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RESEARCH ARTICLE

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Myocarditis and Pfizer/Biontech Bnt162b2 Vaccine Relationship or Coincidence?

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ABSTRACT

Background: Myocarditis is an inflammation of the cardiac muscle, myocardium, characterized by inflammatory infiltrates and myocardial injury without ischemic cause. Being the viral etiology the main cause. Pfizer's BNT162b2 vaccine is a formulated lipid nanoparticle that encodes the full-length peak of SARS-CoV-2

Methodology: A narrative review was carried out through various databases from January 2010 to June 2021; the search and selection of articles was carried out in journals indexed in Spanish and English. The following were used as keywords: Myocarditis, Covid-19, BNT162b2, Pfizer.

Results: There is a close relationship between the development of myocarditis after vaccination with Pfizer / BioNTech BNT162b2, as evidenced in different clinical case reports. Taking into account that the comorbidities present in patients can influence its development.

Conclusions: The present review offers a relationship between the development of myocarditis after the PfizerBioNTech BNT162b2 vaccination, as its cause.

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Introduction

Myocarditis is an inflammation of the cardiac muscle, myocardium, characterized by inflammatory infiltrates and myocardial injury without ischemic cause. Viral diseases are the main causes, with non-infectious etiology being the least frequent [1]. Myocarditis can affect a focal part of the myocardium or a diffuse involvement, being classified as acute, subacute and chronic. Its clinical presentation can range from mild chest pain or fever to life-threatening congestive heart failure or arrhythmia, or even death [2]. The immune system plays an important role in myocarditis and its complications. As is the case of infectious etiologies, the agent enters through the respiratory or gastroenteric system with subsequent binding to the specific receptor of the heart. Leading to cell lysis or damage, mediated by intracellular replication. Fibrosis can also be observed in long-term cases and necrosis with involvement of the coronary vessels [3].

Viral myocarditis is a combination of direct cell injury and T-lymphocyte-mediated cytotoxicity, which can increase in cytokine storm syndrome. The central mediator being Interleukin 6 (IL-6), stimulating a greater release of inflammatory cytokines, which stimulate more T lymphocytes and causing myocardial damage. This affects several races equally and both sexes, it is common in young adults, being involved in 5% of patients who develop an acute viral disease. The incidence is 10 to 22 cases per 100,000 inhabitants, with an estimated 1.5 million cases worldwide in 2013 [4, 5].

The prevalence of myocarditis among COVID-19 patients is unclear. But in case series studies of 150 COVID-19 patients, a

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mortality of 7% of 68 deaths attributed to COVID-19 disease was found [5].

Pfizer's BNT162b2 vaccine is a formulated lipid nanoparticle that encodes the full-length peak of SARS-CoV-2, modified by two mutations of proline to block it in the profusion conformation and more closely mimic the intact virus, with the that the neutralizing antibodies of evoked viruses must interact[(6, 7].

Other studies have reported on inflammatory diseases following the Pfizer BNT162b2 vaccination. Abdulla et al, report on 27 cases of post-vaccination immune-mediated diseases, of which 21 had an autoimmune / rheumatic history [8]. Karolina et al, report the case of a 32-year-old health worker, who presented with itchy granulomatous annular rash on both elbows 48 hours after the first dose [9]. Victoria et al, report on the reactivation of herpes zoster after vaccination with BNT162b2 mRNA in patients with autoimmune inflammatory rheumatic diseases [10]. Therefore, given the high incidence of myocarditis and its high mortality, with a possible association with COVID-19 disease, and the association of the Pfizer BNT162b2 Vaccine with inflammatory diseases, it is advisable to carry out this work, in order to establish the relationship or coincidence between myocarditis and the Pfizer vaccination.

Materials and Methods

A narrative review was carried out, in which the PubMed, Scielo and ScienceDirect databases, among others, were searched. The collection and selection of articles was carried out in journals indexed in Spanish and English from 2010 to 2021. As keywords, the following terms were used in the databases according to the DeCS and MeSH methodology: myocarditis; Covid-19; BNT162-2; Pfizer. In this review, 58 original, review and case report publications related to the subject studied were identified, of which 22 articles met the specified inclusion requirements, such as articles that were in a range not less than the year 2010, that they were full-text articles and that they reported on the relationship of the development of myocarditis after the BNT162b2 vaccination of PfizerBioNTech. As exclusion criteria, it was taken into account that the articles did not have sufficient information and that they did not present the full text at the time of their review.

Results

Development of Myocarditis Post Vaccination with Pfizer / Biontech Bnt162b2

Vaccination against covid-19 is progressing satisfactorily in the world, generally the adverse effects that occur do not require great medical importance, however, several cases of myopericarditis associated with vaccination with Pfizer / BioNTech BNT162b2 have been described [11].

In the case report published by Bautista J, et al. describes a 39-year-old patient with a history of gastritis, autoimmune hypothyroidism, bronchial asthma and episodes of spontaneous pneumothorax and atrial fibrillation, receives two doses of BNT162b2 and develops fever within six hours, undergoes chest x-rays, PCR for SARS-CoV -2, transthoracic echocardiogram, CT angiography without significant findings, the electrocardiogram identified a diffuse elevation in the T wave, troponin T was elevated, so it was decided to opt for medical treatment when suspecting myocarditis, and the diagnosis through cardiac magnetic resonance imaging, where subepicardial enhancement and edema in the T2-STIR sequence were observed in the mid-distal lateral region [12].

Another case report published by D'Angelo T, et al is a 30-year-old patient who consulted for resternal pain and fever 72 hours after receiving the second dose, a nasopharyngeal test for Covid-19 was performed and this was negative, it was ruled out other cardiovascular and metabolic causes, elevated troponin and electrocardiographic findings suggestive of myocardial injury due to ST elevation in V2 and V3 or possible pericarditis, the diagnosis was also made through cardiac magnetic resonance imaging, due to suspected myocarditis [13]. Another case series published by Abu S, et al. Six patients with a mean age of 22 years were studied, all of them suffered a mild course of myocarditis, only two had alterations on the echocardiogram, and subepicardial enhancement and myocardial edema on cardiac magnetic resonance imaging were found in all [14]. In the case presented by Albert E, et al. The patient's symptoms were substernal pain, which worsened with deep inspiration the CPK, troponin I, were found elevated, tomography, transthoracic echocardiogram and normal angiography were also performed, finding pathological cardiac magnetic resonance imaging with gadolinium with characteristic findings of myocarditis sharp [15].

Myocarditis Associated with other Vaccines and Comorbidities

Myocarditis has been previously described as an adverse reaction to other vaccines such as smallpox and against the influenza virus, although the etiology of post-vaccination myocarditis is not known for sure, a possible mechanism of molecular mimicry is suggested as they are similar structurally myocardial protein antigens [13]. On the other hand, myocarditis has also been identified in patients with Covid-19 and different pathophysiological mechanisms are proposed such as the immune response to Sars-CoV-2 with cytotoxic T lymphocytes, direct injury to myocardial cells by the virus, and the cytokine storm [14].

In the systematic review published by Sawalha K, et al. A registry of fourteen cases with suspected myocarditis as a manifestation of covid-19 was described, the mean age was 50.4 years and half of the cases had no comorbidities, 75% of the cases were admitted due to the presence of dyspnea and fever 64% presented shock, mainly of a cardiogenic type, the troponins rose in 91%, the echocardiogram was performed in 80% of the cases, of these in 60% a reduction in the ejection fraction was observed, 20% presented cardiac tamponade and 43% identified the characteristic subpericardial enhancement with gadolinium of myocarditis [16].

Three phases of myocarditis have been described, the first is the inflammatory phase that occurs parallel to the infection, the second is the immune response to the infection, the third is when there is resolution of the infection and the scar occurs in the tissue [17] Even in a systematic review published by Willi S, et al, cardiovascular sequelae were observed in patients who suffered from COVID-19, up to 11 months after infection, such as myocarditis, pericarditis and perimyocarditis, a daunting fact due to possible complications, which They could be generated from this, such as ventricular arrhythmias, ventricular fibrillation and even sudden cardiac death [18]. In the first studies carried out in China during the pandemic, of pathological findings found in patients who died with fulminant myocarditis, mononuclear

cell infiltrates were found, but infection by Sars-CoV-2 was not confirmed [19].

Cardiovascular complications such as acute myocarditis in patients with covid-19 are also usually more frequent in groups with diabetes mellitus. P = 0.004 [20].

The diagnosis of myocarditis as a complication of covid-19 or after vaccination with the BNT162b2 from Pfizer / BioNTech, has been made mainly with cardiac magnetic resonance, using the original and Lake Louise criteria and in the treatment several have been proposed drugs such as colchicine, glucocorticoids, immunoglobulins, interferon, among others, however, evidence is still lacking to establish which is the best therapeutic option [16, 21].

Discussion

There is a close relationship between the development of myocarditis after vaccination with Pfizer / BioNTech BNT162b2, as evidenced by different case reports and case series. Taking into account that the comorbidities present in patients can influence its development. Also, myocarditis has been described as an adverse reaction to other vaccines such as smallpox and against the influenza virus, as well as its development after COVID-19.

In vaccination with COVID-19, patients may experience side effects after the second dose, which can be more intense than the first dose, causing minor side effects such as fever, chills, muscle pain, headache, fatigue, redness at the injection site, swelling, and pain [22]. Elisabeth et al, present a case of development of myocarditis after vaccination with Moderna, although it is not the Pfizer vaccine that this work proposes as a trigger for the development of myocarditis, it affirms it by proposing its development after vaccination against COVID-19 [15].

A strength of the current study is the methodology implemented, with respect to the literature search, and steps in the selection of relevant articles, quality assessment and data extraction. However, this study has several limitations, which should be taken into account before reaching a conclusion, among these is the little evidence from analysis of large-scale clinical trials to accurately determine the relationship between the development of myocarditis after surgery. PfizerBioNTech vaccination as the main trigger.

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