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EFFECTIVENESS OF USING HYDROCOLLOID DRESSING ON THE INCIDENCE OF EXTRAVASATION: AN EXPERIMENTAL STUDY

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ABSTRACT
Extravasation describes the process of leaking of substances injected into blood vessels into surrounding tissues. The incidence of extravasation ranges from 0.5%-6% in patients receiving peripheral chemotherapy. One way of treating extravasation is by using dressings. Hydrocolloid contains carboxymethyl cellulose (CMC) and gelatin. The function of hydrocolloid is to provide a moist environment, overcome inflammation, and protect epithelialised wounds from physical, chemical, and thermal trauma Objective: The purpose of the study was to determine the effectiveness of using Hydrocolloid dressing with regular wound care on the incidence of extravasation in the chronic room of dr. Mdjamil Hospital Padang Method: The type of research is quantitative with an Experimental Study design with a control Pre- Post Test. This study was conducted from February to July 2023 with 50 samples using the Simple Random Sampling technique. Data were collected using observation sheets, then tested with the General Linear Model Repeated Measure. Results: Based on the research results, a P value of 0.001 was obtained, giving hydrocolloid dressing had an effect in overcoming the incidence of extravasation after its use in children with cancer undergoing chemotherapy. The median score of extravasation on hydrocolloid was 7 and on ordinary wound care with a median score of 9 on the incidence of extravasation where the p-value was 0.018 Conclusions: There is an effect of using Hydrocolloid dressing on the incidence of extravasation in the chronic room of Dr. M. Djamil Hospital Padang. There is no effect of regular wound care on the incidence of extravasation in the chronic room of Dr. M. Djamil Hospital Padang.

Keywords: chemotherapy; extravasation; hydrocolloid; pediatric cancer

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INTRODUCTION

Extravasation is a problem that can occur in cancer patients receiving chemotherapy. It can cause pain, ulcers, necrosis, and most likely permanent disability. With proper chemotherapy administration techniques, the occurrence can be avoided, thus reducing the risk of extravasation. Extravasation describes the process of leaking of a substance injected into a blood vessel into the surrounding tissue (Markwick, 2015). The incidence of extravasation ranges from 0.5%-6% in patients receiving peripheral chemotherapy. This incidence is not a true value as many data are not reported. A study examining the incidence of extravasation over a five-week period in a UK hospital established an incidence of 39% in adults. The precise incidence of chemotherapy extravasation varies widely due to underreporting and the absence of a centralized registry of patient chemotherapy extravasation events (Al-Benna et al., 2013).

Extravasation still has a prevalence that can range from 0.1% to 6% when administered via peripheral intravenous access. Research conducted on 420 cancer patients given chemotherapy drugs found that 11.4% of patients experienced extravasation. Research conducted by Manik (2018) found 5 extravasation events from 70 samples. Research conducted by Purnaningsih et al. (2020) there were 14 extravasation events. The published data are not all, because many cases of extravasation are not reported. The scarcity of available data makes it difficult to develop an optimal management scheme. Some data suggest that the incidence is decreasing possibly due to improvements in infusion procedures, early recognition of drug leaks, and training in management techniques (Al-Benna et al., 2013; Purnaningsih et al., 2020).

Common symptoms and signs of extravasation include pain, stinging or burning sensations, and edema around the intravenous (IV) injection site. In severe cases, extravasation may cause tissue dysfunction or physical disability, resulting in delayed treatment efforts, patient distrust, and many other problems. The signs and symptoms of extravasation are similar to phlebitis, such as swelling or edema at the IV catheter site and surrounding area, patient discomfort, changes in the quality and flow of infusions or injections, and seepage or leakage at the IV catheter access (Firmana, 2017). Research conducted by Markwick, (2015) entitled Nurses' knowledge and experience related to short peripheral venous catheter extravasation obtained 3 symptoms of extravasation reported by nurses, including swelling (97.9%), redness (97.2%), pain (92.4%), temperature rise (65.5%), and ulceration (60.0%). Risk factors for extravasation are the type of chemotherapy drugs given, patient characteristics such as small veins, the presence of comorbidities such as diabetes mellitus, obesity, and age (children and geriatrics).

Extravasation can occur due to several factors, including venous physiology, drug pharmacology, body physiology, radiological and mechanical. Most chemotherapy drugs are not vesicants (ulcerogenic), but if less careful, extravasation or fluid into the subcutaneous tissue can occur. Based on the potential of the agent/drug to cause tissue damage, it is divided into vesicant, irritant, and non-vesicant types. The symptomatic manifestations of chemotherapy extravasation are extensive. It can be very mild and can also appear as acute burning pain and swelling at the infusion site according to the amount and concentration of drugs that have extravasated. Pain and erythema, induration, and skin discoloration progressively develop day by day, up to weeks, and may increase to form vesicles leading to invasive and destructive necrosis of deeper structures. Damage can reach tendons, nerves, and joints depending on the location of the vein where extravasation occurs (Kreidieh et al., 2016).

Over the last few decades, various modalities of extravasation management have been empirically implemented. Although small extravasation lesions may heal spontaneously, larger lesions especially vesicant drugs can be dramatic and lead to tissue necrosis requiring debridement and potentially deformity of the affected body (Unseld & Thallinger, 2016). Management should be initiated quickly. The general strategy is to stop the infusion without moving the needle and aspirate the extravasated volume without pressure. The affected leg should be placed in an elevated position. Depending on the substance, cold or warm compresses should be applied within the first 48 hours. Warm dry compresses (44-50°C) increase blood flow and are expected to aid elimination of the drug (Unseld & Thallinger, 2016).

Warm compresses combined with hyaluronidase are recommended for vinca alkaloid extravasation. In contrast cold compress (0°C) will cause vasoconstriction, with a consequent decrease in the diffusion velocity of the extravasated substance in the tissue, therefore minimizing the area of tissue damage. Cold packs can be used for daunorubicin liposomes, doxorubicin liposomes, amsacrine, cisplatin, dactinomycin, daunorubicin, doxorubicin, epirubicin, idarubicin, mitomycin c and mitoxantrone (Unseld & Thallinger, 2016). One way of treating extravasation is by using dressings. Wound dressing is a method of wound treatment using materials applied to the wound to stimulate healing by creating a moist environment in the wound and also protecting the wound surface from trauma or bacterial contamination (Cuschieri et al., 2013). There are many options for modern wound dressings, including alginate, hydrogel, hydrofibre, and hydrocolloid. Hydrocolloids are composed of elastomeric materials (polyurethane) that are both adhesive and colloidal. Frequently used colloidal bases are carboxymethyl cellulose (CMC), pectin, and gelatin. The properties of these bases are impenetrable to bacteria or other contaminants (Skórkowska et al., 2013).

Based on some research results, it is known that the use of hydrocolloids is superior to other therapeutic options for ulcers in the leg or foot area because it can accelerate and heal wounds completely. Research on the effectiveness of hydrocolloids using gauze on wounds and pain in patients who performed skin grafts is more effective in using hydrocolloids to accelerate the growth of epithelial tissue compared to performing wound care without hydrocolloids (Bechert & Abraham, 2019). Based on data from the last three months of extravasation in Dr. M. Djamil Hospital, there were 70 cases of extravasation in children. Based on the initial survey and the results of interviews with parents of children suffering from cancer, it was found that of the 7 children who experienced extravasation, the average experienced swelling, redness, pain, heat, and phlebitis around the infusion line, this can interfere with daily activities, and also cannot play with friends. During this time at Dr. M. Djamil Padang Hospital, the treatment of children who experience extravasation, the actions usually given are warm/cold compresses and wound care but this method will take a long time and extend the treatment of 1 to 2 weeks. Based on the description of the above phenomenon, the researcher is aim to conducting a study to see the effectiveness of the effect of using Hydrocolloid dressing with ordinary wound care on the incidence of extravasation in the chronic room of Dr. M. Djamil Padang Hospital.

METHOD

The study used an Experimental Study design with a control Pre- Post Test. Respondents of this study were children with cancer who experienced extravasation. Respondents were taken with a Simple Random sampling technique, with a total of 50 people. 25 respondents for the intervention group who received hydrocolloid dressing treatment and 25 respondents as a control group. Respondents were selected according to the inclusion criteria, namely children who were cooperative during the study and children who experienced mild to moderate degrees of extravasation who were treated in the children's chemotherapy inpatient room of Dr. M. Djamil Padang Hospital. In this study, respondents were given hydcoloid dressing 1 x 3 days and evaluated when changing the wound dressing. The study was conducted for 9 days so that 3 wound evaluations were obtained, then the results of the evaluation were entered into the research sheet of each respondent. After the data is obtained, the data is tested using the General Linear Model Repeated Measure.

RESULTS

Table 1.
Frequency Distribution of Characteristics in Cancer Children Undergoing Chemotherapy

Variable	N = 50
Gender	
Boys	25 (50%)
Girls	25 (50%)
Age	
< 3 years old	27 (54%)
3-6 years old	8 (16%)
> 6 years old	15 (30%)
Nutrition status	
Malnutrition	17 (34%)
Normal	33 (66%)
Type of drugs	
Irritant	20 (40%)
Vesicant	26 (52%)
Non Vesicant	4 (8%)
Cannula location	
Central	0 (0%)
Peripheral	50 (100%)

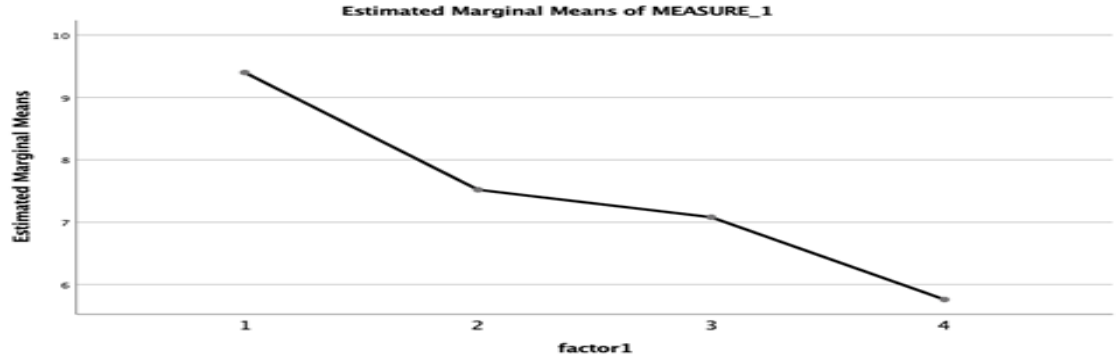
Table 1 shows the distribution and frequency based on the characteristics of the study subjects. There were 50 children with cancer undergoing chemotherapy involved in this study. The same number of boys 25 (50%) and girls 25 (50%). The majority of children with an average age of less than 3 years old as many as 27 (54%) and normal nutritional status 33 (66%) and the type of drug most given to children is Vesicant as many as 26 (52%) and the least is non-vesicant which is 4 (8%).

Table 2.
Effect of Hydrocolloid dressing on the incidence of extravasation

Variable	Pretest	Post-test 1	Post-test 2	Post-test 3	Within group		Time*group interaction	
					p-value	np^2	p-value	np^2
Extravasation skors, median (min-maks)	9 (2-14)	7 (1-12)	6 (1-12)	5 (0-11)	<0.001	0.916	<0.001	0.851

Table 2 above shows that there is a decrease in extravasation scores after administering Hydrocolloid at pretest to post-test 3 times, namely with a median of 9,7,6,5 respectively. Furthermore, the provision of Hydrocolloid dressing has an effect in overcoming the incidence of extravasation well after its use in children with cancer undergoing chemotherapy ($p < 0.05$ with a role of 91.6%.). Other than that, for the posttest measurement of 3 times, it is effective in reducing the extravasation score of 85.1%, meaning that the longer the treatment, the better the wound will be.

Graphic 1.
Effect of Hydrocolloid dressing on the incidence of extravasation



The graph above shows a decrease in extravasation score until post-test 3. in 4 measurements (pretest – Post-test 3) of extravasation score. The decrease occurred in post-test 1 where the highest decrease was obtained in pretest and post-test 3.

Table 3.
Effect of wound care on the incidence of extravasation

	Group	Mean (SD)	P-value
Wound care	Pre	9.44 (3.01)	0.212
	Post	9.60 (3.02)	

Table 3 above shows that statistically there is no decrease in wound healing score, but on the contrary, Pretest 9.44 (3.01) and post-test 9.60 (3.02), which means that there is no effect of providing ordinary wound care on the incidence of extravasation after 3 days, ($p \geq 0.05$).

Table 4.
The difference between the use of Hydrocolloid dressing and normal wound care on the incidence of extravasation

Group	Median (Min-Max)	P-value
Experiment *	7 (1 - 12)	0.018
Control *	9 (3 – 15)	

Data is not normally distributed, using median (min-max)

Table 4 above shows that there is a statistically significant difference between Hydrocolloid dressing with a median of 7 and usual wound care of 9 on the incidence of extravasation where ($p < 0.05$).

DISCUSSION

Frequency distribution of age, gender, nutritional status, and cannula location in cancer children undergoing chemotherapy

Of the 50 children with cancer undergoing chemotherapy involved in this study. The same number of boys as girls. The majority of children with an average age of fewer than 3 years as many as 27 people and the majority of normal nutritional status and the type of drug most given to children is Vesicant more than half and the least is non-vesicant which is as many as four people, the location of the infusion cannula is entirely peripheral. Based on the data on the characteristics of the type of chemotherapy drugs and the location of the infusion cannula on the incidence of extravasation, in line with the research of (Rubach, 2018), the administration of chemotherapy drugs such as vesicant drugs should be given through central venous access, because vesicant drugs can cause extravasation of chemotherapy drugs when given through small peripheral venous access, it is better if given through peripheral veins to use peripheral venous access that is large, elastic and does not manipulate movement much.

Certain chemotherapeutic drugs have tissue-damaging properties and can cause progressive, persistent, and extremely painful ulceration if administered inappropriately (Manik, 2018). In this study, the chemotherapy drugs used were irritant and vesicant agents that increase the risk of extravasation. Of the extravasation events in this study, all were chemotherapy drugs that are irritants and vesicants.

Effect of using Hydrocolloid dressing on the incidence of extravasation in the chronic room

The decrease in extravasation score after the administration of Hydrocolloid from pretest to post-test 3 times is with a median of 9,7,6,5 respectively. Furthermore, the provision of Hydrocolloid dressing has an effect in overcoming the incidence of extravasation well after its use in children with cancer undergoing chemotherapy. Apart from that, for post-test measurements 3 times it is effective in reducing extravasation scores. In line with research conducted by Gifaris, it was found that after modern hydrocolloid wound care, there was an improvement in wound condition which could be seen from the decrease in wound score (Gifaris, 2018; Luo et al., 2024). Another study conducted Takeuchi et al. (2020) also said that wound healing with the addition of Hydrocolloid can make wound healing faster. According to the researcher's assumption, wound healing with hydrocolloid is very influential with wound healing which can be seen from the healing score which is previously measured post-test for 3 times effective in reducing extravasation scores. This means that the longer the treatment, the better the wound will be. It is hoped that this can be a reference and input to health workers so that they can add hydrocolloids to wound care so that wound healing is faster.

Effect of wound care on the incidence of extravasation in the chronic ward

The effect of regular wound care on the incidence of extravasation in chronic rooms was found to be no decrease in wound healing scores, which means that there is no effect of providing regular wound care on the incidence of extravasation after 3 days. Wound care is an action that can help the wound healing process and protect the wound from further injury. Other concurrent studies have suggested that wound care aids in wound healing (Suriani et al., 2023). From these results the researcher assumes that wound care can help in wound healing with the results obtained there is a decrease in scores which can be interpreted as wound healing with wound care. This can also provide health promotion to parents or children that wound care is important with the understanding of parents and children can also help the wound care process run smoothly (Martin & Rahman, 2023; Rahman & Ramadhan, 2020).

Effectiveness of using Hydrocolloid dressing and wound care on the incidence of extravasation in the chronic room

From the results obtained, there was a significant difference between wound care with Hydrocolloid dressing and ordinary wound care which was found to be different from wound care with Hydrocolloid dressing with ordinary wound care. Baranoski & Ayello, (2020) said that Hydrocolloid is able to accelerate wound healing because Hydrocolloid can maintain the stability of wound moisture and the area around the wound along with its function as a wound absorbent, absorb wound exudate and gel formation on the wound surface provides a moist wound environment. In research Huang et al. (2023) said that Hydrocolloid dressing changes were made every 6 hours on the first day, and dressing changes continued with decreasing frequency according to the amount of exudate until the wound healed in neonates who experienced extravasation.

According to the researcher's assumption, it can be said that Hydrocolloid dressing is faster in wound healing than ordinary wound care, which is found in the difference in wound score values with care and with Hydrocolloid dressing scores which can be interpreted that there is more decrease in wound scores on Hydrocolloid dressing than ordinary wound care. This can be interpreted that wound care using Hydrocolloid dressing is more effective. It is hoped that this research can be an input for health workers to increase ordinary wound care to Hydrocolloid dressing.

CONCLUSION

The conclusions obtained are the characteristics of respondents from both the control and intervention groups, the dominant age frequency in this study was at a small age of 3 years, the gender between men and women was found to be the same, and nutritional status was also found to be good, and the type of drug that caused extravasation was vesicant and all infusion cannulas were installed in the peripheral vein area. There is an effect of using Hydrocolloid dressing on the incidence of extravasation in the chronic room of Dr M. Djamil Hospital Padang. There was no effect of usual wound care on the incidence of extravasation in the chronic room of Dr. M. Djamil Hospital Padang. Hydrocolloid dressing is effective in reducing the degree of extravasation significantly and faster than usual wound care in patients who experience extravasation as a result of chemotherapy administration.

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