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Microorganisms (*Staphylococcus* and Fungi) in Radiotherapy Patient Masks before and after Cleaning with Disinfectant Liquid

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Abstract. Background: Radiotherapy masks patients are a fixation tool in radiotherapy radiation services. The function of the radiotherapy mask is to fix the irradiation area in the patient's body part for serial radiation therapy, for approximately 1 month. A printed radiotherapy mask is used by the patient from the first session until the final session of radiation is complete. The inner surface of the mask is always in contact with the patient's skin. Practically, the masks are never been cleaned so it is possible to develop infectious Fungi or microorganisms. The research objective was to determine the difference in the number of microorganisms (*Staphylococcus* and *Fungi*) before and after cleaning using a 70% alcohol disinfectant
Methodology: This is experimental research. The number of microorganisms (*Staphylococcus* and *Fungi*) in 16 radiotherapy masks were identified with the Swap method before and after cleaning using 70% alcohol disinfectant. Data were analyzed using the Wilcoxon test to determine the differences in the number of microorganisms before and after cleaning and to identify the reduction percentages.
Result: the number of *Fungi* and *Staphylococcus* before cleaning were 9,528 and 0.490, while after cleaning were 8228 and 0,194, respectively The amount of percentage reductions before and after cleaning were 43.275% (*Staphylococcus*) and 38.529% (*Fungi*). Based on the Wilcoxon test on *Staphylococcus* , meaning that. There was a difference in *Staphylococcus* (ρ value= 0.003) on the radiotherapy patient's mask before and after cleaning using 70% alcohol. There was no difference in *Fungi* (ρ value= 0.220) before and after being cleaned using 70% alcohol. The research results are very important as material for the revision of standard operational procedures for radiotherapy services.

Keywords: Microorganisms (*Staphylococcus* and Fungi); Radiotherapy Patient Masks; Disinfectants

INTRODUCTION

The equipment for making radiographs consists of an imaging plate, grid, fixation devices, protective devices, and markers. In radiotherapy services, one of the stages of service is the manufacture of a fixation device, namely a radiotherapy mask. Radiotherapy masks are a fixation tool in radiotherapy radiation services whose function is a radiotherapy mask made before radiotherapy is performed. The form of a radiotherapy mask with small holes. The function of the radiotherapy mask to fix the irradiation area is always fixed every time radiotherapy is carried out so that the radiation is carried out accurately. Various kinds of radiotherapy masks for the head, neck, arms, and legs while for the breast is rare. After the mask is made, the radiographer makes a mark in accordance with the illumination point so that the position of the object being lighted will remain the same every time it is illuminated.

According to the regulation (Kepmenkes RI No. 375/ Menkes/ SK/ III/ 2007), regarding the professional standards of radiographers stated that one of the duties of a radiographer in the field of radiology services is the management of facilities and infrastructure for radiology and radiotherapy equipment. In particular, maintaining radiological facilities, infrastructure, and equipment within the limits of its jurisdiction will greatly determine the quality of the results of the services provided. This maintenance includes cleanliness and maintenance as an effort and action of Quality Assurance (QA) radiology. Radiotherapy masks after printing will be used by the patient until the radiation is complete. Usually in a period of approximately 1 month. The mask is used with the inner surface always in contact with the patient's skin. Meanwhile, if it has been irradiated several times, the patient usually experiences irritation and sometimes even cuts. In connection with this, so far the mask has never been cleaned so it is possible to develop Fungi or microorganisms which when attached to the skin of an irritated patient will cause infection in the wound.

This can be proven by previous research from Meddison (2010), markers can be a source of bacteria. Another study states that on the

cassette there are microorganisms and *Fungi* (Laili, 2013). In addition, research conducted by Dartini (2017) states that there is a decrease in the content of microorganisms and *Fungi* on the X-ray cassette after cleaning with 70% alcohol. Dartini (2014), stated that the decrease in the bacterial content on the cassette using chlorine had the highest reduction in chlorine 65.67%, alcohol 63.67%, Lysol 60.33%, and the lowest was anti-bacterial soap 54.33%. In connection with this, radiotherapy patients who have undergone irradiation several times the skin will experience irritation, while chlorine is also more sensitive to irritating the skin, especially injured skin so it will be safer to use alcohol. Based on the above background, the researchers are interested in studying the microorganism content contained in masks before and after cleaning with an alcohol disinfectant solution. This study can provide an overview of the number of microorganisms present in radiotherapy masks before and after cleaning with 70% alcohol in the practice area for students so that they can gain experience that can be applied when they work and provide input to radiographers in the hospital. where they work on efforts for patient safety in order to make improvements and improve the quality of service.

METHODS

This is experimental research with pre and post-treatment approaches. The population of this study were all facial radiotherapy masks in patients at Ken Saras Hospital. The sample consisted of 6 facial radiotherapy masks, 6 breast masks, and 1 clean radiotherapy mask as controls. The number of *Staphylococcus* and *Fungi* were identified with the Swap method before and after cleaning using 70% alcohol disinfectant. The sampling condition (time and environment) was controlled. Data were analyzed Wilcoxon test at the level of significance ρ = 5% to determine the differences in the number of microorganisms before and after cleaning and to identify the reduction percentages.

RESULTS AND DISCUSSION

1. The Number of Microorganisms

Table 1. The Number of Microorganisms in Radiotherapy Patient Masks Before and After Cleaning with Alcohol 70%

No	Bacteria	Condition	Mean	Median	Max	Min	SD
1	*Fungi*	Before	9.528	5.600	92.0	.0	207.433
		After	4.228	3.050	13.3	.0	41.205
2	*Staphylococcus*	Before	.490	.145	2.1	.0	.6077
		After	.194	.050	1.1	.0	.3421

Table 2. Reduction of Microorganisms in Radiotherapy Patient Masks Before and After Cleaning with Alcohol 70%

No	Microorganisme	Before	After	Reduction (%)
1	*Fungi*	9.528	4.228	38.529
2	*Staphylococcus*	0.49	0.194	43.275

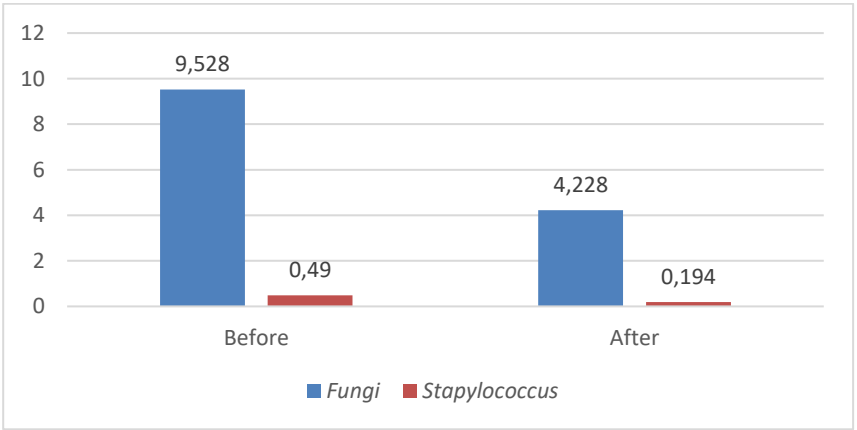

Figure 1. The Number of Microorganisms in Radiotherapy Patient Masks Before and After Cleaning with Alcohol 70%

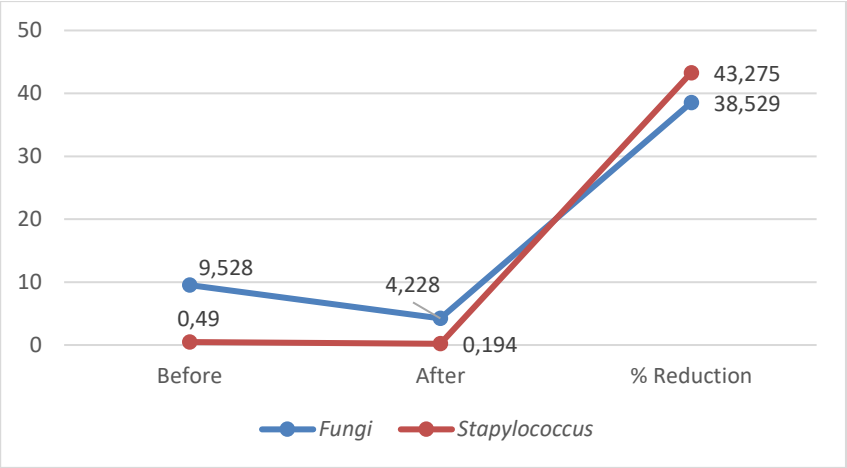

Figure 2. Reduction of Microorganisms in Radiotherapy Patient Masks Before and After Cleaning with Alcohol 70%

The results of microorganisms in radiotherapy patient masks before and after cleaning were then tested using Wilcoxon to determine differences in the content of microorganisms in radiotherapy patient masks before and after cleaning with a confidence level of 5% with the following results:

Table 3. Wilcoxon test results to determine differences in the content of microorganisms in radiotherapy patient masks before and after cleaning using 70% alcohol

	Value (post < pre) f	Value (post = pre) f	Value (post > pre) f	Z	p value
Fungi	11	3	4	-1.226	0.22
S. Aureus	11	0	7	-2.94	0.003

Based on the results of the study showed that the number of microorganisms in radiotherapy patient masks on Fungi it was known that the mean of mold/mold before cleaning was 9.528 while after cleaning the value 8,228 and for *Staphylococcus* it is known that the mean of *Staphylococcus* before cleaning is 0.490 while after cleaning the value is 0.194. Descriptively there was a decrease in *Fungi*, and *Staphylococcus* on the radiotherapy patient's mask after was cleaned with 70% alcohol. In addition, the decrease in microorganisms in radiotherapy patient masks decreased before and after cleaning alcohol. The highest order of reduction of the 2 types of microorganisms was *Staphylococcus* 43.275% and the smallest decrease was in Fungi 38.529%.

According to the regulation (Kepmenkes RI No. 375/Menkes/SK/III/2007) regarding the professional standards of radiographers stated that one of the duties of a radiographer in the field of radiology services, including in radiotherapy, is the management of facilities and infrastructure for radiology and radiotherapy equipment. In particular, maintaining radiological facilities, infrastructure, and equipment within the limits of its jurisdiction will greatly determine the quality of the results of the services provided. One of the maintenance in radiotherapy is the maintenance of radiotherapy patient masks, which includes cleanliness and maintenance as an effort and radiological Quality Assurance (QA) action.

Based on the above, it is proven that by cleaning radiotherapy patient's mask using 70% alcohol it can reduce the content of microorganisms contained in the radiotherapy patient's mask, in the order of the percentage decrease in staphylococus, then Fungi, so it is better if when cleaning the mask, radiotherapy patients must use disinfectants so that the radiotherapy mask not as a medium for nosocomial infection between patients or cause additional effects for patients who have the mask because the infected data is caused by the microorganisms contained in the mask. Meanwhile, Darmadi, 2008 stated that alcohol disinfectants can reduce the number of microorganisms on the surface of the imaging plate, namely by working to denature proteins by dehydrating and dissolving fat so that cell

membranes are damaged and enzymes are activated by alcohol.

According to Darmadi, 2008, to control nosocomial infections, namely by sterilizing the tools used. The disinfectant used to clean masks in radiotherapy patients, soap has a function to remove or reduce microorganisms on the surface of the cassette so that it will reduce the possibility of nosocomial infections between patients and patients and also between patients and radiology workers. The difference in the number of microorganisms in the mask of radiotherapy patients before and after cleaning them with 70% alcohol. Based on the results of different test studies using the Wilcoxon test to determine differences in the content of microorganisms in the radiotherapy patient masks before and after cleaning with a confidence level of 5%, it can be shown as follows:

a) There is no difference in the number of Fungi in the masks of radiotherapy patients before and after cleaning using 70% alcohol with p 0.220> 0.05 Ha rejected Ho is accepted, meaning that there is a difference in the value of Fungi in radiotherapy patient masks before and after cleaning using alcohol 70%.
b) There is a difference in the number of *Staphylococcus* in radiotherapy patient masks before and after cleaning using 70% alcohol with p 0.0001 <0.03 Ha accepted Ho is rejected, meaning that there is a difference in the value of *Staphylococcus* on radiotherapy patient masks before and after cleaning using 70% alcohol

Based on the above results, it is proven that by cleaning radiotherapy patient masks using 70% alcohol there is a difference in the content of microorganisms before and after cleaning with 70% alcohol. The content of microorganisms in radiotherapy patient masks reduce the number of microorganisms contained in radiotherapy patient masks before and after cleaning using alcohol in the order of the percentage decrease in *Staphylococcus*, then Fungi, so it is better if when cleaning the mask radiotherapy patients must use a disinfectant so that radiotherapy masks are not used as a medium. Nosocomial infections between patients or cause additional effects for patients who have the mask because the data on the infection is caused by the microorganisms contained in the mask.

According to Darmadi, 2008, alcohol disinfectants can reduce the number of microorganisms on the surface of the radiotherapy patient masks by working to denature proteins by dehydrating and dissolving fat so that cell membranes are damaged and enzymes are activated by alcohol. In addition, according to Darmadi, 2008 also, for control of nosocomial infection, namely by means of sterilizing the equipment used. The disinfectant used to clean radiotherapy masks, alcohol has a function to remove or reduce microorganisms on the surface of the cassette so that it will reduce the possibility of nosocomial infections between patients and patients and also between patients and radiology workers.

Based on the foregoing, it is better if the radiotherapy patient's mask is cleaned using a disinfectant every morning before using the patient. And storage methods in special places should not be stacked and the storage area is also cleaned with disinfectants, thereby reducing the possibility of nosocomial infections between patients and patients and also between patients and workers in radiology.

In this study, it still has research weaknesses, namely:

1. Radiotherapy patient masks are in the shape of holes and for disinfection by spraying so that disinfectants cannot be ascertained on the entire surface of the mask, especially between the walls of the radiotherapy mask holes.
2. Some of the mask storage are lined up in a certain place, but there are also those that are piled up where the storage is not cleaned.

CONCLUSION

The results showed that the number of microorganisms in the mask of radiotherapy patients showed that the mean Fungi and *Staphylococcus* before cleaning were 9,528, 0.490, while after cleaning the value was 8228,0,194. The percentage decrease in the number of microorganisms on the mask radiotherapy patients before and after cleaning alcohol. The highest order of reduction of the 2 types of microorganisms was *Staphylococcus* 43.275% and the smallest decrease was Fungi 38.529%. Based on the Wilcoxon test on ALT and *Staphylococcus* , it was found that 0.0003 <0.05 Ha were accepted. Ho was rejected, meaning that there was a difference in the *Staphylococcus* values on the radiotherapy patient's mask before and after cleaning using 70% alcohol. Whereas for Fungi p: 0.220> 0.05 Ha is rejected, meaning that there is no difference in the amount of Fungi before and after cleaning

using 70% alcohol. It is better if radiotherapy patient masks are prepared every day before using the patient. storage is arranged in rows, not in piles. We recommend that you clean the disinfectant as well.

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