SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

The Management Outcomes of Maxderm Hydrocolloid Dressing Compared to Povidone Iodine Dressing Post Elective Cesarean Section Operations in Omdurman Maternity Hospital

Mohamed M Hassan[1*], Motaman Ahmed[2], Noon Mohamed[3], Ghaida Mohammed[4], Noora Abubaker[5], Aamir A Hamza[6], Emad Omer[7], Saif Albahar[8]

[1]General Surgeon MD, MRCSed, [2]Senior clinical Fellow, [3-5]Foundation Year[1,] [6]MD (SMSB) Hon, FCS (ECSA), FSASS Dept. of General Surgery, Bahri University), [7,8]Consultant Obstetrics and gynecologists MD, Sudan

DOI: 10.36347/sasjs.2021.v07i10.017 | **Received:** 07.09.2021 | **Accepted:** 09.10.2021 | **Published:** 28.10.2021

***Corresponding author:** Mohamed M Hassan

Abstract **Original Research Article**

Background: Dressing of post-surgical procedures was mainly dependent on Povidone iodine and saline gauze dressing, with longer hospital stay and more frequent dressing times which lead to increase surgical sites infection rates**.** ***Patient and Methods:*** This study is an observational prospective comparative cross-sectional hospital-based study, was conducted at Omdurman Maternity Hospital from November 2020 till August 2021. Data were collected by standardized questionnaire and analyzed by using SPSS version 20**.** ***Results****:* A total of 196 patients who satisfied the inclusion criteria were included in the study,(95) patients were undergone a povidone iodine dressing and (101) patients were on Hydrocolloid dressing. The mean age of recruited patients was found to be 31 ± 5.6 SD years; the age range was (15-47) years. The most encountered symptom in day zero and day 7 was abdominal pain (89%), which was more in povidone iodine dressing patients (50%, p value < 0.0001). The most encountered symptom in day two was the abdominal pain (34.5%) similarly; it was more in povidone iodine dressing group (25%, p value < 0.0001). The most encountered sign in day seven and day 14 was surgical site tenderness (40%, 32% respectively), and it found to be more in povidone iodine dressing group in days seven (27%, p value 0.008) and day 14 (24%, p value 0.0001). P value was also scientifically significant in wound exudate and Fever, as Povidone iodine dressing showed higher percentages compared to hydrocolloid dressing. 17% of patients showed complete healing days 0f <6 days, 87% of them were of hydrocolloids dressing type (P value < 0.0001). Sixty percent of Hydrocolloid dressing patients retained their activity within (8-14) days postoperatively with significant satisfaction and 53% of povidone iodine patients retained their more than 2 weeks postoperative (P value < 0.0001). The mean total cost of dressing including the dressing frequency and nurse feasting hydrocolloid dressing group found to be 3.7±4SD USD and in povidone iodine dressing group found to be 4.7 ±4SD USD with P value 0.473. ***Conclusion****:* Hydrocolloid dressing has less pain, risk of infection postoperatively and less healing days with shorter hospital stay. Hydrocolloid dressing demonstrated early return to daily activity with majority of patients' satisfaction. Regarding the cost Povidone iodine is cheaper as one dressing session but as a whole hydrocolloid dressing is less expensive. We recommend usage of hydrocolloid dressing in various surgical or obstetric operations, and increasing the awareness regarding the safety and efficacy of hydrocolloid dressing compared to conventional and occlusive dressings.

Key words: Surgical Site Infection (SSI), centers for disease control (CDC), Caesarian Sections(C/S).

INTRODUCTION

Recent advances in wound management incorporate new technologies that interact with the wound at a cellular level rather than simply reducing moisture loss. The balance of moisture is critical to healing and this principle has been the driving force in the development of products that are currently available such as hydrogels, hydrocolloids, alginates, foams and films. Surgical wounds (incisions) heal by primary intention when the wound edges are brought together and secured, often with sutures, staples, or clips. Wound healing has three overlapping phases which are inflammation, proliferation, and remodelling. Wound dressings applied after wound closure may provide physical support, protection and effective absorption of exudate [1-3].

Whilst Surgical Site Infections (SSIs) can be difficult to define (one review identified 41 different

definitions and 13 grading scales of SSI (Bruce 2001)), the Centers for Disease Control and Prevention (CDC) have published the following guidelines defining superficial and deep incisional SSIs (Horan 2008). A superficial SSI is defined as: an infection occurring within 30 days after the operation, that only involves the skin and subcutaneous tissue of the incision, and is associated with at least one of the following: purulent drainage, with or without laboratory confirmation, from the surgical site; organisms isolated from an aseptically-obtained culture of fluid or tissue from the surgical site; at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat, and the superficial incision is deliberately opened by the surgeon and is culture-positive or not cultured (a culture-negative finding does not meet this criterion); diagnosis of SSI by the surgeon or attending physician[4].

Infection risk varies according to surgical procedure (clean, clean/contaminated, contaminated, or dirty), whether surgery is planned, and patient factors. After high risk, dirty-infected procedures (such as unplanned colorectal surgery), infection risk may reach up to 25%, whereas the risk after elective clean surgery is typically less than 5% (for example, 4.4% for coronary artery bypass surgery and 1% for breast surgery) [5]. Theoretically, dressings might limit surgical site infection by providing a barrier to exogenous environmental contamination with bacteria, or they might increase surgical site infection by incubation of endogenous commensal organisms (that is, bacteria present from the time of surgery) [6].

PATIENTS AND METHODS

This study is an observational prospective comparative cross-sectional hospital-based study. It was conducted at Omdurman Maternity Hospital, which is the largest obstetric and genealogical hospital in Sudan, located East of Omdurman city, has 5 theatres, performing 20-30 emergencies Caesarian Sections C/S daily, 30-40 elective C/S per day. It contains 150 beds for prenatal and post-natal wards, 3 consultants in every unit and 20 registrars in minimum.

This study was conducted from November 2020 till August 2021. All females underwent elective C/S, except with the exclusion criteria presented to Omdurman Maternity hospital during the period of data collection who used Maxderm hydrocolloid or Pvidone Iodine dressing post C/S were recruited. All females aged 20-40 years had elective C/S, with uneventful antenatal period, were included during the period of data collection in the study. In addition to refusal of participation in the study, females who did not complete the follow up, patients with Diabetes, Immune compromised conditions and patients with known antenatal risk factors (Malaria, preeclampsia…) were excluded.

The patients were randomized for receiving either Maxderm hydrocolloid dressing or Povidone iodine dressing, even number for hydrocolloid and odd number for Povidone Iodine. An interview questionnaire that is structured and pretested used as a tool of data collection from every female had elective C/S done by doctors in charge of this study and registrars of obstetrics and gynecology. Maxderm hydrocolloid (polyurethane) dressing planned for to be changed after 7 days of dressing for 2 weeks. Povidone iodine planned to be changed every 2 days for 2 weeks. Data was collected from study participants in day 0. Follow up_which included patients symptoms and signs_was carried out by telephone calls in days: one, two, three, 7 and 14 postoperatively.

The items in the used questionnaire were: Demographic data, indications of C/S, intra operative bleeding, time of operation, symptoms and signs (abdominal pain, distention, fever, diarrhea, wound exudate, wound pus) hospital stay, place of dressing change, patient satisfaction and cost.

After the completion of data collection, the data was entered into the Statistical Package of Social Sciences (SPSS, IBM. Chicago. Version 20.0) and then analyzed. All statistical tests were based on the <0.05 confidence level 95%.

Ethical clearance and the approval to conduct the study were obtained from hospital administration. Written consent was taken from all participants and confidentiality of data was kept properly.

RESULTS

A total of 196 patients satisfied the inclusion criteria were included in the study (95), patients were undergone a povidone iodine dressing and (101) patients were on Hydrocolloid dressing. We didn't interfere with the selection of the dressing type. The mean age of recruited patients was found (31 ± 5.6 SD) years, the age range was (15-47) years. The majority of patients (74.4%) were residents in Omdurman locality followed by a 16% were from Bahry locality. The mean number of pregnancies was (4 ± 2 SD) with range between (0 -11), 28 % of patients were on their second pregnancy and 21% were on their fourth, mean number of previous C/S was (2 ± 1 SD) with range between (0 – 5), 33% of patients had a history of one scar and 26% with two scars of C/S. 82% of C/S were indicated for previous scar and 7 % for postdate. The type of incision used was pfannenstiel incision in all participants. The most encountered symptoms and signs were abdominal Pain (81% and 53% in day zero and day one post-operative respectively), and surgical site tenderness (54% and 48 % in day five and day seven respectively).

Table-1: Patients Age

Type of Dressing used		N	Minimum	Maximum	Mean	Std. Deviation
Hydrocolloid Maxderm	Patient Age	101	15	45	31.23	5.793
Povidone Iodine	Patient Age	95	20	47	31.26	5.536

Post-operative Day zero signs and symptoms

The most encountered symptom in day zero was pain with 89%, which was more in povidone iodine dressing patients 50% with p value of 0.0001. Regarding surgical site bleeding and post-operative fever, Hydrocolloid dressing showed better results compared to Povidone iodine dressing with insignificant P value.

Table-2: Post-operative day 0 signs and symptoms

	Type of Dressing used		Total	Sig.
	Hydrocolloid Maxderm	Povidone Iodine		
Abdominal pain	38.6%	50.0%	88.6%	.0001
Abdominal distention	4.2%	2.4%	6.6%	.098
Surgical site bleeding	0.0%	0.6%	0.6%	.038
Fever	1.8%	2.4%	4.2%	.352
Total	44.6%	55.4%	100.0%	

Post-operative day two signs and symptoms

The most encountered symptoms and signs in day two were abdominal pain and surgical site tenderness with 34.5% 29% respectively, which founded to be more in povidone iodine dressing patients 25% for abdominal pain p value 0.007 and 18 % for surgical site tenderness P value 0.0001 that was scientifically significant. Hydrocolloid dressing showed better results in the remaining clinical features compared to Povidone iodine dressing a part from diarrhea, with insignificant P value.

Table-3: Post-operative Day 2 signs and symptoms

		Type of Dressing used		Total	Sig.
		Hydrocolloid Maxderm	Povidone Iodine		
Abdominal pain in day 2	% of Total	9.8%	24.7%	34.5%	.007
Abdominal distention in day 2	% of Total	6.7%	7.5%	14.1%	.255
Diarrhea in day 2	% of Total	0.8%	0.0%	0.8%	.005
Wound exudate in day 2	% of Total	0.4%	0.4%	0.8%	.931
Surgical site bleeding in day 2	% of Total	0.8%	1.6%	2.4%	.070
Fever in day 2	% of Total	2.0%	7.5%	9.4%	.000
Surgical site swelling in day 2	% of Total	1.6%	1.6%	3.1%	.860
Surgical site tenderness day 2	% of Total	10.2%	18.4%	28.6%	.000
Surgical site redness in day 2	% of Total	1.2%	3.9%	5.1%	.000
Pus at wound in day 2	% of Total	1.2%	0.0%	1.2%	.001
Total	% of Total	34.5%	65.5%	100.0%	

Post-operative day seven signs and symptoms

The most encountered symptoms and signs in day seven was surgical site tenderness (39%), which was more in povidone iodine dressing (27% p value 0.008) . Pain was encountered more in Povidone iodine dressing 13.4% compared to hydrocolloid 2.2 % with scientifically significant P value .0001. P value was also scientifically significant in wound exudate and Fever, as Povidone iodine dressing showed higher percentages compared to hydrocolloid dressing.

Table-4: Post-operative day seven signs and symptoms

		Type of Dressing used		Total	Sig.
		Hydrocolloid	Povidone Iodine		
	Abdominal pain in day 7	2.2%	13.4%	15.6%	.000
	Abdominal distention in day 7	1.8%	1.3%	3.1%	.547
	Diarrhea in day 7	1.3%	1.3%	2.7%	.899
	Wound exudate in day 7	1.8%	5.4%	7.1%	.000
	Surgical site bleeding in day 7	0.9%	2.2%	3.1%	.012
	Fever in day 7	0.9%	6.3%	7.1%	.000
	Surgical site swelling in day 7	2.7%	5.4%	8.0%	.001
	Surgical site tenderness in day 7	12.1%	27.2%	39.3%	.008
	Surgical site redness in day 7	2.2%	6.3%	8.5%	.000
	Pus at wound in day 7	1.8%	3.6%	5.4%	.009
Total		27.7%	72.3%	100.0%	

Post-operative day fourteen signs and symptoms

The most encountered symptom and sign in day fourteen was surgical site tenderness (32%) which was more in povidone iodine dressing patients (24% p value 0.0001). Hydrocolloid dressing showed better results in the remaining clinical features compared to Povidone iodine dressing a part from pus at wound side which was equal in both groups (3.7%), with insignificant P value.

Table-5: Post-operative Day 14 signs and symptoms

		Type of Dressing used		Total	Sig.
		Hydrocolloid Maxderm	Povidone Iodine		
	Post operative Abdominal pain in day 14	2.1%	14.2%	16.3%	.000
	Post operative Abdominal distention in day 14	0.5%	2.6%	3.2%	.000
	Post operative Diarrhea in day 14	0.0%	1.6%	1.6%	.000
	Post operative Wound exudate in day 14	3.2%	6.3%	9.5%	.001
	Post operative Surgical site bleeding in day 14	1.6%	3.2%	4.7%	.025
	Post operative Fever in day 14	1.1%	3.2%	4.2%	.002
	Post operative Surgical site swelling in day 14	1.6%	7.4%	8.9%	.000
	Post operative Surgical site tenderness in day 14	7.9%	23.7%	31.6%	.000
	Post operative Surgical site redness in day 14	4.7%	7.9%	12.6%	.003
	Post operative Pus at wound in day 14	3.7%	3.7%	7.4%	.813
Total		26.3%	73.7%	100.0%	

Number of dressing in two weeks

31% of patients undergone a total of 2 dressings, 16.5 % were of hydrocolloid dressing and 14.4 % were povidone iodine. The mean number of dressing in hydrocolloid dressing group was 2 ± 1 SD and for povidone iodine group 3 ± 2 with p value of 0.26.

Table-6: Number of dressings in two weeks

			Type of Dressing used		Total
			Hydrocolloid Maxderm	Povidone Iodine	
Number of dressings in two weeks	.00	% of Total	0.5%	0.0%	0.5%
	1.00	% of Total	9.8%	7.2%	17.0%
	2.00	% of Total	16.5%	14.4%	30.9%
	3.00	% of Total	13.9%	12.9%	26.8%
	4.00	% of Total	8.2%	5.7%	13.9%
	5.00	% of Total	2.1%	4.6%	6.7%
	6.00	% of Total	0.5%	2.1%	2.6%
	8.00	% of Total	0.5%	0.5%	1.0%
	11.00	% of Total	0.0%	0.5%	0.5%
Total		% of Total	52.1%	47.9%	100.0%

Complete-healing days

55.6% of hydrocolloids patients showed a complete healing duration of more than 6-10 days, and 50% of povidone iodine patients showed a complete healing of 6-10 days .17% of patients showed complete healing days 0f <6 days 87% of them were of hydrocolloids dressing type. P value < 0.0001which is scientifically significant.

Table-7: Complete healing days

			Type of Dressing used		Total
			Hydrocolloid Maxderm	Povidone Iodine	
Complete healing days	<6 days	Count	27	4	31
		% within Complete healing days	87.1%	12.9%	100.0%
		% within Type of Dressing used	27.3%	4.7%	16.8%
		% of Total	14.6%	2.2%	16.8%
	6-10 days	Count	55	43	98
		% within Complete healing days	56.1%	43.9%	100.0%
		% within Type of Dressing used	55.6%	50.0%	53.0%
		% of Total	29.7%	23.2%	53.0%
	11-14 days	Count	8	15	23
		% within Complete healing days	34.8%	65.2%	100.0%
		% within Type of Dressing used	8.1%	17.4%	12.4%
		% of Total	4.3%	8.1%	12.4%
	>14 days	Count	9	24	33
		% within Complete healing days	27.3%	72.7%	100.0%
		% within Type of Dressing used	9.1%	27.9%	17.8%
		% of Total	4.9%	13.0%	17.8%
Total		Count	99	86	185
		% within Complete healing days	53.5%	46.5%	100.0%
		% within Type of Dressing used	100.0%	100.0%	100.0%
		% of Total	53.5%	46.5%	100.0%

Retain of daily activities

42% of patients returned to their daily activities within (8-14) days postoperatively.60% of Hydrocolloid dressing patients retained their activities within (8-14) days postoperatively , 53% of povidone iodine patients retained their activates in more than 2 weeks postoperatively. P value < .0001

Patients' satisfaction

57% of patients were satisfied with their wound healing result, 67% of them were of hydrocolloid dressing type and 33% of povidone iodine dressing type (p value of 0.001).

Table-8: Patient satisfaction about wound healing * Type of Dressing used Crosstabulation

			Type of Dressing used		Total
			Hydrocolloid Maxderm	Povidone Iodine	
Patient satisfaction abount wound healing	Satisfied	% within Type of Dressing used	73.3%	39.8%	57.2%
		% of Total	38.1%	19.1%	57.2%
	Neutral	% within Type of Dressing used	17.8%	30.1%	23.7%
		% of Total	9.3%	14.4%	23.7%
	Dissatisfied	% within Type of Dressing used	8.9%	30.1%	19.1%
		% of Total	4.6%	14.4%	19.1%
Total		% within Type of Dressing used	100.0%	100.0%	100.0%
		% of Total	52.1%	47.9%	100.0%

Total cost of dressing

The mean total cost of dressing in hydrocolloid dressing group was found to be 3.7±4SD USD and in povidone iodine dressing group was found to be 4.7 ±4 SD USD with P value of 0.473. We think this might be inaccurate due to: unstable local currency exchange rate related to USD, inaccuracy of the cost by many patients, and the variety of dressing cost among the health centers and hospital.

Table-8: Total cost of dressing

Type of Dressing used		N	Mean	Std. Deviation
Cost in USD	Hydrocolloid Maxderm	43	3.7919	1.40463
	Povidone Iodine	41	4.7263	4.03284

DISCUSSION

New techniques in wound dressing with occlusive dressing become popular these days, considering the availability, efficacy and cost. The mean age of recruited patients was found (31 ± 5.6 SD) years.

Clinical features

Post-operative wound site pain was more dominant in Povidone iodine dressing compared to hydrocolloid dressing with significant P value < 0.0001 from day 0 up to day 14 post-operatively, which is the same finding in Biltz H. study, he described statistically significant reduction in pain score in patients treated with hydrocolloid dressing (2·1±1·9 versus 6·5±2·0; *P*<0·01) [7]. Hedman LA. Report described how pieces of hydrocolloid were used to treat 39 soldiers who developed a total of 70 abrasions to their feet during a 160 km, 4-day road hike. Estimation of pain levels before treatment showed that 28% had severe pain, 4% moderate pain and 8% no pain. Of those with initial severe or moderate pain, 92% reported good pain relief and 8% moderate pain relief after application of the dressings. The pain relief provided by the dressing enabled 35 of the 39 soldiers to complete the exercise [8].

Knapik JJ. *et al*. described review of the pathophysiology, prevention and treatment of blisters that appeared in the journal *Sports Medicine* recommended the use of hydrocolloids for treating deroofed blisters, stating that this treatment 'provides pain relief and may allow patients to continue physical activity if necessary[9]. Herman S. reported in his study he used extra thin hydrocolloid dressing in sutured wounds with various etiologies in 95 patients, he stated that hydrocolloid was easy to use, safe and effective in terms of patient's mobility and reducing pain [10].

Regarding surgical site bleeding the results was nearly close with advantage of hydrocolloid over povidone iodine dressing from day 0 to day 14 post-operative ranging from P value (0.12 to 0.70). Post-operative wound exudate become more prominent in Povidone iodine dressing over hydrocolloid, mainly at day 7 post-operative with significant P value < 0.0001, in Michie DD. and Hugill JV study, they used extra thin hydrocolloid dressing versus normal dressing in 28 patients' undergone elective surgeries. At the time of suture removal, the hydrocolloid dressings' ability to contain exudate, protect the wound and facilitate mobility and personal hygiene were more highly rated compared with the gauze-type dressings (*P* < 0·001, for all variables) which is the same as our study [11].

In our study post-operative wound infection and pus discharge was more with Povidone iodine compared to hydrocolloid in day 7 and day 10 with insignificant P value 0.09 and 0.019 respectively, and no difference in day 14 by 3.7 % of the patients for each. Hultén L studied the use of hydrocolloid in about 340 patients in colorectal surgeries with stoma creation and reported no wound infection in 92% of patients in addition to the reduction in inflammation and subsequent scarring [12]. Holm C. *et al*. compared hydrocolloid with conventional dressing in incisional wounds after abdominal operations, 26 patients with hydrocolloid and 17 with conventional dressing, wound infection developed in 1 patient in hydrocolloid compared to 5 in conventional dressing with P value 0.2 which goes with our study [13].

Although Shinohara T. *et al*. compared hydrocolloid dressing with gauze dressing in 134 patients underwent abdominal surgeries and reported that there were no differences between the groups regarding the incidence of infection [14]. As a same for Persson M. *et al*. surgical procedures in this trial were classified by the authors as clean/contaminated. There was no statistically significant difference in the number of surgical site infections in the basic wound contact-dressed group (2/30; 7%) compared with the hydrocolloid-dressed group (2/31; 6%) [15]. Connery SA *et al*., compare the effectiveness of silver-impregnated dressings with traditional wound dressings in reducing additional postoperative visits associated with surgical site infections (SSIs) in patients undergoing cesarean delivery. Two patients whose incisions were covered with a gauze pad and 2 patients who received the silver-impregnated dressings developed an SSI requiring additional wound care visits. Silver-impregnated dressings did not significantly reduce the rate of wound care-related postoperative visits [16].

Dressing frequency and healing days

Regarding dressing change times and healing days in our study, the mean number of dressing in hydrocolloid dressing group was 2 ± 1 SD and for povidone iodine group 3 ± 2 with p value of 0.26. In healing days 17% of patients showed complete healing of <6 days 87% of them were of hydrocolloids dressing type, and 55% of the patients healed in 6-10 days were from hydrocolloid group with p value 0.000255 which is scientifically significant. Povidone iodine group demonstrated higher percentages in > 10 days. Wyatt G Payne et al, studied a Stage II pressure ulcer (mean duration 35 weeks) at five centers in the United States, participants were randomized to treatment with a self-adhesive polyurethane (hydrocolloid) foam (n = 20) or

saline-soaked gauze dressing (n = 16), no difference in time to wound closure was observed (P = 0.817),and the patients in the foam group had less frequent dressing changes (P <0.001) which is the same outcome to our study regarding dressing changes [17]. Madden *et al.* also compared Granuflex/Duoderm (hydrocolloid) with fine mesh gauze in the treatment of 20 donor sites and reported comparable benefits in terms of healing rates (7·4 versus 12·6 days; $P < 0{\cdot}001$), accompanied by greatly reduced infection rates [18]. Gregson H. studied surgical sites infection post caesarean section, Infection rates before compliance with NICE guidance from July 2008 to June 2009 ranged from 5.7% to 9.0%. After introducing the guidelines, rates of SSI at site A and site B were reduced by 3.3% and 3.8% respectively.

Rates of SSI at site A were reduced further to 1.3% on introduction of the hydrofiber and hydrocolloid dressing [19]. Estienne and Di Bella who compared Granuflex/Duoderm (hydrocolloid) with traditional dressings (hypochlorite irrigation and packing with paraffin gauze) in 40 patients for the treatment of pilonidal fistula, they found that wounds dressed with Granuflex/Duoderm achieved complete healing in an average of 6 weeks compared with the 10 weeks required for traditionally treated wounds [20]. Young *et al*. reported the results of a small randomised study involving 49 patients with 54 wounds in which the performance of Granuflex/Duoderm (hydrocolloid) was subjectively compared with that of unspecified standard treatments following clean elective surgeries. In both investigations, it was concluded that hydrocolloid dressings offered an acceptable alternative to conventional products following primary closure [21]. Alsbjorn *et al*. described the use of hydrocolloid dressings following cardiac surgery, compared healing rates achieved with a hydrocolloid, (Granuflex/Duoderm) and paraffin gauze on drainage wounds in 21 patients each of whom had two drains introduced through incisional wounds in the infrasternal area. They examined the wounds on postoperative day 10. At this point, 13 hydrocolloid-dressed wounds had healed compared with six wounds dressed with paraffin gauze. No differences in wound infection rates were detected [22]. Wikblad and Anderson dressed the wounds of 250 patients undergoing heart surgeries to treatment with Granuflex/Duoderm, versus gauze and tape in a randomized controlled study. The conventional absorbent dressing was more effective in wound healing than gauze and tape; there were also fewer skin changes and less redness in the wounds. The differences were not significant with the hydrocolloid dressing. The conventional dressing was less painful to remove than Granuflex/Duoderm. More frequent dressing changes, however, were needed when using the conventional dressing. Despite this, it was the least expensive alternative [23].

Nagai *et al*. described the successful use of a hydrocolloid (Duoderm) as an alternative to elastic bandages following urethroplasty for repairing hypospadias in 12 infants and suggested that the use of the dressing offers significant clinical advantages and a reduction in complications [24]. Wright *et al*. similarly treated 98 patients with partial-thickness burns suitable for outpatient management with Granuflex/Duoderm or Bactigras to compare the safety, efficacy and performance characteristics of the two products. In 67 evaluable patients. Although time to healing was comparable in this study (median 12 days in each case), the quality of healing was rated as 'excellent' in 56% of patients treated with Granuflex/Duoderm compared with only 11% in the group treated with the conventional dressing ($P < 0{\cdot}0001$). Both investigators and patients showed a significant preference for the hydrocolloid despite greater problems of leakage with the hydrocolloid [25]. Rasmussen *et al.* when they compared Granuflex/Duoderm with their standard treatment, which consisted of adhesive wound closures (Steristrip; 3M) covered with an island dressing with a non-woven fabric back (Cutiplast; Smith and Nephew) in a randomized trial that focused on the psychological aspects of the treatment of 88 children who had undergone minor outpatient surgery. They found that the hydrocolloid dressing required fewer dressing changes and readily permitted bathing or washing, while minimizing the physical and psychological trauma to the infants or children and reducing the disruption to the children's and the parents' daily routines [26].

Ubbink D.T *et al*. who investigated a consecutive series of 76 patients with wounds, included in a randomized trial comparing occlusive vs. gauze dressings, change frequency in the occlusive group (median: 0.6/day) was significantly (p = 0.008) lower than in the gauze group (1.1/day) which is goes with our study, Wound healing in the gauze-treated group tended to be quicker than in the occlusive dressing group (medians: 30 vs. 48 days, p value = 0.060) which is against our study [27].

Dressing cost

The difficulty we faced in calculating the cost of the dressing attributed to the unstable local currency, wide range of dressing centers, variety of dressing fees and inaccurate information from the patients regarding dressing cost, we managed to involve only 43 patients in hydrocolloid dressing 3.7±4SD USD and 41 patients in Povidone iodine dressing 4.7 ±4SD USD with P value 0.473. Ubbink D.T *et al*. stated Mean daily material costs of modern dressings were euro5.31 vs. euro0.71 in the gauze group. Mean difference; euro4.60 (euro2.68-euro6.83) while daily total (material plus nursing) costs showed no difference between the groups; mean euro2.86 (CI, euro-6.50-euro10.25)[27]. Wyatt G Payne *et al*. reported that Total cost over the study period was lower by $466 per patient (P = 0.055)

and spending on dressings was lower by $92 per patient in the foam group (P = 0.025). Cost per ulcer healed was lower by $1,517 and cost per ulcer-free day was lower by $80 for patients in the foam group. On the evidence of this study, the foam dressing is a more cost-effective treatment than saline-soaked gauze for the treatment of Stage II pressure ulcers [17]. Shinohara T *et al*. found that post abdominal surgeries in 134 patient, hydrocolloid dressing was less expensive and complicated than GD, which needed to be changed every day ($p < 0.0001$) [14].

CONCLUSION

Hydrocolloid dressing patient demonstrated significant reduction in pain, tenderness, exudate secretions and risk of infection compared to the Povidone iodine during the postoperative 14 days. In hydrocolloid dressing majority of patient healing days were significantly shorter with less dressing used. Povidone iodine single time dressing was less expensive compared to hydrocolloid but when calculating nursing charge and dressing times as a whole, Hydrocolloid had a slight overall advantage and found to be less expensive. Hydrocolloid dressing significantly was more satisfying and demonstrated early return to daily activity or work.

REFERENCES

1. Heng, M. C. (2011). Wound healing in adult skin: aiming for perfect regeneration. *International journal of dermatology*, *50*(9), 1058-1066.
2. Reinke, J. M., & Sorg, H. (2012). Wound repair and regeneration. *European surgical research*, *49*(1), 35-43.
3. George Broughton, I. I., Janis, J. E., & Attinger, C. E. (2006). The basic science of wound healing. *Plastic and reconstructive surgery*, *117*(7S), 12S-34S.
4. Jenks, P. J., Laurent, M., McQuarry, S., & Watkins, R. (2014). Clinical and economic burden of surgical site infection (SSI) and predicted financial consequences of elimination of SSI from an English hospital. *Journal of Hospital Infection*, *86*(1), 24-33.
5. Dumville, J. C., Gray, T. A., Walter, C. J., Sharp, C. A., Page, T., Macefield, R., ... & Blazeby, J. (2016). Dressings for the prevention of surgical site infection. *Cochrane Database of Systematic Reviews*, (12).
6. Horan, T. C., Gaynes, R. P., Martone, W. J., Jarvis, W. R., & Emori, T. G. (1992). CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. *Infection Control & Hospital Epidemiology*, *13*(10), 606-608.
7. Biltz, H., Kiessling, M., & Kreysel, H. W. (1985). Comparison of hydrocolloid dressing and saline gauze in the treatment of skin graft donor sites. In *An environment for healing: the role of occlusion* (pp. 125-128). Royal Society of Medicine London.
8. Hedman, L. A. (1988). Effect of a hydrocolloid dressing on the pain level from abrasions on the feet during intensive marching. *Military medicine*, *153*(4), 188-190.
9. Knapik, J. J., Reynolds, K. L., Duplantis, K. L., & Jones, B. H. (1995). Friction blisters. *Sports Medicine*, *20*(3), 136-147.
10. Hermans, M. H. (1993). Clinical benefit of a hydrocolloid dressing in closed surgical wounds. *Journal of ET nursing: official publication, International Association for Enterostomal Therapy*, *20*(2), 68-72.
11. Michie, D. D., & Hugill, J. V. (1994). Influence of occlusive and impregnated gauze dressings on incisional healing: a prospective, randomized, controlled study. *Annals of plastic surgery*, *32*(1), 57-64.
12. Hultén, L. (1994). Dressings for surgical wounds. *Am J Surg*, *167*(1A):42S-44S; discussion 44S-45S.
13. Holm, C., Petersen, J. S., Grønbœk, F., & Gottrup, F. (1998). Effects of occlusive and conventional gauze dressings on incisional healing after abdominal operations. *European Journal of Surgery*, *164*(3), 179-183.
14. Shinohara, T., Yamashita, Y., Satoh, K., Mikami, K., Yamauchi, Y., Hoshino, S., ... & Maekawa, T. (2008). Prospective evaluation of occlusive hydrocolloid dressing versus conventional gauze dressing regarding the healing effect after abdominal operations: randomized controlled trial. *Asian journal of surgery*, *31*(1), 1-5.
15. Persson, M., Svenberg, T., & Poppen, B. (1995). To dress or not to dress surgical wounds? Patients' attitudes to wound care after major abdominal operations. *The European journal of surgery= Acta chirurgica*, *161*(11), 791-3.
16. Connery, S. A., Downes, K. L., & Young, C. (2012). A retrospective study evaluating silver-impregnated dressings on cesarean wound healing. *Advances in skin & wound care*, *25*(9), 414-419.
17. Payne, W. G., Posnett, J., Alvarez, O., Brown-Etris, M., Jameson, G., Wolcott, R., ... & Ochs, D. (2009). A prospective, randomized clinical trial to assess the cost-effectiveness of a modern foam dressing versus a traditional saline gauze dressing in the treatment of stage II pressure ulcers. *Ostomy/wound management*, *55*(2), 50.
18. Madden, M. R., Finkelstein, J. L., Hefton, J. M., & Yurt, R. W. (1985). Optimal healing of donor site wounds with hydrocolloid dressings. *An environment for healing: the role of occlusion. London: Royal Society of Medicine*, 133-137.
19. Gregson, H. (2011). Reducing surgical site infection following caesarean section. *Nursing Standard*, *25*(50).
20. Estienne, G., & Di Bella, F. (1989). The use of DuoDerm in the surgical wound after surgical

treatment of pilonidal fistulae using the open method. *Minerva chirurgica*, *44*(19), 2089-2092.

21. Young, R. A. L., & Weston-Davies, W. H. (1985). *Comparison of a hydrocolloid dressing and a conventional island dressing as a primary surgical wound dressing* (pp. 153-156). Royal Society of Medicine, London.
22. Alsbjörn, B. F., Ovesen, H., & Walther-Larsen, S. (1990). Occlusive dressing versus petroleum gauze on drainage wounds. *Acta chirurgica scandinavica*, *156*(3), 211-213.
23. Wikblad K, Anderson B. A comparison of three wound dressings in patients undergoing heart surgery. Nurs Res 1995;44:312–6.
24. Alsbjörn, B. F., Ovesen, H., & Walther-Larsen, S. (1990). Occlusive dressing versus petroleum gauze on drainage wounds. *Acta chirurgica scandinavica*, *156*(3), 211-213.
25. Wright, A., MacKechnie, D. W. M., & Paskins, J. R. (1993). Management of partial thickness burns with Granuflex 'E'dressings. *Burns*, *19*(2), 128-130.
26. Rasmussen, H., Larsen, M. J., & Skeie, E. (1993). Surgical wound dressing in outpatient paediatric surgery. A randomised study. *Danish medical bulletin*, *40*(2), 252-254.
27. Ubbink, D. T., Vermeulen, H., & Van Hattem, J. (2008). Comparison of homecare costs of local wound care in surgical patients randomized between occlusive and gauze dressings. *Journal of clinical nursing*, *17*(5), 593-601.