after radical cystectomy in Japanese octogenarians.

Methods: A retrospective multi-institutional study. We reviewed the records of 834 patients treated by open radical cystectomy between 1997 and 2010. All complications within 90 days after surgery were sorted into the 11 categories proposed by the Memorial Sloan-Kettering Cancer Center and graded according to the modified Clavien-Dindo system. We compared the characteristics of complications between ≥80-year (n = 86) and <80-year (n = 748) groups. Multivariate regression models were used to determine the predictors of complications.

Results: American Society of Anesthesiologists score III–IV was more frequent (14% vs. 6%, respectively, P < 0.0001), and ureterocutaneostomy was more frequently performed (30% vs. 21%, respectively, P = 0.0148) in the ≥80-year group compared with <80-year group. There were no significant differences in the rates of any complication, major (Grade 3–5) complication, or 90-day mortality between the two groups (≥80-year group: 70%, 21%, 3.5%, respectively, <80-year group: 68%, 22%, 2%, respectively). The ≥80-year group had fewer genitourinary complications (7% vs. 16%, respectively, P = 0.0131). Multivariate regression analyses revealed that bowel-using urinary diversion (P = 0.0031) and the operative time (P = 0.0269) were significant predictors of any grade of complications, and a male sex (P = 0.0167), annual cystectomy volume (P = 0.0284) and prior cardiovascular comorbidity (P = 0.0034) were significant predictors of major complications.

Conclusions: In our experience, radical cystectomy in Japanese octogenarians caused similar perioperative comorbidities. Old age as a single criterion should not be used to abandon radical cystectomy; careful preoperative assessment is mandatory.

Key words: octogenarian, complication, radical cystectomy, morbidity, mortality

Introduction

Because of the progressive increase of the aging population, especially in developed countries, appropriate medical treatments for elderly people are becoming a marked concern in daily clinical practice. In Japan, according to 2014 population estimates, 25.9% of the population is above the age of 65 (Ministry of Internal Affairs and Communication, Statistics Bureau, http://www.stat.go.jp/english/data/nenkan/1431-02.htm). Furthermore, according to projections of the population based on the present fertility rate, those above this age will account for 40% of the population by 2060.
In urological surgery, radical cystectomy (RC) is associated with high levels of morbidity and mortality, and, so far, RC for the elderly has been reported to be associated with higher but acceptable morbidity and mortality (1–5). For example, Donat et al. reported in the Memorial Sloan-Kettering Cancer Center series that octogenarians had a higher incidence of minor (55% vs. 50%, respectively), and major (17% vs. 13%, respectively) complications than a younger cohort, but the differences were not significant (1). However, in a study derived from Surveillance Epidemiology and End Results database study, Hollenback et al. observed that only 12% of octogenarians with invasive cancer underwent extirpative surgery (6), which suggested that concern over complications/mortality risk associated with RC might drive physicians to select conservative treatments for octogenarians before a thorough health status assessment. For further understanding of complications/mortality risk associated with RC in octogenarians, we consider that data collection in a standardized manner is still warranted. In the current study, using a standardized method reported by Shabsigh et al. (7), where the complications were grouped into 11 categories to allow comparison with different cohorts, we performed a comparative study of the type, incidence, and severity of complications occurring within 90 days after RC between octogenarian and younger groups.

Patients and methods

Each institutional review board approved the review of the medical charts of 928 patients (pts) with muscle-invasive or high-grade non-invasive bladder cancer undergoing open RC at Hokkaido University Hospital and 20 affiliated institutions between 1997 and 2010. We collected information on the backgrounds, perioperative outcomes, and 90-day morbidity events after surgery, and previously published a paper on the total cohort (8). In the present study, in order to homogenize the cohort, we excluded the 94 pts receiving simultaneous nephroureterectomy, and the remaining 834 pts treated by RC were included. In terms of grouping the complications, we categorized those into the 11 categories developed by the Memorial Sloan-Kettering Cancer Center (MSKCC) (7). The 11 categories were as follows: gastrointestinal, infectious, wound, genitourinary, cardiac, pulmonary, bleeding, thromboembolic, neurological, miscellaneous and surgical. In terms of the severity, each morbidity was graded according to the Clavien-Dindo grading system (9). In addition, for the severity of ileus, according to the new Japan Clinical Oncology Group (JCOG) post-operative complication criteria, where the 72 most common post-operative complications are defined in detail according to the general grading rules of the Clavien-Dindo classification (10), we allocated Grade 3 to the complication of gastro-enteric tube (long tube) decompression, which was a common conservative treatment method for ileus in Japan (11), although we applied each investigator's grading in the first paper. Thereafter, we compared the incidence, type, and grading of 90-day morbidity between an octogenarian cohort (n = 86) and a younger cohort (n = 748). In terms of our treatment decision and perioperative care, the method of urinary diversion was determined based on discussions between the patient and physician, and the template of lymphadenectomy was determined by each physician. Regarding perioperative management, an intermittent pneumatic compression pump and/or stockings were used for the prevention of deep vein thrombosis without the routine use of prophylactic anticoagulation. In general, second-generation cephalosporins were prophylactically dripped for 3–4 days. Oral feeding was initiated earlier in the later study period based on the enhanced recovery after surgery (ERAS) protocol (12,13).

Statistical analyses

Comparisons between the two groups were performed using Mann–Whitney U and χ²-tests. Logistic regression analyses were performed to clarify factors predicting that patients would develop complications. The characteristics analyzed were the sex, age (continuous and ≥80 vs. <80 years), American Society of Anesthesiologists (ASA) score, body mass index (BMI), average annual cystectomy volume (<5 per year vs. ≥5 per year), hospital of cardiovascular disease (including hypertension), history of diabetes mellitus, previous surgery, pulmonary disease, and cerebrovascular disease, organ-confined disease, urinary diversion methods (ileal conduit or neobladder vs. others), operative time (≥400 vs. <400 min) and blood loss (>1300 vs. <1300 mL). All calculations were performed using JMP® version 12.01. P values <0.05 were considered significant.

Results

Patient characteristics

Table 1 summarizes patient characteristics divided by age. Cardiovascular comorbidity was more common in the ≥80-year group than in the <80-year group (63%, 54/86 and 39%, 292/748, respectively, P < 0.0001). In terms of urinary diversion, ureterocutaneostomy was selected more frequently in the ≥80-year group than in the <80-year group (30%, 26/84 and 21%, 155/748, respectively, P = 0.0148). As reported previously, 1 hospital was categorized as high-volume, 7 as moderate-volume and 13 as low-volume (8).

Perioperative complications

In the present cohort, 571 (68%, 571/834) patients had at least one complication within 90 days of RC. There was no significant difference in the complication rates between the ≥80-year group and <80-year group (≥80-year group: 70%, 60/86, <80-year group: 68%, 511/748, P = 0.783). Table 2 summarizes complications in the two groups. The ≥80-year group had fewer genitourinary complications (7%, 6/86 vs. 16%, 122/748, respectively, P = 0.0131). Regarding major complications (Grade 3–5), 186 (22%, 186/834) patients experienced them, and no significant difference in the rate was observed between the two groups (≥80-year group: 21%, 18/86, <80-year group: 22%, 168/748, P = 0.7433). Concerning the re-operation rate, there was no significant difference between the two groups (≥80-year group: 14%, 12/86, <80-year group: 11%, 83/748, P = 0.4418). Supplementary Table 1 summarizes the major complications and categories in the two groups. Again, fewer genitourinary complications were observed in the ≥80-year group (1.2%, 18/86 vs. 6.3%, 47/748, respectively, P = 0.0218). There were 18 deaths within 90 days after surgery. No intraoperative death was observed. Overall, eight patients died from cancer progression after surgery, four patients from gastrointestinal events, two from pulmonary events, two from hemorrhagic events, one from a cardiovascular event, and one from an infection-related event, respectively. In the ≥80-year group, one patient died from a gastrointestinal event, one from a hemorrhagic event, and one from an infectious event. The 30-day mortality rate was 2.3% (2/86) in the ≥80-year group and 0.5% (4/748) in the <80-year group (P = 0.1257), and the 90-day mortality...
rate was 3.5% (3/86) in the ≥80-year group and 2% (15/748) in the <80-year group (P = 0.405).

Predictors of complications
Tables 3 and 4 show the results of logistic regression analyses. Urinary diversion methods (P = 0.0031) and the operative time (P = 0.0269) were significant predictors of any grade of complications in the multivariate model (Table 3). For major complications, male sex (P = 0.0167), annual cystectomy volume (P = 0.0284) and prior cardiovascular comorbidity (P = 0.0034) were significant on multivariate analysis (Table 4).

Discussion
We previously reported that 68% (635/928) of patients experienced at least one 90-day complication, and 17% (156/928) experienced major complications (8). In the present study, excluding patients with simultaneous nephroureterectomy, we compared the postoperative comorbidity and mortality occurring within 90 days after RC between octogenarians and younger groups. Recently, 90-day estimates of comorbidity and mortality have been the most frequently used. A potential background factor would be that recent improvements in perioperative management have postponed surgery-related complications, especially death events. Isbarn et al. also reported in the SEER data that 30-, 60- and 90-day perioperative mortality rates were 1.1%, 2.4% and 3.9%, respectively, and 90-day rates would be the most meaningful assessments (14). As a result, we observed that there was no significant difference in the incidence or severity of postoperative complications between the two groups. Regarding perioperative mortality in the octogenarians undergoing RC, Izquierdo et al. reviewed the previous studies, and reported that the mortality rate among series varied widely from 0 to 14% (2). Hence, the present mortality rate in the Japanese octogenarians was in the lower range of the previous series (30-day mortality: 2.3%, 90-day mortality: 3.5%). To our knowledge, this is the largest study of perioperative morbidity and mortality of octogenarians in an Asian cohort. We consider that one of the main reasons for our low mortality would be the low incidence of cardiac (1.2%, 3/193). Iwai et al. also observed a low incidence of cardiac (3/193; 1.6%) and thromboembolic (1/193; 0.5%) events in another Japanese cohort (16). The long postoperative stay (40 days) in our study, probably influenced by universal health coverage, which allows for long admission with an affordable self-pay burden, and the lower BMI (median, 23.0 kg/m²) might also have had some impact on the mortality rate in the current cohort. Because there would be hidden patients managed non-surgically due to their unfitness for RC, our observation of the equivalent morbidity between the two groups might indirectly support the...
In the present comparative study of categories between octogenarian and younger groups, fewer genitourinary complications were observed in the octogenarians for both all and major complications, actually, in the present cohort, ureterocutaneostomy was performed more frequently, and the total operative time was significantly shorter in the octogenarian compared with younger cohort (17). Old age as a single criterion should not be used to abandon RC; careful preoperative assessment of the overall health status is mandatory.

In terms of risk factors for postoperative complications, urinary diversion methods ($P = 0.0031$) and the operative time ($P = 0.0269$) were significant predictors of any grade of complications in the multivariate model. We consider that these observations indirectly support the concept of avoiding the use of the bowel for urinary diversion in vulnerable patients. Actually, in the present cohort, ureterocutaneostomy was performed more frequently, and the total operative time was significantly shorter in the ≥80-year group than in the <80-year group. Recently, Berger et al. reported a significantly lower overall rate of severe complications in a ureterocutaneostomy group (11.5%) compared with patients undergoing bowel-using diversion (25%) ($P = 0.03$) in those aged 75 years or older, and noted the need to reconsider ureterocutaneostomy in vulnerable patients (18). As major complications, prior cardiovascular comorbidity ($P = 0.0034$), the annual cystectomy volume ($P = 0.0284$) and male sex ($P = 0.0167$) were significant on multivariate

### Table 2. Summary of complications and categories according to age group

| Category       | Total, $n = 834$ | ≥80 years, $n = 86$ | <80 years, $n = 748$ | $P$ value | Complication                        | Frequency         |
|----------------|-----------------|------------------|-----------------|----------|-----------------------------------|------------------|
| **Gastrointestinal** | 216             | 23               | 193             | 0.8507   | Ileus                             | 189              |
|                |                 |                  |                 |          | Bowel leak                        | 14               |
|                |                 |                  |                 |          | Gastrointestinal bleeding         | 5                |
|                |                 |                  |                 |          | Clostridium difficile colitis     | 12               |
|                |                 |                  |                 |          | Rectal stenosis                   | 1                |
|                |                 |                  |                 |          | Gastric ulcer                     | 3                |
| **Infectious**  | 258             | 31               | 227             | 0.2848   | FUO                               | 25               |
|                |                 |                  |                 |          | UTI                               | 186              |
|                |                 |                  |                 |          | Sepsis                            | 11               |
|                |                 |                  |                 |          | Gastroenteritis                   | 2                |
|                |                 |                  |                 |          | Cholecystitis                     | 2                |
|                |                 |                  |                 |          | Iliopsoas muscle abscess          | 1                |
|                |                 |                  |                 |          | Other site infection              | 33               |
| **Wound**      | 179             | 16               | 163             | 0.4889   | Wound dehiscence                  | 162              |
|                |                 |                  |                 |          | Urinary leak                      | 34               |
|                |                 |                  |                 |          | Renal failure                     | 5                |
|                |                 |                  |                 |          | Necrosis of ileal conduit         | 5                |
| **Cardiac**    | 6               | 1                | 5               | 0.6336   | Arrhythmia                        | 2                |
|                |                 |                  |                 |          | Ischemic heart disease            | 2                |
|                |                 |                  |                 |          | Congestive heart failure          | 2                |
|                |                 |                  |                 |          | Pneumonia                         | 11               |
| **Pulmonary**  | 12              | 2                | 10              | 0.4984   | Respiratory distress              | 2                |
|                |                 |                  |                 |          | Pleural effusion                  | 1                |
|                |                 |                  |                 |          | Lung edema                        | 2                |
|                |                 |                  |                 |          | Interstitial pneumonia            | 1                |
| **Bleeding**   | 4               | 1                | 3               | 0.4019   | Anemia requiring transfusion      | 3                |
|                |                 |                  |                 |          | Wound hematomata                  | 1                |
| **Thromboembolic** | 3               | 0                | 3               | 0.4186   | Deep venous thrombosis            | 1                |
|                |                 |                  |                 |          | Pulmonary embolism                | 2                |
| **Neurological** | 15              | 3                | 12              | 0.2618   | Cerebrovascular event             | 7                |
|                |                 |                  |                 |          | Peripheral neuropathy             | 3                |
|                |                 |                  |                 |          | Delirium/ Agitation               | 5                |
| **Miscellaneous** | 21              | 1                | 20              | 0.3498   | Lymphocele                        | 2                |
|                |                 |                  |                 |          | Dermatitis                        | 2                |
|                |                 |                  |                 |          | Liver dysfunction                 | 3                |
|                |                 |                  |                 |          | Other rare complications           | 14               |
| **Surgical**   | 6               | 1                | 5               | 0.6336   | Rectal injury                     | 3                |
|                |                 |                  |                 |          | Incisional hernia                 | 3                |

**Recent concept of comprehensive geriatric assessment in older patients with cancer, not solely based on the chronological age (17).**
analysis. The significance of prior cardiovascular comorbidity was consistent with our previous observation (8). Regarding the effect of the surgical volume on the morbidity rate, this was well-established in previous studies (19,20). For example, Leow et al., using an all-payer hospital discharge database in the USA, reported that surgeons performing ≥7 RCs/year had 45% lower odds of encountering major complications (odds ratio: 0.55; P < 0.001) compared with surgeons performing one RC/year (21). In terms of sex differences, we do not have an adequate explanation. In contrast, Siegrist et al. reported that their female cohort showed a significantly higher rate of complications (22).

The Clavien-Dindo classification for postoperative complications has been widely used and it enables us to compare surgical outcomes from different institutes. However, the inter-observer variability inherent in the classification was also recognized because of its general criteria (23,24). For example, long-tube decompression is frequently used for the conservative management of postoperative ileus in Japan, which reaches the distal small bowel beyond the Treiz ligament. However, the original Clavien-Dindo classification does not define specific grading. As mentioned in Materials and Methods, according to the JCOG criteria, we allocated Grade 3 to postoperative ileus treated by long-tube decompression and Grade 2 to that treated with a nasogastric tube (short tube), which resulted in a higher major complication rate of 22% than our previous observation (17%). In the present series, 57 patients underwent long-tube decompression, and, in 86% (49/57) of the patients, Grade 2 had been allocated by the original grader. We agree that detailed grading

| Variables analyzed                  | No. of patients | Univariate analysis | Mutivariate analysis |
|------------------------------------|-----------------|---------------------|---------------------|
|                                    |                 | Odds ratio (95% CI) | P value             | Odds ratio (95% CI) | P value             |
| Sex                                |                 |                     |                     |
| Male                               | 642             | 1.503 (1.071–2.101) | 0.0186              | 1.363 (0.959–1.928) | 0.0837              |
| Female                             | 192             | 1                   |                     |
| Age                                |                 |                     |                     |
| ≥80                                | 86              | 1.070 (0.666–1.764) | 0.783               |                      |
| <80                                | 748             | 1                   |                     |
| Continuous                         |                 |                     |                     |
| ASA score                          |                 |                     |                     |
| ≥II                                | 462             | 1.015 (1.000–1.031) | 0.0469              | 1.016 (0.999–1.034) | 0.0678              |
| I                                  | 296             | 1                   |                     |
| BMI (kg/m²)                        |                 |                     |                     |
| ≥25                                | 216             | 1.015 (0.683–1.767) | 0.2146              |                      |
| <25                                | 581             | 1                   |                     |
| Average annual cytectomy volume    |                 |                     |                     |
| High (10 ≤ per year)               | 122             | 0.992 (0.640–1.555) | 0.9715              |                      |
| Moderate (5–10 per year)           | 366             | 1.030 (0.751–1.414) | 0.8532              |                      |
| Low (≤5 per year)                  | 346             | 1                   |                     |
| Prior cardiovascular comorbidity    |                 |                     |                     |
| Yes                                | 346             | 1.012 (0.780–1.316) | 0.837               | 1.363 (0.959–1.928) | 0.0837              |
| No                                 | 488             | 1                   |                     |
| Prior surgical history             |                 |                     |                     |
| Yes                                | 139             | 1.015 (0.666–1.764) | 0.783               |                      |
| No                                 | 695             | 1                   |                     |
| Prior pulmonary comorbidity        |                 |                     |                     |
| Yes                                | 44              | 1.015 (0.666–1.764) | 0.783               |                      |
| No                                 | 790             | 1                   |                     |
| Prior cerebrovascular comorbidity  |                 |                     |                     |
| Yes                                | 46              | 1.015 (0.666–1.764) | 0.783               |                      |
| No                                 | 788             | 1                   |                     |
| Prior diabetes mellitus comorbidity|                 |                     |                     |
| Yes                                | 131             | 1.015 (0.666–1.764) | 0.783               |                      |
| No                                 | 692             | 1                   |                     |
| Organ-confined disease             |                 |                     |                     |
| No                                 | 368             | 1.015 (0.666–1.764) | 0.783               |                      |
| Yes                                | 455             | 1                   |                     |
| Types of urinary diversion         |                 |                     |                     |
| Ileal conduit or neobladder        | 646             | 1.015 (0.666–1.764) | 0.783               |                      |
| Others                             | 188             | 1                   |                     |
| Operative time (minutes)           |                 |                     |                     |
| ≥400                               | 389             | 1.015 (0.666–1.764) | 0.783               |                      |
| <400                               | 423             | 1                   |                     |
| Estimated blood loss (mL)          |                 |                     |                     |
| ≥1300                              | 406             | 1.015 (0.780–1.316) | 0.837               |                      |
| <1300                              | 407             | 1                   |                     |
guidelines allow more precise comparative studies of surgical complications (10).

The present study had several limitations, including its retrospective design. Several minor events might be missed during data extraction. There would be variations in terms of surgical techniques as well as postoperative management among the participating hospitals. Because our multi-institutional database only included patients undergoing RC, we could not calculate the number of octogenarians in whom RC was aborted due to a poor performance status or for whom conservative treatment was selected in the participating hospitals. Several background factors are different from those in Western countries, including the healthcare insurance system in Japan and postoperative management for ileus, which might have influences on our observations. Interestingly, at least in the United States and United Kingdom, decompression with a short tube (nasogastric tube) is the most common conservative management for postoperative ileus, and a long tube is barely selected (personal communication). In addition, a minimum invasive approach has also been introduced to RC in Japan; therefore, we need to re-evaluate the incidence and severity of postoperative complications in the latest cohort. Nevertheless, we believe that the present study generated several important findings.

Supplementary data
Supplementary data are available at Japanese Journal of Clinical Oncology online.
Acknowledgements

We thank Toru Harabayashi, Kimyoshi Mitsushashi, Katsuki Miura, Ichiro Takeuchi, Manabu Kitahara, Satoshi Nagamori, Shin Suzuki, Kouichi Kanagawa, Masashi Murakumo, Junri Shindo, Ken Morita, Kinya Matsunura, Masami Nantan, Shigeo Sakashita, Akira Kumagai, Takeshi Shibata, Yutaka Toyoda, Yuichiro Shinno, Sosho Satou, Takaya Hioka, Hiroyuki Matsuda, Takuya Sato, Keiji Sugishita, Shinji Kamota, Takekori Yamashita, Tatsuo Kaneda, Manabu Mouri, Takenori Ono, Takenori Sakuta, Tango Mochinuki, Toshiki Aoyagi, Hidegori Kato, Haruo Seki, Kazushi Hirakawa, Keita Minami, Toshimori Seki, Masaki Togashi, Hiroshi Sano, Junji Ishizuki, Yukiko Kanno, Tomohide Akino and Tatsuya Mori for data collection.

Conflict of interest statement

None declared.

References

1. Donat SM, Siegrist T, Cronin A, Savage C, Milowsky MI, Herr HW. Radical cystectomy in octogenarians—does morbidity outweigh the potential survival benefits? J Urol 2010;183:2171–7.
2. Izquierdo L, Peri L, Leon P, et al. The role of cystectomy in elderly patients—a multicentre analysis. BJU Int 2015;116:73–9.
3. Tyritzis SI, Papadoukakis S, Katafigiotis I, et al. Implementation and external validation of Preoperative Aspects and Dimensions Used for an Anatomical (PADUA) score for predicting complications in 74 consecutive partial nephrectomies. BJU Int 2012;109:1813–8.
4. Zakaria AS, Santos F, Tanguay S, Kassouf W, Aprikian AG. Radical cystectomy in patients over 80 years old in Quebec: A population-based study of outcomes. J Surg Oncol 2015;111:917–22.
5. Schiffmann J, Gandaglia G, Larcher A, et al. Contemporary 90-day mortality rates after radical cystectomy in the elderly. Eur J Surg Oncol 2014;40:1738–45.
6. Hollenbeck BK, Miller DC, Taub D, et al. Aggressive treatment for bladder cancer is associated with improved overall survival among patients 80 years old or older. Urology 2004;64:292–7.
7. Shabagh A, Korets R, Vora KC, et al. Defining early morbidity of radical cystectomy for patients with bladder cancer using a standardized reporting methodology. Eur Urol 2009;55:164–74.
8. Takada N, Abe T, Shinnohara N, et al. Peri-operative morbidity and mortality related to radical cystectomy: a multi-institutional retrospective study in Japan. BJU Int 2012;110:E756–64.
9. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240:205–13.
10. Katayama H, Kurokawa Y, Nakamura K, et al. Extended Clavien-Dindo classification of surgical complications: Japan Clinical Oncology Group postoperative complications criteria. Surg Today 2016;46:668–85.
11. Tanaka S, Yamamoto T, Kubota D, et al. Predictive factors for surgical indication in adjuvant small bowel obstruction. Am J Surg 2008;196:23–7.
12. Karl A, Buchner A, Becker A, et al. A new concept for early recovery after surgery for patients undergoing radical cystectomy for bladder cancer: results of a prospective randomized study. J Urol 2014;191:335–40.
13. Ceranotta Y, Valerio M, Persson B, et al. Guidelines for perioperative care after radical cystectomy for bladder cancer: Enhanced Recovery After Surgery (ERAS®) society recommendations. Clin Nutr 2013;32:879–87.
14. Isbarn H, Jeldres C, Zini L, et al. A population based assessment of perioperative mortality after cystectomy for bladder cancer. J Urol 2009;182:70–7.
15. Osawa T, Lee CT, Abe T, et al. A multi-center international study assessing the impact of differences in baseline characteristics and perioperative care following radical cystectomy. Bladder Cancer 2016;2:251–61.
16. Iwai A, Koga F, Fujiy Y, et al. Perioperative complications of radical cystectomy after induction chemoradiotherapy in bladder-sparing protocol against muscle-invasive bladder cancer: a single institutional retrospective comparative study with primary radical cystectomy. Jpn J Clin Oncol 2011;41:1373–9.
17. Wildiers H, Heeren P, Puts M, et al. International Society of Geriatric Oncology consensus on geriatric assessment in older patients with cancer. J Clin Oncol 2014;32:595–603.
18. Berger I, Wehrberger C, Ponholzer A, et al. Impact of the use of bowel for urinary diversion on perioperative complications and 90-day mortality in patients aged 75 years or older. Urol Int 2015;94:394–400.
19. Elting LS, Pettaway C, Bekele BN, et al. Correlation between annual volume of cystectomy, professional staffing, and outcomes: a statewide, population-based study. Cancer 2005;104:975–84.
20. Barbieri CE, Lee B, Cookson MS, et al. Association of procedure volume with radical cystectomy outcomes in a nationwide database. J Urol 2007;178:1418–21; discussion 21-2.
21. Leow JJ, Reese S, Trinh QD, et al. Impact of surgeon volume on the morbidity and costs of radical cystectomy in the USA: a contemporary population-based analysis. BJU Int 2015;115:713–21.
22. Siegrist T, Savage C, Shabagh A, Cronin A, Donat SM. Analysis of gender differences in early perioperative complications following radical cystectomy at a tertiary cancer center using a standardized reporting methodology. Urol Oncol 2010;28:132–7.
23. Poletajew S, Zapala L, Pietrowicz S, et al. Interobserver variability of Clavien-Dindo scoring in urology. Int J Urol 2014;21:1274–8.
24. Elkoshy MA, Luz MA, Bendiur T, Aldousari S, Aprikian AG, Andonian S. Clavien classification in urology: is there concordance among post-graduate trainees and attending urologists? Can Urol Assoc J 2013;7:179–84.