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Original article

# Surgical site infection of scrotal and inguinal lesions after urologic surgery

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ABSTRACT

To clarify the incidence of surgical site infection (SSI) after urological scrotal and inguinal surgical procedures and the preventive effect of antimicrobial prophylaxis for SSI, retrospective analysis was performed. The patients who underwent scrotal and inguinal operations from 2001 to 2010 were included in this analysis. A first or second generation cephalosporin was administered as antimicrobial prophylaxis just before the start of surgery and no additional prophylaxis was conducted. The surgery was classified into 76 (38%) cases with testicular sperm extraction (TESE), 72 (36%) with radical orchiectomy, 29 (14.5%) with bilateral orchiectomy (surgical castration) and 23 (11.5%) with other scrotal and inguinal operations. The median age and age range were 36 years and 18–81 years, respectively. SSI occurred in 7 (3.5%) cases. The frequencies of SSI were 6.5% in the patients with urological inguinal surgery and 1.6% in those with scrotal surgery. The frequency of SSI in the patients with urological inguinal surgery was not negligible even though it is considered a clean operation, and further analysis is warranted to prevent SSI.



## 1. Introduction

Surgical site infection (SSI) is one of the major postoperative complications. In the urology field, SSI frequently occurs in patients who undergo radical cystectomy with urinary diversion or reconstruction, which is considered to a contaminated operation [1]; however, it rarely occurs in patients with clean operations [1]. Although a survey of SSI in urological surgery with antimicrobial prophylaxis (AMP) [2] showed that the frequency of SSI in patients with clean operations was usually low (1.1%), the frequency of SSI in patients with inguinal hernia repair as a clean operation ranged from 3.1 to 4.2% [3,4] under routine AMP. In addition, another report [5] showed that SSI developed in 3.6% of the patients with scrotal surgery. Therefore, the SSI rates in inguinal and scrotal operations may be somewhat higher than in clean operations as a whole. However, there have been few reports about the incidence of SSI after urological scrotal and inguinal operations. The purpose of this study was to clarify the frequency of SSI in the patients who undergo urological scrotal and inguinal operations.

## 2. Patients and methods

This retrospective study included the male patients aged 18 years or more who underwent urological scrotal and inguinal surgical procedures from 2001 to 2010 in Department of Urology, Sapporo Medical University Hospital. The medical charts of the patients were reviewed for age, body mass index (BMI), operative time, comorbidity with/without diabetes and perioperative management, and analyzed. A prophylactic antimicrobial agent was commonly and principally administered intravenously 30 min before the start of surgery by using a single dose of a first or second generation cephalosporin except in a few exceptional cases. If patients had bacteriuria with $10^4$ colony-forming units per milliliter or more preoperatively, antimicrobial chemotherapy was performed before surgery [6,7]. All operations were performed in the standard aseptic manner and the surgical procedures are described below. Testicular sperm extraction (TESE) was performed according to the standard procedure [8] through a scrotal approach with or without microscopy. Radical orchiectomy was performed according to the standard procedure [9] through an inguinal

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**Table 1**
Characteristics of the patients with scrotal and inguinal surgeries.

| | Patients with scrotal surgery ($N = 124$) | Patients with inguinal surgery ($N = 76$) | $p$ Value |
|---|---|---|---|
| SSI rate | 2 (1.6%) | 5 (6.5%) | 0.1075 |
| Age (average ± SD) (years old) | 45 (±17.2) | 37 (±11.8) | 0.0012 |
| BMI (average ± SD) (kg/m$^2$) | 24.3 (±3.7) | 22.9 (±3.5) | 0.0120 |
| Operative time (average ± SD) (minutes) | 60 (±25.9) | 89 (±35.3) | <0.001 |
| Comorbidity with diabetes | 6 (4.8%) | 8 (10.5%) | 0.0955 |
| Perioperative management since 2004 | 84 (67.7%) | 61 (82.4%) | 0.0542 |

SD: standard deviation.
SSI rate and comorbidity with diabetes were analyzed using Fisher's exact probability test.
Age, BMI, and operative time were analyzed using Student's $t$-test.
Perioperative management was analyzed using the chi-squared test.

approach and high ligation of the spermatic cord at the level of the internal ring was commonly done. Scrotal (simple) orchiectomy (surgical castration) that led to androgen blockade against prostate cancer was performed through a scrotal approach with ligation of the spermatic cord at the level of the external ring [10]. Hydrocelectomy was performed through a scrotal approach with the Jaboulay bottleneck technique. In brief, the edge of the sac was sewn with covered testis and epididymis [11]. In surgical procedures, if necessary, skin or pubic hair was shaved just before the start of surgery using an electric shaver, not a razor. Perioperative management for surgical wounds [7] is described below. From 2001 to 2003, irrigation of subcutaneous tissue just after suturing the fascia was not performed and removal of the OpSite dressing (Smith & Nephew, Tokyo, Japan) was done on postoperative day (POD) 7 as conventional management. Since 2004, irrigation of subcutaneous tissue has been performed and the surgical dressing is removed on POD2 as current management. In the patients with radical orchiectomy, open drainage (using a Penrose tube) was removed on POD1 or 2 during the study period. The definition of SSI was according to the guideline of the Centers for Disease Control and Prevention (CDC) [1] within 30 days after the operation.

Statistical analysis was done using $t$-tests for comparing each background and characteristics, with the chi-square test and Mann–Whitney $U$ test used for univariate analysis. Logistic regression analysis was used for multivariate analysis. In statistical analysis, $p < 0.05$ was considered to be statistically significant.

## 3. Results

Totally, 200 patients were included in this study. Their median age was 36 years (range: 18–81). The surgical procedures were classified into 76 (38%) cases with TESE, 72 (36%) with radical orchiectomy, 29 (14.5%) with scrotal orchiectomy, 11 (5.5%) with hydrocelectomy, and 12 (6.0%) with other scrotal and inguinal surgeries. The total number of inguinal operations was 76 (38.0%), including 72 cases of radical orchiectomy, 3 of orchidopexy and 1 simple orchiectomy, and that for scrotal surgery was 124 (62.0%). The background characteristics of the patients, average age, BMI and operative time were different in the groups with scrotal and inguinal operations (Table 1). SSI developed in 5 (6.5%) patients with urological inguinal surgery and the surgical procedure was radical orchiectomy in all those cases. SSI developed in 2 (1.6%) patients with scrotal surgery, with one surgical procedure being orchidopexy and the other scrotal orchiectomy. In the 7 patients with SSI, superficial incisional SSI developed and 2 of the 7 patients had comorbid diabetes. Causative pathogens of the SSI were isolated in 5 of these 7 patients with (Table 2). In 4 of the 5 patients, the pathogens isolated from wound pus were resistant to the antimicrobial agents administered as AMP. In patient 7, the susceptibility of pathogens to fosfomycin was not examined.

SSI rarely developed in the patients with scrotal surgery. In addition, the backgrounds were significantly different between the patients with scrotal and inguinal operations (Table 1). SSI developed in 5 (6.5%) cases with urological inguinal surgery and the surgical procedure was radical orchiectomy in all those cases. Therefore, univariate and multivariate analyses were done for the 72 cases with radical orchiectomy. In addition, we analyzed the tumor sizes of those cases. In the patients with radical orchiectomy, the median age was 36 years (range: 20–78), median operative time was 79 min (45–198), and median BMI was 22.5 kg/m$^2$ (16.9–32.5). The median tumor size was 6 cm (1.5–18). In multivariate analysis (Table 3) no specific items could be identified as risk factors for SSI.

## 4. Discussion

The definition of SSI according to the guideline of the CDC [1] considers operations with uninfected wounds without exposure to the genital or uninfected urinary tract to be clean operations in the urology field. Therefore, scrotal and urological inguinal surgeries are classified as clean operations. This means that the SSI rate in scrotal and urological inguinal operations must as low as for other clean operations, including nephrectomy, adrenalectomy and so on.

In this study, AMP was employed for all 124 patients with scrotal surgery and the SSI rate was 1.6%. This SSI rate was lower than the

**Table 2**
Microbiological characteristics of the patients with SSI.

| Patients with SSI | Surgical procedure | Comorbidity with diabetes | Strains isolated from would pus culture | Strains isolated from urine culture preoperatively | Antimicrobial agents administered as AMP | Antimicrobial susceptibility of strains from wound pus to AMP |
|---|---|---|---|---|---|---|
| 1 | Radical orchiectomy (left) | Without diabetes | MSSA<br>Klebsiella oxytoca | Negative | CMZ | MSSA: sensitive<br>Klebsiella oxytoca: resistant |
| 2 | Radical orchiectomy (right) | With diabetes | *M. morganii* | *M. morganii*<br>*E. coli* | CEZ | Resistant |
| 3 | Radical orchiectomy (right) | With diabetes | NA | MSSA | CEZ | – |
| 4 | Radical orchiectomy (right) | Without diabetes | MRSA | Negative | CEZ | Resistant |
| 5 | Radical orchiectomy (left) | Without diabetes | NA | NA | CEZ | – |
| 6 | scrotal orchiectomy (bilateral) | Without diabetes | MRSA | Negative | CEZ | Resistant |
| 7 | Orchidopexy (bilateral) | Without diabetes | *S. epidermidis*<br>*E. coli* | NA | FOM | unknown |

AMP, antimicrobial prophylaxis; NA, not applicable; MSSA, methicillin-sensitive *Staphylococcus aureus*; MRSA, methicillin-resistant *Staphylococcus aureus*; *M. morganii*; *Morganella morganii*; *S. epidermidis*, *Staphylococcus epidermidis*; *E. coli*, *Escherichia coli*; CMZ, cefmetazole; CEZ, cefazolin; FOM, fosfomycin