



Lipodystrophy following Covid-19 Vaccination: A case report

Mehrnaz Shakarami^a, Farnaz Sinaei^a, Bardiya Ghaderi Yazdi^a, Bentolhoda Ziaadini^{b,*}

^a Department of Neurology, Shariati Hospital, Tehran University of Medical Sciences, Tehran, Iran

^b Neurology Research Center, Kerman University of Medical Sciences, Kerman, Iran

ARTICLE INFO

Keywords:

Lipoatrophy
Covid-19
Sinopharm Vaccine
Coronavirus

ABSTRACT

Lipodystrophy is a medical condition characterized by complete or partial loss of adipose tissue. The etiology of lipoatrophy can be congenital or acquired, including traumatic, iatrogenic, or idiopathic. Rarely, vaccination can cause lipodystrophy. Here, we report the first case of lipodystrophy associated with the COVID-19 Sinopharm vaccine in a 55-year-old woman.

Introduction

On March 11th, 2020, the World Health Organization announced the recognition of COVID-19 as a pandemic after the total cases in 114 countries of the world exceeded 114,000 [1]. The first Covid vaccine, the Pfizer-BioNTech COVID-19 Vaccine, was approved under Emergency Use Authorization (EUA) by the FDA on December 11th, 2020 [2]. After that, other COVID-19 vaccines, including the Sinopharm COVID-19 vaccine, obtained Emergency Use Listing (EUL) [3]. The Sinopharm or SARS-CoV-2 Vaccine prompts the synthesis of antibodies against the inactivated virus antigen with an effectiveness of 86 % [4,5]. This vaccine was developed by a Chinese company and was approved in December 2020 [5,6]. Two biweekly injections of this vaccine are recommended [5]. According to the Johns Hopkins Coronavirus Resource Center [7], as of January 5th, 2022, 53,018,325 people have been vaccinated against COVID-19.

The commonly reported side effects of the administration of the Sinopharm Covid vaccine were mostly reported as soreness in the injection site, short-term fever, headache, chills, and body aches [8–11]. There are reports of emerging neurological complications as the adverse effect of SARS-CoV-2 vaccination, including Guillain-Barré syndrome (encapsulating all Guillain-Barré syndrome variants including Miller Fisher syndrome), Bell's palsy, myasthenic disorders, and hemorrhagic stroke [12]. Cardiovascular complications are another category of reported COVID-19 vaccine side effects, which include myocarditis, cardiac arrhythmia, and pericarditis [13]. Lipodystrophy is a term that describes the partial or complete loss of fat tissues. Lipodystrophy can

occur in many diseases. One of the etiologies of lipodystrophy is an adverse effect, that arises after some vaccine injections. We report a case of lipoatrophy for the first time as the adverse effect of receiving the Sinopharm Covid-19 vaccine in 2021.

Case presentation

A 55-year-old diabetic woman approached our medical center with a complaint of skin depression on both her arms and thigh. She has been under treatment for diabetes for the last eight years, and she has been receiving insulin for four years. She injected insulin in her belly, and no injections were performed in her arms for four years. She received the first dose of the Sinopharm Covid-19 vaccine in August 2021 in the left deltoid muscle. Since she noticed skin depression on her left arm after a month, she received the second dose in September 2021 in the right arm. She did not experience any inflammatory reactions, including fever, chills, or myalgia, following Covid vaccinations. It was about two months, November 2021, after her second dose that she noticed a painless depression in her right deltoid, and recently, in December 2021, a milder pitting in the right quadriceps muscle (Fig. 1). She had not experienced any adverse effects after her previous non-COVID vaccines, including her recent Influenza vaccine.

Neurologic examination, including muscle tone, force, and stretch reflexes, was unrevealing. Electrodiagnostic studies, Creatine-Kinase levels, Triglyceride levels, and Liver enzyme tests were normal. The cholesterol level is 250 mg/dl, and the HbA1C is 7.5 %. Magnetic resonance imaging (MRI) showed no muscle involvement, but a

Abbreviations: Covid-19, Coronavirus disease 2019; EMG, Electromyography; NCV, Nerve Conduction Velocity; MRI, Magnetic Resonance Imaging; DPT, Diphtheria, Pertussis, Tetanus; HPV, Human Papillomavirus.

* Corresponding author.

E-mail address: dr.bentolhodaziaadini@gmail.com (B. Ziaadini).

<https://doi.org/10.1016/j.jvacx.2024.100513>

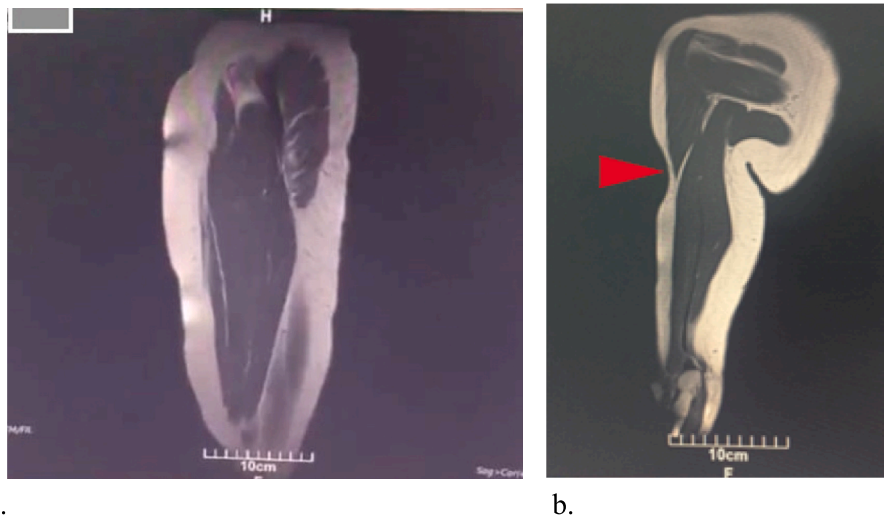
Received 7 December 2022; Received in revised form 16 April 2024; Accepted 19 June 2024

Available online 22 June 2024

2590-1362/© 2024 Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



Fig. 1. Lipodystrophy in Both Arms (left picture) and Thigh (right picture).



a.

b.

Fig. 2. Images of T2 Coronal (a) and Sagittal (b) MRI of arm: Sagittal (b) view represents signal change over subcutaneous Fat Tissues (lowered hyper signal fat tissues showed by arrowhead).

profound subcutaneous atrophy in the fat tissue was observed (Fig. 2).

This complication, which occurred following our patient's injection of the COVID-19 vaccine, was unexpected and has not been reported. The reported lipoatrophy in our patient's arms and thigh remained unchanged after four months of follow-up.

Discussion

The side effects of the administration of the Sinopharm COVID-19 vaccine were mainly reported as soreness in the injection site, short-term fever, headache, chills, and body aches [8–11]. Some studies even mentioned Sinopharm having the mildest side effects compared to other vaccines in their investigation [11]. Our patient did not report any acute inflammatory reaction, and developing delayed lipoatrophy was uncommon and unforeseen.

For our patient, neuromuscular involvement, including myositis [14] and macrophagic myofasciitis [15], was ruled out because our patient's creatine kinase (CK) and electromyography turned out to be normal. Other causes of lipodystrophy were irrelevant in our patient. These causes include antiretroviral therapy or genetic abnormalities in skin fat cells that may cause local adverse effects after injections. [16].

Localized lipoatrophy is a noted adverse effect due to the injection of

diverse drugs, such as insulin, corticosteroids, and benzathine penicillin [17]. However, there are a few reports of lipodystrophy recognized as a vaccine injection side effect [4,18–21], and these include the Diphtheria-Pertussis-Tetanus vaccine (DPT), Influenza vaccine, Quadrivalent human papillomavirus (HPV), recombinant vaccine (Gardasil), and AstraZeneca Covid-19 Vaccine.

Localized lipoatrophy is a noted adverse effect due to the injection of diverse drugs such as insulin, corticosteroids, and benzathine penicillin [17]. We reported here, for the first time, an adverse effect of the Sinopharm Covid-19 vaccine appearing as lipoatrophy.

There is no clear pathogenesis of lipoatrophy due to vaccine injections. Lipodystrophy is a common adverse effect of insulin injection in diabetes patients either due to repeated injections at the same site or an immune complex-mediated response at the injection site [22]. Although immune-triggered lipoatrophy at insulin injection sites has become rare since the advent of human insulin [23], the same mechanism can be applied to lipodystrophy with the COVID-19 vaccine. Another Mechanism could be an inflammatory reaction in the site of injection, due to improper needle penetration [20]. Moreover, it is noteworthy that the Sinopharm vaccine contains Aluminum Hydroxide as an adjuvant to boost the immune response [24], which may have contributed to post-vaccine atrophy [25]. The appropriate needle

length, which depends on age, body mass, and proper injection technique, is consequential in preventing the seeping of the vaccine into the subcutaneous tissue [26]. Although esthetical impairments must be regarded carefully, we strongly suggest considering the long-term prognosis by following up with the vaccinated community over time.

Ethical approval and consent to participate

Ethical approval is unnecessary for retrospective studies and case presentations in our institutional policies.

Consent for publication

The patient gave written informed consent to publish this case report and any accompanying images. The editor-in-chief of this journal can review a copy of the written consent.

Funding

This research received no specific grant from any public, commercial, or not-for-profit funding agency.

CRedit authorship contribution statement

Mehrnaz Shakarami: Writing – review & editing, Writing – original draft, Validation, Data curation. **Farnaz Sinaei:** Writing – review & editing, Validation, Supervision, Project administration, Conceptualization. **Bardiya Ghaderi Yazdi:** Writing – review & editing, Supervision. **Bentolhoda Ziaadini:** Writing – review & editing, Supervision, Data curation, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgments

None

References

- [1] FDA Approves First COVID-19 Vaccine, <https://www.fda.gov/news-events/press-announcements/fda-approves-first-covid-19-vaccine>.
- [2] WHO Coronavirus Disease (COVID-19): Vaccines World Health Organization), <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines>.
- [3] WHO lists additional COVID-19 vaccine for emergency use and issues interim policy recommendations <https://www.who.int/news/item/07-05-2021-who-lists-additional-covid-19-vaccine-for-emergency-use-and-issues-interim-policy-recommendations>.
- [4] Cook IF. Localized lipoatrophy and inadvertent subcutaneous administration of a COVID-19 vaccine. *Hum Vaccin Immunother* 2022;18(5):2042136. <https://doi.org/10.1080/21645515.2022.2042136>. Epub 2022 Mar 8. PMID: 35258436; PMCID: PMC9196709.
- [5] Saeed BQ, Al-Shahrabi R, Alhaj SS, Alkolkhardi ZM, Adrees AO. Side effects and perceptions following Sinopharm COVID-19 vaccination. *Int J Infect Dis* 2021;111:219–26 [PMC free article] [PubMed] [Google Scholar].
- [6] Xia S, Duan K, Zhang Y, Zhao D, Zhang H, Xie Z, et al. Effect of an inactivated vaccine against SARS-CoV-2 on safety and immunogenicity outcomes: interim analysis of 2 randomized clinical trials. *J Am Med Assoc* 2020;324(10):951–60 [PMC free article] [PubMed] [Google Scholar].
- [7] Understanding Vaccination Progress John Hopkins Coronavirus Resource Center, <https://coronavirus.jhu.edu/vaccines/international>, [last accessed: January 15, 2022].
- [8] Abu-Halaweh S, Alqassieh R, Suleiman A, Al-Sabbagh MQ, AbuHalaweh M, AlKhader D, et al. Qualitative assessment of early adverse effects of Pfizer–BioNTech and sinopharm COVID-19 vaccines by telephone interviews. *Vaccines* 2021;9(9):950.
- [9] Ahamed F, Ganesan S, James A, Zaher WA. Understanding perception and acceptance of Sinopharm vaccine and vaccination against COVID–19 in the UAE. *BMC Public Health* 2021;21(1):1–11.
- [10] Saeed BQ, Al-Shahrabi R, Alhaj SS, Alkolkhardi ZM, Adrees AO. Side effects and perceptions following Sinopharm COVID-19 vaccination. *Int J Infect Dis* 2021;111:219–26.
- [11] Zahid MN. *Vaccines* 2021;9(11):1369.
- [12] Patone M, Handunnetthi L, Saati D, Pan J, Katikireddi SV, Razvi S, et al. Neurological complications after first dose of COVID-19 vaccines and SARS-CoV-2 infection. *Nat Med* 2021;27(12):2144–53.
- [13] Patone M, Mei XW, Handunnetthi L, Dixon S, Zaccardi F, Shankar-Hari M, et al. Risks of myocarditis, pericarditis, and cardiac arrhythmias associated with COVID-19 vaccination or SARS-CoV-2 infection. *Nat Med* 2022;28(2):410–22.
- [14] Ramírez-Rivera J, Vega-Cruz AM, Jaume-Anselmi F. Polymyositis: rare complication of hepatitis B vaccination. An unusual cause of toxic shock syndrome. *Boletín de la Asociación Médica de Puerto Rico* 2003;95(6):13–6.
- [15] Lach B, Cupler EJ. Macrophagic myofasciitis in children is a localized reaction to vaccination. *J Child Neurol* 2008;23(6):614–9.
- [16] Dowell P, Flexner C, Kwiterovich PO, Lane MD. Suppression of preadipocyte differentiation and promotion of adipocyte death by HIV protease inhibitors. *J Biol Chem* 2000;275(52):41325–32.
- [17] Milan G, Murano I, Costa S, Pianta A, Tiengo C, Zulato E, et al. Lipoatrophy induced by subcutaneous insulin infusion: ultrastructural analysis and gene expression profiling. *J Clin Endocrinol Metab* 2010;95(7):3126–32.
- [18] Buntain WL, Missall SR. Local subcutaneous atrophy following measles, mumps, and rubella vaccination. *Am J Dis Child* 1976;130(3):335.
- [19] Javelle E, Soulier B, Brosset C, Lorcy S, Simon F. Delayed focal lipoatrophy after AS03-adjuvanted influenza A (H1N1) 2009 vaccine. *Vaccine* 2011;29(6):1123–5.
- [20] Ahmed I. Post-injection involutinal lipoatrophy: ultrastructural evidence for an activated macrophage phenotype and macrophage related involution of adipocytes. *Am J Dermatopathol* 2006;28(4):334–7.
- [21] Ojaimi S, Buttery JP, Korman TM. Quadrivalent Human Papillomavirus recombinant vaccine associated lipoatrophy. *Vaccine* 2009;27(36):4876–8.
- [22] Reitman ML, Arioglu E, Gavrilova O, Taylor SI. Lipoatrophy revisited. *Trends Endocrinol Metab* 2000;11(10):410–6.
- [23] Radermecker RP, Pierard GE, Scheen AJ. Lipodystrophy reactions to insulin. *Am J Clin Dermatol* 2007;8(1):21–8.
- [24] Sinopharm [Vero Cell]- Inactivated, COVID-19 vaccine, WHO (2021), available at: <https://www.who.int/publications/m/item/sinopharm-vero-cell-inactivated-covid-19-vaccine>.
- [25] Dahl PR, Zalla MJ, Winkelmann RK. Localized involutinal lipoatrophy: a clinicopathologic study of 16 patients. *J Am Acad Dermatol* 1996;35(4):523–8.
- [26] SARS-COV-2 Vaccine Administration Training, Adapted from Northwestern Medicine North Region EMS System, Chicago, IL, available at: https://www.ems.gov/pdf/COVID-19_Vaccine_Administration_Training_for_EMTs.pdf.