

A Useful Tip for Preventing Surgical Site Infections after Hypospadias Repair. A Single Surgeon's Experience of 376 Cases

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Abstract

Purpose: We report the efficacy of pre- and post-operative showering for preventing surgical site infections (SSIs) and urethrocutaneous fistula after hypospadias surgery. **Materials and Methods:** In 2006, standardised pre- and postoperative showering was introduced for hypospadias patients. Showering involves washing the genitals and groin 2 h preoperatively as well as immediately after the removal of a stent postoperatively. Data from 520 procedures performed on 376 hypospadias patients by a single surgeon from 1996 to 2015 were collected prospectively. The shower (S) group comprised 258 patients (372 procedures) and the nonshower group comprised 118 patients (148 procedures). Management protocols were identical for two groups. **Results:** Patient demographics were similar. SSIs were significantly less in the S group (0% vs. 2.0%; $P < 0.05$). The incidence of fistulas was lower in the S group (2.0% vs. 6.3%). The mean duration of follow-up was significantly shorter in the S group (3.6 vs. 12.8 years; $P < 0.05$) but longer than the mean time taken for complications to develop (0.4 years). **Conclusions:** Our results suggest that pre- and post-operative showering may contribute to preventing SSIs and fistulas in hypospadias patients.

Keywords: Hypospadias, pre-operative shower, surgical site infections, urethrocutaneous fistula

INTRODUCTION

Complications of hypospadias repair, such as bleeding, haematoma, surgical site infections (SSIs), wound dehiscence and skin necrosis are well documented.^[1] SSI is associated with one of the most major post-operative problems of hypospadias, urethrocutaneous fistula, especially in smaller children with hypospadias because perineal hygiene is often not promoted actively.^[2] The groin is exposed to more moisture and susceptible to more humidity than other parts of the body and routine bathing is often insufficient for maintaining hygiene. Bathing is usually continued until the day before the surgery and pre- and post-operative disinfections are not as effective as generally believed for decreasing the number of superficial organisms in the groin.

Currently, there are no reports about pre- and post-operative management for preventing SSI in patients with hypospadias, thus, to better improve the prevention of SSIs in hypospadias

patients, we introduced a pre- and post-operative showering programme for hypospadias patients involving washing the genitals and groin in a standardised way both pre- and postoperatively. Here, we report the efficacy of this pre- and post-operative showering program for preventing SSI, urethrocutaneous fistula and wound dehiscence after hypospadias surgery.

MATERIALS AND METHODS

Data for this study were collated from the medical records of 376 hypospadias patients who had a total of 520 procedures performed by a single surgeon between 1996 and 2015. Surgery for hypospadias patients included ventral penile

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curvature correction ($n = 190$), urethroplasty ($n = 298$) and fistula closure ($n = 32$). Of the 190 penile curvature corrections, 4 were redo curvature corrections, one of whom had been referred from elsewhere. Of the 298 urethroplasties, 7 were redo urethroplasties, 3 of whom had been referred from elsewhere. Of the 32 fistula closures, 22 cases had been referred from elsewhere. Our surgical techniques for ventral penile curvature correction, urethroplasty and fistula closure are described elsewhere.^[3,4]

Of the total of 376 hypospadias patients enrolled in this study, 258 (372 procedures), who had hypospadias surgery between 2007 and 2015 had pre- and post-operative showers (S group). The remaining 118 patients (148 procedures) had hypospadias surgery between 1996 and 2006 before our showering programme and did not shower according to a standardised protocol (nonshower [NS] group). A pre-operative shower in the S group is defined as washing the genital and groin with soap and showering up to 2 h preoperatively. If patients opened their bowels after showering, the standard shower protocol was repeated. All patients in both groups were prepped in the same way in the operating room using a two-stage disinfection technique where povidone iodine-based surgical soap was used for the first stage followed by the application of povidone-iodine to the entire surgical field for the second stage before hypospadias surgery. During both stages of disinfection, care was taken not to touch the anus to prevent contamination.

All patients had a 6 or 8 French urinary stent inserted under sterile conditions in the operating room. In ventral curvature correction and fistula closure cases, the urinary stent was removed the day after surgery and in urethroplasty cases, it was removed 7 days after the surgery. Wounds were dressed postoperatively using Tegaderm™ dressings applied under sterile conditions in the operating room and removed in all patients the day after the surgery. All cases in the S group had a post-operative shower similar to the pre-operative shower immediately after the Tegaderm™ dressing was removed. Thereafter, parents of all S group cases were advised to shower their son after each dressing was removed, which could be as often as twice a day, until their next scheduled outpatient visit. A staff nurse supervised the parents during post-operative showering the first two times. In addition, an extra shower was added whenever the wound was at risk for contamination, for example, a bowel motion. In the NS group, the wound was cleaned with a 0.05% sterilised chlorhexidine gluconate solution by a staff nurse immediately after the Tegaderm™ dressing was removed, and repeated daily until discharged home. In the NS group, no post-operative showers were taken before discharge, but showers were advised after discharge home.

Post-operative management protocols were identical in both groups. All patients had one dose of intravenous antibiotics (Flomoxef sodium) preoperatively, three more doses postoperatively, and prophylactic oral antibiotics (Cefaclor) while the urinary stent was *in situ*. Cases who had curvature correction and fistula closure were discharged home the

day following removal of the stent, while cases who had urethroplasty were discharged home between 1 and 8 days after surgery, depending on the family's circumstances. For example, if parents requested early discharge with the stent in the neourethra *in situ*, discharge within a few days of surgery was arranged, and the stent removed on day 8 at an outpatient clinic visit, otherwise, discharge was arranged on day 8 after removal of the stent.

The duration of follow-up was calculated as the period from discharge after surgery to the last outpatient clinic attendance. All data following discharge were collected from hospital ward records and outpatient clinic medical records.

Following the definition of the Centres for Disease Control,^[5] SSI was classified as minor superficial incisional, moderate superficial incisional or deep incisional. Minor superficial incisional SSI, indicated only by the presence of redness was managed by daily disinfection with 0.05% sterilised chlorhexidine gluconate solution. Oral antibiotics were not prescribed. Moderate superficial incisional SSI, indicated by redness without visible pus, was treated by oral or intravenous antibiotics. Deep incisional SSI, indicated by the presence of infection involved deep soft tissues, was treated by intravenous antibiotics. Redness due to inflammation from suture materials was not regarded as an infection.

Ethics

This study was approved by our institutional ethics committee of and complies with the Helsinki Declaration of 1975 (revised 1983).

Statistical analysis

Data were expressed as mean \pm standard deviation. The Fisher's exact test was used for categorical data (Prism software; GraphPad Software, Inc., San Diego, CA). A value of $P < 0.05$ was considered to be statistically significant.

RESULTS

Patient demographics were similar between the two groups; mean age at ventral penile curvature correction was 2.7 ± 2.7 years in the NS group and 2.6 ± 1.9 years in the S group; mean age at urethroplasty was 3.0 ± 2.9 years in the NS group and 3.7 ± 3.5 years in the S group; mean age at fistula closure was 12.4 ± 6.0 years in the NS group and 11.1 ± 9.8 years.

In the S group. There were 3 SSIs in the NS group. All SSIs became apparent within 3 days of surgery. One was a deep incisional SSI [Figure 1], and the other two were moderate superficial incisional SSI. Two of the infections resulted in urethrocutaneous fistulas. There were no SSIs in the S group. The difference in infection rates per number of procedures performed was 3/148 (2.0%) versus 0/372 (0%), which was statistically significant ($P = 0.023$).

The incidence of urethrocutaneous fistula after urethroplasty was 4/202 (2.0%) in the S group and 6/96 (6.3%) in the NS



Figure 1: A case with deep incisional surgical site infection with visible pus after urethroplasty in the nonshower group

group, which was not significant ($P = 0.081$). There were no cases of wound dehiscence in either group. The incidence of stenosis of the neourethra after urethroplasty was 2/96 (2.1%) in the NS group and 4/202 (2.0%) in the S group. There were two cases of postoperative diverticulum of the neourethra in the NS group and both cases were treated by diverticulectomy. Overall, there were 8/372 (2.2%) postoperative complications in the S group, which was significantly lower than the 13/148 (8.8%) post-operative complications in the NS group ($P = 0.0019$). The mean duration of follow-up was significantly shorter in the S group (3.6 vs. 12.8 years; $P < 0.05$) but longer than the mean time taken for post-operative complications to occur (0.4 ± 0.4 years).

All parents expressed confidence with showering after being supervised by staff nurses.

DISCUSSION

Despite pre-operative prepping with povidone-iodine soap/solution, use of prophylactic antibiotics, and/or use of intra-operative antibiotics to prevent SSIs,^[6] minor and moderate SSIs after hypospadias surgery are common enough to be problematic and if severe can cause disruption of repair and wound dehiscence.^[1] In such situations, proximal urinary diversion may even be needed. From experience, even minor or moderate SSIs are capable of causing urethrocutaneous fistula and/or stenosis. Thus, preventing infection in patients with hypospadias surgery is crucial for preventing more serious post-operative complications such as fistula, diverticulum and wound dehiscence.

Unfortunately, there are few reports focussing specifically on the prevention of SSIs after hypospadias surgery.^[2,7,8] One report examined if intravenous prophylactic antibiotics could prevent SSIs and concluded there were no significant differences in SSI rates in relation to the use of intravenous prophylactic antibiotics.^[9]

We are the first to report the usefulness of a pre- and post-operative showering program for the prevention of

infection in hypospadias patients. Our results suggest that showering/cleaning a patient pre- and postoperatively is effective for preventing SSIs and perhaps even prevent post-operative urethrocutaneous fistula. The number and type of bacteria that comprise a person's normal skin flora are dependent on a variety of host factors, sanitary conditions, temperature and humidity^[2] and it is generally assumed that the perineum/groin is often heavily contaminated with microorganisms originating from the anus.^[9] Thus, while a combination of bathing (which is most usually in the evening, so most likely to be the night before surgery) and disinfection in the operating room just before the surgery appears to be inadequate for cleaning the genitals adequately, especially if the patient had a bowel motion anytime between bathing and surgery, pre- and post-operative showering would appear to be more thorough for clearing microorganisms from the genitals both pre- and postoperatively. Thus, pre-operative patient showering is justified in patients with hypospadias since almost all of them would either be infants or very young children, probably still using diapers, which would compound the pathogenicity of natural flora in their groins because urine and/or faeces would be in constant contact with the skin.

At our institution, the post-operative wound dressing is removed the day after surgery. According to a Japanese hypospadias study^[7] that compared a post-operative neourethral swab culture 'positive' group ($n = 10$) with a 'negative' group ($n = 8$ cases), duration of post-operative wound dressing use was shorter in the 'negative' group (4.3 vs. 6.7 days; $P = 0.05$). Their results are consistent with our post-operative management protocol regarding the duration of dressing usage. We prefer to minimise the duration of our post-operative wound dressing usage and commence post-operative showering on day 1 after surgery to prevent infection, which is equivalent to their findings.

Ratan *et al.*^[2] reported some interesting findings about the pathogenic flora in 60 hypospadias repair patients from swab samples taken from the perimeatus: (1) at the time of admission, (2) after disinfection before surgery, (3) during surgery and (4) at the time of removing the dressing after surgery. They found a correlation in pathogenic flora between 'after disinfection' and 'during surgery' in 80% of the 60 patients, and also a correlation between 'after disinfection' and 'removal of dressing' in 60% of the 60 patients. This suggests that the removal of pathogenic flora appears to be an important factor in the prevention of SSI.

To decrease the number of pathogenic flora from the genitals of either diaper-wearing infants or diaper-wearing very young children, we strongly feel that disinfection alone is insufficient. While showering does not disinfect, it physically removes organisms and contributes to overall cleanliness. Parents are often hesitant to shower a post-operative wound because it is often swollen and tender looking, but education with thorough practical demonstration will improve confidence and ensure hypospadias patients' genitals are as hygienic as possible.

CONCLUSIONS

To the best of our knowledge, this is the first study about the effectiveness of pre- and post-operative showering for preventing infection. This low-cost common sense approach is simple and effective for preventing SSIs and urethrocutaneous fistulas.

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Conflicts of interest

There are no conflicts of interest.

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