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Original Article

Surgical site infection outcomes of 2 different regimens for preoperative skin antisepsis: single layer with povidone-iodine versus double layer with povidone-iodine/ octenidine dihydrochloride

Preoperatif cilt antisepsisi için 2 farklı rejimin cerrahi alan enfeksiyon sonuçları: povidon-iyot ile tek katmana karşı povidon-iyot / oktenidin dihidroklorür ile çift katman

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Abstract

Aim: Surgical site infection (SSI) is a frequent complication following any surgery. SSI still one of the main causes of elongated hospitalization, morbidity, and cost charges despite the development of new techniques, new materials, and new procedures. This study aims to compare the postoperative outcomes concerning single or double-layer or disinfectant application.

Material and Methods: This is a retrospective study aiming to inference the results of 2 different methods of preoperative skin disinfection after Lichtenstein tension-free open hernia repair with prolene mesh. A total of 298 patients enrolled in this study. This is a retrospective study comparing the outcomes of SSI open herniorrhaphy with prolene mesh.

Results: Wound infection has occurred in 13 patients from Group-1 (6.80%) versus 3 patients on Group-2 (2.80%) respectively, which is statistically significantly lower than Group-1($p<0.05$).

Conclusion: As our results showed, we suggest that octenidine dihydrochloride could be considered a powerful alternative to conventional disinfectant solutions, but further investigations with a single application of octenidine dihydrochloride are needed.

Keywords: Herniorrhaphy; skin preparation; skin antisepsis

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Öz

Amaç: Cerrahi alan enfeksiyonu (SSI), herhangi bir ameliyattan sonra sık görülen bir komplikasyondur. SSI, yeni teknikler, yeni malzemeler ve yeni prosedürlerin geliştirilmesine rağmen, uzun süreli hastanede yatış, morbidite ve maliyet ücretlerinin ana nedenlerinden biri olmaya devam etmektedir. Bu çalışma, tek veya çift katmanlı dezenfektan uygulamasına ilişkin postoperatif sonuçları karşılaştırmayı amaçlamaktadır.

Gereç ve Yöntemler: Bu retrospektif bir çalışmadır. Prolen mesh ile Lichtenstein gerilimsiz açık fıtık onarımı sonrası 2 farklı preoperatif cilt dezenfeksiyon yönteminin sonuçlarını çıkarmayı amaçlayan geriye dönük bir çalışmadır. Bu çalışmaya toplam 298 hasta katılmıştır. Bu, SSI açık herniorafi sonuçlarını prolen mesh ile karşılaştıran retrospektif bir çalışmadır.

Bulgular: Grup-1'de 13 hastada (%6.80), Grup-2'de ise 3 hastada (%2.80) yara enfeksiyonu meydana geldi ve bu Grup-1'den istatistiksel olarak anlamlı derecede düşüktü ($p<0.05$).

Grup-1'den 1 hasta hariç tüm hastaların yüzeyel yara enfeksiyonu temel antibiyotik tedavisi ile çözüldü. Bu hastada parenteral antibiyoterapi gerektiren yara enfeksiyonu gelişti ve 10 günlük tedaviden sonra çözüldü.

Sonuç: Sonuçlarımızın gösterdiği gibi, oktenidin dihidroklorürün geleneksel dezenfektan solüsyonlarına güçlü bir alternatif olarak düşünülebileceğini, ancak tek bir oktenidin dihidroklorür uygulamasıyla daha ileri araştırmalara ihtiyaç olduğunu öne sürüyoruz.

Anahtar kelimeler: Herniorrhaphy; cilt hazırlığı; cilt antisepsisi

Introduction

Surgical site infection (SSI) is a frequent complication following any surgery. SSI still one of the main causes of elongated hospitalization, morbidity, and cost charges despite the development of new techniques, new materials, and new procedures [1].

To avoid SSI, the algorithm consists of three stages; preoperative, intraoperative, and postoperative prevention. One of the most significant stage to avoid SSI is the preoperative stage of skin preparation of the surgical site [1,2].

Povidone-iodine is an antiseptic solution made up of polyvinylpyrrolidone, water, iodide, and 1% accessible iodine having bactericidal properties against a wide range of microorganisms [5]. Although there is a lot of research on its usage as a topical antibacterial agent in surgery, it hasn't been studied as much as its use as a prophylactic irrigation solution to prevent surgical site infection.

Octenidine is a very efficient drug with limited absorption and toxicity [6-8]. Because of these qualities, octenidine-containing skin antisepsis solutions may have a better impact than SSI.

The aim of this study is to compare the postoperative outcomes with respect to single or double-layer or disinfection applications.

Materials and methods

Ethical approval was obtained from the Ethics Committee of Hitit University Non-interventional Research (Year:2021, Decision number: 2021-81) in accordance with the Declaration of Helsinki Principles. This is a retrospective study aiming to inference the results of 2 different methods of preoperative skin disinfection after Lichtenstein tension-free open hernia repair with prolene mesh. A total of 298 patients enrolled in this study. This is a retrospective study comparing the outcomes of SSI open herniorrhaphy with prolene mesh. 298 patients enrolled in this study were male aged between 18 and 65, who were admitted to the outpatient clinic with unilateral inguinal hernia and were eligible for Lichtenstein tension-free open hernia repair using mesh.

Patients excluded from the study who had scrotal, incarcerated ischemic or necrotic bowel tissue, perforation/infection, or femoral hernia; and prior laparoscopic/open inguinal hernia repair. The local ethics committee approval has been taken for this study, and all patients have signed written informed consent.

Preoperative skin disinfection

Group-1: Regular skin preparation with scrubbing povidone-iodine on-table immediately before surgery starts by the chief surgeon who had his/her hands scrubbed.

Group-2: Octenidine dihydrochloride sprayed directly to the skin at a distance of 10-15 cm and scrubbed with sterile gauzes by the chief surgeon before the surgeon's hands scrubbed, let dry while the surgeon getting ready for the procedure, afterward povidone-iodine applied same as Group-1.

After prophylactic antibiotherapy was applied, the incision

has started centering 1 cm upper and latitude of the inguinal ligament, originated from the pubic bone and reaching out 4-5 cm upper of the midinguinal line. Subcutaneous tissue has passed through pudendalis superficialis and epigastrica superficialis branches of these vessels. The Scarpa fascia is dissected to the external oblique muscle's aponeurosis, then exposure of the external inguinal ring and inguinal ligament is completed. The external oblique aponeurosis incised from external inguinal ring to upper-lateral for 5-6 cm. Nervus ilioinguinalis has been secured from secondary trauma. Skin flaps prepared and context of spermatic cord with cremaster muscles hanged up to ensure the security of these structures and help expose the area of herniation. Polypropylene mesh has augmented for herniorrhaphy. The patchy edges of the mesh rasped to maintain the optimal adaptation to the prepared area. The mesh has been fixed with 3.0 polypropylene stitches.

Hemostasis secured and spermatic cord layers and other anatomical structures have closed concordantly with the anatomic plane.

The patients have been assessed in respect of early and late postoperative complications and hernia recurrence. The Ki-square test used for statistical analysis was performed using the software package SPSS 17.0 (IBM Corp. Armonk, NY). A difference with $p<0.05$ was considered statistically significant.

Results

A total of 298 patients diagnosed with a unilateral primary inguinal hernia were included and evaluated retrospectively by the patient records. Of 298 patients which enrolled in this study were all male aged between 18 and 65 (mean 54.4), 191 patients were used single layer disinfection (Group-1), and 107 were used double-layer disinfection (Group-2).

Demographic parameters evaluated the two groups consisted of all male patients (mean age: 54.4 years ± 6.3 vs. 51.2 years ± 7.8 for Group-1 and Group-2, respectively ($p>0.05$) (Table 1).

The median duration of operation was 55.1 min ± 9.1 on Group-1, and the median duration of operation was 59.6 min ± 10.4 on Group-2 ($p>0.05$).

Table 1: Patient demographic characteristic and outcome of comparison between groups

	Total,n:298	Group-1,n:191	Group-2,n:107	p value
Age,years, mean±SD	53.2± 5.4	54.4± 6.3	51.2 ± 7.8	>0.05
Duration of operation,minute, mean±SD	57.7± 5.4	55.1 ± 9.1	59.6 ± 10.4	>0.05
Hospital stay,day	1	1	1	>0.05
Complication	none	none	none	
Wound infection,n(%)	16(5.3)	13(6.8)	3(2.8%)	<0.05
Recurrence	none	none	none	>0.05

Statistically significant results in bold

Mean hospital stay for all patients was 1 day, and no statistically significant difference has detected between groups.

None patients participating in this study suffered any intraoperative or postoperative major complication.

Wound infection has occurred in 13 patients from Group-1 (6.80%) versus 3 patients on Group-2 (2.80%) respectively, which is statistically significantly lower than Group-1($p<0.05$).

Superficial wound infection dissolved with basic antibiotherapy of all patients except 1 patient from Group-1. The patient had developed wound infection requiring parenteral antibiotherapy, which dissolved after 10 days of treatment.

The rate of patients in need of analgesics during the follow-up did not differ significantly ($p>0.05$).

No recurrence has detected in both groups after 11.2 months of follow-up.

Discussion

The extent of mindfulness and implementation of suggested parameters of avoidance of SSI are considered to have an important value. The application and standardization of skin preparation still consist a huge part of preoperative measures to avoid SSI after surgery[3]. Many studies with various methods had run to propound the ideal parameters of preoperative preparation, but the optimal approach still stays controversial. Additively the new materials keeps to be discovered for example antibacterial sutures, very new kind of disinfectants and surgical masks/gloves with special aspects makes the pursuit more complicated [3,4].

Despite these huge amounts of several different studies, many centers seemed to stay conservative and conformist, which may be failed to enhance the optimal level of skin preparation [9-11]. Our study demonstrated not only the different techniques of skin antisepsis but also a very significant attempt to digress the comfort zone of conventional disinfection techniques.

Upon the skin is a strict substantial border that doesn't allow nearly no microorganisms to pass and develop any kind of

infestation. On the other hand, SSI could originate from any kind of surface in the surgical site, including surgeons' skin, circulating air, or even the instruments besides the skin of the patient but with no doubt, in our surgical units' facilities rarely allow the colonization from surgical instruments, etc.[12]. So the skin antisepsis continues to be one of the major concerns of SSI development after surgery [13].

Our study was designed in order to demonstrate the outcomes of 2 different regimens of disinfectant application, and our thought is this demonstration has the potential to add a new approach as double-layered antisepsis of the surgical area in pursuant of results showed above.

Antiseptics which are being used for preoperative skin preparation has several ''must have"s according to Dumville JC et al. [14], described exactly as;

· ''kill all bacteria, fungi, viruses, protozoa, tubercle bacilli and spores

· be nontoxic

· be hypoallergenic

· be safe to use in all body regions

· not be absorbed

· have residual activity

· be safe for repetitive use '' [14,15].

Iodine solutions have a strong efficacy on several types of microorganisms, including Gram-positive and Gram-negative bacteria, fungi, and viruses as an agent that used to be applied for several decades conventionally [14-16]. On the other hand, the octenidine dihydrochloride has strong both bactericidal and fungicidal effects, and it has very spectacular efficacy on Gram-positive and Gram-negative bacterias[17,18]. Additionally not absorbable and safe on high amounts of application [19,20].

Our study has limitations. Although being retrospective is the most important limitation, the short follow-up period can also be counted as a limitation. It was from a single center and was overwhelmingly white. We did not collect data about patient feedback or any adverse events that may have been related to study group assignments other than SSIs. The fact that it is a big, contemporaneous, and properly implemented clinical trial is one of the study's merits. The study's pragmatic design and implementation closely resemble real-world practice, making it more generalizable to various surgical populations.

Conclusion

While we know SSI are one of the most debilitating complications of all types of surgery, we believe that it is very important to maintain new studies to enhance the optimal results of preventive techniques in respect of surgical site infection. This study aimed to assess the impact on SSI of two different techniques of skin disinfection to serve the search of optimal ''on-table" technique for surgical cite disinfection. Thus we believe one of the the major component of SSI path is skin disinfection; due to our results, we suggest that octenidine dihydrochloride could be considered as a powerful alternative to conventional disinfectant solutions on preventing SSI.

Declaration of conflict of interest

There is no person/organization that financially supports the work and the authors have no conflict of interest.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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