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Analysis of Contamination Characteristics in The Hand Function Evaluation Process

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Abstract

This study is to investigate characteristics of infection during hand function evaluation process by the difference in disinfection methods between hands and evaluation tools in order to find out how to manage effective disinfection of hand agility evaluation tools used in the occupational therapy service. The subjects of study were adults over 19 years of age, and methods was three groups by selecting the O'conner's dexterity test and the Grooved peg board test, which are hand agility evaluation tools. In the first group (n=3), the subject's hands were sterilized with an alcohol swab and the evaluation tools were not sterilized, and an agility test was performed according to the existing method, and the degree of contamination of the hands was measured. In the second group (n=3), the evaluation tool was sterilized with an alcohol swab, and agility was evaluated without disinfecting the hands of the subject, and the degree of contamination was measured. In the third group (n=3), the subject's hands and evaluation tools were sterilized with an alcohol swab, and the hand agility test was conducted and the degree of contamination was conducted. There was significant difference in frequency and size of contamination between 3 groups ($p<0.05$). In addition, contaminationbetween two group showed significant differences in thumb and index finger($p<0.05$).In this study, disinfection and management of both hands and evaluation tools that are the main cause of contamination is the most effective for contamination control, and removing the source of infection by determining the disinfection method according to the contents of the hand function evaluation reduces the risk of infection

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and personal hygiene.

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Introduction

A prime role in the development of civilization and industry in human history is the use of hands. As one of the important functions of the hand, it manipulates objects and plays an essential role in social interaction functions as a means of expression(Meyer., 2003; Schoneveld K *et al.*,2009). And the hand is described as a part of the body that is very sensitive to cross infection, which is transmitted to other patients after contact with a contaminated object.The primary hygiene management to prevent infection through contaminated objects can prevent endogenous or exogenous infection and crossinfection of potential pathogens by 70% by regularly washing the subject's hands(Choe J G*et al.*,2005). However, the staff in charge of the examination at the hospital not only wash the hands of the subject, but also prevent the contamination of medical environment such as endogenous or exogenous infections and potential pathogens in advance, and improve the factors of cross infection that may occur during the examination process through regular disinfection. Recently, various therapy and rehabilitation training have been proposed to improve upper limb and hand function due to damage of central nerve system and musculoskeletal system. In addition, in order to objectively prove the effectiveness of various treatments, various hand function evaluations are regularly used in patients. Specifically, the evaluation tools used in the occupational therapy service to evaluate the recovery of hand function such as hand function test of JebsenTaylor, test of Wolf motor function, box and block dexterity test, 9 hole pegboard test, O'connor finger dexterity test, Grooved pegboard test, and Purdue pegboard test, etc(Mcphee S D., 1987; Bryden P J *et al.*,2005).Evaluation tools are being used, which are very important evaluation tools for evaluating the improvement of hand function through treatment due to the task performance, coordination and agility of the hand. However, various evaluation tools performed in

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occupational therapy rooms can give patients who perform them the possibility of exposure to exogenous infections and potential pathogens, and problems of cross infection at all times during the evaluation process. Therefore, in order to resolve cross infection between patients in the process of evaluating hand function in the occupational therapy room, occupational therapists need a scientific and systematic evaluation tool for disinfection and quarantine methods. In addition, due to changes in the infection control system, medical institutions are demanding more continuous and systematic contents of the subject's hand washing and management of infectious agents in the clinical evaluation process. Therefore, this study aims to identify effective infection prevention and management methods based on the evaluation tool used in the process of hand function evaluation of occupational therapists. Therefore, in this study, among the areas of occupational therapy evaluation, an evaluation tool that is widely used for hand agility evaluation was selected, and the difference and characteristics of contamination generated in the hand function evaluation were identified through the difference in disinfection methods of the hands of the subjects to be evaluated. It seeks to find effective countermeasures for the sanitation activities of the evaluation tool.

Materials and Methods

Subjects

This study was conducted with a total of 9 normal adults over 19 years of age. In addition, two hand agility evaluation tools, which are most often used in occupational therapy rooms, were selected and the characteristics and differences of contamination were checked through differences in disinfection methods for each group.

Methods

In this study, 9 subjects were classified into 3 groups of 3 subjects each.In the first group (n=3), the subject's hand was sterilized with an alcohol swab and the evaluation tool was not sterilized, and the agility test was performed according to the conventional method, and the degree of contamination of the hand was measured. In contrast to the first group, the second group (n=3) sterilized the evaluation tool with an alcohol swab and evaluated the agility without disinfecting the hand of the subject, and then measured the degree of contamination of the hand.In addition, in the 3rd group (n=3), all the evaluation tools and hands were sterilized with alcohol swabs, and the degree of contamination was conducted after inspection As shown in figure 1, two hand agility tests of this study, which are frequently used in occupational therapy rooms, were selected to investigate the characteristics and differences of contamination levels.First, the grooved peg board test was first developed as a neuropsychological test by Dr.Ronald at the Royal Ottawa hospital located in Canada Ontario Ottawa, but later developed as a tool used to screen agile movements of the hand. This test is used to evaluate the complex visual-motor coordination ability of patients with brain injury or to screen

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industrial workers' performance. A total of 26 key-shaped bins are arranged in irregular directions, and the agility of the hand is evaluated through the execution time(Bryden P J & Roy E A., 2005). In addition, the O'conner finger dexterity test evaluates the manipulation power of the subject's pins. It is a tool that evaluates the recovery of hand function and manipulation and coordination due to industrial accidents. Each pin is placed, and when all pins are filled in the hole, points are scored according to the set criteria(Berger M A M et al., 2009). In consideration of the pinch pattern, the area of the finger for measuring the contamination level was set as a contamination site for bacteria in the area of the two body parts from the fingertips of the subject's thumb, index and middle finger. In order to measure the degree of contamination, two hand agility evaluations were performed, and 1 mL of the contaminated area of the finger was smeared on Lysogeny broth (LB) agar, and then incubated at 48 hours in an incubator of 37°C. After cultivation, colony forming units (CFU) grown on LB agar were analyzed for each individual and group by measuring the number of contaminated sites on the cultured fingersin fig 1.

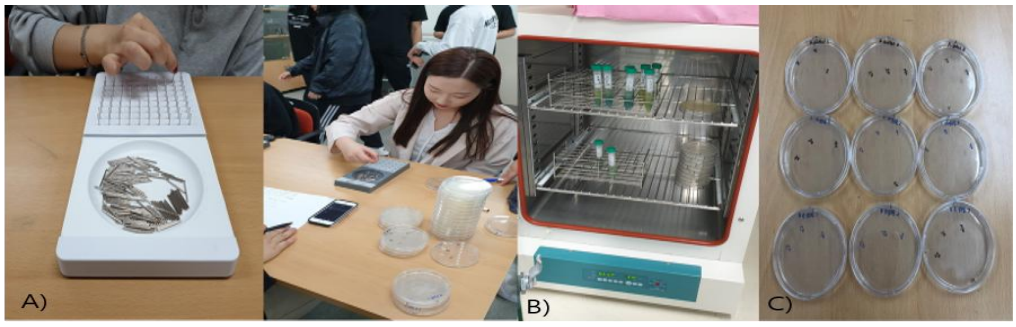

Figure 1: It's shows the two hand agility evaluation tools used in the experimental procedure (A), the finger measuring site was propagated using Lysogeny broth(LB) agar, and then incubated for 48 hours in an incubator of t 37°C (B). The number of colony forming unit (CFU) cultured was measured(C).

Statistical analysis

For the study analysis, data were analyzed using SPSS 22.0. This study used technical analysis of the number of contaminated bacteria by finger to analyze the contamination level of three groups, and oneway analysis of variance (oneway ANOVA) and postmortem analysis to investigate the characteristics and differences of contamination among 3 groups. Verification was carried out. Statistical significance was α=0.05.

Results and Discussion

Results

A Comparison of Change of contaminant degree finger dexterity test tool and thumb tip , index finger and middle finger used pinch among the groups

As shown in Table 1, The characteristics of pollution conducted in group 3 are as follows. First, in group 1, Case 1 is thumb tip 157, index finger 58, middle finger 72, case 2 is thumb tip 2, index

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finger 1, middle finger 16, case 3 is thumb tip 59, index finger 74, middle finger 57, and the average value of group 1 is thumb tip 72,67, index finger 44.33 , middle finger 48,33. In group 2, Case 4 was thumb tip 16, index finger 156, middle finger 22, case 5 was thumb tip 1, index finger 16, middle finger 4, case 6 was thumb tip 105, index finger 38, middle finger 87, and the mean value of 2 group was thumb tip 41, index finger 70.00 middle finger 37.67. Finally, in Group 3, Case 7 is thumb tip 3, index finger 6, middle finger 10, case 8 is thumb tip 4, index finger 2, middle finger 13, case 9 is thumb tip 3, index finger 172, middle finger 65, and the average value of group 3 is thumb tip 3.33 index finger 60.00 middle finger 29.33. And there was a statistically difference in degree of contamination among three groups ($p<0.05$)in Table 1, Fig2, 3.

Table 1. Comparison of contamination of thumb tip, index finger, and middle fingers after performing evaluation tools between the groups(N=9)

Variable		Thumb tip	Index finger	Middle finger	F	Turkey
HDG	case 1	157	58	72	5.460	0.014*
	case 2	2	1	16		
	case 3	59	74	57		
	M	72.67	44.33	48.33		
TDG	case 4	16	156	22		
	case 5	1	16	4		
	case 6	105	38	87		
	M	41.00	70.00	37.67		
HTDG	case 7	3	6	10		
	case 8	4	2	13		
	case 9	3	172	65		
	M	3.33	60.00	29.33		

*p<.05, M: mean, HGD: hand disinfection group, TDG: tool disinfection group, HTDG: hand and tool disinfection group

Comparison of differences in contamination of thumb tip, index finger and middle fingers among groups

In Table 2, Thumb finger and index finger showed a statistically significant difference among three groups($p<0.05$)., and the middle finger showed no a statistically significant difference($p>0.05$).

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Table 2. Comparison of differences in contamination of thumb tip, index finger and middle fingers among groups (N=9)

Variable	HDG	TDG	HTDG	F	Turkey
Thumb tip	72.67	44.33	48.33	3.077	0.02*
Index finger	41.002	70.00	37.67	15.594	0.03*
Middle finger	3.33	60.00	29.33	0.754	0.52

*p<.05, M: mean, HDG: hand disinfection group, TDG: tool disinfection group, HTDG: hand and tool disinfection group

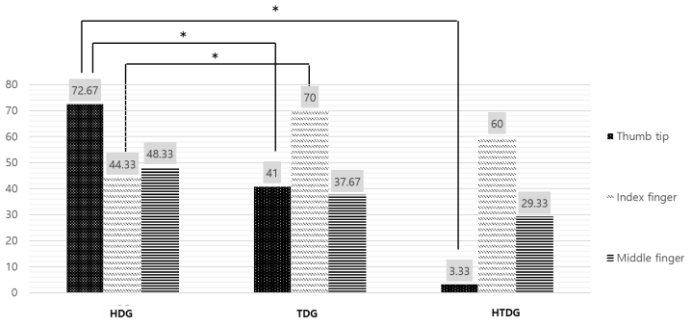

Figure 2 : Comparison of contamination of thumb tip, index finger and middle fingers after performing evaluation tools among groups

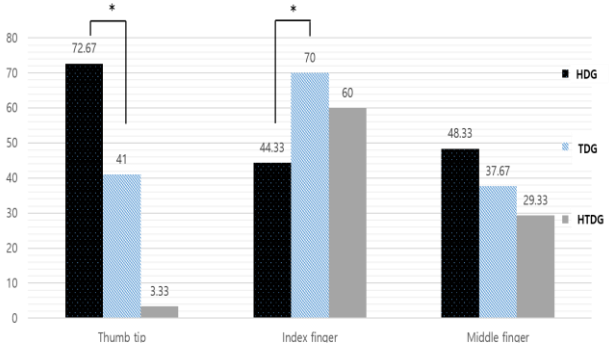

Figure 3: Comparison of differences in contamination of thumb tip, index finger and middle fingers among groups

Discussion

In this study, in order to prevent crossinfection of potential pathogens, the evaluation used in the process of hand function evaluation of occupational therapists is to find out which factors are effective not only in the method of washing the subject's hands, but also in the method of blocking contamination of the evaluation tool in advance. We want to check

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effective infection prevention and control methods based on tools.In the previous study, occupational therapists who performed the evaluation were highly aware of infection control in the clinical evaluation process, but the process of practicing hand-sewing was very small, raising the need for infection prevention education.Therefore, this study attempted to investigate the difference between the method of disinfecting the test tool and the method of disinfecting the hand(Won J H *et al.*,2019). In the results of this study, there was a difference between the group that performed both disinfection and disinfection of evaluation tools and the group that disinfected only hand disinfection and tools.Through this, it is judged that disinfection of hands that cause crossinfection as well as the medium of infection is the most effective method(Ryu S M., 2013; Eckstein B C*et al.*,2007). In addition, there was no difference in the size of infection between hand disinfection and tool disinfection, but there was a difference in infection between fingers performing the evaluation tool.In the group 1 who performed only sterilization, a large amount of contamination was found on the thumb, but in the group 2, where only the evaluation tool was sterilized, a lot of the size of contamination was found on the second finger.Based on these results, it is judged that it is effective to select a disinfection method according to the characteristics and factors of the evaluation of the subject's upper limb and hand function.This is thought to be the best way to effectively prevent crossinfection by changing the disinfection method based on the evaluation content or activities performed by the subject, rather than the conventional hand disinfectioncentered infection control method(Guerrero D., 2013). Therefore, in this study, it is considered that not only the subject's hand disinfection but also the characteristics of the subject's evaluation, and disinfecting and managing the evaluation tool accordingly, is considered to be effective in pollution control.Also, in disinfecting hands, regular disinfection and management of finger disinfection and evaluation tools according to the frequency of use is thought to be a way to reduce the risk of cross-infection through hands.

Conclusion

In this study, in order to find out the effective disinfection management of hand agility evaluation tool, the characteristics and differences of infection were investigated through the difference between hand disinfection and disinfection method of evaluation tool. As a result of the study, there was a significant difference in contamination level among groups ($p<0.05$), and there was a significant difference on contamination in thumb tip and index finger among groups ($p<0.05$). Based on the results, disinfection and management of both hands and assessment tools that are the main cause of contamination are the most effective for contamination control. It is important to prevent.

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