

RESEARCH ARTICLE

Sterility of Gauze Packed in One and Three Layer Layer Parchment Paper

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ABSTRAK

Pendahuluan: Kasa steril merupakan salah satu contoh alat medis habis pakai yang sering digunakan di fasilitas kesehatan. Sterilitas kasa dapat dipengaruhi oleh beberapa hal, salah satunya adalah teknik pengemasan. **Tujuan:** Untuk menguji sterilitas kasa yang dikemas dengan kertas perkamen satu lapis dan tiga lapis terhadap pertumbuhan mikroorganisme.

Metode: Penelitian ini merupakan penelitian eksperimental dengan rancangan *quasi experimental*. Sampel penelitian adalah 60 kasa yang dikemas dengan kertas perkamen satu lapis dan 60 kasa yang dikemas dengan kertas perkamen tiga lapis yang disimpan di IGD RSND. Sterilitas kasa diuji menggunakan kultur pada minggu ke-0, 2, dan 4. Perbedaan antarkelompok dianalisis menggunakan uji *Chi-square* dengan interval kepercayaan 95%.

Hasil: Tidak terdapat perbedaan yang bermakna pada sterilitas kasa yang dikemas dengan kertas perkamen 1 lapis terhadap pertumbuhan mikroorganisme selama 4 minggu ($p=0,126$). Tidak terdapat perbedaan yang bermakna pada sterilitas kasa yang dikemas dengan kertas perkamen 3 lapis terhadap pertumbuhan mikroorganisme selama 4 minggu ($p=0,675$). Terdapat perbedaan yang bermakna pada sterilitas kasa yang dikemas dengan kertas perkamen 1 lapis dan 3 lapis terhadap pertumbuhan mikroorganisme ($p=0,002$).

Kesimpulan: Terdapat perbedaan yang bermakna pada sterilitas kasa yang dikemas dengan kertas perkamen 1 lapis dan 3 lapis terhadap pertumbuhan mikroorganisme. Kasa yang dikemas dengan kertas perkamen satu lapis lebih steril dibandingkan dengan tiga lapis.

Kata kunci : uji sterilitas, kasa steril, kertas perkamen

ABSTRACT

Introduction: Sterile gauze is one of disposable medical tools commonly used in healthcare facilities. The sterility of gauze can be affected by several factors including packaging technique. **Objective:** to determine the sterility of gauze packed in one layer and three layer of parchment paper.

Methods: a quasi-experimental design. The sample were 60 gauzes packed in one layer parchment paper and 60 gauze packed in three layers of parchment paper stored in the ER RSND. The sterility of gauze tested were assessed at week 0, 2, and 4. The differences between groups were analyzed using *Chi-square* test at 95% confidence intervals.

Results: There was no significant difference in sterility among gauzes packed in one layer of parchment paper between week 0, 1,4 ($p = 0.126$). There was no significant difference in sterility among gauzes packed in 3 layers of parchment paper between week 0, 1,4 weeks ($p = 0.675$). There was a significant difference in sterility between gauze packed in 1 and 3 parchment paper ($p = 0.002$).

Conclusions: There was a significant difference in sterility of gauze packed in 1 parchment paper 1 layer and 3 layers based on growth of microorganisms. The gauze packed in one layer of parchment paper is more sterile than that of in three layers.

Keywords: sterility, sterile gauze, parchment paper

INTRODUCTION

Hospital is one of a health care institutions obliged to prevent the risk of infection among the hospital personnel and patients. One of success indicators in the health service is a lower infection rates in hospitals (WHO, 2002). Infection control in hospitals can be done in different ways including isolation of infected patients, maintaining environmental hygiene, disinfection and sterilization (WHO, 2002; Rutala *et al.*, 2008). Sterilization centers are essential for infection control and play a role in efforts to decrease the incidence of infection in hospitals (MOH, 2009).

The term of sterilization is related to the process of

eliminating all forms of microbial organisms including spores conducted in health care facilities with physical or chemical methods (Rutala *et al.*, 2008; Elliot *et al.*, 2009). The sterilization process is influenced by several factors. These factors include the nature of the targeted object to sterilize, the level of microbial resistance, sterilization method, and the access of the sterilizing agent for the items to process (Miller, 2015).

Sterile gauze is one examples of non electromedical sterile medical devices preventing wound from contamination (such as dirt or germs) and infection (MOH, 2014). In addition, sterile gauze can be used to cover the side of the catheter, cover

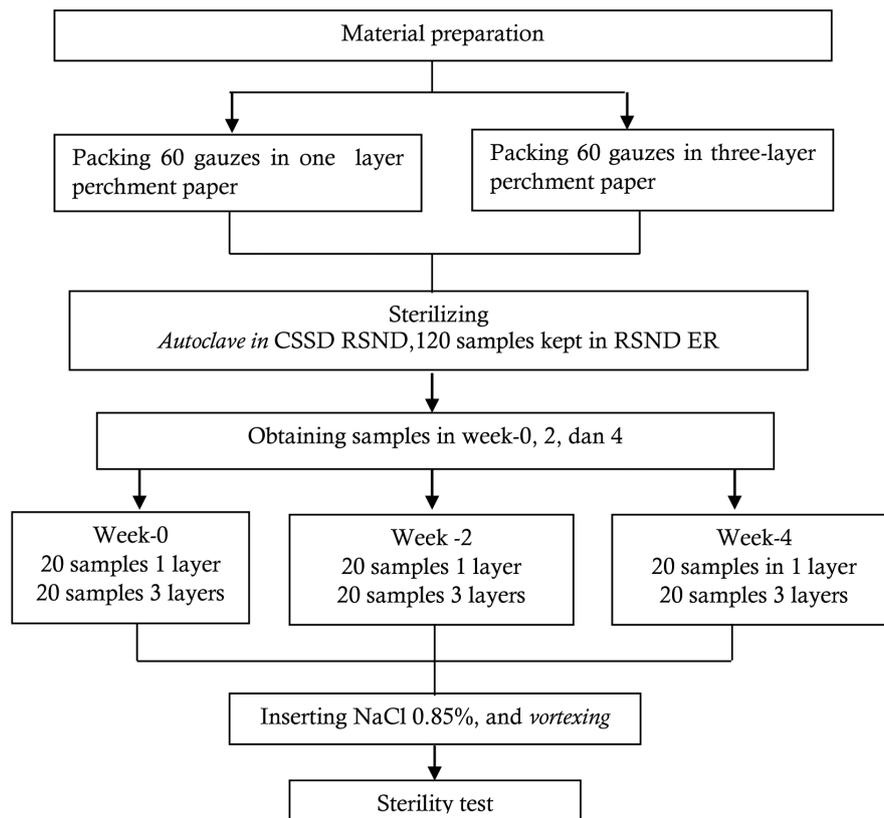


Figure 1. Flow Research

the incision area before surgery, and wipe the blood and mucus from the nose and mouth of the newborn babies (Meah *et al.*, 2016; Gates and Fink, 2008; Yoost and Crawford, 2016; Tsyhykalo, 2011; Thygeron *et al.*, 2012).

The sterility of gauze can be affected by several factors such as the method of sterilization, packaging sizes, packaging method, the level of resistance to chemicals and packaging materials (Berger and Dodrill, 2001; Price and Frey, 2004). *Rumah Sakit Nasional Diponegoro Semarang* (RSND) or Diponegoro National Hospital is the new hospitals which strive to improve its quality of health services. The central sterilization as an important part of the hospital is developing the most effective and efficient packaging method using parchment paper. Thus, a study on the sterility of gauze packed with parchment paper (one layer and three-layer) is needed.

METHODS

This was an experimental study with a quasi-experimental design using primary data of the growth of bacterial colonies on the gauze packed in one layer of the three layer of parchment paper RSND between May and June 2016. The exclusion criteria of this study was broken, wet, torn, and open parchment. The procedures

performed in this study was a tool preparation, packaging of sterile gauze with parchment paper, tool sterilization, preparation of medium Nutrient Agar, sterility testing, and analysis of the sterility test (Figure 1).

Parchment Paper

Parchment paper Steri-Green C Paperwrap 3M (cat no. 075) cut in the size of 5x5 cm².

Mechanical Packaging

Gauze has been cut to the size of 1x1 cm² wrapped in one layer and three layer parchment paper. Packaging method using the envelope fold. Folding techniques like making envelopes. Indicators internal sterility 3M *Comply*™ is placed on top of the screen to ensure the sterility of gauze. Gauze that had been packed with parchment paper were wrapped in an air tight plastic container laid out according to the time interval decision (Figure. 2).

Gauze Sterilization

Gauze packed in parchment paper was sterilized using steam (autoclaving) in CSSD RSND (GETINGE 400/500HC series steam sterilizer with pacs 3500 controls).

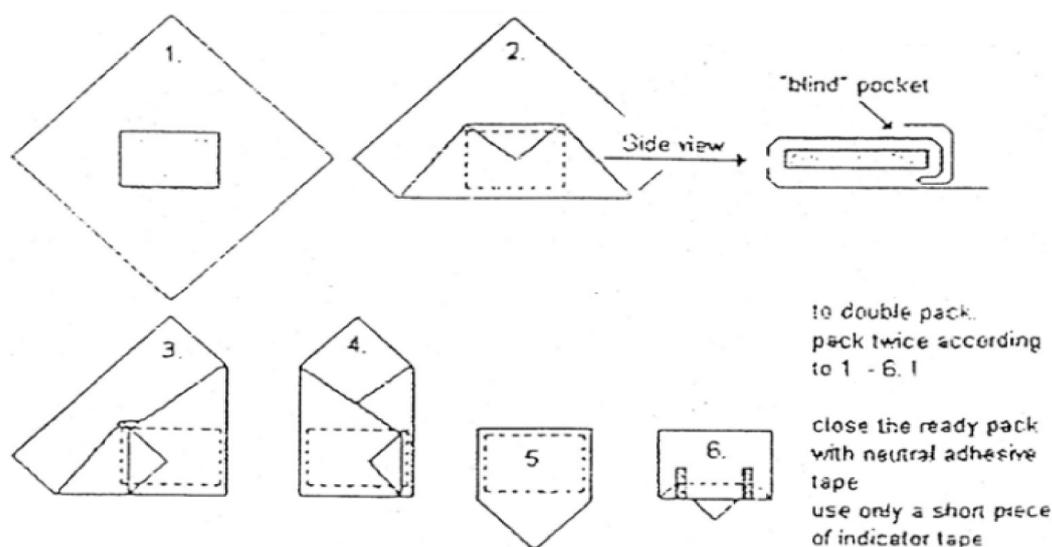


Figure 2. Mechanical folding From Surgical Technology for the Surgical Technologist: AP ositive Care Approach (Price 2014, p.157)

Table 1. Differences in microbial growth in the gauze samples

Gauze Packaging	Microbial growth		p
	Grow	not grow	
1 layer	2 (3.3%)	58 (96.7%)	0.002
3 layers	13 (21.7%)	47 (78.3%)	

Table 2. Storage duration and microbial growth

Storage duration Sterile gauze	growth of Microorganisms		p
	Grow	not grow	
Week 0	5 (12.5%)	15 (87.5%)	1,000
Week 2	5 (12.5%)	15 (87.5%)	
Week 4	5 (12.5%)	15 (87.5%)	

The Preparation of Media Nutrient Agar (NA)

Composition (g/L): *Peptone from meat* (5), *Meat extract* (3), *Agar* (12).

Method: 14 grams Nutrient agar (HIMEDIA (M001)) were dissolved in distilled water to 500 ml, then heated above the boiling water bath until clear using a hot plate, sterilization by autoclaving in the microbiology laboratory at a temperature of 121°C for 15 minutes.

Sterility Test

At the pre determined time, packed and stored gauze was re-opened at week 0, 2, 4 each as many as 40 samples, 20 samples consisting of one layer and 20 samples of three layers. The discoloration was observed in internal indicators. The gauze was taken with sterile tweezers and inserted into a tube of sterile saline 0.85% and then in the vortex. 20 uL solution of vortex was taken using a micropipette and dropped on media NA and spread with glass spreader. Media NA was placed in an incubator at a temperature of 35°C for 18 hours later and was observed for changes to the medium NA (is there a growth of germs). The observation results were recorded in the research log book.

Data Analysis

Microbial growth on the NA media of gauze packed with 1 layer parchment paper 1 and 3 layer during the sampling period at week 0, week 2 and week 4 were analyzed using Chi-square test with a 95% confidence interval.

RESULTS

Comparison of sterility between the sterile gauzes Table 1 shows that there was difference in sterility between gauze packed in one and three-layer parchment based on the bacterial growth. The analysis showed $p = 0.00$ ($p < 0.05$), meaning that there was a significant difference between the sterility between gauze packed in one and three-layer parchment based on the bacterial growth.

Storage Duration and Microbial Growth

Once saved during week 0, week 2 and week 4, obtained microorganism growth respectively of 5 samples so that there are no differences in sterility significance ($p = 1.000$) between the amount of time

sterile gauze packed with parchment paper 1 layer and 3 layer on the growth of microorganisms (Table 2).

Comparison of microbial growth between different duration of storage and packaging methods

Based on Table 3, obtained the growth of microorganisms on the packaging 3 layers as many as five samples each at week 0 and week 4, in week 2 as many as 3 samples, while the packaging 1 layer found 2 samples only at week 2. The analysis showed the value of $p = 0.000$ ($p < 0.05$), meant there were significant differences between the sterility of the packing gauze with parchment paper 1 layer and 3 layer against the growth of microorganisms.

Table 3. Duration of Storage and Growth Microorganisms

variable	growth of Microorganisms		p
	Grow	Not Grow	
Week 0			
Packaging 1 layer	0 (0.0%)	20 (100%)	0,000
Packaging 3 layers	5 (25%)	15 (75%)	
Week 2			
Packaging 1 layer	2 (10%)	18 (90%)	0,000
Packaging 3 layers	3 (15%)	17 (85%)	
Week 4			
Packaging 1 layer	0 (0.0%)	20 (100%)	0,000
Packaging 3 layers	5 (25%)	15 (75%)	

Table 4. Microbial Growth of Sterile Gauze 1 And 3 Layer Parchment Paper and Storage Duration

Long Storage	1 layer		p *	3 layers		p *
	Grow	not grow		Grow	not Grow	
Week 0	0 (0.0%)	20 (100%)	0.126	5 (25%)	15 (75%)	.675
Week 2	2 (10%)	18 (90%)		3 (15%)	17 (85%)	
Week 4	0 (0.0%)	20 (100%)		5 (25%)	15 (75%)	

Table 4 shows there was no significant difference in the microbial growth between gauze between one and three layer parchment paper at weeks 0, 2, 4. The analysis showed the value of $p = 0.126$. The result

showed 3 layer of packaging analysis indicates the value $p = 0,675$, meaning that there was no significant difference in microbial growth between the packaging 3 layers of gauze to the amount of time (weeks 0, 2, and 4).

DISCUSSION

This study showed that there was no significant difference in sterility ($p = 1.000$) between the storage duration of sterile gauze for 0, 2, and 4 weeks with parchment paper 1 layer and 3 layer. This is consistent with previous research by Maulinda Yosinaga, gauze packed with parchment paper remain sterile for 3 days (Yosinaga, 2009). Other studies have showed that a sterile gauze with parchment paper packaging remains sterile until day 14 (Sihotang, 2009). Gauze packed in parchment paper remain sterile after being stored due parchment paper at the time of manufacture processed in acid. Acid modified cellulose to make paper smoother and resistant to water and oil (Marsh and Bugushu, 2007).

Our data showed a significant difference in sterility between gauze packed with parchment paper 1 layer and 3 layers based on growth of microorganisms. The difference is possibly due to the density of sterility gauze packing three layers that are too dense to make access to hot water from the steam sterilization process can not penetrate the netting so that the sterilization process was not optimal and causes the growth of bacteria on nutrient agar media (Miller, 2015). It is evident from the lack of intensity (not black) internal sterilization indicator placed on the packaging of gauze that contained the growth of microorganisms. At the time of the study, external indicators, indicators of mechanical and biological indicators in the CSSD in RSND showed good results.

In this study, the possibility of contamination was because it was conducted by one researcher, by the same method, the same time, as well as performed in laminary flow to reduce the risk of exposure. Limitations of this study is the absence of randomization and the limited time. Studies with a longer storage duration to compare the packaging using parchment paper and plastic pouche are needed.

CONCLUSION

In conclusion, this study shows a significant difference in sterility between gauze packed in one and three parchment papers. The gauze packed in one layer of parchment paper is more sterile than that of in three layers of parchment paper.

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