Rev. Fac. Med. Hum. 2023; 23(3):22-27.
DOI: 10.25176/RFMH.v23i3.5906
ORIGINAL PAPER

ISSN Versión Online: 2308-0531
Facultad de Medicina Humana URP
RFMH

ANTISEPTICS SOLUTIONS IN THE PREVENTION OF SURGICAL WOUND INFECTION IN PATIENTS OPERATED BY COMPLICATED ACUTE APPENDICITIS

SOLUCIONES ANTISÉPTICAS EN LA PREVENCIÓN DE INFECCIÓN DE HERIDA QUIRÚRGICA EN PACIENTES OPERADOS POR APENDICITIS AGUDA COMPLICADA

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ABSTRACT

Introduction: Surgical wound infection secondary to complicated acute appendicitis is frequent. **Objective:** The objective was to compare the Dakin and the Superoxidative solutions to prevent surgical wound infections in complicated acute appendicitis. **Methods:** It was a comparative, cross-sectional study, in 104 patients with complicated acute appendicitis (medium age 36.29 years, 69(66.43%) men). Group 1: 52 patients with surgical wound lavage with Dakin modified solution. Group 2: 52 patients with superoxidative solution (Microdacyn®). All patients received ceftriaxone 1 g before surgery; conventional appendectomy was performed and the wall closure with Vicryl 1 and Nylon 2/0. **Results:** Surgical wound was evaluated 7 days after surgery, looking for pus, edema, erythema, local heat. X2 and Student's t were used. **Conclusion:** Surgical wound infection was present in 11 (10.6%) patients, 3(5.8%) patients from group 1 and 8(15.4%) from group 2 (p=0.1). Both solutions are useful to prevent surgical wound infections in patients operated by complicated acute appendicitis.

Keywords: Appendicitis; Infections; Surgical Wound; Anti-Infective Agents, Local; Sterilizing Agents. (Source: MESH-NLM)

RESUMEN

Introducción: La infección de la herida quirúrgica en apendicitis aguda complicada es frecuente. **Objetivo:** El objetivo fue comparar la solución Dakin y la Superoxidativa para prevenir infecciones de herida quirúrgica en pacientes con apendicitis aguda complicada. **Métodos:** Estudio comparativo, transversal, en 104 pacientes con apendicitis aguda complicada (Edad media: 36.29 años, 69(66.43%) hombres). Grupo-1: 52 pacientes, con lavado de herida quirúrgica con solución Dakin modificada. Grupo-2: 52 pacientes con solución superoxidativa (Microdacyn®). Se administró ceftriaxona 1 gr antes de la cirugía, se realizó apendicectomía convencional y cierre de pared con Vicryl-1 y Nylon-2/0. Se evaluó herida quirúrgica 7 días después de la operación, registrando presencia de pus, edema, eritema y calor local. Se utilizaron X2 y t de Student. **Resultados:** Se presentó infección de herida quirúrgica en 11(10.6%) pacientes; 3(5.8%) pacientes del Grupo-1 y 8(15.4%) del Grupo-2 (p=0.1). **Conclusión:** Ambas soluciones son útiles para prevenir infecciones de herida quirúrgica en pacientes con apendicitis aguda complicada.

Palabras clave: Apendicitis; Infecciones; Herida Quirúrgica; Antiinfecciosos Locales; Esterilizantes. (Fuente: DeCS- BIREME)

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Cite as: García-Galicia A, Montiel-Jarquín AJ, Corona-Olmedo L, Flores-Ramos YE, Parker-Bosquez RA, Loría-Castellanos J, De-la-Rosa VV, Ramírez-Mendoza J. Antiseptics solutions in the prevention of surgical wound infection in patients operated by complicated acute appendicitis. Rev Fac Med Hum. 2023;23(3):22-27. doi 10.25176/RFMH.v23i3.5906

Journal home page: http://revistas.urp.edu.pe/index.php/RFMH

INTRODUCTION

Appendectomy is the most common emergency surgical procedure worldwide; delayed diagnosis increases its complications, which range from seromas, wound dehiscence, intra-abdominal abscesses, surgical wound infection (SWI), peritonitis, to septicemia and/or death [1-4]. SWIs are the second leading cause of healthcare-associated infections in hospitalized patients, accounting for up to 20% of all such infections [4]. They occur in 4% of clean wounds and in 35% of contaminated wounds[5].

SWI following appendectomy impacts the patient's disease progression [5] and is associated with increased mortality[4]. Phase IV of acute appendicitis, compared to non-complicated phases of acute appendicitis, has a higher risk of presenting SWI [6]. The type of surgical approach does not reduce the frequency of SWI; the open approach has a higher frequency of parietal SWI, and the laparoscopic approach of organ and/or space infection[7,8]. Prevention of SWI includes various techniques such as the use of antimicrobials, skin asepsis and antisepsis, to solutions for irrigation with or without antiseptics[9].

Antiseptic solutions are used to reduce the frequency of SWIs. Broad-spectrum antimicrobial solutions and so-called superoxidative solutions are alternatives to saline solution and/or iodine solutions (iodine, iodopovidone, which can cause irritation or allergy) [10-14]. The Dakin solution has variable results when compared with other antiseptics [15]. The aim was to compare the results of using modified Dakin solution vs superoxidative solution in preventing SWI in patients undergoing conventional surgery for phase IV acute appendicitis.

MATERIALS AND METHODS

Design and Study Area

A comparative and cross-sectional clinical study conducted in a Secondary Level Medical Care Hospital in Puebla, Mexico.

Population and Sample

Through non-probabilistic convenience sampling, all patients with complicated acute appendicitis - Phase IV operated on by conventional surgery, over 18 years of age, with complete clinical follow-up, were included if they agreed to participate in the study by filling out and signing an informed consent. Phase IV of acute appendicitis is understood to be when the intraoperative finding was appendicular necrosis-perforation with local abscess, generalized peritonitis, or multiple intraperitoneal abscesses[6].

Inclusion and exclusion criteria

Patients with concomitant immunosuppressive pathologies such as diabetes mellitus, rheumatic diseases, etc., were excluded. Those who chose to leave the study or did not complete the information for any other reason were eliminated.

Procedures

The assignment of the antiseptic solution was done using a table of random numbers, balanced every 10 patients.

Group 1 consisted of patients treated with Dakin solution.

Group 2 consisted of patients treated with superoxidative solution.

The physical appearance of both solutions is the same, so during the application, the surgical team was unaware of which solution was being applied.

Surgical Technique

All patients underwent a right paramedian approach (Jalaguier-Battle). Once access to the abdominal cavity was achieved, the cecal appendix was located, the mesoappendix was ligated with vicryl 2-0, appendectomy was performed by ligating the base of the cecal appendix with free silk 2-0, and the base was invaginated with a purse string suture using chromic catgut 2-0. The purulent material found was aspirated and subsequently washed with saline solution. It was

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aspirated and dried with gauze. A Penrose-type drain was then placed, brought out through a counter-opening, and the abdominal wall was closed in layers until the aponeurosis (standard technique, [16-18]). Once the aponeurosis was closed, the wound was irrigated with either Dakin or superoxidative solution. The wound was dried, and the subcutaneous tissue was sutured with separate stitches using vicryl 2-0 and the skin with simple Sarnoff-type stitches.

Antiseptic Solutions

The superoxidative solution contains hypochlorite (35.7 mg/L), hypochlorous acid (25.2 mg/L), sodium chloride (110.6 mg/L), and hydrogen peroxide (999.8 g/L). It has a pH of 6.2-7.8 and an osmolarity of 13 mOsm/kg. It is processed by electrolysis, allowing it to form reactive species of oxygen and chlorine. It does not induce cytotoxicity in fibroblasts and, therefore, does not interfere with the healing process [19,20]. The modified Dakin solution (MDS) contains 0.025% to 0.25% sodium hypochlorite mixed with 5% sodium bicarbonate in equal parts. Concentrations below 0.025% lose their bactericidal effect, and concentrations above 0.25% are toxic to tissues. The solution also promotes wound healing by increasing the strength in epithelial junctions without damaging tissues [21-22]. The Modified Dakin Solution was used at 0.05%, prepared with 5 milliliters of 6% sodium hypochlorite (commercial bleach), one liter of 0.9% saline solution, and one ampule of bicarbonate.

Pharmacological Management

All patients in both groups received antimicrobial prophylaxis with 1g intravenous ceftriaxone 30 minutes before surgery, according to the current Clinical Practice Guide for acute appendicitis [16]. From the immediate postoperative period, the antibiotic regimen was continued with ceftriaxone 1g IV every 12 hours and metronidazole 500 mg IV every 8 hours. In cases of suspected generalized peritonitis, amikacin 500 mg IV every 12 hours was added. This regimen was maintained for 5 days, and at the end, patients were discharged to continue outpatient care with oral ciprofloxacin 500 mg every 12 hours, with follow-up in outpatient consultation.

For analgesia, 30 mg of Ketorolac was used, diluted in 100 ml of 0.9% saline solution every 6 hours, and if the pain persisted, 1g of metamizole in 100 ml of 0.9% saline solution was administered every 8 hours. This analgesic regimen was maintained until hospital discharge. The wound's progress was monitored for pus discharge, edema, erythema, and heat 7 days after surgery. Surgical wound infection (SWI) was considered with the presence of at least one of these signs or symptoms.

Statistical Analysis

Descriptive statistics, Chi-square (X2), and Student's t-test for independent samples were used. A p-value of ≤0.05 was considered statistically significant.

Ethical Aspects

This study was approved by the Local Research Committee of the participating medical unit of the Instituto Mexicano del Seguro Social, with the registration number: R-2019-2106-023. Patients signed an informed consent form, and the anonymity of the participants was preserved at all times.

RESULTS

104 patients were recruited; the average age was 36.29 (18 to 70) ± 12.56 years; the age group of 21 to 30 years predominated with 46 (44.23%) patients; 69 (66.43%) patients were men, and 35 (33.65%) were women. In 11 (10.6%) patients, surgical wound infection occurred. (See table No. 1)

Group 1: Thirty-six (69.23%) patients were men and 16 (30.77%) women. The average age was 43 (18 to 66) ± 12.17 years. In 3 (5.8%) patients, surgical wound infection occurred, manifested by purulent discharge in all, edema in 2 (66%), erythema in 1 (33%), and local heat in 1 (33%).

Group 2: Thirty-three (63.46%) patients were men and 19 (36.54%) women. The average age was 47.5 (21 to 70) ± 12.11 years. In 8 (15%) patients, surgical wound infection occurred. All had purulent discharge, 3 (37.5%) had edema, 3 (37.5%) had erythema, and 5 (62.5%) had local heat.

The presence of surgical wound infection by group, as well as the sociodemographic data, signs, and symptoms evaluated in the SWI, are shown in table I. There was no statistically significant difference in the presentation of SWI for any of these signs and symptoms in both groups.

The difference in the presentation of surgical wound infection by patient group is shown in table II, which was representative, but in reference to the presence of infection in both cases, there was no statistically significant difference between both groups, p=0.1.

Table 1. Comparison of patient groups, sociodemographic data, and clinical manifestations evaluated in surgical wound infection.

Sociodemographic data and clinical manifestations	Group 1 SWI		Group 2 SWI	
Data and clinic	+	-	+	-
Male p = 0.18	2	34	5	28
Female p = 0.37	1	15	3	16
Purulent discharge p = 0.11	3	49	8	44
Edema p = 0.64	2	50	3	49
Erythema p = 0.30	1	51	3	49
Local heat p = 0.09	1	51	5	47

Abbreviations: SWI = surgical wound infection, + = present, - = absent, p = statistical significance

Table 2. Comparison of solutions regarding surgical wound infection.

Patient Group	SWI		
	+	-	*p*
Group 1	3	49	0.1
Group 2	8	44	

Abbreviations: SWI = surgical wound infection, + = present, - = absent, p = probability

DISCUSSION

Acute appendicitis phase IV, compared to uncomplicated acute appendicitis, has a higher likelihood of complications. These complications include the presence of seroma, wound dehiscence, intra-abdominal abscesses, peritonitis, and even septicemia; the most frequent is surgical wound infection (SWI). SWI occurs in up to 20% of hospitalized patients, 35% in contaminated wounds, which hinders patient recovery. There are various mechanisms to prevent these infections, including the use of antibiotics administered before, during, and after surgery, proper hand hygiene of personnel involved in patient care, implementing an appropriate surgical protocol, and rinsing the surgical wound with antiseptic solutions such as chlorhexidine, povidone-iodine, superoxidative solutions, and Modified Dakin's Solution.

Modified

In this study, which included 104 patients, an average age of 36 ±12 years for the presentation of acute appendicitis phase IV was obtained. This data agrees with what is reported in global literature, where the presentation age for acute appendicitis is 18 to 35 years [2]. The percentage of patients by gender with acute appendicitis phase IV was 66.34% in men and 33.65% in women. This data also matches what is reported in global literature, which states that the incidence is higher in men compared to women at a 2:1 ratio[2,3].

Regarding SWI occurrence, 10.6% of patients suffered it. This percentage is lower compared to the global literature, in patients without the application of antiseptic solutions, which indicates that SWI occurs in up to 35% of wounds [5]. It is likely that the use of antiseptic solutions contributes to this decrease in SWI. On the other hand, regarding the clinical data evaluated in SWI, the most frequent was pus discharge, which occurred in all SWIs, followed by local heat and swelling, which occurred in 54.54% and 45.45% respectively of the infected wounds.

This matches literature where SWI manifests with the presence of pus, swelling, erythema, and local heat [5]. Although it was searched in the literature, we did not find the frequency of each of these manifestations in patients.

SWI occurred in 5.8% and 15.4% of patients in group 1 and 2 respectively, without statistically significant differences (p≥0.05) between both groups, implying that both solutions offer good outcomes for surgical wound management in patients undergoing appendectomy for complicated acute appendicitis or phase IV.

With these results, it is suggested to conduct comparative studies with populations that are not washed with any of these solutions to further define their importance. Therefore, not having made this comparison can be considered a weakness of this study.

CONCLUSION

It is concluded that both solutions can be effective in reducing the occurrence of SWI in patients undergoing appendectomy for acute appendicitis phase IV.

Authorship contribution: AGG participated in: Concept and design of the article, Data analysis and interpretation, Article drafting, Critical review of the article, Final version approval, Statistical advice, Technical or administrative advice. AJMJ participated in: Data analysis and interpretation, Article drafting, Critical review of the article, Final version approval, Statistical advice, Technical or administrative advice. LCO participated in: Collection of results, Data analysis and interpretation, Contribution of patients or study material. YEFR participated in: Data analysis and interpretation, Article drafting, Final version approval, Contribution of patients or study material, Technical or administrative advice. RAPB participated in: Concept and design of the article, Data analysis and interpretation, Article drafting, Critical review of the article, Final version approval. JLC participated in: Article drafting, Critical review of the article, Final version approval. VVR participated in: Article drafting, Critical review of the article, Contribution of patients or study material. JRM participated in: Article drafting, Critical review of the article, Final version approval.

Financing: Self-financed.

Conflict of interest: The authors declare that they have no conflicts of interest.

Received: March 08, 2022.
Accepted: June 02, 2022.

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