A Comparison of Urinary Tract and Surgical Site Infection Rates in Anterior Cervical Discectomy and Fusion with and without Urinary Catheterization

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Abstract

Introduction: Although SSIs after ACDF are rare, each occurrence carries high patient morbidity and healthcare cost. To minimize infection risk, routine urinary catheterization has been questioned.

Materials and methods: 138 patients who underwent ACDF were retrospectively analyzed. 65 patients received urinary catheters, 73 were not catheterized. Average follow up was 108.2 days (range 61-542), UTIs and SSI were recorded.

Results: SSI rates were not statistically different between the two groups and the overall SSI was 3.6%. The UTI rate with catheters 5.5% and the positive UA rate was 32.7%.

Conclusion: While urinary catheterization was not associated with increased infection rate, there were associated UTIs. Avoiding catheterization or early removal protocols may be associated with improved clinical outcomes in patients undergoing ACDF.

ABBREVIATIONS

ACDF: Anterior Cervical Discectomy and Fusion; SSI: Surgical Site Infection; UTI: Urinary Tract Infection; UA: Urinalysis

INTRODUCTION

Anterior cervical discectomy and fusion (ACDF) is one of the most commonly performed spinal procedures. The most common surgical indications are either radiculopathy or myelopathy [1]. While the reported clinical success rates are very high [2-5], many risks have been reported with this procedure. Though Surgical Site Infection (SSI) rates are generally low, cited at 1.6% or less [6,7], each incident may result in high morbidity and increased health care costs. Therefore, it is incumbent on the treating surgeon to minimize all potential causes of infection.

Urinary catheters are often inserted prior to the initiation of surgery. Potential benefits include bladder decompression for intra-abdominal or pelvic procedures, measurement of urine output as an indicator of fluid status, and avoiding urinary retention with surgical time greater than 2 hours [8]. However, the rate of urinary retention after lumbar and thoracic spine surgery has been reported from 0.9 to 38% [9,10].

Prolonged urinary catheterization via an indwelling Foley catheter has resulted in a 9.6% urinary tract infection (UTI) rate in the hospital setting [11]. Intermittent catheterization, the alternative to an indwelling Foley catheter, has resulted in between a 12% [12] and 15% [13] rate of urinary tract infection in the hospital setting. In addition, urinary bacteria have been implicated in 9.9% of all surgical site infections [14], which have prompted consideration if catheterization is necessary for ACDF. The purpose of this study is both to compare surgical site infection rates of ACDF with and without urinary catheterization and to report the UTI rate and its correlation with urinalysis (UA).

MATERIALS AND METHODS

After obtaining Institutional Review Board approval at our institution, a retrospective analysis was performed on all patients who underwent stand alone ACDF at a single institution by two experienced spine surgeons. Inclusion criteria included single-stage surgeries, both primary and revision procedures, and...
follow up of at least 6 months. Patients with pre-existing prostate pathology or supplemental posterior surgery were excluded.

A total of 180 patients had ACDF performed. 42 were excluded: 28 had insufficient follow up, 10 underwent staged posterior surgery during the same hospitalization, and 4 had pre-existing prostate hypertrophy, leaving 138 for study inclusion.

All patients who were catheterized had a clean UA and urine culture taken immediately prior to removal on post-operative day #1. Either oral trimethoprim/sulfamethoxazole or ciprofloxacin were given if the UA was positive, as defined by the positive nitrites or more than trace leukocytes (Sultana). The antibiotics were continued only if the urine culture was positive, as defined by more than $10^4$ colony forming units per mL [15].

Post-operative infections were categorized as superficial wound drainage that responded to oral antibiotics, deep infection or osteomyelitis that required a formal irrigation and debridement, or phlegmon that presented after 6 months.

Statistical analysis was made between the two groups using T tests for nominal variables and Fisher’s exact test for categorical variables. A p value less than 0.05 was used for statistical significance.

**RESULTS**

The baseline demographics are show in table 1. The included patients had an average age of 52.6 years old (range 32 to 78) and 53.1% were female. 65 patients had a catheter placed and 73 did not. The average number of levels performed was 2.28 (range 1-4) and 23.4% were revision. The average length of follow up was 108.2 days (range 61-542).

Surgical site infection rates were not statistically different between the two groups, (p = 0.39). In the catheter group, the UTI rate was 5.5% and the positive UA rate was 32.7%. No urinary retention was observed.

**DISCUSSION**

Post-operative infections are devastating potential complications. Overall, SSI rates prolong hospital stays an average of 9.7 days and cost $20,842 [16] per case and from 5 to 10 billion dollars annually [17]. In addition, hospital acquired UTIs have increased hospital stays by an average of 2.4 days [18]. Therefore, it is paramount to minimize infection rates.

Our protocol is to remove the catheter on the first post-operative day. Theoretically, early removal should decrease urinary retention rates compared to immediate catheter removal. In addition, early catheter discontinuation has been associated with quicker ambulatory times and decreased hospital stays [19], which decreases overall infection rates [19]. Similarly, early catheter removal is associated with decreased urinary tract infection rates [11,20], which supports our catheter management.

While UTI data is sparse in the spine surgery population, rates after total knee arthroplasty have been reported up to 15% [13]. We attribute our favorable UTI rates when compared to reported rates to our early removal protocol, since studies have reported the daily UTI risk at 16.2 nosocomial UTIs per 1000 catheter days [21].

Our overall infection rate was 3.9%. 2.3% of our patients had superficial infections that responded to antibiotics and 1.6% required irrigation and debridement, values which are comparable to the literature [22,23]. Our values may in fact be favorable when taken in context that prior infection reports are based on uninstrumented fusions.

In addition to early removal, many emerging strategies and technology exist to decrease UTI rates. Increased importance to sterile technique during insertion and removal are common nursing practices that minimize bacteria introduction into the bladder. Early diagnosis with a UA and treatment with antibiotics, as employed in our study, may decrease nosocomial UTIs. Silver-coated catheters have also been used to decrease bacterial adherence, although initial results have been mixed on its efficacy [21,24,25].

There are some limitations to this study. This was a retrospective analysis and is subject to all its inherent weaknesses. In addition, 20.2% of patient had to be excluded due to insufficient follow up. However, this study does provide a UTI rate from catheterization as well suggest a catheter removal protocol. More prospective research is needed to address these topics as nosocomial infections have significant individual and population implications.

**CONCLUSION**

While urinary catheterization was not associated with increased infection rate, there were associated UTIs. No adverse
effects of early catheter removal were observed. Avoiding catheterization or early removal protocols may be associated with improved clinical outcomes in patients undergoing ACDF.

REFERENCES


