

Carnitine palmitoyltransferase II deficiency and post-COVID vaccination rhabdomyolysis

Alicia Tan¹, Karolina M. Stepien², Shashi Thej Koppa Narayana¹

¹Warrington and Halton Hospitals NHS Trust, United Kingdom ²Salford Royal NHS Foundation Trust, UK

Email of the corresponding author: Alicia.tan1@nhs.net

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Abstract

Carnitine palmitoyltransferase II (CPT II) deficiency is a disorder affecting fatty acid oxidation. The myopathic form of the condition is the most common among adults and manifests itself with a high serum creatine kinase (CK) concentration. Triggers of very high CK concentrations include periods of fasting, infection, exercise, stress, and exposure to extreme temperatures.

A 27-year-old man known to have CPT II deficiency presented feeling generally unwell after his COVID-19 vaccine. His CK concentration of 105,000 U/L and deranged liver function tests (ALT 300 U/L and AST 1496 U/L) were in keeping with rhabdomyolysis. His biochemical parameters and myopathy resolved with continuous intravenous dextrose 10% and a high carbohydrate diet.

Caution should be exercised when administering vaccinations (including the COVID-19 vaccination) to this population. Clinicians should be wary for signs and symptoms of CPT II deficiency exacerbations and be vigilant in monitoring serum CK.

Introduction

Carnitine palmitoyltransferase II (CPT II) deficiency is a disorder of long-chain fatty-acid oxidation (FAO), caused by mutations in the *CPT2* gene¹. FAO is a process that aids the breakdown of fat into energy. Without this process, the body cannot breakdown fat, and as a result, fatty acids accumulate in the liver, heart, and muscles. The most common form of CPTII deficiency in adults is the myopathic form causing a high creatine kinase (CK) and myoglobin, often paired with myalgia due to rhabdomyolysis. Triggers of severe muscle symptoms include periods of fasting, infection, exercise, stress, and exposure to extreme temperatures¹.

Case Report

A 27-year-old man, known to be affected with an underlying inherited metabolic disorder developed a generalized illness five hours after he had his COVID-19 Vaccine AstraZeneca. He

presented with fever, vomiting, shortness of breath, frank haematuria, and myalgia. On examination, he had muscle weakness and no bruises or swelling of his muscles. There was no recent history of trauma or use of recreational drugs. He was not affected with COVID-19 infection before.

On admission, his haematological and biochemical blood tests showed slightly raised white cell count at 12.9×10^9 , deranged liver function tests (ALT 300 U/L and AST 1496 U/L) and a CK 102,560 U/L that peaked at 250,000U/L on day 3 (Fig 1). There were no obvious signs of infections on clinical or radiological findings. His serum potassium and phosphate were normal. His adjusted calcium was slightly low at 1.98 mmol/L, which can occur during rhabdomyolysis.

Clinical management included continuous intravenous 10% dextrose and a carbohydrate rich diet as per BIMDG guidelines². His myalgia and fever resolved with paracetamol treatment. Eventually on day 9 of an in-hospital stay, his CK had decreased to around 1000 U/L and he was discharged home (Fig 1).

Discussion

Due to the rarity of FAOD, published material related to these disorders, COVID and the COVID vaccine are relatively scarce. There is a case report on a 23-year-old female with a background of Long-chain L-3 hydroxyacyl-CoA dehydrogenase (LCHAD) deficiency who unfortunately died due to COVID³. In this case, the patient developed metabolic decompensation leading to rhabdomyolysis and acute kidney injury, and subsequently died due to acute respiratory failure and acute cardiomyopathy³. This illustrates the significant morbidity and mortality of COVID in individuals with FAODs.

Side effects of the vaccine as seen in this case are rare. Common and recognised post COVID vaccine side effects include tenderness around the injection site, fever, headache, nausea, and myalgia. The safety report released by Medicines and Healthcare products Regulatory Agency (MHRA) suggests adverse reactions were generally less frequent in older adults⁴.

There is evidence to suggest that Triton X – 100, commonly used in the making of biopharmaceutical products, such as the influenza vaccine, causes exacerbation of CPT II¹. Caution is often advised for individuals with CPT II deficiency before receiving annual flu vaccinations. More research should be carried out to investigate if there is a similar mechanism with the COVID vaccine and exacerbation of CPTII deficiency.

It is important for us to be cautious when delivering vaccinations to individuals with FAODs as highlighted in this case. Clinical trials clearly illustrate the efficacy of the COVID vaccine with more than 70% and 90% efficacy for AstraZeneca and Pfizer respectively after the first dose^{5,6}. This paired with the vulnerability of these individuals demonstrate the benefits of the COVID vaccine far outweigh the side effects. However, we must recognise the rare but potentially fatal side effect of rhabdomyolysis with the COVID vaccine and be vigilant to monitor serum CK concentration in this population.

Learning Point for Clinicians:

- CPT II is a rare neuromuscular disease that may present with repeatedly raised CK throughout life.

- The common triggering symptoms are infection, dehydration, exercise, and prolonged fasting.
- COVID-19 vaccination is a triggering factor for rhabdomyolysis in a patient affected with an underlying neuromuscular disorder.

Patient consent

Informed consent was obtained from the patient for publication of this case report.

Conflicts of Interest

The authors have no conflicts of interest to declare.

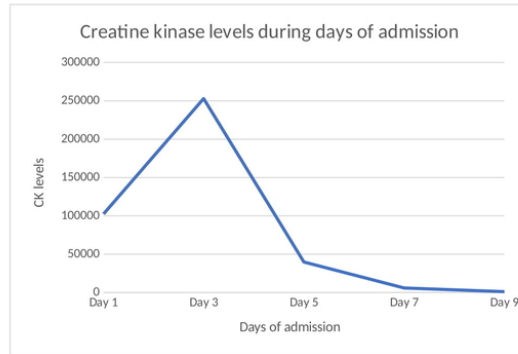
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Figure 1



70x98mm (300 x 300 DPI)

List of Abbreviations:

CK- creatine kinase

CPT II- Carnitine palmitoyltransferase II deficiency

FAO-fatty acid oxidation

FAOD- fatty acid oxidation defects

MHRA- Medicines and Healthcare products Regulatory Agency