

# Postoperative Urinary Retention Following Anterior Cervical Spine Surgery for Degenerative Cervical Disc Diseases

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**Background:** Postoperative urinary retention (POUR) may cause bladder dysfunction, urinary tract infection, and catheter-related complications. It is important to be aware and to be able to identify patients at risk of developing POUR. However, there has been no study that has investigated the incidence and risk factors for the development of POUR following anterior cervical spine surgery for degenerative cervical disc disease.

**Methods:** We included 325 patients (164 male and 161 female), who underwent anterior cervical spine surgery for cervical radiculopathy or myelopathy due to primary cervical disc herniation and/or spondylosis, in the study. We did not perform *en bloc* catheterization in our patients before the operation.

**Results:** There were 36 patients (27 male and 9 female) that developed POUR with an overall incidence of 11.1%. The mean numbers of postoperative in-and-out catheterizations was 1.6 times and mean urine output was 717.7 mL. Thirteen out of 36 POUR patients (36%) underwent indwelling catheterization for a mean 4.3 days after catheterization for in-and-out surgery, because of persisting POUR. Seven out of 36 POUR patients (19%) were treated for voiding difficulty, urinary tract irritation, or infection. Chi-square test showed that patients who were male, had diabetes mellitus, benign prostate hypertrophy or myelopathy, or used Demerol were at higher risk of developing POUR. The mean age of POUR patients was higher than non-POUR patients (68.5 years vs. 50.8 years,  $p < 0.01$ ).

**Conclusions:** To avoid POUR and related complications as a result of anterior cervical spine surgery for degenerative cervical disc disease, we recommend that a catheter be placed selectively before the operation in at-risk patients, the elderly in particular, male gender, diabetes mellitus, benign prostate hypertrophy, and myelopathy. We recommend that Demerol not be used for postoperative pain control.

**Keywords:** Postoperative urinary retention, Anterior cervical spine surgery, Degenerative cervical disc diseases

Postoperative urinary retention (POUR) occurs after anesthesia and surgery and the overall incidence reported in the

literature ranges widely from 5% to 70%.<sup>1-4)</sup> Inappropriate diagnosis and management of POUR may cause bladder dysfunction, urinary tract infection, and catheter-related complications. Awareness and identification of patients at risk of developing POUR thus assumes great significance for the prevention or management of POUR and its related complications. When performing anterior cervical spine surgery for degenerative cervical disc diseases, we do not use *en bloc* indwelling catheterization before the operation for our patients because of the minimal blood loss and due

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to the need for transfusion in this type of surgery. It has been our experience that POUR occurs in some patients who undergo anterior cervical spine surgery for degenerative cervical disc diseases. To our knowledge, however, there has been no study to investigate the incidence and risk factors for the development of POUR after anterior cervical spine surgery for degenerative cervical disc diseases. When risk factors are identified for POUR after anterior cervical spine surgery for degenerative cervical disc diseases, the catheterization regime can be adjusted according to the individual risk for POUR. Therefore, we undertook the current study to analyze this issue.

## METHODS

Between January 2007 and December 2010, there were 325 patients (164 male and 161 female) who underwent anterior cervical decompression and fusion or total disc replacement for cervical radiculopathy and/or myelopathy due to primary herniated nucleus pulposus or spondylosis and who were included in this study. One-hundred sixty four patients were male and 161 were female. Mean age of the patients was 51.2 years (range, 27 to 76 years). Level of the operation was 218 patients at one-level surgery, 103 at 2-level surgery, and 4 at 3-level surgery. Two-hundred sixty-five patients underwent anterior cervical discectomy and fusion using allograft and demineralized bone matrix and 60 patients underwent artificial disc replacement. The patients were not catheterized *en bloc* before operation. No patients underwent transfusions perioperatively.

The diagnosis of POUR was made by a urologist and was based on the occurrence of pain and discomfort in the lower part of abdomen, especially upon palpation of the suprapubic area; the inability to void despite a full bladder, and the need for postoperative catheterization were additional symptoms towards diagnosis.<sup>1-4)</sup> Risk factors for development of POUR that were included in the analysis were age, gender, comorbidities (diabetes, hypertension, cerebrovascular accident, and benign prostate hypertrophy), previous surgical histories (abdominal pelvic and hemorrhoid), disease type (radiculopathy or myelopathy), and perioperative medications. Total blood loss, total input, operation time, level of surgery, patient's age, and duration of hospital stay were analyzed as well. Statistical analyses were performed using the chi-square test and independent sample *t*-test. A  $p < 0.05$  was considered to be significant.

## RESULTS

Out of 325 patients, 36 patients (27 male and 9 female)

had POUR with an overall incidence of 11.1%. The mean number of postoperative in-and-out catheterization was 1.6 times (range, 1 to 3 times) and mean urine output was 717.7 mL (range, 323 to 895 mL). In addition, 13 (36%) out of 36 POUR patients underwent indwelling catheterization for a mean 4.3 days (range, 3 to 8 days) additionally because of POUR persisting after in-and-out catheterization. Mean hospital stay of POUR and non-POUR patients was 8.5 days (range, 6 to 10 days) and 5.7 days (range, 3 to 7 days), respectively; the difference was statistically significant ( $p < 0.05$ ). Seven patients (19%) were treated for voiding difficulty, urinary tract irritation, or infection in urology for 2 to 4 weeks after surgery, respectively.

According to the independent sample *T*-test, the mean age of POUR patients was significantly higher than for non-POUR patients ( $68.5 \pm 6.2$  years vs.  $50.8 \pm 5.2$  years,  $p < 0.01$ ). However, there were no significant differences in operation time ( $102.8 \pm 31.5$  minutes vs.  $98.2 \pm 28.3$  minutes,  $p = 0.293$ ), level of surgery ( $1.42 \pm 0.6$  levels vs.  $1.33 \pm 0.5$  levels,  $p = 0.346$ ), total blood loss ( $52.9 \pm 21.7$  mL vs.  $45.2 \pm 16.9$  mL,  $p = 0.626$ ), and total input ( $590.8 \pm 122.1$  mL vs.  $547.3 \pm 106.2$  mL,  $p = 0.645$ ) between POUR and non-POUR patients, respectively.

Chi-square test showed that male sex (male 16.5% vs. female 5.5%,  $p < 0.01$ ), diabetes (23.9% vs. 9.8%,  $p < 0.01$ ), benign prostate hypertrophy (56.7% vs. 7.5%,  $p < 0.001$ ), and myelopathy (myelopathy 33.3% vs. radiculopathy 10.0%,  $p < 0.01$ ) were significant risk factors for the development of POUR. However, previous abdominal/pelvic surgeries (5% vs. 9.5%,  $p = 0.523$ ), hemorrhoid surgery (0% vs. 12.5%,  $p = 1$ ), hypertension (7.8% vs. 12.5%,  $p = 0.482$ ), and cerebrovascular accident (0% vs. 9%,  $p = 1$ ) were not significant risk factors.

Finally, we analyzed the effect of medications on the development of POUR using the chi-square test. With respect to medications, the use of Demerol was the only risk factor for POUR; the incidence of POUR was significantly higher in patients who received Demerol injections, especially in amounts more than 100 mg, compared with patients who did not (20.5% vs. 9.8%,  $p < 0.05$ ). However, the use of Ketoracyn (4.2% vs. 10%,  $p = 0.475$ ), Zopran (5.9% vs. 13.7%,  $p = 0.109$ ), Fentanyl (8.4% vs. 12.5%,  $p = 0.498$ ), Ketorolac (7.5% vs. 14.6%,  $p = 0.212$ ), and Nausea (12.8% vs. 7.8%,  $p = 0.375$ ) were not significant risk factors for POUR.

## DISCUSSION

Because anterior cervical spine surgery for degenerative cervical disc diseases is performed through the inter-

muscular tissue plane, it causes minimal blood loss and so the patient generally does not need a large amount of intravenous fluid or transfusion. It has been our policy not to use an indwelling catheterization preoperatively in all patients with *en bloc*. It has also been our experience that POUR occurs in certain patients and that they often suffer the double blows of POUR and catheter-related complications. In contrast to our policy, most spinal surgeons routinely use an indwelling catheterization preoperatively. It may seem to be convenient to catheterize for avoidance of POUR. However, there are concerns about the increased rates of both urinary and deep infections in catheterized patients.<sup>5-7)</sup> The decision to catheterize a patient preoperatively while they undergo anterior cervical spine surgery for degenerative cervical disc disease treatment seems to be somewhat controversial.

According to previous studies, risk factors for development of POUR are multifactorial; they include increasing age, male gender, spinal anesthesia, acute confusion, immobility, previous history of urological diseases, enlargement of the prostate, urethral stricture, large amount of intravenous fluids or transfusion, long duration of surgery, diabetes for more than 15 years, and cholinergic medications and analgesics.<sup>1-4,8-11)</sup> When risk factors are identified for POUR, the catheterization regime can be adjusted to an individual's risk for POUR. However, there has been no study to investigate the incidence and risk factors for POUR after anterior cervical spine surgery for degenerative cervical disc diseases. Therefore, we undertook the current study to analyze this issue.

The current study demonstrates that the incidence of POUR after anterior cervical spine surgery for degenerative cervical disc diseases was 11.1% and that older age, male gender, comorbidities of diabetes and benign prostate hypertrophy, myelopathic disease, and use of Demerol were significant risk factors for development of POUR. The 11% occurrence of POUR in our series was relatively lower than we expected. We think that the lower incidence of POUR in our series may be attributed to the minimal blood loss, lack of transfusions, relatively small amount of intravenous fluid, and short operation duration times in our sample. Risk factors for POUR in our series are consistent with previous studies: older age (about 68.5 years), male gender, diabetes and benign prostate hypertrophy.<sup>1-4,8-11)</sup> An interesting risk factor of our study was disease type, i.e., myelopathy: POUR occurs about 3 times higher in patients with myelopathy than in patients with radiculopathy. Cervical myelopathy is a chronic disease caused by long-standing compression of the spinal cord,

while cervical radiculopathy is caused by acute compression of the root. We think that the difference in nature of cervical myelopathy and radiculopathy could affect the incidence of POUR.

In general, opioid and non-opioid analgesics have been used for postoperative pain control after surgery. It has been known that the tone of the bladder detrusor muscle, ureters, and vesicle sphincter is increased by opioids, which sometimes results in urinary retention.<sup>12-15)</sup> The effect of perioperative medications on POUR after anterior cervical spine surgery for degenerative cervical disc diseases has not been investigated. In our series, the use of Demerol, especially more than 100 mg, significantly increased the incidence of POUR. However, other medications that include non-opioids did not significantly affect the incidence of POUR. Therefore, we recommend Demerol not to be used for postoperative pain control if possible. However, we did not analyze the effect of anaesthetics and other concomitant medications that could reinforce the impairing effect on micturition in the current study. Further studies are needed to investigate this issue.

For the treatment of POUR of our series, all POUR patients underwent in-and-out catheterization prior to undergoing surgery. Among the patients enrolled in this study, 36% of the POUR patients underwent indwelling catheterization in addition, because POUR persisted after in-and-out catheterization. POUR patients had to be discharged approximately 2 days later compared with non-POUR patients. Finally, 19% of the POUR patients were treated for POUR and catheter-related complications in the urology department for 2 to 4 weeks after surgery. The current study was undertaken to identify independent risk factors for the development of POUR after anterior cervical spine surgery for degenerative cervical disc diseases. Our results are helpful in counseling patients about their individual risk of POUR and in adjusting the catheterization regime before the operation in patients with risk factors, to avoid POUR and catheter-related complications. In conclusion, we recommend that a catheter be placed selectively before the operation in high risk patients, especially in the elderly patients, with the risk factors of male gender, diabetes mellitus, benign prostate hypertrophy, myelopathy; we recommend that Demerol not be used for postoperative pain control.

## CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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