Neonatal Extravasation Management With Minimal Incision And Moist Therapy

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ABSTRACT

Peripheral Intravenous Catheter (IVP) is the most widely used vascular access device for the administration of Total Parenteral Nutrition (TPN) and drugs in hospitalized neonates. However, 95% of peripheral intravenous catheters are removed due to complications. Extravasation is one of the most disastrous complications of the fragile skin of the neonate. This study reviews aspects of extravasation injury, from the cellular level to the role of vesicants in vascular injury and their role in triggering inflammation and even necrosis. Knowledge of extravasation management is needed in neonates—in addition, nursing actions to deal with extravasation are based on evidence-based practice, using minimal incisions and moist therapy. This research is a quantitative research with a case study approach. The nurse uses Millan's extravasation wound staging to observe the development of staging. The interventions performed were IVP removal, disinfection with chlorhexidine alcohol, a minimum incision of +/- 1cm in the subcutaneous area at the IVP insertion area, gentle pressure to remove the TPN fluid, followed by a moist gauze compress of 0.9% NaCl (Moist Therapy) and elevation. Four hours later, reperfusion improved, swelling reduced, leg was warm, and skin color returned to normal (Stage 2, Stage extravasation injury from Millan). After three days, the wound started to heal, closing without necrotic tissue. Minimal incision and moist therapy are more effective than aspiration in treating extravasation in neonates.

Keywords: Neonatal Extravasation, Minimal Incision, Moist therapy

INTRODUCTION

Extravasation injuries are skin injuries caused by accidental leakage of intravenously administered treatments. It can cause short-term pain, inflammation, tendon or nerve damage, and long-term scarring, sometimes resulting in limited movement of the affected joint. This injury may be especially problematic for babies because of their fragile skin. Immediate treatment is usually needed, but there needs to be an agreement on the best treatment approach. It is mainly because much of the published research is of limited value in helping to inform treatment decisions. This project aims to identify which treatments hold the most promise for infants and children. The results will help to inform which treatments are most appropriate for study in the future. (Mark, et. al., 2018).

In the neonatal population, peripheral infusion therapy does associate with a complication rate of up to 75%. Peripheral infiltration and extravasation are involved in up to 65% of IV-related complications. Extravasation injuries can potentially cause severe damage (Matheus, 2021). Of the 36 premature neonates, an average of 3.2 days after cannulation, they experienced extravasation wounds due to neonatal parenteral nutrition formulas and antibiotics acting as vesicants. (Kyu Sang Cho, et al., 2019). 20-80% of children experience complications from infusion, and 11-58% of neonates have a risk of extravasation injury, which has caused the loss of 0.24% of the epidermal layer of the skin in children (Mubarakh, 2013).

In this study, 34 cases of severe extravasation injury occurred in 1409 neonates admitted to a single neonatal unit for 24 months (2.4% incidence). Total parenteral nutrition solutions are involved in most cases. All patients were treated within 30 minutes of injury record using a flush-out technique with regular saline irrigation and occlusive paraffin dressings on the infiltrated area. Most injuries affected premature, low birth weight infants (mean gestation 32 weeks + 6 days, mean birth weight 1885 g), with a mean age at injury of 11.6 days and a mean weight of 2045 g. Neither gestational age ($p = 0.87$) nor birth weight significantly influenced ($p = 0.07$) the incidence of extravasation injury. However, the incidence of skin necrosis had a significant correlation with gestational age ($p = 0.009$) and birth weight ($p < 0.001$). All patients responded well to treatment, and their wounds healed smoothly within a maximum of 25 days without secondary surgery covering the skin (Nikolaos et al., 2015).

This case study reports a case of a baby admitted to the perinatal ward with pharyngitis who experienced extreme extravasation. We discussed the condition and the success of our management with the incision. Minimal and moist therapy show success in wound healing.

The purpose of this study was to describe the intervention of minimal incision and moist dressing to address the incidence of extravasation in neonates receiving intravenous therapy in the perinatology room at Dr. Hi Hospital. Abdoel Moeloek, Lampung Province. This is a quantitative study with a case study approach

METHOD

The study applied interventions performed were the removal of the IVP, disinfection with alcohol chlorhexidine, a minimum incision of +/- 1cm to the subcutaneous area at the IVP installation area, gentle pressure to remove TPN fluid, followed by a moist gauze compress of 0.9% NaCl (Moist Therapy) and elevation. The nurse used Staging of extravasation injuries from Millan to observe the wound progress.

RESULT

On the second installation day, the peripheral infusion area looked reddish and slightly swollen, then a new peripheral infusion was transferred and placed in the dorsal pedis extra vein. Two hours after installation, the leg looks swollen; the skin color is whitish, it feels cold, and the toes look pale, stage 4 according to Staging of extravasation injuries from Millan.

The IVP was removed and then disinfected with an alcohol chlorhexidine swab and a minimum incision of +/- 1 cm to subcutaneous in the IVP insertion area; gentle pressure apply to remove TPN fluid, and 30 minutes after the procedure appeared reperfusion, the swelling was reduced, followed by moist gauze compresses and elevation. 4 hours after the procedure the swelling has decreased, the feet feel warm, the skin color returns to normal stage 2 according to the Staging of extravasation injuries from Millan. One day after the

minimal incision, the wound does treat using tulle and gauze closed occlusive; three days after the action, the incision wound has started to close, and one week later, the wound heals without necrotic tissue forming.

DISCUSSION

Peripheral vein therapy is needed to provide fluids, nutrition, and drug therapy (Saputro et al., 2020). Babies who receive parenteral nutrition through venous access will experience a risk of damage to the integrity of the skin due to the installation of venous access. Injury due to serious extravasation is an iatrogenic complication that can cause pain, increase the length of stay, and exacerbate health conditions such as infections. Extravasation-related injuries also lead to increased hospital costs. Extravasation occurs in 11% of infants admitted to the NICU (Kenner & Lott, 2007).

Respondent Baby Ny. F was three days old while undergoing treatment in the NICU room. Age with the incidence of infusion extravasation in respondents has a relevant relationship. According to research (Mubarakh, 2013), children are an age group that is prone to complications during infusion; 20-80% of children experience complications from infusion, and 11-58% of children have a risk of extravasation injury Extravasation has caused a loss of 0.24% of the epidermal layer of the skin in children. Anatomy and physiology of blood vessels in children, adults, and the elderly will differ in structure and content of the blood product itself; for example, in infants and neonates, the flexibility of the blood vessel walls is not yet mature, active activity creates a risk of punctured blood vessel walls during infusion. (Darmawan, 2012).

The incidence of extravasation via the intravenous route averages 0.1% to 7% via the peripheral venous route. The incidence rate via central venous catheter is 0.3% to 4.7%. The incidence of extravasation in children is more significant than in adults; it does estimate that 4.65% of children experience extravasation because the number of intravenous lines with high tissue in children is 11-58% (Gault, 2009). The incidence of necrotic skin injury due to extravasation injury in the age group under one year (neonatal and infant age group) was 24 patients (55%) of the total incidence of necrotic skin injury due to extravasation injury.

From the data above, it can be seen that the incidence of necrotic skin injuries due to extravasation injuries in the group of children will be higher the younger the patient's age, influenced by the size and strength of blood vessels in neonates and infants, the skin is still immature and thin, the thinner obesity, as well as known delays in extravasation events (Saputro et al. l, 2020). Other risk factors with a high potential for extravasation were also disclosed by the Gippsland Oncology Nurse Group (GONG, 2008), and one of them is age and small vein size. Age in this study is also closely related to the inability to communicate; for example, in neonates (infants and young children) and patients in a coma or using sedation (patients who are restless and lack rest), this process is what hinders the speed of incident management extravasation in children.

Baby Mrs. F received antibiotic therapy of ampicillin-sulbactam, gentamicin, and total parenteral nutrition (TPN). Each 50 ml of TPN has the composition: dextrose 40% 14.9 ml, dextrose 10% 2.7 ml, MgSo4 0.1 ml, Aminosteril 6% 28.3 ml, Phosphate 0.5 ml, KCl 1 ml, Ca Gluconate 10 % 2.5 ml. TPN was administered via peripheral intravenous route at 80 ml/kg/day.

Most fluids that cause necrotic skin injuries are due to hypertonic extravasation (Safiudin, 2013). Hypertonic fluids have a higher total osmolality than extracellular fluids and can attract fluids and electrolytes from tissues and cells into the blood vessels (Smeltzer et al., 2013). Hypertonic fluids have hot properties that can cause damage to blood vessels, so when used, they must be mixed with isotonic solutions so as not to cause extravasation of attached infusions (Schulmeister, L. (2007). High osmolarity reaching 1000 mOsm/L must be given within a few hours duration. The duration should be less than three hours to reduce the contact time of the irritating mixture with the vein wall. To reduce the risk of extravasation, it can also be done by choosing the most prominent peripheral vein and using a small and short catheter (Perry & Potter, 2010). This study consisted of isotonic fluids and hypertonic fluids. Isotonic fluids have a total osmolality that approaches extracellular fluid and does not cause red blood cells to shrink or swell.

Meanwhile, hypertonic fluids have a total osmolality that moves away from extracellular fluids and causes red blood cells to shrink or swell (Smeltzer & Bare, 2010). The osmolarity of the fluid itself and the speed of fluid administration will also affect infusion extravasation, meaning that if hypertonic fluids are given in fast conditions, the risk of extravasation will be

higher. If the slower the infusion of hypertonic solutions does give, the extravasation risk will be even lower.

In addition to hypertonic fluids, isotonic fluids can cause extravasation if given too quickly or as a bolus. In addition, the causes of extravasation in children are antibiotics, bicarbonate, and calcium solutions (Marlene et al., 2018).

The two fluids most often used in this study are isotonic and hypertonic. Other things cause extravasation, namely infusion, which is a particular treatment, such as KCL, Ca Gluconas, dextrose 40% 14.9 ml, dextrose 10% 2.7 ml, MgSo4 0.1 ml, Aminosteril 6% 28.3 ml, Phosphates 0.5. In clinical applications, special fluids indicated for particular correction have high osmolarity and heat properties that can cause damage to blood vessels. They must be mixed with an isotonic solution not to cause extravasation in the attached infusion (Gafathar, 2010).

Administration of drug therapy via a peripheral intravenous route, or bolus injection, is mainly performed on hospital patients (Marlin et al., 2018). Side effects and complications arising from peripheral intravenous routes include infection, local effects such as phlebitis and extravasation, and systemic complications. Infection can occur through IVD intermediaries, cannula, or infusion solutions (Philips, 2011).

Bolus injections are direct intermittent bolus injections, small volumes of drug solution administered through a peripheral vascular access device or cannula. The bolus injection is given over 3-10 minutes, depending on the type of drug. The bolus injection can increase the potential for side effects, especially if the drug is given too quickly; it has the potential to cause damage to the vein, for example, extravasation and phlebitis (Boyd, 2015).

Based on research conducted by Adiputra and Mirah (2012), it is known that extravasation caused by antibiotics can be prevented by avoiding infusions on the dorsum of the hand and near the joints, which can cause functional damage, and by rinsing the veins with intravenous fluids every 2-3 minutes between bolus injections of drugs especially antibiotics and cytotoxic Relation of Intravenous Chateter size with the incidence of infusion extravasation in pediatric patients Maintain blood flow around the cannula to prevent inflammation.

Bolus injections and multiple drugs affect extravasation; this has been studied by Rosdiana (2009), where in her research, it was found that three types of drugs caused extravasation, namely vesicant drugs (which are blisters, blisters and cause tissue damage), irritant drugs

(drugs anti-pain) and non-vesicant drugs (drugs that rarely produce acute reactions and tissue necrosis).

In neonates, according to (Kenner & Lott, 2007), risk factors for tissue injury due to intravenous extravasation in neonates and infants are the type of fluid given, especially hypertonic fluids, mechanical pressure from using infusion pumps, poor perfusion of the skin due to reduced refilling. The nurse knows capillaries in infants who are seriously ill or due to obstruction of venous circulation due to splinting in the infusion area and the duration of this incident.

The location of the peripheral infusion in Ny. F's baby was done in the right cubital vein and the dextra dorsalis pedis vein. Previous research conducted by Murphy (2019) stated that most cases of extravasation were found at the location of peripheral venous access in the superior extremity, as much as 70% (Murphy et al., C.J. (2019). The area of the dorsum of the manus and pedis and cubital fossa are areas with a thin thickness of subcutaneous fat, thus increasing the risk of extravasation complications up to necrosis of the entire thickness of the skin above the subcutis area (Gault, D.T. (1993)). Fixation on the right side will also increase the risk of extravasation due to right-sided injury is the active site in motion. The continuous movement will cause the intravenous cannula to rub, bend, and damage the vessel wall so that extravascular fluid/drug leakage can occur (mechanical factor) (Odom et al. (2018).

Two hours after installation, extravasation occurred in the dorsalis pedis in different veins; it looked swollen, the skin color was whitish, it felt cold, and the toes looked pale. The characteristics of extravasation are pain, swelling, stiffness, feeling cold, slowed or stopped-flow, and wet dressings (Mubarakh, 2013); this happened to respondents 2 hours after TPN administration.

One of the complications of providing peripheral venous access is necrotic skin injury due to extravasation. Injury due to serious extravasation is an iatrogenic complication that can cause pain, increase the length of stay, and exacerbate health conditions such as infections (Setyowati, 2014). Extravasation-related injuries also lead to increased hospital costs. Extravasation occurs in 11% of infants admitted to the NICU (Kenner & Lott, 2007).

There is no national agreement on how to treat skin in premature babies. Each hospital sets its policy, which may differ from one hospital to another. It is in line with research conducted in America showing results that there are differences in skin care practices, especially in terms

of culture examination and the use of Aquaphor (Baker et al., 1999). The incidence of complications in peripheral infusion is more than double compared to PICC in the NICU (Colachio et al., 2012). Cleansing the skin and applying moisturizer are two simple strategies for maintaining healthy skin. Good skin cleansing helps babies against unwanted irritation to saliva, nasal secretions, urine, feces and fecal enzymes, dirt, and pathogenic microbes (Telofski et al., 2012).

Based on the choice of therapeutic modalities for initial wound care due to extravasation injuries, judging from the initial assessment of the wound and the problems that arise. At Dr. Hospital Hi.Abdole Moeloek Bandar Lampung, Neonates who experience damage to the integrity of the skin by extravasation of peripheral venous access. Implementations that have been implemented using transparent tape are beneficial in monitoring the possibility of extravasation. Monitoring is also carried out every time you touch and give medicine intravenously. Monitoring is also done when the baby looks uncomfortable or feels pain. The nurse immediately removes the venous access if it is known to have extravasation and reinstalls the venous access in another location. Neonate with extravasation resulting in swelling and redness of the right leg. The implementation was carried out after removing venous access, elevating the leg slightly higher, making minimal incisions, and using moist therapy by applying warm compresses of 0.9% NaCl using gauze.

Extravasation injury creates areas of tissue ischemia due to endothelial damage and vascular thrombosis, which may be accompanied by the appearance of an ulcer with surrounding red, swollen skin and superficial skin breakdown in the area of extravasation, followed by progressive damage and development of a necrotic ulcer which will slough off the tissue and look like a dry black eschar (Naylor, W. (2005)). Moist Wound Care, or another name for Moist Wound Healing, is a process of wound healing in a moist or moist manner by maintaining the isolation of the wound environment with occlusive and semi-occlusive materials (Fatmadona & Oktarina, 2016). Moist Wound Care supports the healing process so that natural tissue growth occurs, which is moist and can expand if the amount of exudate is excessive, and prevents bacterial contamination from the outside (Ose et al., 2018). Minimal incisions help the process of tissue repair and perfusion so that wound vascularization and regeneration can run well. 0.9% NaCl fluid is also an adequate physiological fluid for wound care because it matches the body's salt content (Kristianingrum, 2013). Minimal incision and moist therapy are more effective than aspiration in managing extravasation in neonates.

CONCLUSION

From this study, several conclusions can be drawn regarding the prevalence of necrotic skin due to extravasation injury; there is a relationship between the incidence of necrotic skin injury due to extravasation injury and age, the type of fluid/drug given, and the location of peripheral venous pathways. In contrast, the incidence does not relate to gender. The initial treatment modality that is still frequently used today is autolytic debridement.

ACKNOWLEDGE

We thank (Head Unit NICU RSAM) for providing NICU care, we thank. Dr.(Director RSAM), and especially the family of babY

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