The Liquid and Viral Barrier Properties of Reusable and Disposable Surgical Gowns

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수술가운의 방수성과 방균성에 관한 연구

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국문 초록

최근에 처럼적인 바이러스, 특히 에이즈를 이르는 Human Immunodeficiency Virus (HIV), 또는 간에 심각한 병을 이르는 Hepatitis B Virus (HBV)와 같은 무서운 바이러스가 환자의 피나 분비물을 통하여 의사에게 전염되는 사례가 늘어감에 따라 이제는 환자의 피나 분비물의 청지를 막기 위해 방수성과 방균성을 가진 수술복 착용이 절대적으로 필요하게 되었다. 따라서 본 연구의 목적은
1. 수술가운을 만드는 5가지 대표적인 직물의 방수성과 방균성을 측정하고 2. 세탁시 캐플렉의 사용유무가 그 직물의 방수성과 방균성에 미치는 영향을 알아보고 3. 반복세탁이 그직물의 방수성과 방균성에 미치는 영향을 알아 보는데 있다.

이 실험을 위해 3가지 제사용 수술가운(Gore-tex®, membrane reinforced; Compel™, fabric reinforced; Acep™, non-reinforced) 두 가지 일회용 가운(Evolution® gwon, fabric reinforced; Evolution® Specialty, film reinforced)이 사용되었다. 캐플렉을 사용한 세탁이 직물의 방수성과 방균성에 미치는 영향을 알아보기 위해 제사용 가운을 세탁, 건조, 살균을 하였다. 세탁과 살균의 반도수는 1, 20, 40, 50, 60, 70, 80번 이었다.


실험 결과는 다음과 같다. 1. Gore-Tex® 가온과 Evolution® Specialty 가온은 방수성과 방균성의 성질을 가졌다. 그러나 캐플렉을 사용하여 70번 세탁한 Gore-Tex® 가온은 membrane의 구조가 파괴되어 방균성을 상실했다. 2. Evolution® 가온, Acep™ 가온과 Compel™ 가온은 오직 Impact Penetration test만 통과했다. 즉 이 직물들은 큰 압력의 가왔기 없는 splash resistance만 가지고 있었다. 그러나 Acep™ 가온과 Compel™ 가온은 20번과 60번 세탁 후 각각 그들의 splash resistance가져도 성실했었다.

*박사학위논문의 일부입니다.
I. INTRODUCTION

Surgical gowns have been worn since the late 1800's to protect patients from contamination from the surgical staff and objects in the operating room. Before then, there was little attention given to the role of surgical gowns as protective barrier clothing. In 1883, Neuber used clean linens for the first time during surgery to separate the aseptic areas from contaminated areas\(^1\). Since then, surgical gowns were used to protect patients form surgical staff and objects during operation. However, recently, as we recognized that a patient's blood can penetrate gown materials and directly contaminate the surgeon's skin, it is needed to protect surgical team from patients' infectious blood and other body fluids. Specifically, dangerous viruses including Hepatitis B Virus (HBV) which causes serious liver diseases and Human Immunodeficiency Virus (HIV), which causes Acquired Immunodeficiency Syndrome (AIDS), may be transmitted via the patient's blood. Only a small amount of contaminated "strike through" blood is needed to infect surgeons\(^5\). As a result, surgical gowns should provide resistance to the transfer of blood and other body fluids from the patients to the surgical team.

The Center for Disease Control (CDC) has issued guidelines for prevention of surgical infection, specifically that surgical gowns must resist the passage of aqueous liquids\(^6\). In addition, according to CDC recommendations\(^4\), we should consider that all human blood and other potentially infectious materials are treated as if known to be infectious for HIV and HBV (Universal Precautions). The Association of Operating Room Nurses (AORN) has recommended that surgical gowns should be made of material that is resistant to blood and other liquids which cause contamination and should establish a barrier to minimize the passage of microorganisms between nonsterile and sterile areas\(^9\). In December, 1991, the Occupational Safety and Health Administration (OSHA) promulgated final rules to eliminate or minimize occupational exposure to HBV, HIV, and other blood borne pathogens. The rules recommended that personal protective clothing/equipment must be provided at no cost to employees who may be exposed to blood or other body fluids in the workplace. Personal protective equipment such as gowns, gloves, and face masks will be considered appropriate only if they do not permit blood or other potentially infectious materials to pass through to or reach the healthcare workers' clothes, skin, eyes, or mouth under normal conditions of use and for the duration of time which the protective equipment will be used. The type and characteristics of gowns will depend upon the task and degree of exposure anticipated\(^6\).

It has been known that wet bacterial penetration occurs as a result of liquid strike-through. Therefore, if the liquid passes through the fabric, the suspended microorganisms in the liquid will follow. Therefore, there is a direct relationship between wetting by liquids and bacterial penetration of surgical gown fabrics. Thus, the rate of penetration of a barrier material by microorganism is directly related to the rate of liquid strike-through. Moreover, past research on surgical gowns has indicated that if the liquid will penetrate one layer, it will go through additional layers of the same fabric\(^7\).

For the purpose of barrier testing, we should test under conditions which are as close as possible to actual use conditions. Therefore, we have to consider many situations that might happen in the operating room and develop the most appropriate test methods. In the operating room, people encounter various liquids that vary depending on their viscosity, surface tension, volume, etc. Since surgeons and nurses are performing all kinds of movements-stretching, rubbing, pressing, etc.-liquid penetration through the fabrics can be accelerated. In addition, there is an interaction between liquids and the surgi-