Brief Report

Rhabdomyolysis after BNT162b2 mRNA Covid-19 vaccine in an adolescent male

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Abstract

Pfizer-BioNTech COVID-19 (BNT162b2) conferred a high level of protection against Covid-19 with a proven short-term safety profile. Although cases of vaccine-associated myopericarditis have been reported, the existence of rhabdomyolysis without myocarditis has not yet been published.

A 16-year-old, healthy male patient, who did not use any herbal or illegal drugs before, was admitted with muscle pain that developed after the second dose of BNT162b2 vaccine. Cardiac examination and heart enzymes were normal and the patient had significantly higher creatinine kinase levels. The patient, whose enzymes returned to normal with only force hydration therapy, recovered without complications.

Reporting the side effects of the vaccine, which has a short history of application to large populations, is of vital importance in the conduct of vaccine development studies and in identifying the risky group in terms of side effects.

Key words: Pfizer-BioNTech COVID-19, rhabdomyolysis, adolescent

Introduction

After the Covid-19 pandemic caused millions of casualties around the world, Covid-19 vaccines broke new ground in the fight against the pandemic. One of those, the PfizerBioNTech COVID-19 (BNT162b2) vaccine, a lipid nanoparticle-formulated, nucleoside modified mRNA vaccine, gained emergency use authorization (EUA) by The Food and Drug Administration (FDA) for use in persons aged ≥16 years on December 11, 2020[1]. On May 10, 2021, the EUA was extended to 12 according to the Phase 3 clinical trial[2,3].

Following the administration of the Pfizer-BioNTech vaccine to the adolescent age group, especially to young males, increasing cases of myopericarditis thought to be vaccine-related have been reported[4]. Thereupon, the Centers for Disease Control (CDC)'s Advisory Committee on Immunization Practices (ACIP) reconsidered its EUA decision, reviewed the available data, and then decided to continue to administer the vaccine above 12 years of age, stating that the risks associated with the disease are greater than the side effects of the vaccine[5]. Vaccine Adverse Event Reporting System (VAERS) is currently ongoing to monitor the safety of the Pfizer-BioNTech vaccine[6]. Therefore, it is vital that physicians administering vaccines in the field report the side effects they encounter. The transparency to be carried out in this area will also benefit clinicians in terms of vaccine opposition and hesitancy.

Although the association of Biontech myopericarditis has been defined, to the best of our knowledge, rhabdomyolysis without myocarditis related to the Pfizer-BioNTech vaccine has never been presented before. Herein, we describe an adolescent male who experienced severe myositis within 10 days of BNT162b2 mRNA Covid-19 vaccination without an alternative cause.

Case

A previously healthy 16-year-old male patient attended the pediatric clinic of our university hospital with the complaint of generalized weakness and muscle pain. He had been vaccinated with a second dose ofBNT162b2 mRNA Covid-19 (Pfizer-BioNTech) vaccine 10 days prior. After about 48 hours, he experienced bilateral leg pain and muscle weakness. He complained of subfebrile fever and headache that disappeared within two days. The patient had no history of previous Covid 19 infection, no history of trauma, excessive exercise, or exposure to temperature extremes before admission. He denied using any kind of herbal or illegal drugs prior to admission.

Physical examination was unremarkable other than increased body weight [body mass index (BMI) 28,3] and slightly decreased muscle strength (4/5 on both extremities). Cardiac examination revealed a normal apical heart beat and heart sounds. On laboratory evaluation: White blood cell count 8350 cells/mm3, hemoglobin 14.8 g/dL, absolute neutrophil count 5480 cells/mm3, absolute lymphocyte count 2340 cells/mm3 and platelets 269.000 cells/mm3. Electrolytes include sodium 140 mmol/L, potassium 5 mmol/L, chloride 100 mmol/L, phospor 4.6 mg/dL and magnesium 2.4 mg/dL. Other laboratory parameters included blood urea nitrogen 42 mg/dL, creatinine 1,57 mg/dL, creatine kinase (CK) 71339 U/L (normal < 270 U/L), uric acid 7.9 mg/dL, CK-MB 58 U/L (normal <25 U/L), troponin-I 0,001 mcg/L (normal < 0.2 mcg/L). Prothrombin time, active partial thromboplastin time and D-dimer tests were within normal limits.

Respiratory viral polymerase chain reaction (PCR) analysis including 22 respiratory viruses [adenovirus, coronavirus 229E, coronavirus HKU1, coronavirus NL63, coronavirus

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OC43, middle east respiratory syndrome coronavirus (MERS-CoV), severe acute respiratory syndrome coronavirus (SARS-CoV-2), human metapneumovirus, human rhinovirus, enterovirus, influenza A, influenza A/H1, influenza A/H3, influenza A/H1-2009, influenza B, parainfluenza virus type 1,2,3 and 4, respiratory syncytial virus] and 4 bacteria (*Bordetella pertussis, Bordetella parapertussis, Chlamydia pneumonia, Mycoplasma pneumonia*) [BIOFIRE® FILMARRAY® Respiratory 2.1 plus Panel (RP2.1plus) Instruction Booklet, FAIV] were negative.

Electrocardiogram revealed normal sinus rhythm. His echocardiographic examination was normal. Abdominal ultrasonography revealed mild hepatic steatosis. He was hydrated with saline (2000 cc/m2/day) for 4 days. In the follow-up, the patient improved, creatinine and CK levels gradually decreased, and normalized within 2 weeks (Table-1).

Discussion

It is a fact that a revolution has been made in the fight against COVID with mRNA vaccines. In an ongoing multinational, placebo-controlled, pivotal efficacy trial, a two-dose regimen of BNT162b2 conferred 95% protection against Covid-19 with a proven short-term safety profile[7]. In the publications reported from various countries that share real-life experiences after the application in the general population, it has been declared that the vaccine is generally safe. Most of the reported side effects are non-serious events like injection site pain, fatigue, headache, muscle pain, and chills[3,7,8]. Likewise, although administration of the vaccine in adolescents has a relatively short period of time, based on VAERs findings among 8.9 million vaccinated adolescents, 90% of the reported adverse events were non-serious conditions[6]. In the light of current data, estimated myocarditis/pericarditis rates (most serious side effects from vaccination) are ≈12.6 cases per million doses of second-dose mRNA vaccine among individuals 12 to 39 years of age[9]. Although the cause has not been clarified yet, it is believed to be immune response related.

Rhabdomyolysis, the breakdown of skeletal muscle cells, can develop due to many causes such as autoimmune, toxin-related, infectious, endocrine disorders, or trauma-like events[10]. In a comprehensive study in which patients with rhabdomyolysis were evaluated, the most common etiological reasons were trauma, immobilization, and sepsis, respectively[11]. In another study evaluating 475 patients, exogenous toxin exposure was the leading cause[12]. Underlying myopathy or metabolic defects were observed in the minority of the patients[12]. The release of cellular constituents (myoglobin, electrolytes, and cellular enzymes like creatine kinase) can lead to life-threatening consequences including acute kidney injury and disseminated intravascular coagulation[13]. The presentation of rhabdomyolysis includes muscle weakness, myalgias, myoglobinuria related to red to brown urine, and laboratory evidence of cellular damage like increased serum muscle enzymes, hyperkalemia, hyperphosphatemia, and/or hypocalcemia and acute renal injury. Removal of the underlying cause and maintaining fluid and electrolyte balance is the mainstay of treatment[14].

Although there are few case reports proposing an association between rhabdomyolysis with/ without myocarditis and the influenza vaccine, in the light of the literature review, there is no case of rhabdomyolysis associated with the Pfizer-BioNTech vaccine yet[15]. Despite severe rhabdomyolysis in our case, the absence of myocarditis is also an important feature. Although we could not perform a detailed examination in terms of metabolic diseases and a drug/toxic screen in our case, we think that rhabdomyolysis is vaccine-related, since the patient was completely healthy before, laboratory analysis was normal in terms of infectious diseases with the most common association of rhabdomyolysis, and there was no use of herbal or illegal drugs. The possibility of myocarditis has been eliminated by the absence of chest pain, the normality of cardiac enzymes, ECG, and echocardiographic examination in the patient. The uncomplicated recovery of our patient after forced diuresis, which is recommended for the treatment of rhabdomyolysis, was the highlight of the case and enabled us to avoid possible genetic and metabolic causes as a diagnosis.

Conclusions

Initial findings on mRNA vaccines, which ushered in a new era in the covid-19 pandemic, indicate that the highly effective vaccine is generally safe. However, reporting the side effects that can be seen in large population applications is very important in order to prevent hesitancy and opposition that may develop against the vaccine by creating transparency around the world.

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