

Case Studies in Nursing of Mitochondrial Diabetes

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SUMMARY

Mitochondrial diabetes (mtDM) which is caused by genetic defect of islet β cells is a new subtype of diabetes. It has many clinical manifestations compared with ordinary diabetes. We reviewed our nursing experiences on four cases with mtDM and focused on the nursing characteristics and management in order to explore specific care knowledge for mtDM.

KEY WORDS: Mitochondrial diabetes, Nursing.

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INTRODUCTION

In recent years, islet cells' dysfunction caused by mitochondrial gene mutation is defined as a new subtype of diabetes. As commonly known single gene mutation diabetes, mitochondrial diabetes (mtDM) belongs to the diseases of islet B cell genetic defects.¹ According to the new criteria of diabetes diagnosis and classification enacted by American Diabetes Association (ADA) in 1997 and World Health Organization (WHO) in 1999, mtDM is listed as a special type of diabetes. So far, at least 20 types of mitochondrial mutations and 5 types of rearrangements have been detected to be relative with diabetes², among which the A-to-G transfer

in 3243 site of mitochondrial tRNA leucine gene is the most common. The data in China showed that the incidence of the mutations in randomly chosen population suffering from diabetes is 0.4%-1.8%, close to 1.5% reported abroad.³ With the increasing knowledge of this disease, its diagnosis rate will further increase. However, since its relative low incidence and rare reports, there was insufficient knowledge about its nursing.

CASE REPORT

In 2007, we diagnosed four cases with mitochondrial gene mutation diabetics. The present study focused on our experiences in the specific nursing characteristics of mtDM. The four cases with mtDM belonged to three different families, and their relatives were also detected and proved to be with the transfer from A to G at 3243 point of mitochondrial tRNA leucine gene. The clinical characteristics are described in Table-I.

1.1 Neurotic deafness: About 80% of the patients suffered from hearing loss, usually bilaterally, sometimes unilaterally.⁴ It showed a conspicuous trend of downwardness with age, even completely deaf in severe cases.

1.2 Age of onset: It usually occurs in young people under 45 years old, even before 10.

1.3 Maternally inherited: Only mothers can pass their mutant gene to their children, while fathers cannot.

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1.4 Manifestations in other systems: A small number of patients would have dysfunction in their nerves, eyes, skeleton or myocardial accompanied by increased blood lactic acid.

1.5 Clinical phenotype heterogeneity: Thousands of mitochondria from the ovum are replicated in zygote developing and randomly assigned to stem cells. If some of them contain gene mutation, the number of mutated mitochondrial genes in each stem cell will be different, leading to the inconsistency of the degrees of mitochondrial gene mutation in different tissues and organs. Therefore, one kind of mutation may show utterly different clinical manifestations in different individuals. This difference is obviously represented by insulin requirement. One patient might need only four units of insulin to control blood sugar to an ideal level, while another may need even more than forty units.

1.6 Psychological characteristics: Owing to the early start of the disease accompanied with deafness or other complications, the patients may be more anxious than others, or even develop pessimism. Besides, they have difficulty in contacting with the outside world because of deafness, which further increase their anxiety and depression.

Patients with mtDM, especially in younger patients, may go to two extremes: 1) The parents often feel so sorry about the children's disease and it's hereditary that they would spoil him/her; the children themselves may attribute their misfortune to their parents and develop a bossy and willful character, then doing whatever they want; 2) Some children with mtDM learn to take care of themselves

and be more self-reliant than the health of their age. They may be too assertive to follow doctor's advice, which also result in poor control of their disease. In our report, the two patients under 20 years old were just types of the two extremes. One patient would lose control of his emotion about some trifles and the other didn't obey the doctor's advice, entered for the entrance examination of a police academy, kept secret state of her illness from her teachers and fellow students and kept training with high intensity until ketosis emerged, but before complete recovery, she went back to her academy again.

DISCUSSION

Given to its specific clinical characteristics, we improved our nursing practice in order to get better management accompanying with doctor's treatment.

1.1 Enhancing psychological guidance: Patients with Mitochondrial diabetes normally have a feeling of fear and inferiority which is aggravated mainly by loss of hearing. In this situation, we should understand them and offer the psychological guidance more patiently and intensively to gain their cooperation, which is useful to improve their management.⁵ We should inform the patients of the real conditions of their disease and explain the aim of treatment, making them know what affect their health and how to dispel anxiety and depression. The aim of health guidance is to avoid the possibility that they become pessimistic, prevent inducible factors and get rid of nervousness and fear. Meanwhile, we should act actively to win

Table-I: Clinical characteristics of the patients.

Cases	1	2	3	4
Gender	Female	Female	Female	Female
Age (years)	46	45	19	18
Occupation	Staff	Staff	Student	Student
Diabetes course (years)	7	11	8	9
Complications	Nervous deafness, Renal kidney failure, Heart failure, Coronary heart disease, Resistant hypertension, Diabetic ketoacidosis Hyperkalemia, Peripheral neuropathy, Cardiomyopathy	Nervous deafness, Diabetic ketoacidosis, Hypertriglyceridemia, Optic neuropathy, Suspicious skeletal muscle disease	Diabetic ketoacidosis, Hypertrigly-ceridemia	Diabetic ketoacidosis, Hyperthyroidism, Asthma

* 2 and 3 are mother and daughter.

the support and cooperation from their families, relatives and friends. As for those who have severe psychological illness and fail to react to psychological nursing, it's best to communicate in time with doctors. To those who have lost hearing, we should be more patient and painstaking and try to communicate with them by writing. Patients who are teenagers should be nursed in accordance with the characteristics of their ages. At the same time, blood sugar should be monitored using blood glucose meter to avoid repeated superficial vein puncture, protect blood vessels and reduce the suffering of the patients, thus alleviating the patients' mood fluctuation.⁶

Owing to lack of knowledge about diabetes, most patients were fearful and pessimistic. They asked repeatedly about the severity of their illness and treatment plan. To help patients get rid of psychological burden, medical workers should introduce diabetes' knowledge and explain its related complications and conditions, which is useful to enhance their confidence and ability of self-regulation.⁷ Thus patients would be in the best state of mind to cooperate with treatment and nursing.

1.2 Enhancing dietary guidance: It is powerful to use the method of adjusting food portion.⁸ Though this method is comparatively cursory, it could indeed enhance food choice which is convenient for patients to learn. It is advocated to have roughage of proper amount and avoid glucose, sucrose and other sweet foods.³ Since patients with mtDM are usually emaciated, food control should be adjusted within an appropriate range.

Concrete measures:

- 1) The restriction on their staple food is relaxed but monosaccharide reduced;
- 2) Restrict fat intake;
- 3) Increase dietary fiber intake appropriately;
- 4) Intake of vitamins and minerals should also be increased;
- 5) Have meals in fixed quantity regularly and eat small meals often.

1.3 Giving patients sports guidance and encouraging them to do aerobics: For diabetics, appropriate exercise can increase tissue's sensitivity to insulin, thus increasing the use of glucose in blood and decreasing the blood sugar level. However, since the blood lactate level will significantly increase after exercise in mtDM, it is better to engage in mild exercise only. Aerobic exercise is the most appropriate way instead of strenuous exercises.⁹ Aerobics can

increase oxygen inhalation, transportation and usage in the body, thus improving cardiopulmonary function, especially body metabolism. Monitor the level of blood sugar before, during and after exercises; and inform patients to take exercises according to their own capability and carry candy and cookies with themselves to prevent the possible hypoglycemia.

1.4 Grasping characteristics of each patient and taking duly nursing measures: Defects of insulin secretion have a certain relationship with the number of mutations in mitochondrial genes.^{1,3} Therefore, part of mtDM have acute onset and insulin therapy is demanded once the disease is diagnosed.³ Due to the significant difference in patient's sensitivity to insulin, we should intently observe patients' glucose fluctuation to make sure it's in an optimal level.

Concrete measures:

- 1) To patients who receive insulin injection treatment, we should observe their diet, monitor their blood sugar level and adjust insulin dose accordingly in good time;
- 2) Insulin dose should be precise and vibration of the insulin should be avoided;
- 3) Injection time should be flexible based on patient's mealtime;
- 4) When subcutaneous injection is administered, it is suitable to choose soft parts of the skin and transform among different points in a planned and orderly way; make sure that drip speed is uniformly when intravenous drip is conducted to prevent the sudden impact on patient's blood glucose levels;
- 5) Reinforce observation of patient's symptoms and differ symptoms of diabetes itself from those of diseases in other systems;
- 6) Guide the patients to understand the reasons, manifestations and treatment of hypoglycemia.

In summary, mtDM have many clinical characteristics which are different from ordinary diabetics. As to clinical nursing, in addition to general care of diabetic patients, we should also apply special measures in accordance with their unique characteristics to clinical treatment in order to get better prognosis and improve patients' quality of life.

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