A Case of Para-Bombay Phenotype Caused by Homozygous Mutation of the *FUT1* Gene

FUT1 Genindeki Homozigot Mutasyondan Kaynaklanan Bir Para-Bombay Fenotipi Olgusu

Jung-Kuang Yu[1], Yi-Hong Liu[2], Tze-Kiong Er[2,3]

[1]*Asia University Hospital, Department of Orthopedics, Taichung, Taiwan*
[2]*Asia University Hospital, Division of Laboratory Medicine, Taichung, Taiwan*
[3]*Asia University Faculty of Medicine, Department of Health and Nutrition Biotechnology, Taichung, Taiwan*

To the Editor,

A 79-year-old female patient presented at the hospital with osteoarthritis. Examination of the patient revealed hemoglobin level of 10.8 g/dL, RBC count of $3.45x10^6$/µL, WBC count of 10.1x103/µL, and platelet count of $122x10^3$/µL. Plasma levels of blood urea nitrogen, creatinine, sodium, potassium, and alanine aminotransferase were all within the normal ranges, while aspartate aminotransferase was slightly higher than normal. A blood sample obtained from the patient was submitted to our division for blood typing and cross-matching, with a request to receive 2 units of packed red blood cells. ABO typing was performed using standard serological techniques after an immediate spin. Testing the patient's red blood cells revealed no detectable ABO antigens upon forward/cell grouping (group O blood type). On the other hand, reverse/serum grouping showed the presence of A antibodies in the serum (group B blood type). To resolve the discrepancy between cell and serum grouping we performed an agglutination examination of anti-H serum; the red blood cells from the sample did not exhibit an agglutination reaction. Additionally, secretor status was determined in order to assess the presence of soluble blood group substances. Our results showed the presence of B and H antigens in the saliva. Based on these results, the patient in the present case was diagnosed as having a para-Bombay B phenotype (Table 1, Figure 1).

Genotyping of the *ABO* and *FUT1* genes was also performed. Direct DNA sequencing of the patient's *ABO* gene indicated the B/O^1 genotype. To examine potential mutations in the *FUT1* gene, we amplified and sequenced the full coding region of the gene. *FUT1* gene sequence analysis revealed that the patient harbored the homozygous mutation c.881_882delTT (p.Phe294Cysfs*40). A heterozygous mutation in *FUT1* (880delTT) has been previously reported as the cause of the para-Bombay phenotype [1,2]. However, the homozygous mutation c.881_882delTT (p.Phe294Cysfs*40) only rarely causes the para-Bombay phenotype. Previously, a study indicated that homozygous mutations are a cause of the para-Bombay phenotype [3,4].

In patients with the para-Bombay blood group, ABH antigens are present in saliva but not expressed in red blood cells. The para-Bombay phenotype results either from an inactive *FUT1* gene present together with a normal *FUT2* gene or from a mutated *FUT1* gene present with or without an active *FUT2* gene [1]. H deficiency is slightly more common in Taiwan, affecting 1 of 8000 people [2]. More than 56 silencing or weakening *FUT1* mutations have been reported in the dbRBC database (https://www.ncbi.nlm.nih.gov/projects/gv/mhc/xslcgi.cgi?cmd=bgmut/systems_info&system=hh).

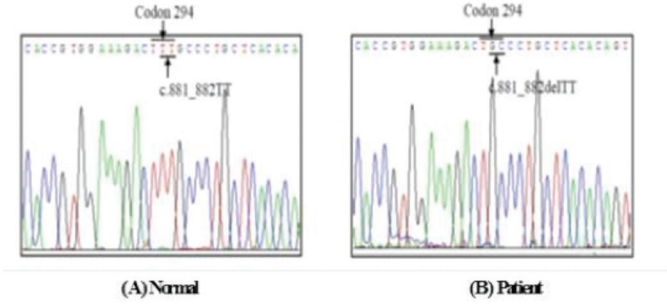

Figure 1. Sequencing results confirm the wild-type (A) and the presence of the *FUT1* homozygous mutation c. 881_882delTT (p. Phe294Cysfs*40) (B).

Table 1. Serologic and saliva test results of the patient: ABO group discrepancy.

Cell grouping			Serum grouping			Test for H antigen	Saliva secretor status	
Anti-A	Anti-B	Anti-D	A_1 cells	B cells	O cells	Anti-H	A_1 cells	B cells
0	0	4+	4+	0	0	0	2+	0

0= No agglutination, 1+= multiple small agglutinates with hazy supernatant, 2+= multiple large agglutinates with clear supernatant, 3+= 2-3 large agglutinates with clear supernatant, 4+= single large agglutinates.

In conclusion, identification of this phenotype is very important because this particular patient subgroup may be clinically mislabeled as group O. If patients with anti-H in their circulation receive transfusions of blood with the H antigen, it may cause a transfusion reaction such as an acute hemolytic reaction. Here we have reported a rare case of the para-Bombay phenotype caused by the homozygous mutation c.881_882delTT (p.Phe294Cysfs*40).

Acknowledgments

Our gratitude goes to Michael Burton, Asia University. This study was supported by grants from Asia University and China Medical University Hospital (ASIA-105-CMUH-07).

Keywords: Para-Bombay, Phenotype, *FUT1* gene, Blood transfusion

Anahtar Sözcükler: Para-Bombay, Fenotip, *FUT1* geni, Kan transfüzyonu

Conflict of Interest: The authors of this paper have no conflicts of interest, including specific financial interests, relationships, and/or affiliations relevant to the subject matter or materials included.

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Address for Correspondence/Yazışma Adresi: Tze-Kiong ER, M.D.,
Asia University Hospital, Division of Laboratory Medicine, Taichung, Taiwan
E-mail : tzekiong92@gmail.com **ORCID-ID:** orcid.org/0000-0002-7068-1652

Received/Geliş tarihi: May 29, 2017
Accepted/Kabul tarihi: August 04, 2017

DOI: 10.4274/tjh.2017.0220