THE PROCESS OF WOUND HEALING IN POST-CAESAREA PATIENTS USING NORMAL SALINE (0.9%) AND POVIDONE-IODINE (10%) IRRIGATIONS: A COMPARATIVE STUDY

Dedi Kunia[1], Restuning Widiasih[1], Urip Rahayu[1]
[1]Faculty of Nursing, Universitas Padjadjaran
Corresponding Email: restuning.widiasih@unpad.ac.id

Abstract

Surgical Site Infection (SSI) is a complication after surgery, and one of the causes is the use of intra-operative irrigation fluids. The most common irrigation fluid was 0.9% Normal Saline and 10% Povidone-Iodine in several hospitals in Indonesia. However, the difference in composition has not been observed for its effect on wound healing. This study aimed to determine the difference in using 0.9% Normal Saline and 10% Povidone-Iodine for irrigation in the wound healing process for post-cesarean patients. The research design used is a descriptive comparative study with ex post facto approaches. Due to the COVID-19 pandemic, researchers changed the data collection method from direct observations to analyzing secondary data post-cesarean surgery data in 2019. The study was conducted in a referral hospital in West Java Province, Indonesia. The sampling used non-probability sampling with a purposive sampling technique. The sample was 440 patient medical records. These records consisted of 0.9% Normal Saline irrigation fluid, 140 respondents, and 10% Povidone-Iodine irrigation fluid, 300 respondents. The chi-square analysis showed significant differences in the two types of intra-operative wound irrigation (0.9% Normal Saline and 10% Povidone-Iodine) with a wound healing process (P-value = 0.021). The distribution frequency showed that the infection of 0.9% Normal Saline fluid was 5% of the 133 respondents, and 10% Povidone-Iodine was 12% out of 300 respondents. The study results showed that 0.9% Normal Saline and 10% Povidone-iodine could be used for intra-operative wound irrigation with different characteristics and compositions that impact the postoperative wound healing process. There is a need for further research to do a direct observation to test the effectiveness of two types of irrigation fluids from intra-operative to postoperative and assess other influencing factors.

Keywords : Irrigation fluids, intra-operative, post-cesarean, wound healing

INTRODUCTION

Surgical Site Infection (SSI) is part of the global problem of Healthcare-associated infections (HAIs), accounting for 9% (3% -21%) of 1.4 million clients worldwide. This figure was reported by the World Health Organization (WHO), which surveyed 14 countries to 28,861 patients in 47 hospitals (WHO, 2020). According to the Indonesian Ministry of Health, SSI incidence in public hospitals in Indonesia was 55.1% of the total number of hospitalized (DEPKES, 1995).

Laparotomy is a surgical operation with a high infection rate of 5% - 11% (Tietjen B& N, 2011). Laparotomy is often performed in the digestive and reproductive areas (Smeltzer S.C & Bare BG, 2002). The Sectio Caesaria (SC) surgery is a laparotomy that is performed in the uterus. The percentage of Cesarean surgery cases increases yearly by 5-15% of deliveries per 1000 births in the world (WHO, 2020). Indonesian IDHS data shows that SC in urban areas is much higher (11%) than in rural areas (3.9%). The RISKESDAS report found that SC accounted for 9.8% of 49,603 births in 2010-2013 (Sihombing N, Saptarini I, dan Putri DSK, 2013). The highest proportion of SC was in the province of DKI Jakarta (19.9%), and the lowest was in Southeast Sulawesi province (3.3%). For many surgeons (97%), wound irrigation is one method of preventing SSI (APSIC, 2018). In addition, post-partum with caesarean surgery may risk of post-partum depression (Wardani, V. A., Lestari, K. B., & Nurbaeti, I, 2021). Several fluids are used for wound irrigation, but the ones often used in hospitals for intra-operative wound irrigation are Normal Saline and povidone-iodine. This study investigated the comparison wound healing process in the post-cesarean using 0.9% Normal Saline and 10% Povidone-Iodine for wound irrigation.

METHODS

The design of this research was descriptive comparative ex post facto. The sampling technique in this study was purposive sampling. This study's sample consisted of 440 respondents who were post-caesarean and treated with 0.9% Normal Saline and 10% Povidone-Iodine irrigation during the intra-operative time. This study's inclusion criteria were patients with post-caesarean had an excellent general condition, typical vital signs, hadn't a history of surgery for more than five hours, hadn't anaemia, had average weight, and hadn't comorbidities at the time of preoperative. This study's sampling was taken from Medical records in 2019 in a referral hospital in West Java province, Indonesia. This study's criteria

took from the postoperative infection records on the SSI Form contained in the Medical records of a private hospital in Bandung City, West Java, Indonesia. The wound healing process is delayed if the patient is experiencing infection symptoms, such as changes to redness (rubor), heat (calour), swelling (tumour), pain (dolour), and loss of function (function laesa) (Rosen E &Tsesis I, 2014). Data analysis used the Chi-square statistical test.

RESULTS

The wound healing process in the post-cesarean using 0.9% Normal Saline and 10% Povidone-Iodine irrigations.

Table 1. The Irrigation Fluid for Post-SC surgery and the wound category (n= 440).

Type of Fluid	Wound Condition		Total	P-Value
	No-infection	Infection		
Normal Saline 0,9%	133	7	140	0.021
	95%	5%	100%	
Povidone-Iodine 10%	264	36	300	
	88%	12%	100%	

Table 1 shows the incidence of infection occurring in patients post-SC with 10% Povidone-Iodine wound irrigation only slightly; there were only 36 respondents (12%). It was also known that a small proportion of patients post-SC experienced infection after using 0,9% Normal Saline wound irrigation, and there were only seven respondents (5%). The result of statistical analysis using Chi-square showed that there was a significant difference between the two types of fluids used for intra-operative wound irrigation (0.9% Normal Saline and 10% povidone-iodine) with the incidence of SSI on day 5-7 at the time of the first control (P-value = 0.021).

DISCUSSION

The study showed the two types of fluids used for irrigation. Both 0.9% Normal Saline and 10% povidone-iodine had a small percentage of infection incidence rates in the study samples after analysis of medical records during the first control 5-7 days post-surgery. However, based on the number of respondents adjusted for the total number of patients for each treatment, patients with 10% Povidone-Iodine irrigation experienced the most infections compared to 0.9% Normal Saline fluid. These results are supported by Wolcott & Fletcher

(2014), who stated that the composition of 0.9% Normal Saline has low toxicity to wounds and can reduce the burden of limited bacteria (Wolcott, R. D., & Fletcher J. 2014). In line with this, Perry also stated that 0.9% Normal Saline is an isotonic solution that is safe for the body, doesn't irritate, protects tissue granulation from dry tissue conditions, maintains moisture around the wound, and can minimize the occurrence of SSI (Potter, P. A., & Perry AG, 2005). As is well known that SSI is one of the most common hospital infections and contributes substantially to postoperative morbidity and mortality. SSI can also increase the cost of care and length of stay in the hospital (Barung, S., Sapan, H. B., Sumanti, W. M., & Tubagus R, 2017) .

However, doctors and nurses use 0.9% Normal Saline to keep the wound surface moist, thereby enhancing the development and migration of epithelial tissue. Cleaning wounds carefully with 0.9% Normal Saline is common to heal wounds and debridement of wet or dry wounds. Different from 0.9% Normal Saline, 10% povidone-iodine, an antiseptic-based solution, has been recommended for intra-operative wound irrigation. However, its use is still necessary due to the high level of toxicity to the skin (Potter, P. A., & Perry AG, 2005)

The data taken in this study are secondary data seen from the medical record of the patient's first control results on days 5-7 after SC laparotomy. However, we as researchers have limitations because we cannot directly see the wound when the patient is the first control, so the results are only the reports in the medical record. This is due to the condition of the COVID-19 pandemic, so researchers cannot freely observe or assess the postoperative wound healing process. Another area for improvement in this study is that it is challenging to conduct a more in-depth discussion due to the latest literature's constraints.

The results of statistical analysis using Chi-square showed that there was a significant difference between the two types of fluids used for intra-operative wound irrigation (0.9% Normal Saline and 10% povidone-iodine) with the incidence of SSI on day 5-7 at the time of the first control (P-value = 0.021). This showed differences in wound irrigation using 0.9% Normal Saline and 10% Povidone-Iodine due to different fluid characteristics.

The characteristic of 0.9% Normal Saline is a physiological solution to the body, so it doesn't irritate and supports granulation growth. However, 0.9% Normal Saline is not an antiseptic, so it cannot kill the wound's bacteria. Therefore, this fluid is usually used in clean wounds

(Lilley, L., Collins, S. R., & Snyder J,1999). Laparotomy surgery wound irrigation usually uses a sterile 0.9% Normal Saline fluid. However, there is no adequate data regarding the impact of using this fluid on preventing SSI (Potter, P. A., & Perry AG, 2005). The RCT results showed no significant difference between regular saline irrigation and without irrigation (OR: 1.09; 95% CI: 0.44-2.69; P = 0.85).

WHO does not have sufficient evidence to recommend or discourage regular saline irrigation for incisional wounds before closure to prevent HAIs (WHO, 2020). In addition, the National Institute for Health and Care Excellence (NICE) HAIs prevention guidelines oppose the application of wound irrigation (APSIC, 2019). However, it is different from Perry, who stated that 0.9% Normal Saline is an isotonic solution that is safe for the body, doesn't irritate, protects tissue granulation from dry tissue conditions, maintains moisture around the wound, and can minimize SSI occurrence (Potter, P. A., & Perry AG, 2005). Nurses use 0.9% Normal Saline to keep the wound surface moist, thereby increasing the development and migration of epithelial tissue. Cleaning wounds carefully with 0.9% Normal Saline is common to heal wounds and debridement of wet or dry wounds.

Unlike normal saline, the characteristics of 10% Povidone-Iodine are bacteriostatic at a level of 640µg / ml and are bacterial sid at a group of 960 µg / ml. In 10% Povidone-Iodine, it has 1% iodine which can kill bacteria in 1 minute and kill spores within 15 minutes. The mechanism of action of 10% Povidone-Iodine starts after direct contact with the tissue. Then the iodine element will be released slowly, which inhibits the metabolism of bacterial enzymes, thus interfering with bacterial multiplication, which results in bacteria becoming weak. In 10% Povidone-Iodine, the iodine composition is not less than 9.0% and not more than 12.0%, calculated against the dried substance. Povidone-Iodine fluid reacts with an acid to litmus paper. The 10% Povidone-Iodine is soluble in water and ethanol but insoluble in chloroform, carbon tetrachloride, ether, hexane, and acetone.

WHO guidelines show that 10% Povidone-Iodine irrigation is more effective than 0.9% Normal Saline irrigation in a meta-analysis that included seven RCTs (OR: 0.31; 95% CI: 0.13-0.73; P = 0.007). Consequently, consideration of using water-based 10% Povidone-Iodine irrigation before wound closure is recommended, especially against clean and uncontaminated wounds, but with the conditions required. The Centers for Disease Control (CDC) also recommend considering intraoperative irrigation of deep or subcutaneous tissues

using water-based iodophor solutions to prevent SSI, but with weak recommendations. In addition, the National Institute for Health and Clinical Excellence (NICE) provides guidelines that irrigation of a 10% Povidone-Iodine fluid can reduce SSI incidence.

The use of 10% Povidone-Iodine is only recommended on intact skin, so they don't recommend using 10% Povidone-Iodine irrigation for surgical incisions before closure to prevent SSI. Studies cited by WHO didn't report clinical signs of iodine toxicity. But there are concerns regarding allergic reactions and adverse metabolic events due to iodine absorption. The research conducted by Mahomed et al. stated that irrigation using a 10% Povidone-Iodine solution might lead to an increased risk of re-admission of intravenous antibiotics post-surgery (Mahomed, K., Ibiebele, I., & Buchanan J, 2016). Disadvantages of 10% Povidone-Iodine has a broad spectrum of antimicrobial activity, has cytotoxic for healthy cells and granulation tissue in a higher percentage, and often irritates the skin. Therefore, 10% Povidone-Iodine is good to use only to disinfect the outer skin so that bacteria don't rise to the incision wound. According to Singh's study, side effects that can appear after using 10% Povidone-Iodine can irritate, toxic reactions to skin fibroblasts, lungs, keratinocytes, and osteoblasts, sunburn, and discolouration of the skin (Singh S, 2010). In addition, the WHO expressed concern over the potentially toxic effects of 10% Povidone-Iodine on fibroblasts, mesothelium, and tissue healing (APSIC, 2019).

This study used secondary data (medical records), then analyzed and found significant differences between the two types of irrigation fluids (0.9% Normal Saline and 10% Povidone-Iodine). The results of this analysis are supported by several theories/research/opinions suggesting differences in the composition of the two fluids. In addition, each juice has advantages and disadvantages. In this connection, it can cause different healing effects in postoperative wounds. Therefore, this study concluded that both fluids could be used for intra-operative wound irrigation with other characteristics affecting the postoperative wound healing process. Furthermore, this study still has limitations because it isn't conducted directly, so researchers can't assess the wound's condition and explore other things related to the patient, such as lifestyle.

CONCLUSION

This study shows a statistical difference between the two types of irrigation fluids (0.9% Normal Saline and 10% Povidone-Iodine) in wound healing. However, both fluids can be

used for irrigation with different characteristics and compositions that impact the postoperative wound healing process. In addition, the two types of fluids only showed a small proportion of those with an infection. Therefore, further research needs to be carried out using primary data collection approaches to test the effectiveness of the two types of fluids and observing the wound, followed by analyzing other influencing factors of wound healing from the intra-operative to postoperative period.

REFERENCES

WHO.2020. Safe Surgery Guideline. https://www.who.int/patientsafety/safesurgery/en/; 2020 [accessed 13 March 2020].

DEPKES RI. 1995. Farmakope Indonesia Edisi IV. Jakarta: DEPKES RI

Tietjen B& N, 2011. Panduan Pencegahan Infeksi Untuk Fasilitas Pelayanan Kesehatan Dengan Sumber. Jakarta: Salemba Raya

Smeltzer SC, Bare BG. 2002. Buku Ajar Keperawatan Medikal Bedah. In: 21st ed. Jakarta: EGC

Sihombing N, Saptarini I, Putri DSK. 2017.The Determinants of Sectio Caesarea Labor in Indonesia (Further Analysis of Riskesdas 2013). Jurnal Kesehatan Reproduksi.;8(1):63–75.

APSIC. 2019. Pedoman APSIC untuk Pencegahan Infeksi Daerah Operasi [Internet]. 2018. p. 1–58. Available from: https://apsic-apac.org/wp-content/uploads/2019/02/APSIC SSI Prevention guideline Jan 2019 IN.pdf

Rosen E, Tsesis I. Pain. 2014 Swelling, and Surgical Site Infection. In: Complications in Endodontic Surgery. Springer; p. 129–36.

Wolcott, R. D., & Fletcher J. 2014 Technology Update: Role of Wound Cleansing in The Management of Wounds. Wounds UK.10(2):63.

Potter, P. A., & Perry AG. 2005. Buku Ajar Fundamental Keperawatan : Konsep, Proses, dan Praktik. In: Komalasari R, editor. 4th ed. Jakarta: EGC

Barung, S., Sapan, H. B., Sumanti, W. M., & Tubagus R. 2017. Pola Kuman dari Infeksi Luka Operasi pada Pasien Multitrauma. J Biomedik.;9((2)):115–20.

Lilley, L., Collins, S. R., & Snyder J (1999). Pharmacology And The Nursing Process. Jakarta

Mahomed, K., Ibiebele, I., & Buchanan J. (2016). The Betadine Trial - Antiseptic Wound Irrigation Prior to Skin Closure at Caesarean Section to Prevent Surgical Site Infection: A Randomised Controlled Trial. Aust New Zeal J Obstet Gynaecol. 56((3)):301–306.

Singh S. Pharmacology for Dentistry [Internet]. 2010. Available from: https://www.pdfdrive.com/pharmacology-for-dentistry-e18336761.html

Wardani, V. A., Lestari, K. B., & Nurbaeti, I. (2021). Relationship of self-esteem to postpartum depression in postpartum mothers. *Journal of Maternity Care and Reproductive Health, 4*(1).