

Prevention of MRSA spread in the neurosurgical field

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Abstract Infection control was examined for 8 examples in which MRSA (Methicilin-Resistant Staphylococcus Aurous) from squint was detected in a neurosurgical ward. The stamp method was utilized for this MRSA infection research and analysis. Samples were gathered from a ward, patient environment and medical staff uniforms. After those samples were collected, they were cultivated and identified. In addition, a patient nutritional conditions were examined to evaluate the infection control. In order to identify the level of infection in patient environment, the PFGE genome typing was implemented for 41 MRSA stumps. The results were categorized into 5 genome types. The results suggested that a room environment and medical staff were infected by MRSA from patient squint. We were able to reconfirm that a daily infection measure and infection control need to be work out.

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Key Words : MRSA, PFGE, patients with cerebral vasacular disease, neurosurgical field

1. Introduction

MRSA can be stained on frocks, fingers, linens and in a room environment when patients are taken care of. It could easily cause respiratory infections in compromised host by contagion and aerial infection. In this kind of situation, patients might not be strong enough to have sufficient meals, which leads to a condition where their immunity level declines. In fact, patients with low level of immunity can easily be infected. In this case, it's difficult for them to recover once they are infected with MRSA. Also, long-term carriers would be carriers would be an infection cause for other patients.

To avoid MRSA diffusion, it is important to grasp all the time condition in separating MRSA all the time by examining the actual condition of infected frocks and a ward environment regularly.

MRSA examination was done for frocks, wards and their environment¹⁾²⁾. In those research, MRSA was separated from frocks, sheets, beds, and a floor. As a consequence, the possibility of MRSA infection among medical staff and patients in that ward was suggested from the MRSA DNA pattern. In the research, by grasping the condition of MRSA separation from the neurological patients, their existing infection control was evaluated. Also, future

action plans were discussed.

2. Objects and Methods

1) MRSA infected patients

8 patients with MRSA respiratory infections in May 1999 were targeted (Table 1). All of the 8 patients with cranial trouble were in bed all day long. Regarding their environment, 74 places and items (14 nurses, wards, floors, beds, sheets, etc) were investigated. MRSA stumps were gathered directly from the patients and separated into each DNA type by utilizing the pulse field method. By looking at the map for the stump

Table 1. Summary of patients

Case	age/sex	Underlying diseases	Examination article
1	75/M	Cranial embolism	Squint
2	50/M	Cranial embolism	"
3	68/F	Hypertensive Hydronephrosis	"
4	85/F	Cranial thrombosis	"
5	66/M	Muscular dystrophia	"
6	74/M	Pneumonectasia Cranial embolism	"
7	60/F	Cranial embolism	"
8	77/F	Cranial hemorrhage	"

diffusion, the relations in infection at a hospital were investigated.

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2) Methods of investigation for the ward environment

—where and how the samples were taken—

<Patient room and his or her sandals>

Seed swap 1 (Eiken) was wetted with sterilized normal saline solution (0.9%). Within a 50 X 50 cm framework, samples were wiped off where medical staff usually walk from the zoned room entrance to the bed. Also, the soles of sandals were wiped off with above method and were planted on TGSE medium.

<Frocks, beds, and sheets>

On the day of the examination, samples were gathered by utilizing the stamp method, that is, by pressing lightly TGSE agar culture medium (10 cm X 10 cm, Nissui Seiyaku) on the frock that had been taken off four hours before, the sheet that had been used earlier, and the mattress that was being used at that time.

<The analysis of MRSA with electrophoresis>

Genome typing was implemented with pulse field method in order to identify MRSA chromosome. In this way, we were able to see germs spread on patients.

3. Result

1) Patient background

Total protein and albumin at the environment research are shown on Table 2. In the 7th case of Table 2, the amount of total protein and albumin was normal. However, in the other cases, nutrition deficiency was detected. At the time of

Table 2. Nutrition state of the patients with MRSA pneumonia or colonization

Case	Total protein (g/dl)	Albumin (g/dl)	DNA-PFGE
1	6.4	2.9	C
2	6.7	2.9	B
3	5.7	3.0	B
4	5.5	2.9	C
5	6.0	2.7	C
6	6.7	2.4	A
7	7.2	3.4	C
8	6.6	2.9	A

investigation, patient body temperature was between 36.2 and 36.9 C. No rise in patient temperature was observed at that time, antibiotics like vancomycin were not given to the patients.

2) MRSA contamination on and around the sick-bed

Table 3 indicates the sickbed environment contaminated by MRSA germ carriers. From the ward floor, MRSA was detected 100%. As for the beds, sheets and frocks, MRSA was detected 50%. We were able to reconfirm that floors, beds and

Table 3. Contamination by MRSA carriers in their environment

Places where samples gathered	where were	306 2 bed room	307 2beds	308 1bed	310 4 beds
Patient bedside floor		++	++	+	++ -- --+ -- +
Sandal		--	+	--	++ -- ++ -- + --
Sheets		--	--	+	-- -- + + -- -- --
Bed		++	+	--	-- --
Room entrance		+ --	--	+	--
floor					
Medical staff uniforms	staff				

sheets can be easily contaminated because the surface of them is flat, and frocks can also be easily contaminated because they come indirect contact with the patients. Sandals can also be easily contaminated.

On the other hand, around 11 bands were identified in MRSA taken from the patient's sputum and the sickbed environment by utilizing the method of PFGE and genome typing.

Table 4. MRSA and It's DNA

Survey place	306 twin room	307 twin room	308 twin room	310 four men's room
Bedside floor	A	BB	A	D
Sandals	BB	EE	C D	
Sheet	AB	A B	AB A	AB B C
Bed	A	A		C D D
Entrance and exit of room floor	D			
Nurse's gown	A B	A B		C C

By classifying the roots that have the same moving pattern, they could be categorized into 11 genome types (Chart No. 11). As a result of the above classification, they are separated into two groups: 5 types and 1 independent type (table 4).

The genome type from both the patient sputum and the sickbed environment was almost identical. Therefore, it was reverified that the germ from the patients easily contaminate their sickbed environment. In addition, nurse uniforms

were contaminated with the same type of germ that was taken from the patients since nurses often come in direct contact with patients.

Within four working hours, MRSA was detected in 2 nurse uniforms out of 14 ones. This MRSA type matched with the one from the patients.

3) Contamination in the MRSA non-carrier environment.

Table 5. Un Infection carrier for MRSA

Survey place	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Franks	-	-	-	-	-	-	-	-	-	-	+	-	+	-
HC	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nurse center	-	-	-	-	-	-	-	-	-	-	-	-	-	-

In order to measure the effects of zoning, contamination in the MRSA non-carrier environment was also investigated. As a result, there was no contamination on and around the sickbed.

However, there are high possibilities of the contamination from germs in the case of the nurse uniforms (Table 5).

4. Consideration

There is a high risk of complication in the ward where there are cerebral arteriosclerosis patients. Those patients immune system could be weak because most of them are older on and they tend to be deficient in nutrition. In this research, MRSA was found in all of, the 8 examples. As for these 8 examples that were in an acute condition, they were infected by nasal tube.

In these kinds of cases, infection should be thorough by controlled.

Moreover, when patients are in chronic condition, they are not independent in terms of their everyday life due to paralysis. Their paralysis prevents them from taking enough nutrition. However, because they have no physical changes like high temperature, the infection control tends to be negligent. At the same time, from the standpoint of infection control management, if patients have different PFGE patterns in their DNA, they should not be in the same room.

In conclusion, we would like to emphasize more thorough infection control management in terms of

cleanliness and sterilization on and around the sickbed, and in nurse uniforms to prevent infection.

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脳外科病棟でのMRSAの感染管理について

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要 旨 脳血管障害患者の入院する病棟で喀痰よりメチシリン耐性黄色ブドウ球菌（MRSA）を検出した8例について院内感染対策について検討した。病床環境，医療従事者のMRSAによる汚染，患者の栄養状態を調査した。MRSA 41株について保菌者の菌と環境菌との関係をPFGEのゲゲノムタイピングを行った。5ゲノムタイプに分類された。その結果，患者の喀痰により，常時病室環境・医療従事者は菌により汚染している。そのため日常的な感染対策をとる必要があると再確認できた。

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