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Evaluation of the impact of surgical wound hygiene on the rate of surgical site infection post appendectomy

Avaliação do impacto da higiene da ferida operatória na taxa de infecção do sítio cirúrgico pós-apendicectomia

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ABSTRACT

Introduction: Surgical site infection (SSI) is a frequent healthcare-related complication in Brazil, representing 14% to 16% of infections in hospitalized patients. Prophylactic antibiotic therapy is used for prevention, but bacterial resistance increases costs and compromises recovery.

Objective: Estimate the rate of surgical wound infection after appendectomies using a specific incision and cleaned after closing the aponeurosis.

Method: This is a quantitative, analytical and prospective study, carried out from October 2022 to October 2023, with a sample of 66 patients undergoing appendectomy through a specific incision. Patients were divided into groups according to the substances used (saline n = 33; chlorhexidine n = 25; and topical iodine n = 11) and instructed to return for evaluation between 7 and 14 days postoperatively to evaluate the surgical wound.

Result: Surgical wound infection was identified in 3 cases, all cleaned with saline solution, 1 being found on the 4th and the other 2 on the 10th and 14th postoperative day respectively. There was no statistical significance for a 95% interval. As for patients cleaned with antiseptic solution, the study showed no complications.

Conclusion: Antiseptic solutions proved to be effective in preventing surgical site infections. On the contrary, in patients undergoing hygiene with saline solution, there were who presented complications, although without statistical significance.

KEYWORDS: Surgical site infection. Appendectomy. Surgical wound.

Central Message

Surgical site infection is one of the main complications related to healthcare in Brazil, ranking third among all infections in healthcare services and comprising 14-16% of those found in hospitalized patients. As a strategy for its prevention, prophylactic antibiotic therapy is performed; however, many bacteria present in the hospital environment have become resistant to most antibiotics used in the perioperative period due to exposure to these drugs, increasing hospital costs, as well as harming the patient's recovery.

Perspective

To estimate the rate of surgical wound infection after appendectomies using a specific incision and cleaned after closing the aponeurosis is interesting on applied research and clinical care. Antiseptic solutions proved to be effective in preventing surgical site infections. On the contrary, among the ones undergoing hygiene with saline solution, there were some who presented complications, although without statistical significance.

RESUMO

Introdução: A infecção de sítio cirúrgico (ISC) é uma complicação frequente no Brasil, representando 14% a 16% das infecções em pacientes hospitalizados. A antibioticoterapia profilática é usada para prevenção, mas a resistência bacteriana aumenta custos e compromete a recuperação.

Objetivo: Estimar a taxa de infecção da ferida operatória após apendicectomias com incisão específica e limpeza após o fechamento da aponeurose.

Método: Trata-se de um estudo quantitativo, analítico e prospectivo, realizado no período de outubro de 2022 a outubro de 2023, com amostra de 66 pacientes submetidos à apendicectomia por meio de incisão específica. Os pacientes foram divididos em grupos de acordo com as substâncias utilizadas (soro fisiológico n = 33; clorexidina n = 25; e iodo tópico n = 11) e orientados a retornar para avaliação entre 7 e 14 dias do pós-operatório para avaliação da ferida operatória.

Resultado: A infecção da ferida operatória foi identificada em 3 casos, todos limpos com soro fisiológico, sendo 1 encontrado no 4º dia e os outros 2 no 10º e 14º dia de pós-operatório, respectivamente. Não houve significância estatística para intervalo de 95%. Quanto aos pacientes limpos com solução antisséptica, o estudo não mostrou complicações.

Conclusão: As soluções antissépticas mostraram-se eficazes na prevenção de infecções de sítio cirúrgico. Ao contrário, nos pacientes submetidos à higiene com soro fisiológico, houve pacientes que apresentaram complicações, porém sem significância estatística.

PALAVRAS-CHAVE: Infecção de sítio cirúrgico. Apendicectomia. Ferida cirúrgica.

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INTRODUCTION

Surgical site infection (SSI) is one of the main complications related to healthcare in Brazil, ranking third among all infections in healthcare services and accounting for 14-16% of those found in hospitalized patients. A national study conducted by the Ministry of Health in 1999 found an SSI rate of 11% of all procedures analyzed. This rate is more relevant due to factors related to the population served and procedures performed in healthcare services.[1] Data published in 2014 by the Society for Hospital Epidemiology in America (SHEA) and the Infectious Diseases Society of America (IDSA) reveal that in the United States of America, SSI affects 2-5% of patients undergoing surgical procedures, and that between 160,000 and 300,000 episodes of SSI occur each year in the country.[1] Surgical site infection is one of the most common complications that occur after appendectomy.[2,3] As a strategy to prevent it, prophylactic antibiotic therapy is performed, however, many bacteria present in the hospital environment have become resistant to most antibiotics used in the perioperative period due to exposure to these drugs, increasing hospital costs, as well as harming the patient's recovery.[4]

Acute appendicitis is the leading cause of surgical acute abdomen worldwide, with a prevalence of approximately 7% in the population. It has a peak incidence between 10 and 14 years in females and between 15 and 19 years in males,5 Appendectomy is the treatment of choice because, in addition to allowing a definitive diagnosis, it also significantly reduces the risk of complications, such as perforation, sepsis and death.[6] Surgical treatment consists of removing the appendix using an open technique, a surgery described by McBurney in 1894, or through laparoscopic appendectomy, described by Semm in 1983.[7] In uncomplicated cases - especially those operated on within the first 48 h - or without evidence of generalized peritonitis, specific incisions in the right iliac fossa, either oblique (McBurney incision: centered on McBurney's point) or transverse (Davis incision) are the most recommended, as they retract, rather than cut, the muscle fibers of the abdominal wall and allow access to the cecum and appendix. These incisions are better tolerated by patients, have a better aesthetic effect and have a lower rate of incisional hernias in the late postoperative period. When there is no team with experience in videolaparoscopy, in cases where there is diagnostic doubt or with suspicion of generalized peritonitis, a median incision is recommended - which can be easily enlarged for exploration and extensive washing of the peritoneal cavity - and even the performance of other surgical approaches.[8]

There are few studies in the literature related to surgical site hygiene with topical solutions, saline or even mechanical drying and its association with wound infection. This project aims to estimate the rate of surgical wound infection, post appendectomy by specific incision and sanitized after closure of the aponeurosis.

METHOD

The study was approved by the Research Ethics Committee (CEP) of the Regional Public Hospital Prefeito Osvaldo Rezende Franco in the municipality of Betim, Minas Gerais, under opinion number 2,824,061.

Quantitative, prospective and analytical study related to surgical wound infection after appendectomy by specific incision, carried out at the Regional Public Hospital of Betim Prefeito Osvaldo Rezende Franco. Data were collected from 66 patients who underwent appendectomy through a specific incision between October 30, 2022 and October 30, 2023, with all participants being over 18 years of age and capable, with a signed Free and Informed Consent Form (FICF).

The criteria for exclusion from the study were: patients known to be allergic to chlorhexidine and/or povidone-iodine, under 18 years of age and incapacitated, undergoing appendectomy by median incision, and those who, regardless of the type of incision, did not agree and, therefore, did not sign the informed consent form.

Patients eligible for the study were admitted by the general surgery team, in the emergency room, referred from the Emergency Care Units of Betim and municipalities in the microregion with characteristic signs and symptoms of acute appendicitis with evolution of up to 72 h and the substance used was defined according to the preference of the surgeon responsible for the surgical procedure. The 66 patients were divided into groups according to the substances used to clean the surgical wound after closing the aponeurosis: 0.9% saline solution with 30 patients (45.5%), chlorhexidine with 25 patients (37.9%) and topical iodine with 11 patients (16.7%).

The study included 29 female (43.9%) and 37 male (56.1%), with a mean age of 34.2 years (±12.5; 18-66 years). All received prophylactic antibiotics during anesthetic induction. Upon hospital discharge, patients were instructed to return to the service for postoperative evaluation within 7 to 14 days, except for cases that had been hospitalized for more than 7 days or developed surgical wound infection during that period; these patients were instructed to return to the general surgery outpatient clinic.

The data collected were: name, age, sex, date of the procedure, substance used to clean the surgical wound, appearance of the wound upon return and date of return. This information was collected from the medical records after the patient's permission was obtained by signing the informed consent form and structured in a table.

Statistical analysis

Fisher's exact test was used to compare the infection rate between groups, since the Chi-Square Test of Independence has limitations due there are groups with 0 cases of infection. Fisher's exact test requires a 2x2 contingency table, but we have 3 groups (Saline, Chlorhexidine and Iodine). To solve this, Fisher's test was performed to compare the groups two by two. Thus, Saline vs. Chlorhexidine and Saline vs. Iodine were compared.

RESULT

In the case series evaluated, 3 patients presented surgical wound infection, all of whom were sanitized with saline solution, one of which was diagnosed on the 4th and the other 2 on the 10th and 14th postoperative days, respectively. There was no statistical significance for a 95% confidence interval. None of the patients who were sanitized with antiseptics presented surgical site infection.

Nine patients who returned for evaluation of the surgical wound did not return for the consultation with the anatomopathological result, even when instructed to return.

The first case of SSI was identified in November 2022, in a 36-year-old male with no comorbidities, presenting only grade I obesity. He returned on the fourteenth postoperative day reporting drainage of serous secretion through the wound. On evaluation, the wound was hyperemic, painful to palpation and with drainage of purulent secretion, without systemic signs and symptoms, and the abdomen showed no signs of peritoneal irritation. The stitch was opened to drain the secretion, the patient received guidance on local wound care, oral antibiotic therapy and a return visit for wound evaluation. He returned again 10 days later, and the surgical wound was found to be in good condition, with no signs of infection after completing the antibiotic therapy period.

The other cases occurred in February 2023, the second being a 23-year-old male who presented with a wound infection while still hospitalized. On the fourth postoperative day, he complained of pain in the surgical incision, with no associated systemic symptoms. He was receiving antibiotic therapy with a regimen of gentamicin and metronidazole. The examination revealed a large amount of pus discharged from the surgical wound, subcutaneous emphysema and hyperemic wound, and an abdomen with no sign of peritoneal irritation. He underwent abdominal tomography, which showed no intra-abdominal collections. Upon discharge from the hospital, he received guidance on wound care, oral antibiotic therapy and outpatient follow-up for general surgery.

The third case, a 51-year-old female with no comorbidities, presented an infection on the tenth postoperative day, with hyperemia, pain on palpation, purulent secretion, and no associated systemic signs and symptoms. She received guidance on surgical wound care, oral antibiotic therapy, and outpatient follow-up. Her last follow-up visit was 21 days after the first visit for wound evaluation, and she was discharged with complete improvement of her condition.

The application of the Fisher Test determined whether the distribution of infections between the groups differed significantly, according to the following sequence (Table)

The results of Fisher's exact tests to compare infection rates between groups are: Saline vs. Clorexidina: p-value = 0,251; Saline vs. Iodine: p-value = 0,561

TABLE — Distribution of infection in groups

Solution	Yes	No	Total
Saline	3	30	33
Chlorhexidine	0	25	25
Iodine	0	11	11
Total	3	63	66

None of the comparisons resulted in a p-value less than 0.05, which indicates that there is no statistically significant evidence to state that infection rates differ between the groups (Saline vs. Chlorhexidine or Saline vs. Iodine).

This suggests that, based on the available data, there is no statistically significant difference in the rate of surgical wound infection between the different solutions used.

DISCUSSION

Although the study did not show statistical significance regarding the wound infection rate after cleaning with saline solution or with iodine or chlorhexidine-based components, there is still a need for a larger sample, as well as for other surgical procedures.

The choice of components for sanitization was based on what the surgeons in the service were already used to using. Some surgeons did not agree with the use of iodine solution or chlorhexidine where the skin was not intact, arguing that these were components that could lead to cell death and, therefore, damage structures sanitized with these components. Chlorhexidine gluconate (CHG) and iodophors are frequently used in aqueous, alcoholic and degerming solutions.

Iodine destroys microbial proteins and DNA. Its derivatives are widely used due to their broad-spectrum antimicrobial properties, efficacy and safety on almost all skin surfaces, including mucous membranes, regardless of age. Aqueous CHG acts by disrupting the membrane of bacterial cells, and its action is concentration-dependent. At low concentrations, it has a bacteriostatic effect, causing changes in the osmotic balance of the bacterial cell; and at high concentrations, it is bactericidal, causing precipitation of its cytoplasmic contents.

CHG has broad-spectrum activity, including gram-positive and gram-negative microorganisms, non-spore-forming bacteria, fungi, and lipid envelope viruses, including human immunodeficiency virus (HIV). When compared to PVP-I, CHG has a more prolonged residual activity and is resistant to blood products. Its application is similar to that of PVP-I, with the exception of being contraindicated in the genital region, ocular conjunctiva, auditory canal, and meninges, due to the potential damage it causes in these regions, as reported by Oliveira et al.[9] In the present study, no wound infections were observed in patients who used a solution containing iodine or chlorhexidine, and it cannot be stated that a particular substance was superior. Meta-analysis conducted by Noorani et al.[10], seeking to recognize the effectiveness of chlorhexidine compared to povidone-iodine in wounds classified as clean-contaminated, concluded that chlorhexidine was more efficient (p = 0.019).[10] This statement was confirmed by Levin et al.[11]

who compared povidone-iodine and chlorhexidine in alcoholic solutions in gynecological laparotomies (p = 0.011).[13] While in 2009, Swenson et al.[12], demonstrated the superiority of iodine compounds over chlorhexidine in a study involving 3,209 surgical procedures.

Patients with acute appendicitis are referred from the prompt service - UPA or from municipalities in the microregion, where they are evaluated by the general surgery team and referred to the surgical center.

Complicated appendicitis is defined as appendiceal phlegmon (a simple, non-pusp-filled inflammatory mass located in the lower right corner of the appendix) or appendiceal abscess (a pocket of pus around an acute and/or ruptured appendix). People with this condition usually require surgical removal of the appendix to relieve their symptoms and prevent complications. The timing of surgical removal of the appendix is controversial. Immediate surgery is technically demanding. Some experts question the appropriateness of delayed appendectomy because people are unlikely to experience a recurrence after successful nonsurgical treatment. However, the true diagnosis may be uncertain in some cases, and delaying appendectomy may delay diagnosis of the underlying disease.[13]

CONCLUSION

Antiseptic solutions have proven effective in preventing surgical site infection. On the other hand, in patients who underwent sanitation with saline solution, there were some who presented complications, although without statistical significance.

Authors' contribution

Igor Saint'Clair de Castro Doco – Conceptualization, Project Management
Mariana Araujo de Moura Silva - Supervision
Alisson Rodrigues Pinto - Validation
Jéssica Gomes Baldoino Araújo - Investigation
Maria Alice Matias Cardozo - Methodology
Victor Faleiro Barroso Lourenço - Project Management

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