

中文題目：乳癌病患接受三劑 COVID-19 疫苗後之體液及細胞免疫反應

英文題目：Humoral and cellular immune response after 3rd dose of COVID-19 vaccination in breast cancer patients

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Background

The novel coronavirus, SARS-CoV-2 are corresponding to coronavirus disease (COVID-19) since 2019. Patients with cancer have more complication and higher mortality rate in COVID-19. Vaccination provide protection from COVID-19 infection and decrease severity of disease. However, previous study showed that cancer patients had poor immune response to COVID-19 vaccine, especially in patients who receive cytotoxic agents or patients with hematological malignancy. Fortunately, humoral immunity improves after two dose of vaccination and had benefit on third dose of COVID-19 vaccination. However, T cell response to vaccination in cancer patients is still investigating.

Breast cancer is the most common malignancy in the world. There are different treatment strategies in different breast cancer subtypes. Medical treatment includes endocrine treatment, chemotherapy, target therapy, antibody drug conjugate, and immunotherapy. We would like to study immune response in breast cancer patients received 3rd dose of COVID-19 vaccination. To investigate the influence on immune response in different treatment and disease status.

Method

We collected patients with breast cancer in single institution in south Taiwan. All patients are ≥ 20 years-old, without history of COVID-19 infection, received 3rd dose of COVID-19 vaccination at least two weeks ago. We had informed consent with all patients. We checked anti-spike-RBD Ab (anti-S Ab) to evaluate humoral immunity, anti-nucleocapsid Ab (anti-N Ab) for diagnosis of infection with SARS-CoV-2. We used cPass assay to measure neutralizing antibody for Wuhan strain, Delta variant, and Omicron BA.1 variant. To evaluate cellular immunity, we used Covi-Feron 500, to detected IFN γ responses to SARS-CoV-2 and its variants specific proteins (including Wuhan, Alpha, Beta, and Gamma strains).

Results

Twenty-eight female patients were enrolled. The characteristics and result as shown in Table 1. All of them (28/28, 100%) had anti-S antibody and no patients had positive anti-N antibody. Twenty-six (26/28, 93%) patients had neutralizing antibody for Wuhan strain; twenty-six (26/28, 93%) patients had neutralizing antibody for

Delta strain; Four (4/28, 14%) patients had neutralizing antibody for Omicron BA.1 strain.

For cellular immunity, we evaluate T cell response by IFN γ responses to SARS-CoV-2 and its variants specific proteins. The result revealed twenty-two patients had reactive T cell response. Among the six patients with non-reactive response, five patients of them had advanced breast cancer, and three patients had progressive disease. All patients with early breast cancer who received endocrine treatment had reactive T cell response.

Conclusion

Breast cancer patients received 3rd dose of COVID-19 vaccination had good response to Wuhan strain and Delta variant but poor response to Omicron BA.1 variant. Patients who had poor cellular response may related to disease status and cancer treatment. We are going to evaluate the response to omicron BA.4 and BA.5, and the response after patient who received 4th dose vaccination.

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Table 1

PR: Partial response; SD: stable disease; CR: complete response; PD: Progressive disease
Anti-HER2 Tx: anti-HER2 treatment; C/T: chemotherapy; ET: endocrine treatment; CDK4/6 i:
CDK4/6 inhibitor; ADC: Antibody drug conjugate.

Red color words: Non-reactive T cell response

Yellow highlight: Non-detectable neutralizing antibody (< 30% means there is no detectable neutralizing antibody)

All patients are negative for anti-nucleocapsid Ab (not shown in the table)

Table 1

| Pt | Age | Disease | | Current treatment | Anti-S Ab (U/mL) | Neutralizing Ab for Wuhan (%) | Neutralizing Ab for Delta (%) | Neutralizing Ab for Omicron BA.1 (%) | T cell response |
|----|-----|----------|----|-------------------|------------------|-------------------------------|-------------------------------|--------------------------------------|-----------------|
| 1 | 57 | Advanced | PR | Anti-HER2 Tx | 2500 | 97.6 | 96.6 | -2.5 | Reactive |
| 2 | 66 | Advanced | SD | C/T | 2500 | 97.9 | 97.0 | 15.1 | Reactive |
| 3 | 52 | Early | CR | ET | 2500 | 97.9 | 97.0 | 52.4 | Reactive |
| 4 | 70 | Early | CR | ET | 2415 | 97.7 | 96.2 | 9.4 | Reactive |
| 5 | 34 | Early | CR | ET | 2500 | 97.5 | 96.2 | -4.9 | Reactive |
| 6 | 56 | Advanced | PD | CDK4/6 i, CT, ET | 2500 | 97.7 | 96.5 | -7.9 | Non-reactive |
| 7 | 46 | Early | CR | Anti-HER2 Tx | 171 | 76.8 | 60.6 | 2.4 | Reactive |
| 8 | 58 | Advanced | SD | Anti-HER2 Tx | 2500 | 97.7 | 97.0 | 58.3 | Reactive |
| 9 | 73 | Advanced | SD | CDK4/6 i, ET | 2500 | 97.6 | 96.0 | -4.1 | Reactive |
| 10 | 49 | Advanced | PD | Anti-HER2 Tx, C/T | 224.8 | 74.8 | 70.0 | 11.5 | Reactive |
| 11 | 63 | Early | CR | Anti-HER2 Tx, ET | 2500 | 97.5 | 96.4 | 23.0 | Reactive |
| 12 | 45 | Advanced | PR | CDK4/6 i, ET | 1133 | 84.1 | 73.3 | -13.2 | Reactive |
| 13 | 58 | Advanced | PD | C/T | 354 | 72.7 | 54.8 | -6.0 | Non-reactive |
| 14 | 50 | Advanced | PD | CDK4/6 i, ET | 2500 | 97.5 | 96.4 | 13.1 | Non-reactive |
| 15 | 53 | Advanced | PR | Anti-HER2 Tx | 2500 | 97.9 | 96.9 | 34.0 | Reactive |
| 16 | 40 | Early | CR | C/T | 2500 | 97.8 | 96.7 | -2.6 | Reactive |
| 17 | 52 | Early | CR | Anti-HER2 Tx, C/T | 2500 | 97.7 | 95.6 | 6.6 | Reactive |
| 18 | 46 | Early | CR | ET | 2500 | 97.4 | 92.8 | 23.5 | Reactive |
| 19 | 48 | Early | CR | ET | 2500 | 97.8 | 96.7 | -1.5 | Reactive |
| 20 | 42 | Advanced | PR | Anti-HER2 Tx, C/T | 1222 | 97.5 | 95.7 | 15.7 | Reactive |
| 21 | 31 | Advanced | CR | Anti-HER2 Tx, C/T | 24.48 | 91.1 | 83.7 | 4.7 | Non-reactive |
| 22 | 52 | Early | CR | Anti-HER2 Tx, C/T | 1964 | 97.4 | 92.7 | 2.8 | Non-reactive |
| 23 | 83 | Advanced | SD | CDK4/6 i, ET | 2500 | 97.6 | 85.6 | 8.7 | Non-reactive |
| 24 | 81 | Advanced | SD | ADC | 20.51 | 10.7 | 0.9 | 7.3 | Reactive |
| 25 | 64 | Advanced | PR | CDK4/6 i, ET | 2500 | 97.5 | 96.2 | 29.0 | Reactive |
| 26 | 52 | Advanced | PR | Anti-HER2 Tx, C/T | 2500 | 97.5 | 95.8 | 0.1 | Reactive |
| 27 | 42 | Advanced | CR | C/T | 2500 | 17.6 | 10.9 | 8.4 | Reactive |
| 28 | 49 | Early | CR | ET | 2500 | 97.7 | 96.6 | 77.0 | Reactive |