

Comparison of Simple Penile Dressings following Hypospadias Repair: does it really matter?

SYED WAQAS ALI¹, UZAIR ASLAM², SAAD KHALID², SYED MUHAMMAD ASHRAF JAHANGEER³, MUHAMMAD ARIF MATEEN KHAN¹

¹Department of Paediatric Surgery, Dow University of Health Sciences, Karachi, Pakistan.

²Department of Medicine, Dow University of Health Sciences, Karachi, Pakistan.

³Department of Community Medicine, Dow University of Health Sciences, Karachi, Pakistan.

Correspondence to Dr. Saad Khalid, Email: saadkhalidonly@gmail.com, Cell: +92-334-2805506

ABSTRACT

Background: Hypospadias repair requires an appropriate wound dressing to prevent complications, but there is a lack of studies comparing the efficacy of different dressings.

Aim: To compare the clinical outcomes of occlusive hydrocolloid dressing and petroleum-impregnated gauze with zinc oxide adhesive plaster, and recommend an appropriate dressing based on efficacy, availability, and cost-effectiveness.

Methods: We performed a retrospective cohort study on paediatric patients who had undergone hypospadias repair between August 2017 and November 2020 at Dr. Ruth K. M. Pfau Civil Hospital Karachi, Pakistan. All the patients receiving one of the two wound dressings, occlusive hydrocolloid dressing (group A) or petroleum-impregnated gauze with zinc oxide adhesive plaster (group B) during primary or secondary hypospadias repair, operated by the same paediatric surgeon were included in this study. Patients with missing data were excluded. There was only one patient lost to follow up in this study.

Results: A total of 64 male hypospadias patients with a mean age of 6.0 ± 3.4 years were included in this study. Group A patients (n=37) received a thick 10 x 10 cm occlusive hydrocolloid dressing whereas, in Group B patients (n=27), a 2.5 x 10 cm petroleum-impregnated gauze with zinc oxide adhesive plaster was applied over the wound. In group A, five patients (13.5%) suffered post-operative fistula and wound dehiscence. Whereas, in group B, the post-operative fistula was seen in three patients (11.1%).

This study provides evidence-based information to clinicians and healthcare providers regarding the use of wound dressings for hypospadias repair. By demonstrating the efficacy of a cheaper and more accessible dressing, this study could help improve access to care and reduce costs for patients, especially in resource-limited settings.

Conclusion: Occlusive hydrocolloid dressing and petroleum-impregnated gauze are equally effective in the healing of hypospadias repair wounds. The simpler and cheaper petroleum-impregnated gauze may be preferable in resource-limited settings.

Keywords: Hydrocolloid dressing; Petroleum impregnated gauze; Paraffin gauze; Hypospadias

INTRODUCTION

Hypospadias is the most frequent congenital malformation of male external genitalia. In hypospadias, the urethral meatus is misplaced due to a midline fusion defect in the male urethra. Its prevalence ranges from 0.6–69 per 10,000 births in Asia.¹ Approximately 300 distinct surgical procedures for hypospadias correction have already been identified and employed to restore the functional and cosmetic appearance of the penis. Snodgrass's tubularised incised plate urethroplasty (TIPU) is likely one of the most prevalent procedures used in the previous 10-15 years.² There is limited evidence available on several elements of surgical management of hypospadias, such as operating technique, indications for foreskin repair, suture type, type and length of urine diversion, and postoperative dressing³.

The selection of an ideal wound dressing is an important facet of hypospadias surgery.⁴ Yet, there is no consensus in the literature on the selection of various penile dressings available following hypospadias repair⁵. Various forms of dressing, such as Silastic foam, elastic bandage, glove finger, Opsite, Tegaderm, Cavicare, and more recently silicone foam sheets, have been used for healing surgical wounds of hypospadias repair⁶. An ideal dressing should be easy to apply and remove, non-adherent to the incision, capable of properly absorbing wound leakages, capable of minimizing postoperative oedema, and bleeding, prevent haematoma formation that may lead to infection, keep the stent in place and serve as a barrier to the environment. Hydrocolloid dressing with its moisture reactive particles remain securely fixed to the skin, providing a significant therapeutic benefit. It has been shown to be an effective dressing for wound healing without any complications. Whereas petroleum gauze dressing provides a moist environment for wound healing because of its petroleum content.⁷⁻⁹ However, there is a lack of scientific evidence comparing the effectiveness of hydrocolloid and petroleum dressing after hypospadias repair surgery.

The primary objective of this study is to assess the differences in the clinical outcome of the two types of dressings, hydrocolloid dressing and petroleum-impregnated gauze, used for hypospadias repair surgery and to encourage surgeons to use a particular dressing based on its efficacy, availability, and cost-effectiveness.

MATERIALS AND METHODS

Study Design: Following approval of the Institutional Review Board (IRB-2216/DUHS/ EXEMPTION/ 2021/710), we performed a retrospective cohort study on paediatric patients who had undergone hypospadias repair between August 2017 and November 2020 in Dr. Ruth K. M. Pfau Civil Hospital Karachi, Pakistan. All the patients receiving one of the two wound dressings based on their availability, occlusive hydrocolloid dressing or petroleum-impregnated gauze with zinc oxide adhesive plaster (Figure 1) during primary or secondary hypospadias repair, operated by the same paediatric surgeon were included in this study. Patients with missing data and who were lost to follow-up were excluded.

Data Collection: The data was retrieved from the hospital case files of the patients and entered into Microsoft Excel. The data obtained were demographic information, type of hypospadias, the procedure performed, history of previous repair, type of dressing, date of surgery, date of discharge, outcome, and follow-up.

Sample Size: We calculated the sample size of this study based on research results by Apelqvist *et al*¹⁰ keeping the Confidence Interval (CI) at 95%, and power at 80% with an equal group ratio using OpenEpi version 3.01, using the sample size formula for cohort, cross-sectional and Randomized control trial. The sample size was found to be 52 with 26 patients in each group.

Sample Population: Through consecutive sampling technique, 64 out of 65 patients that underwent hypospadias repair were investigated. One patient was lost to follow. The patients were 1-14 years of age. The sample population was divided into two groups A

and B based on the type of available surgical dressing applied over the wounds at the time of surgery. Group A patients (n=37) received a thick 10 x 10 cm occlusive hydrocolloid dressing. Whereas, in Group B patients (n=27), a 2.5 x 10 cm petroleum-impregnated gauze with zinc oxide adhesive plaster was applied over the wound.

Hypospadias Repair Surgery procedure: The choice of surgery depended upon the type of hypospadias, appearance of the urethral plate, availability of foreskin for urethroplasty, and scarring from previous surgery. All patients underwent surgery under general anaesthesia with prophylactic antibiotics at the time of induction. The duration of surgery ranged between 60 and 90 minutes. The most commonly performed procedure was Snodgrass repair (Tubularised Incised Plate Urethroplasty) During this procedure, a circumferential subcoronal incision is made approximately 2 mm proximal to the urethral native meatus, and the penis is then degloved. Along the lateral edges of the urethral plate, a U-shaped incision is made. After that, the glans wings are created. To allow for tension-free urethral tubularisation, a relaxing incision is created in the middle of the urethral plate. The actual tubularisation is subsequently carried out with a 6/0 running suture.¹¹ Postoperatively, the surgical wound of the two groups was covered with the dressings. Group A had hydrocolloid dressing while group B had petroleum-impregnated gauze and zinc oxide adhesive plaster. On 3rd postoperative day, the dressings were removed in both groups. Subsequently, topical polymyxin and bacitracin ointment was used on the wound till healing. On the 7th postoperative day, the urinary catheter was removed in both the groups in the follow-up clinic. The parents were advised to visit the hospital for a follow-up at 2 weeks with a voiding video of the child. Subsequent follow-ups were arranged at 1 month, 6 months, and after 1 year, and then on yearly basis. At the follow-up visits, the patients were reviewed for position and site of urinary meatus, calibre and force of urinary stream, cosmetic appearance, chordee, fistula, and other wound-related complications.

Outcome: A successful/uncomplicated repair was defined as a patient passing a single stream of urine from the neo-meatus at 1 month after removal of stent without fistula, stenosis, wound dehiscence or chordee and a cosmetically satisfactory glanular meatus.

Statistical Analysis: The data was retrieved from the patients' files containing routine information and entered on SPSS Version 26. Qualitative variables were described as frequencies and percentages. Quantitative variables were presented as mean and standard deviation. An independent samples t-test was performed to determine the association between age and different dressing types. Chi square test was used to compare the proportion of successful repair between the treatment and control group, one month after removal of stent. All results were interpreted at a *p* value of ≤0.05. Considering the patient outcome at one month in the follow-up out-patient department we categorized them as uncomplicated repair and repair with complications. We conducted a multivariate logistic regression analysis to find the best predictors of hypospadias repair. The outcome variable or the dependent was repair status at one month follow-up. While dressing types, age, type of repair surgery performed, and type of hypospadias were considered as risk factors.

RESULTS

A total of 64 male hypospadias patients with a mean age of 6.0±3.4 years were included in this study (Table 1). Thirty-seven (57.8%) hypospadias patients underwent surgical repair for subcoronal hypospadias while the rest 27 (42.2%) were operated on for coronal, glanular, midpenile, proximal penile, and peno-scrotal hypospadias or re-operated for previous failed repair. Snodgrass was the most performed procedure (62.5%). In group A, five patients (13.5%) suffered post-operative fistula and wound dehiscence. Whereas in group B, post-operative complications were seen in three patients (11.1%).

An independent samples t-test and chi square test was performed to compare the association between age and postoperative outcome with types of dressing respectively. Age was non-significantly associated with the different dressing types, $t(53) = 0.386$, $p = 0.701$. Additionally, no significant association was found between the postoperative outcomes of both the groups (83.8% versus 88.9%, $p = 0.722$, Fisher's exact test) (Table 2). These results suggest that both dressings are equally effective in preventing postoperative complications after hypospadias repair surgery. However, the petroleum-impregnated gauze is a simpler and cheaper alternative and may be preferable in resource-limited settings.

A multivariable logistic regression model was run to assess the effect of the type of dressings and type of procedure. However, these variables did not affect the outcome of hypospadias repair surgery between the two groups. All the *p* values in the final model were greater than 5% while the Cox and Snell R^2 was 0.016.

This study provides evidence-based information to clinicians and healthcare providers on the efficacy of wound dressings for hypospadias repair. The study demonstrates the effectiveness of a more accessible and cost-effective dressing, which could improve access to care and reduce costs for patients in resource-limited settings. The findings could also help inform clinical practice guidelines for hypospadias repair, resulting in better patient outcomes.

Figure 1: (a) Petroleum impregnated gauze covered over with zinc oxide adhesive plaster. (b) Occlusive hydrocolloid dressing.



Table 1: Basic characteristics of patients operated for hypospadias in a tertiary care hospital in Pakistan.

Characteristics	Overall			Occlusive Hydrocolloid dressing			Petroleum impregnated gauze with zinc oxide plaster		
	n (%)	95% Lower CL	95% Upper CL	n (%)	95% Lower CL	95% Upper CL	n (%)	95% Lower CL	95% Upper CL
Diagnosis									
Subcoronal Hypospadias	36 (56.3)	44.0	67.9	20 (55.6)	39.4	70.8	16 (44.4)	29.2	60.6
Coronal Hypospadias	6 (9.4)	4.0	18.3	4 (66.7)	28.6	92.3	2 (33.3)	7.7	71.4
Glanular Hypospadias	3 (4.7)	1.3	12.0	3 (100.0)	.	.	0 (0.0)	.	.
Midpenile Hypospadias	4 (6.3)	2.1	14.2	3 (75.0)	28.4	97.2	1 (25.0)	2.8	71.6
Penoscrotal Hypospadias	2 (3.1)	0.7	9.6	0 (0.0)	.	.	2 (100.0)	.	.
Proximal Penile Hypospadias	2 (3.1)	0.7	9.6	0 (0.0)	.	.	2 (100.0)	.	.
Fistula	7 (10.9)	5.0	20.3	3 (42.9)	13.9	76.5	4 (57.1)	23.5	86.1
Complete Disruption	4 (6.3)	2.1	14.2	4 (100.0)	.	.	0 (0.0)	.	.
Type of procedure									
Snodgrass Repair	40 (62.5)	50.3	73.6	23 (57.5)	42.1	71.9	17 (42.5)	28.1	57.9
Snodgraft Repair	3 (4.7)	1.3	12.0	3 (100.0)	.	.	0 (0.0)	.	.
Duplay Repair	6 (9.4)	4.0	18.3	5 (83.3)	44.2	98.1	1 (16.7)	1.9	55.8
MAGPI	2 (3.1)	0.7	9.6	2 (100.0)	.	.	0 (0.0)	.	.
Fistula Repair	7 (10.9)	5.0	20.3	3 (42.9)	13.9	76.5	4 (57.1)	23.5	86.1
Spongioplasty with Meatoplasty	1 (1.6)	0.2	7.1	1 (100.0)	.	.	0 (0.0)	.	.
Bracka two stage Repair	5 (7.8)	3.0	16.3	0 (0.0)	.	.	5 (100.0)	.	.
Type of dressing									
Occlusive Hydrocolloid Dressing	37 (57.8)	45.6	69.3	37 (100)	-	-	0 (0.0)	-	-
Petroleum impregnated gauze with zinc oxide plaster	27 (42.2)	30.7	54.4	0 (0.0)	-	-	27 (100.0)	-	-
Outcome									
No complications	56 (87.5)	75.9	92.8	32 (86.4)	43.2	68.9	24 (88.8)	31.1	56.8
Postoperative Fistula	6 (9.3)	4.0	18.3	4 (10.8)	16.7	83.3	3 (11.1)	16.7	83.3
Wound Dehiscence	2 (3.1)	0.7	9.6	1 (2.7)	.	.	0 (0.0)	.	.
Type of case									
Virgin	51 (79.7)	68.7	88.1	28 (54.9)	41.3	68.0	23 (45.1)	32.0	58.7
Redo	13 (20.3)	11.9	31.3	9 (69.2)	42.3	88.6	4 (30.8)	11.4	57.7

Abbreviations: CL = Confidence Level; MAGPI = meatal advancement and glanduloplasty

Table 2: Association of type of dressing with the outcomes in hypospadias repair surgery.

Variable	Occlusive Hydrocolloid dressing		Petroleum impregnated gauze with zinc oxide plaster		T statistics/Chi square statistics	p value
	Mean	SD	Mean	SD		
Age in years	6.10	3.38	5.75	3.20	.386	.701
Outcome, n (%)	N	%	N	%	.377	.722
No complications	31	83.8	24	88.9		
Complication	6	16.2	3	11.1		

DISCUSSION

Hypospadias repair is a common procedure done by paediatric urologists and surgeons. To decrease its failure rates and reoperations, many advancements have been done in the operative surgical practice including the use of various types of post-surgical wound dressings. Accordingly, two varieties of simple penile dressings are used in our institution. These are occlusive hydrocolloid dressing and petroleum-impregnated gauze with zinc oxide adhesive plaster. Since these two dressings are used for other multiple wound types, these are readily available at our institute. There is a dearth of literature on the optimal dressing of hypospadias repair. This study addresses the comparative effectiveness of these two dressings and analyses the effectiveness of these dressings in terms of the outcome.

The outcomes reported in our study include (i) uncomplicated successful repair, (ii) fistula formation, (iii) wound dehiscence. None of the patients had complications like wound infection, intractable oedema, and hematoma formation. Post-operative fistula formation is the commonest complication following hypospadias repair¹². One of the risk factors for the development of a fistula depends upon the original location of the meatus. The greater the proximity to the base of the penis and length of urethral defect, the greater the risk^{13,14}. Factors like postoperative local ischemia, wound infection, and oedema formation, avoided by penile dressings have also been implicated in the formation of a fistula. Wound dehiscence is another complication that can be encountered following repair. It is associated with both local and systemic factors. Complications like wound infection can be prevented by using appropriate aseptic measures and avoiding intra and post-operative ischemia^{15,16}. This can largely be prevented by meticulous surgical technique, appropriate penile dressings, and judicious use of antibiotics. Both the dressings used in this study showed a near-equal percentage of fistula and wound

dehiscence, hence none of the two is superior in preventing these complications.

The similar outcomes of the two groups are possibly attributed to the homogeneous functional architecture of the two types of dressings. Hydrocolloid dressings are waterproof, occlusive, impervious to bacteria and other pollutants and it possess physical qualities that guard against pressure injuries¹⁷. It is double layered, the outer impermeable polyurethane foam layer assists in thermal and mechanical protection, and the inner adhesive and hydrophilic layer consist of hydrocolloid particles that absorb the exudate of the wound and gets converted into a moist gel. The dressing is adherent to the normal surrounding skin only^{18,19}. It, therefore, provides a moist environment for healing, occlusion for collagen synthesis, and protection to newly formed tissues during dressing removal. Modelling studies revealed that these dressing materials transfer mechanical forces including pressure, shear, and friction²⁰. On the other hand, sterile petroleum-based gauze, used as a single layer, provides a moist environment due to its petroleum content and it can be adhered to the wound site by zinc oxide adhesive plaster.⁷ The zinc oxide cotton adhesive plaster used to secure the gauze is waterproof and allows washing and bathing without the risk of soaking the gauze. Petroleum-impregnated gauze is opaque and obscures the wound but this did not increase the rate of complications. Both are capable of absorbing excess exudate of the wounds, are easy to apply and remove, and have shown satisfactory healing of the postsurgical wounds of hypospadias repair.

Although Chaby et al., in the systematic review, have provided a weak level of evidence supporting the superiority of hydrocolloid dressing in healing diverse wound types when compared with paraffin gauze, our study's results are not coherent with it⁸. Another study comparing hydrocolloid dressing with conventional daily dressing (including petroleum gauze) demonstrated that one time application of hydrocolloid dressing

compares favourably to conventional dressings in terms of comfort, convenience, ease of wound care instructions and scar appearance⁹. The conclusions of the above studies differ from ours probably due to the different nature of the wounds and heterogeneity of variables such as patient demographics and patient's expectations of cosmesis.

Since both have comparative functional outcomes, there are still factors that can influence the selection of one of the two dressings, the cost of dressing and the ease of availability, especially in low- and middle-income countries where there are limited financial resources. Based on this, it may be preferable to use inexpensive sterile petroleum-impregnated gauze for wound healing over the relatively more expensive hydrocolloid dressing.

Limitations: The parameters that limit the study include the inclusion of variable types of hypospadias and the respective procedures done for specific hypospadias types. Furthermore, a larger sample size would have drawn more accurate results.

Strength: A single operating surgeon performing all the surgical procedures prevents the inaccuracy that might have occurred due to the variable skill set of multiple surgeons.

CONCLUSION

Our study has shown equivalent efficacy of the hydrocolloid dressing and petroleum-impregnated gauze in healing hypospadias repair wound and preventing wound complications. We conclude that a simple penile dressing can be used in hypospadias surgery without compromising the outcome.

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