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# Is the Repair of Reusable Surgical Drapes Safe? A Pilot Study

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## Abstract

**Introduction:** Sterile surgical drapes provide a barrier between the operative site and the environment. These drapes can be made from reusable fabrics, or can be single use disposable items. Each has advantages; however there has been a trend toward the use of disposable drapes in recent years. Our institution uses Compel® (Standard Textile, Cincinnati OH) reusable drapes, and many have undergone repair with fabric patches. This pilot study aimed to identify whether repairing reusable surgical drapes increases intra-operative bacterial recolonisation of the drape during orthopaedic surgery.

**Methods:** This was an observational pilot study of ten orthopaedic trauma cases where the reusable surgical drapes used in the procedure had undergone fabric patch repairs within the surgical field. Microbiological swabs were taken from the repaired site on the drape, as well as an intact control site, prior to surgical incision and then at set 30 min intervals thereafter. Samples were cultured aerobically and anaerobically for seven days and a colony count performed to determine bacterial recolonisation rates.

**Results:** A total of 84 intraoperative samples (42 repair and 42 control sites) were taken from ten drapes during January and February 2015. Neither aerobic nor anaerobic cultures showed evidence of bacterial recolonisation at either the repair sites (0/84) or control sites (0/84). Three plates showed evidence of contaminant species outside the inoculation area (3/168).

**Discussion:** This small pilot study demonstrated no evidence that patched repair of reusable surgical drapes resulted in increased intra-operative bacterial recolonization, suggesting no increased risk of infection from using repaired drapes.

**Keywords: Surgical drapes; Orthopaedics; Surgical wound infection; Infection control; Surgical equipment**

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## Introduction

The implications of infection following orthopaedic surgery are significant for both patient morbidity and resource consumption. In particular, orthopaedic procedures that often involve inserting implants and metalware can be prone to resistant deep infections. An important barrier against infection is the sterile surgical drape, which can be either a single use disposable item, or a reusable fabric drape that requires laundering. Fabric drapes have benefits of long-term cost-effectiveness if laundry and sterilization services are already established, but the disadvantages include ongoing maintenance, quality control & loss of resistance to liquid penetration with repetitive use [1]. There has been a trend toward disposable drapes in recent years despite there being no evidence to indicate increased rates of surgical site infection with reusable drapes [2]. Our institution uses Compel® (Standard Textile, Cincinnati OH) reusable drapes for most orthopaedic surgeries and has been in the habit of repairing damaged areas of these drapes with fabric patches. One of the authors of this study (PS) noticed that during procedures, surgeons and their assistants would intermittently rest their gloved hands on patched repairs of the fenestrated portion of the drape which was directly in the surgical field (Figure 1). These gloves would then handle surgical instruments and manipulate the patient's tissue directly. The author was concerned that these patched repairs may harbour increased bacterial load, which could see the surgeon inadvertently transferring bacteria from the repaired drape to the patient's wound via their gloved hand.

Prior to designing the study, we assessed the drapes used in our designated orthopaedic trauma theatre over a single working week. This showed 53% of cases used at least one drape with a patched repair within the surgical field. Of these cases, over 87% were Open Reduction and Internal Fixation

(ORIF) procedures with a mean duration of surgery of 86 min per case. These data confirmed that patched repairs were commonplace amongst our surgical drapes.

After consultation with orthopaedic surgeons, microbiologists and infectious diseases specialists, a pilot study for real-time intraoperative sampling was devised to assess the repaired surgical drapes. The aim of our study was to establish whether repairing reusable surgical drapes resulted in increased intraoperative bacterial recolonisation.

## Methods

We received a grant from New Zealand Orthopaedic Association Research Foundation for a 10 case pilot study. Cases were identified prospectively between January and February 2015 from the orthopaedic trauma theatres at Christchurch Public Hospital, New Zealand. Inclusion criteria were cases using Compel® reusable drapes with at least one patched repair in the operative field, and an anticipated operating time of at least 60 min. Eligible cases needed to occur during working hours on weekdays due to the inability to process study samples in the laboratory after hours.

Repairs were identified by visual inspection at the time of draping in theatre. All sampling was undertaken by a surgical assistant who had undergone a surgical scrub, with samples obtained using our standard transystem microbiological swabs (Copan Italia, Italy). The drape repair site and a control site equidistant from the operated limb were encircled with a marking pen, and then swabbed prior to the skin incision. Sampling was then repeated at 30 min intervals thereafter. A final swab was taken at the end of the procedure if more than 10 min had elapsed since the penultimate swabs. Samples were labeled and then cultured on both aerobic and anaerobic Columbia Sheep Blood Agar plates (Fort Richard Laboratories, Auckland), and incubated for seven days in the Canterbury District Health Board laboratory. After seven days of incubation a clinical photographer photographed the plates before they underwent assessment by a microbiologist. The photographs were used for a colony count to determine recolonisation rate. Other information collected included the type and duration of the surgical procedure for which the drape was used. Other than swabbing the drapes intraoperatively, no aspect of patient care was changed from standard practice.

## Results

Results for the ten cases included in the pilot study are summarised in Table 1. All cases involved open reduction and internal fixation of fractures. Median operative time was 88 min (range 59 min to 163 min). Median number of samples for each case was four per site (range 3 to 7). Cases 4,7 and 8 each had one plate that grew single colonies outside of the inoculated area (3/168). These were deemed to be contaminants on assessment by the microbiologist. On sequential sampling, none of the aerobic or anaerobic cultures from the repair sites (0/84) or the control site (0/84) showed any evidence of bacterial recolonisation.

## Discussion

This pilot study showed that the incidence of colonization of repaired surgical drapes was no higher than intact areas of the same drape. This suggests that repairing these drapes is a safe practice, even in areas that are close to the operative field.

Our recent phone survey of New Zealand public hospitals with orthopaedic operating theatres indicated that 57% (16/28) used disposable drapes exclusively. Of the remainder, 21% (6/28) used predominantly disposable drapes, while 21% (6/28) were mostly using reusable drapes. Canterbury District Health Board (CDHB) provides orthopaedic services to three of those hospitals predominantly using reusable drapes - Christchurch Public Hospital, Burwood Hospital and Grey Base Hospital. At these hospitals, the majority of trauma and elective orthopaedic cases use reusable drapes, with the exception of arthroscopy procedures and some shoulder and hip surgeries. The Compel® drapes used by CDHB are a woven 100% polyester fabric that has been treated with fluorocarbon [3]. The drape can be divided into two distinct areas - the central fenestrated portion which is dark blue in colour and thicker, with a more textured weave, and the peripheral pale blue area which contains a pinstripe indictor to help identify flaws in the material. The fenestrated area is directly adjacent to the operated limb during surgery and is the area that had previously been deemed inappropriate to repair according to CDHB protocol.

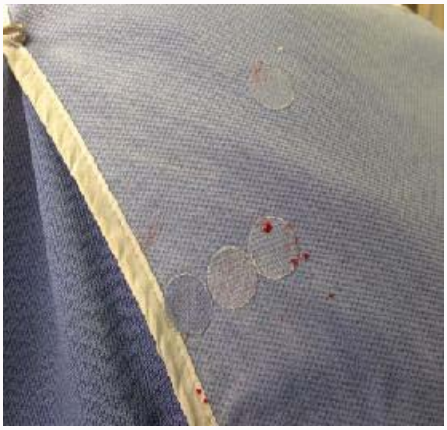

**Figure 1:** A Compel® reusable surgical drape demonstrating multiple patched repairs of the fenestrated portion of the drape.

The infrastructure required to maintain and launder reusable drapes is significant. While many hospitals have moved to disposable drapes and downsized their laundry services, our institution has maintained this infrastructure. In fact, the drapes are owned by the hospital laundry and leased back to the CDHB. Defects in the drapes are identified by sterile services and then repaired by the laundry staff. The current guidelines for maintenance of the surgical linen at CDHB were drafted in 1991 and they outline appropriate methods of repair. This allows for patched repair of defects with similar material, but states that the fenestrated area of the drape, which is directly in the surgical field, should not undergo repair. They specify that this fenestrated area should be completely replaced if damaged. This has clearly not been happening in recent times given our experience with these drapes. It was interesting to note that the stocks of repaired drapes seemed to diminish once word of this study disseminated around the institution, making the identification of study cases more difficult than anticipated and extending the study time by several weeks. However, we found no evidence that repairing this fenestrated area would be detrimental to the patients' outcome.

The long-term cost-effectiveness of reusable drapes is an incentive for hospitals to resist the shift toward disposables. Commercially sensitive pricing figures from our hospital suggest that a pack of three reusable drapes for a hip arthroplasty costs on average 60% of the price of the equivalent disposable hip drape, when costs are averaged across

**Table 1:** Summary of results.

| Case | Procedure | Duration (min) | Swabs per site | Repair Site (positive results/ cultures) | Control Site (positive results/ cultures) | Contaminated Samples (contaminants/total cultures) |
|---|---|---|---|---|---|---|
| 1 | ORIF Ankle | 93 | 4 | 0/8 | 0/8 | 0/16 |
| 2 | ORIF ACL avulsion | 59 | 3 | 0/6 | 0/6 | 0/12 |
| 3 | ORIF Distal Femur | 98 | 4 | 0/8 | 0/8 | 0/16 |
| 4 | ORIF Distal Humerus | 163 | 7 | 0/14 | 0/14 | 1/28 |
| 5 | ORIF Ankle | 85 | 4 | 0/8 | 0/8 | 0/16 |
| 6 | ORIF Olecranon | 65 | 3 | 0/6 | 0/6 | 0/12 |
| 7 | ORIF Ankle | 91 | 4 | 0/8 | 0/8 | 1/16 |
| 8 | ORIF Radial shaft | 77 | 4 | 0/8 | 0/8 | 1/16 |
| 9 | ORIF Distal radius | 77 | 4 | 0/8 | 0/8 | 0/16 |
| 10 | ORIF Radial shaft | 109 | 5 | 0/10 | 0/10 | 0/20 |
| | **Totals** | | | **0/84** | **0/84** | **3/168** |
| | **Median Values** | **88 min** | **4 swabs** | | | |

ORIF: Open Reduction Internal Fixation of fractures; ACL: Anterior Cruciate Ligament

fifty procedures. However, this does not include the cost of waste disposal, which may be significantly in favour of reusable textiles. One 2012 review paper noted that in the United States 2% of municipal waste comes from hospitals, and 2% of hospital waste is disposable surgical drapes and gowns [4]. They also found that reusable drapes show considerable sustainability benefits over disposables. They cite disposable items resulting in 250% increase in water consumption, 200% to 300% increase in carbon footprint and energy use, as well as an astounding 750% increase in solid waste when compared to using reusable textiles [4]. The 2008 National Institute for Health and Care Excellence (NICE) guideline for prevention and treatment of surgical site infection states that there is no evidence to suggest a difference in surgical site infection incidence between reusable textiles and disposables [2]. Similarly the Center for Disease Control (CDC) found that there was insufficient evidence to suggest that reusable drapes posed increased risk for surgical site infections [5]. The NICE and CDC conclusions are indicative of the lack of robust trials in recent years given the wide range of reusable textiles available and a shift from obsolete cotton and cotton-polyester blends toward newer lightweight synthetic materials [4].

The strengths of this study include the use of real time intraoperative sampling techniques, and also the use of microbiology swabs which were chosen to mimic the initial observation of contact between the repaired drape and the surgeon's gloved finger. The limitations include the small numbers in this pilot study, and also that the use of swabs may not be the most sensitive method of bacterial sampling.

In conclusion, this pilot study suggests that patch repair of reusable drapes does not result in increased rates of intraoperative bacterial recolonization, which is reassuring both to the surgeon and the institution where these repairs are used.

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