

โรคกล้ามเนื้อหัวใจและเยื่อหุ้มหัวใจอักเสบในผู้ป่วยเด็ก หลังได้รับวัคซีนโคเมอร์เนตีที่จังหวัดสระบุรี ประเทศไทย

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บทคัดย่อ

ผลข้างเคียงสำคัญของวัคซีนชนิดเอ็มอาร์เอ็นเอ คือโรคกล้ามเนื้อหัวใจและเยื่อหุ้มหัวใจอักเสบ ในการวินิจฉัยต้องใช้องค์ประกอบได้แก่ ค่าซีรั่มโทรโปนิน การตรวจคลื่นไฟฟ้าหัวใจ และการตรวจหัวใจ ด้วยคลื่นเสียงความถี่สูง ผู้ป่วยชายที่มีอายุน้อยเป็นปัจจัยเสี่ยงที่สำคัญที่เกิดโรค ผู้ป่วยเด็กที่มีภาวะ โรคกล้ามเนื้อหัวใจและเยื่อหุ้มหัวใจอักเสบมักจะพบอาการเจ็บหน้าอก ในรายงานผู้ป่วยนี้รายงานถึง ผู้ป่วยเด็กชายหลังจากได้รับวัคซีนบีเอ็นที162บี2 และมีอาการเจ็บหน้าอก ค่าซีรั่มโทรโปนินและการตรวจ คลื่นไฟฟ้าหัวใจแสดงถึงภาวะโรคกล้ามเนื้อหัวใจและเยื่อหุ้มหัวใจอักเสบ ได้รับการรักษาด้วยยาบรรเทา อาการอักเสบที่ไม่ใช่สเตียรอยด์

คำสำคัญ

กุมารเวช, วัคซีน, โรคกล้ามเนื้อหัวใจและเยื่อหุ้มหัวใจอักเสบ, โควิด-19, โรคกล้ามเนื้อหัวใจ, โรคเยื่อหุ้มหัวใจอักเสบ

Myocarditis and Pericarditis in A young boy After BNT162b2 Vaccine in Saraburi, Thailand

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Abstract

The predominant adverse events of the mRNA vaccine are myocarditis and pericarditis. These conditions are diagnosed by serum troponin level, electrocardiogram (ECG), and echocardiogram. A young male is one of the significant risk factors being reported so far. Chest pain is a symptom that occurs in all pediatric patients with myocarditis or pericarditis. In this report, we documented a typical case of a young male patient who received his first dose of the BNT162b2 vaccine and developed chest pain. His ECG and serum troponin level showed abnormalities which were associated with myopericarditis. Finally, he was treated with non-steroidal anti-inflammatory drugs (NSAIDs) and his symptoms were fully recovered.

Key word

pediatric, vaccine, myopericarditis, covid-19, myocarditis, pericarditis

Introduction

COVID-19 disease was first documented in 2019 and rapidly spread throughout the world. The hope for the end of the COVID-19 pandemic is vaccine development. Subsequently, mRNA vaccine technology was successfully introduced. One of the mRNA vaccines is the BNT162b2 so-called Comirnaty vaccine or Pfizer-BioNTech COVID-19 vaccine by Pfizer Inc. and BioNTech SE.¹ In 2021, Food and Drug Administration (FDA) approved this vaccine for the prevention of COVID-19 disease in individuals at age of 12 years or older.² According to the data collected in Europe until May 31, 2021, myocarditis occurred in 145 cases among 177 million doses and 19 cases among 20 million doses who received BNT162b2 and Spikevax (Moderna), respectively.³ In the United States of America, the Vaccine Adverse Event Reporting System (VAERS) revealed 1626 cases of myocarditis between December 2020 and August 2021.⁴ In Thailand, the BNT162b2 vaccine was first provided for children at aged of 12 through 18 years in October 2021.⁵ To our knowledge, this is the first report of a patient who developed COVID-19 mRNA vaccine-related myopericarditis in Thailand.

Case Presentation

A young Thai boy visited the emergency department with epigastrium pain for 1 day and progressive chest discomfort with palpitation for 1 hour. The chest discomfort was described as tightness without radiation. His underlying disease was well-controlled asthma without the need for controller or reliever medication. He recently received his first dose of the BNT162b2 vaccine in the last 15 days. On physical examination, the body temperature was 37.1°C, heart rate was 92 beats per minute (BPM), blood pressure was 116/89 mmHg., respiratory rate was 20/min, and oxygen saturation was 98% on room air. The cardiovascular examination revealed normal first and second heart sounds, no audible murmur, and regular heart rate. The pericardial rub was not heard. The respiratory examination showed equal breath sound without adventitious sound. Other physical examinations were unremarkable.

Investigation

Electrocardiography (ECG) was done and showed sinus tachycardia rate 100 BPM with diffuse concave ST elevation and PR depression in lead I, II, III, aVF, aVL, and

V3-6 with ST depression in aVR (Figure 1) which compatible with pericarditis characteristic. The patient had elevation in cardiac enzymes including creatine kinase myocardial band (CK-MB) of 121.7 U/L (0-24 U/L), troponin T of 1.7 ng/mL (< 0.013 ng/mL) and N-terminal pro B-type natriuretic peptide (NT-pro-BNP) of 807 ng/L (< 450 ng/L). Chest radiography showed no abnormality. Transthoracic echocardiogram (TTE) showed impaired LV systolic function, LVEF 42%, inferior wall hypokinesia without pericardial effusion (Figure 2A, 2B, 2C, and 2D).

Complete blood count test and other blood chemistries were demonstrated

in Table 1. Other investigation revealed C-reactive protein (CRP) 47.06 mg/L (0-10 mg/L) and Erythrocyte sedimentation rate (ESR) of 21 mm/h (1-12 mm/h). Nasopharyngeal and throat swab for SARS CoV-2 RT-PCR was undetectable. SARS CoV-2 Anti Nucleocapsid IgG, Mycoplasma pneumoniae Ab IgG and IgM nasal swab for respiratory 33 pathogens panel were all negative. The most likely diagnosis of chest pain in this patient was COVID-19 mRNA vaccine-related myopericarditis according to the patient's abnormal ECG pattern. Furthermore, the elevation of the cardiac enzyme and impaired LVEF in TTE,



Figure 1 Electrocardiography (ECG) showing sinus tachycardia rate 100 BPM with diffuse concave ST elevation and PR depression in lead I, II, III, aVF, aVL, and V3-6 with ST depression in aVR.

myocarditis should also be diagnosed. In this clinical scenario, the acute coronary syndrome was less likely, as the patient was young and had no other risk factor that was responsible for coronary disease. The most common cause of myocarditis and pericarditis in pediatrics is the viral infection. However, in this patient, he had no viral prodromal symptoms and the respiratory 33 pathogens panel and SARS CoV-2 RT-PCR were all negative. Since there were no other causes that might lead to

myopericarditis in this patient, mRNA vaccination was likely the most suspicious etiology for his condition.

Treatment

After the diagnosis of myopericarditis, naproxen 1 gram per day was prescribed

Outcome and follow-up

His chest discomfort gradually resolved. After a 10-day follow-up, an transthoracic echocardiogram was performed

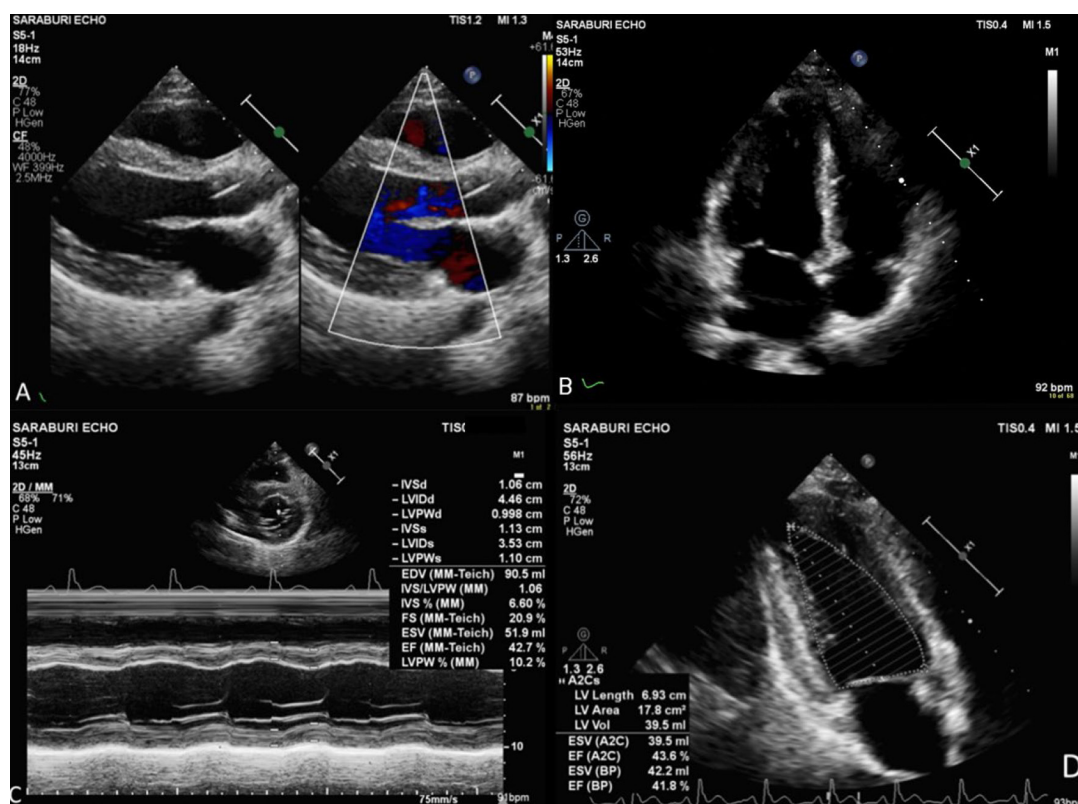


Figure 2 (A ,B, C, and D) Transthoracic echocardiogram (TTE) showed impaired LV systolic function, LVEF 42%, inferior hypokinesia without pericardial effusion.

Table 1 Laboratory parameters

Laboratory	Results	Normal range
Complete blood count		
Haemoglobin	14.1 g/L	(12-15.8 g/L)
White cell count	$16.3 \times 10^9/L$	$(4.5-8.6 \times 10^9/L)$
Neutrophil	79%	(55-75%)
Lymphocyte	12%	(20-35%)
Monocyte	8%	(2-6%)
Eosinophil	1%	(1-3%)
Platelets	$216 \times 10^9/L$	$(140-400 \times 10^9/L)$
Blood chemistries		
Urea nitrogen	8.8 mg/dL	(6-20 mg/dL)
Creatinine	0.83 mg/dL	(0.5-1.5 mg/dL)
Calcium	8.9 mg/dL	(8.3-10.9 mg/dL)
Magnesium	1.6 mg/dL	(1.5-2.5 mg/dL)
Phosphorus	3.6 mg/dL	(2.5-4.8 mg/dL)
Albumin	4.4 g/dL	(3.5-5.0 g/dL)
Total bilirubin	0.54 mg/dL	(0.2-1.5 mg/dL)
Direct bilirubin	0.09 mg/dL	(0.0-0.3mg/dL)
Aspartate aminotransferase	110 U/L	(8-40 U/L)
Alanine aminotransferase	28 U/L	(5-35 U/L)
Alkaline phosphatase	140 U/L	(34-122 U/L)
Creatine kinase myocardial band	121.7 U/L	(0-24 U/L)
Troponin T	1.7 ng/mL	(< 0.013 ng/mL)
N-terminal pro B-type natriuretic peptide	807 ng/L	(< 450 ng/L)
C-reactive protein	47.06 mg/L	(0-10 mg/L)
Erythrocyte sedimentation rate	21 mm/h	(1-12 mm/h)

and the results showed impaired LV systolic function, LVEF 60%, and no wall hypokinesia

Discussion

Chest pain is one of the most common pediatric problems that brought them to the emergency department.

There are various etiologies of chest pain including idiopathic, musculoskeletal, psychological, gastrointestinal, cardiac, and respiratory causes which were accounted for 35.63%, 19.75%, 16.31%, 10.36%, 9.57%, and 8.39%, respectively.⁶ Regarding cardiac chest pain, arrhythmia is the most

common cause followed by pericarditis and myocarditis. Acute myocardial infarction is rare in pediatrics. Myocarditis is an inflammatory disease of the myocardium resulting from various etiologies and might lead to myocardial dysfunction. Pathogenesis of myocarditis consisted of three phases: (1) the first phase (cardiac injury and activation of the innate immune response), (2) the second phase (acute myocardial inflammation), and (3) the third phase (recovery or progression to dilated cardiomyopathy).⁷ The causes of pediatric myocarditis were divided into infection-related and non-infection-related. For infection-related myocarditis, possible pathogens could be virus, bacteria, fungus, and protozoa. The most common pathogen is virus. In the view of non-infectious causes, autoimmune, hypersensitivity, and toxin are the main etiologies leading to myocarditis. The definition of diagnosis required one of the following: pathological diagnosis from cardiac biopsy, cardiac magnetic resonance (CMR), or clinical suspicious.⁸ The symptoms include viral prodromal symptoms, gastrointestinal involvement, fatigue, dyspnea, and arrhythmias.⁹ ECG usually show sinus tachycardia, low-voltage QRS complexed,

or ST-T wave abnormalities.¹⁰ Inflammatory markers such as white blood cell count, CRP, and ESR can be elevated. Troponin elevation was more sensitive than CK-MB.¹¹ Echocardiography may show segmental wall motion abnormalities, normal-sized or mildly dilated LV, diastolic dysfunction, and LV wall thickening.¹² CMR imaging in children is less beneficial as it could not distinguish between myocarditis from inflammatory and non-inflammatory.⁸ Nonsteroidal anti-inflammatory drugs (NSAIDs) are the standard treatment for myocarditis in children who has normal and mild ventricular dysfunction.¹³ According to the Centers for Disease Control and Prevention (CDC)¹⁴, This patient had probable to be the myopericarditis which met criteria for both myocarditis and pericarditis.

In the United States, the mRNA COVID-19 vaccines had been administered in approximately 296 million doses on June 11, 2021. A total of 1,226 patients developed myocarditis after mRNA vaccination were reported. Most of the patients were young males and usually occurred after the second dose of vaccine. Nevertheless, our patient had myopericarditis at the first dose of mRNA vaccination. All patients have chest pain, nevertheless,

the clinical was rarely severe and usually have full recovery.¹⁴ No patient died nor required intensive care unit.^{14, 15} Rising of troponin level was found in all patients but decreased LVEF in TTE were not necessary.¹⁵

In this case, A cardiac magnetic resonance imaging (CMR) was not possible due to a lack of available resources and machines capable of performing the procedure. Therefore, there was a limitation in this regard.

This patient presented with chest pain. His ECG showed abnormal ST changes compatible with myopericarditis. The cardiac enzyme and inflammatory markers were elevated. In Addition, the TTE showed impaired LV systolic function and inferior wall hypokinesia. The diagnosis was the myopericarditis. The viral cause has been excluded therefore the etiology of the disease is highly suspicious of mRNA vaccination.

Learning point/Take home message

- Pediatric patients presenting with chest pain in the COVID-19 era, after exclusion of emergency conditions and other possible causes including covid infection itself, vaccine-related myocarditis

and pericarditis should be suspected until proven otherwise.

- The myopericarditis may occur even after the first dose of mRNA vaccination.
- The ECG and troponin are necessary for the diagnosis of this complication.
- Finally, there was still no report of mRNA vaccination-related death and myopericarditis adverse event is usually mild.

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