RESEARCH
Hip Knee J. Vol. 5, No. 2, 2024, pp.19-23
p-ISSN: 2723-7818
e-ISSN: 2723-7826
http://dx.doi.org/10.46355/hipknee.v5i2.159

ADHESIVE PLASTIC DRAPES DID NOT PROVE TO PREVENT SURGICAL SITE INFECTION IN TOTAL KNEE ARTHROPLASTY: A RANDOMIZED CONTROLLED TRIAL

Ludwig Andretia Powantia Pontoh[1], Ismail Hadisoebroto Dilogo[2], Anggaditya Putra[3], Wahyu Widodo[4], Ihsan Oesman[5], Jessica Fiolin[6], Joshua Alward Herdiman[7]

[1] Department of Orthopaedic and Traumatology, Fatmawati General hospital, Faculty of Medicine, Universitas Indonesia
[2,3,4,5] Department of Orthopaedic and Traumatology, Dr. Cipto Mangunkusumo General hospital, Faculty of Medicine, Universitas Indonesia
[6] Jakarta Knee, Shoulder and Orthopaedic Sport Clinic, Pondok Indah Hospital
[7] Faculty of Medicine, Dr. Cipto Mangunkusumo General Hospital, Faculty of Medicine, Universitas Indonesia

ABSTRACT

Introduction: Surgical site infection (SSI) prevention is crucial in total knee arthroplasty (TKA) procedures. One controllable factor is preventing foreign substances from contaminating the surgical field, for which adhesive draping over surgical drapes is commonly used. Aim to determine whether using adhesive transparent film dressing has any effect on the occurrence of SSI in TKA. Methods: We conducted a study comparing 100 TKA, divided into two groups (each with 50 participants). The first group received adhesive plastic draping during TKA, while the second group was the control. Bacterial aerobic culture swabs were taken before applying the plastic draping and after surgery following skin closure. Follow-up evaluations were conducted within one month to detect signs of SSI. The results none of the 100 TKAs included in the study yielded positive bacterial culture results. One-month post-operative evaluations revealed no signs of SSI in any of the groups. The conclusion The use of adhesive plastic drapes does not provide any benefit in preventing SSI in TKA. Skin preparation, prophylaxis, and surgeon preparation protocols are more crucial for SSI prevention than adhesive plastic drapes.

Keywords: adhesive plastic drapes, surgical site infection, total knee arthroplasty

Article History:
Submission : March 25th, 2023
Revision : April 22th, 2023
Accepted : August 13th, 2024

Corresponding Author:
Ludwig Andretia Powantia Pontoh
Department of Orthopaedic and Traumatology, Fatmawati General hospital, Faculty of Medicine, Universitas Indonesia lappontoh@gmail.com

INTRODUCTION

Surgical site infection (SSI) is a potentially devastating orthopedic surgery complication. Typically, in the presence of metalware, such as in the case of total knee Surgical site infection (SSI) is a potentially devastating orthopedic surgery complication. Typically, in the presence of metalware, such as in the case of total knee arthroplasty (TKA), although less virulent, the slow-growing pathogens may cause periprosthetic joint infections (PJI). Despite being one of the most successful procedures of the decade, the risk of PJI remains a serious complication in TKA (1-3).

SSI rates in total knee replacement range around 1-2%. The main bacteria implicated in SSI in clean surgery are those of the skin flora. Hence, the importance of skin preparation to eliminate transient flora and reduce resident flora (4). SSI occurs within 30 days after the operation and has at least one of the following: purulent drainage from the superficial incision (with/without laboratory confirmation); microorganisms isolated from a culture from the superficial incision; at least one sign/symptom of infection (pain/tenderness, localized swelling, redness, heat) (5).

The route by which these pathogens gain entrance into the wound remains unclear. However, one potentially controllable route is direct contamination from the surrounding surgical field during the procedure. The purpose of surgical drapes is to act as a barrier to external sources of contamination. Hence, the use of disposable drapes is now becoming routine (1). Furthermore, in decades of recent practice, many orthopedic surgeons added a second layer of dressing using adhesive transparent film dressing (6). In the end, the primary intention is still the same: to prevent any foreign substance from contaminating the surgical site while securing the operation field.

Various studies have already been conducted on surgical drapes but not on the use of the adhesive transparent film itself, especially in total TKA. The purpose of this research is to determine whether using adhesive transparent film dressing has any effect on the occurrence of SSI in TKA.

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MATERIAL AND METHODS

We conducted a prospective randomized controlled trial study per the CONSORT criteria (7), comparing 100 knees that received TKA from August 2021 to October 2022 in a single level 1 referral hospital. One medical doctor divided all participants randomly into two groups right before the surgery. Group 1 received adherent plastic adhesive incision drapes, while Group 2 did not. Both groups were draped using disposable, non-woven drapes. Senior consultants for knee reconstruction surgery performed all the surgery. The surgery utilized the standard media parapatellar approach and a pneumatic tourniquet.

Our inclusion criteria were patients with surgically indicated minimal deformity knee osteoarthritis. Our exclusion criteria were knee osteoarthritis with severe deformity, previous or any history of infection in the knee, and auto-immune-related knee arthritis. The adhesive transparent film that we used is OPSITE® Film by Smith & Nephew©. The reasoning behind the adhesive transparent film selection is the moisture vapor's permeable, conformable, and extensible properties of the adhesive transparent film.

Pre-operation preparation and the intraoperative procedure followed WHO standards and hospital surgical protocol, including chlorhexidine bath, usage of clipper for hair removal, pre-operative antibiotics prophylaxis, disposable surgical drapes, surgeon renewing outer gloves after laying out drapes and before putting on the implant, and usage of pulsed lavage (8). During surgery, before the application of the adhesive plastic drapes and after the operation (just after the skin closure), we performed a bacterial aerobic culture swab (with buds and transport medium) on the skin. Finally, the post-operative wound was taken care of, observed, and evaluated weekly until one-month post-operative for wound dressing and SSI signs observation. This study was conducted per the local Institutional Research Board and the Declaration of Helsinki, with registry number 231220.

RESULTS

From 100 TKA included in the study, no single culture came back positive for any pathogen from the bacterial culture. The mean suture removal was 14 ± 5.27 days. One-month close evaluation of the post-operative wound yielded no sign of any infection.

Our participant consists of 72 females and 28 males. Fifty-seven of the participants were diabetic (female 40, male 17), 32 of the participants had hypertension, and 25 male participants had a smoking habit. No patient had hypoalbuminemia or UTI. We described our patients' baseline demographic data in Table 1.

Table 1. Baseline Demographic and Intraoperative Data.

	Mean
Age (years old)*	64 ± 0.32
BMI (kg/m2)*	34.4 ± 3.78
Operation time (minutes) (skin to skin)*	82.6 ± 19.11
Operative blood loss (cc)*	96.3 ± 19.4
48h drain production (cc)*	420 ± 38.7
Hospital length of stay (days)*	5,72

*Data were presented in mean ± SD

DISCUSSION

Our study indicates that adhesive plastic drapes did not prevent SSI in TKA. The stagnant level of prevention is due to the extensive steps implemented to prevent SSI, including chlorhexidine baths, prophylaxis antibiotics, skin hair clippers, surgical drapes, pulse lavage, and many other measures (9). The accumulation of these preventive measures resulted in no further benefit in applying adhesive plastic drapes to prevent SSI in TKA.

The Cochrane review by Webster J et al. showed similar results, adhesive plastic drapes application to prevent SSI yields no benefit. However, the review by Webster J et al. included various types of surgery. Hence, there were many compounding factors (10). Moreover, although many of our patients have obesity, diabetes, smoking habits, and other comorbid conditions that originally favor infection, there were no incidents of SSI. Our surgeries had a fair-paced operation time, moderate blood loss during and 48 hours after the surgery, and an average length of stay.

Bacterial colonization through drapes is one of the primary sources of surgical site contamination. Hence, adequate draping is considered pivotal. The fact that bacteria can penetrate through drapes renders the non-woven disposable drapes more favorable than other draping types (1). Other factors include the length of the surgery, the extent of surgical manipulation, and the distance between surgical sites and foreign particles (9, 10). Another crucial factor is the adherence of the draping to the skin. When the surgeon lifted the draping, contamination from the non-disinfected area to the operated area was unavoidable. Hence, adhesive plastic drapes minimize the probability of this incidence (6). However, from this study, we learned that adhesive plastic drapes do not produce further benefits in preventing SSI if all other measures per recommended guidelines have been applied (8).

Other methods of reducing the risk of SSI in surgeries include iodine-impregnated incision drapes (IIID). A recent systematic review by Sworm et al. (11) demonstrated that IIID prevents SSI in patients with clean or clean contaminated wounds and showed that IIID usage in cardiothoracic surgery effectively reduces infections. However, these findings have no benefit in orthopedic surgeries. This difference finding might be due to the duration of operation time, which might be longer for

the cardiothoracic surgery and hence increase the risk of SSI.

The limitations of this study include a limited sample size and a short follow-up period. Both limitations occurred due to the limited budget to include more sample size and to perform longer follow-ups. However, in this research, we highlighted that there is no benefit in applying adhesive plastic drapes to prevent SSI in TKA. Our findings can also be applied to populations with comorbidities such as diabetes, smoking habits, and obesity, as our sample size is not limited to certain groups of people.

CONCLUSIONS

Adhesive plastic drapes do not benefit SSI infection prevention in TKA. Skin preparation, prophylaxis, and surgeon preparation protocols are more crucial measures than applying adhesive plastic drapes.

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