Journal of Dermatology Research

Open Access

Case Report

Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report

Chii-Shyan Wang[1], Hsuan-Hsiang Chen[2,3]*

[1]Department of Dermatology, En Chu Kong Hospital, New Taipei City, Taiwan

[2]Department of Dermatology, National Taiwan University Hospital and National Taiwan University College of Medicine, Taipei, Taiwan

[3]Department of Dermatology, Fu Jen Catholic University Hospital, Fu Jen Catholic University, New Taipei City, Taiwan

***Corresponding Author:** Hsuan-Hsiang Chen, MD, Department of Dermatology, National Taiwan University Hospital, 7, Chung-Shan South Road, Taipei, Taiwan; E-mail: beauty101@gmail.com

Received Date: 16-06-2022; **Accepted Date:** 15-07-2022; **Published Date:** 22-07-2022

Abstract

Background: Alopecia Areata (AA) is a common autoimmune disease leading to non-scarring hair loss. Previously, AA had been noted following various vaccinations including influenza virus, hepatitis B virus, herpes zoster virus, human papillomavirus, Japanese encephalitis, and Clostridium tetani. During this pandemic, AA following SARS-CoV-2 vaccine injection was rarely reported

Objective: We report a case of diffuse AA and its trichoscopic findings following COVID-19 mRNA-1273 vaccination.

Method: A trichoscopic examination of the scalp was performed. An English literature review through PubMed and an online search of the Vaccine Adverse Event Reporting System (VAERS) database were conducted.

Finding: Only 20 patients of AA following SARS-CoV-2 vaccination were reported in the English literature. Black dots and broken hair were the most common features, followed by yellow dots and exclamation mark hairs. The VAERS database showed 77.8% were associated

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

with the BNT162b2 vaccine and 20.9% with the COVID-19 mRNA-1273 vaccine, respectively.

Conclusion: A rare case of AA and its trichoscopic findings following COVID-19 mRNA-1273 vaccine injection was reported. The COVID-19 vaccines may play a role in various immune-related dermatologic conditions.

Keywords

Alopecia Areata; COVID-19; Dermatology; Hair Loss, mRNA Vaccine; Trichoscopy

Introduction

Alopecia Areata (AA) is an autoimmune non-scarring hair loss disease with complex pathogenesis of hair bulb inflammation and the loss of hair follicle immune privilege mediated through Major Histocompatibility Complex (MHC) presentation and interferon-γ (IFN-γ) expression [1-4]. Increased susceptibility to AA may be associated with genes related to the immune system, structural proteins, and antioxidant enzymes. Four theories, including activation of mast cells via neuroendocrine stimuli, activation of the innate immune system via Toll-like receptors, stress-induced MHC class I polypeptide-related sequence A (MICA) expression on hair follicles, and central immune dysregulation, were proposed to explain immune privilege collapse [5]. Further participation of other immune pathways, such as interleukin-15 and T-helper-17, are required to result in immune privilege collapse [5].

Cases of AA have been identified after vaccination against influenza virus, hepatitis B virus, herpes zoster virus, human papillomavirus, Japanese encephalitis, and Clostridium tetani [6,7]. During this pandemic, acute SARS-CoV-2 infection has been associated with the development of telogen effluvium, alopecia areata, friction alopecia, and anagen effluvium [8]. AA following various SARS-CoV-2 vaccine injections was rarely reported, however [1,6,7,9-13]. The exact pathogenetic mechanism that leads to AA after infection or vaccination is still unclear. Herein, we report a case of diffuse AA following COVID-19 mRNA-1273 (Moderna) vaccination. Its common trichoscopic findings are also discussed.

Case Report

A 27-year-old female patient developed diffuse hair loss one week after the first dose of the COVID-19 mRNA-1273 vaccine. The hair loss developed over the vertex, frontal, and bilateral

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

temporal scalp. The patient complained of weight loss with a poor appetite under her psychiatric medication recently but denied any other previous history of similar hair loss episodes, autoimmune diseases, thyroid disorders, infectious diseases, or contacts with COVID-19 patients. The scalp examination revealed diffuse hair loss over the vertex, frontal and bilateral temporal scalp (Fig. 1). The pull test of the scalp was positive. Her eyebrows, eyelashes, axillary, and genital hairs were not involved.

A trichoscopic examination demonstrated yellow dots, black dots, exclamation mark hairs, and vellus hairs (Fig. 2). These findings were compatible with diffuse AA. However, the patient did not accept other investigatory laboratory examinations or a scalp biopsy. She was treated with oral prednisolone 20 mg daily for 2 weeks. Her condition became worse, and she was lost to follow up.

Figure 1: Diffuse hair loss developed over the frontal, temporal, and vertex scalp.

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

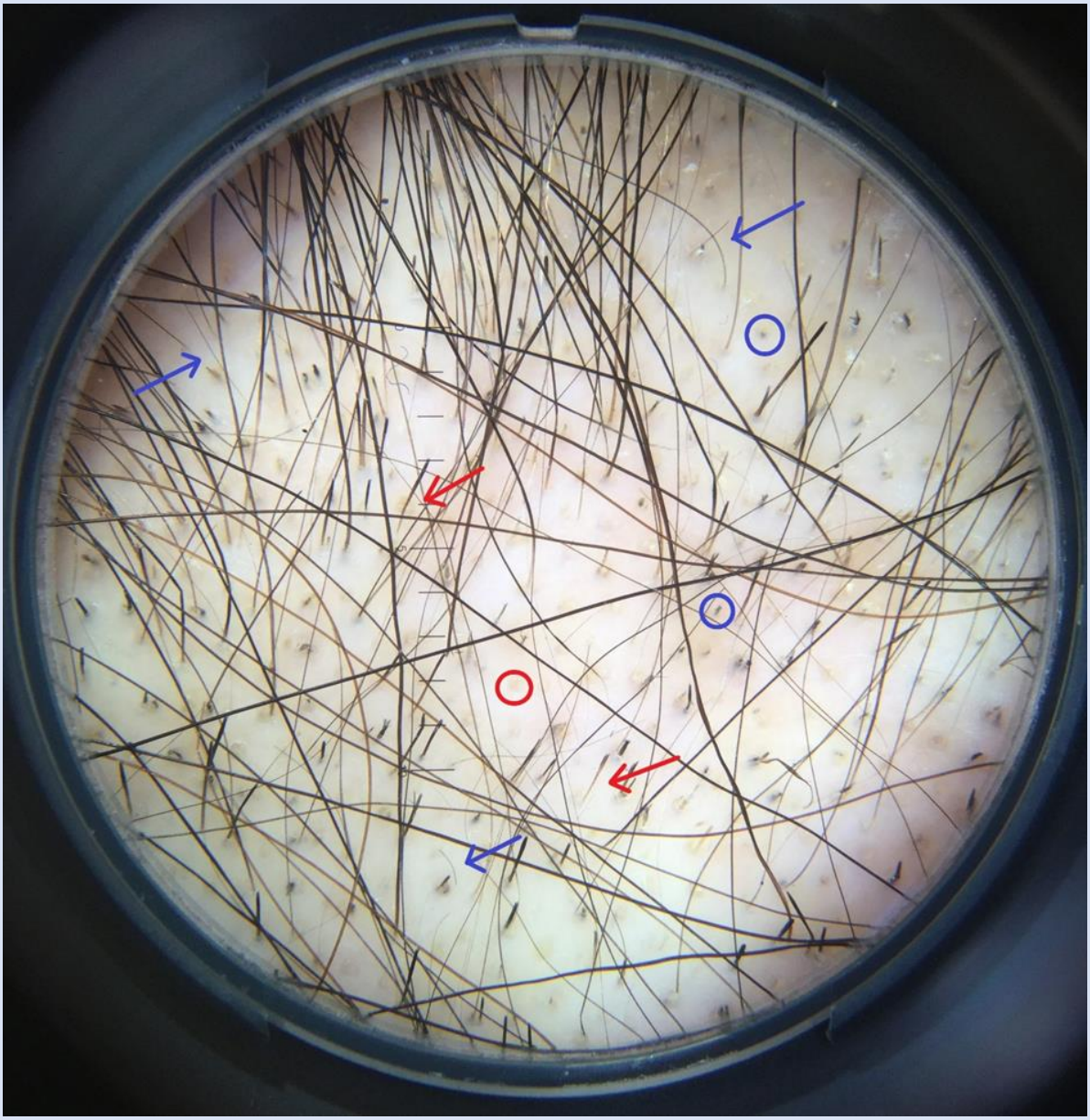

Figure 2: Trichoscopy revealed yellow dots (red circle), black dots (blue circle), exclamation mark hairs (red arrow), and vellus hairs (blue arrow).

Discussion

AA is an autoimmune-mediated hair loss with an estimated incidence of around 2% in the community [8]. Genetic factors, autoimmune diseases, stress, atopic diathesis, nutritional deficiency, hormonal changes, infections, and vaccination have been implicated in the pathogenesis of this disease. A perifollicular immune dysregulation associated with T-cells,

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

Natural-Killer (NK) cells, plasmacytoid dendritic cells, Interleukin-15 (IL-15), IFN-γ, MICA, NK group 2 member D (NKG2D), and Autoimmune Regulator (AIRE) gene has been identified [5]. During the COVID-19 pandemic, its incidence has risen significantly. Bardazzi, et al., described three patients aged 28 to 56 years who developed AA 2 to 3 weeks following a moderate SARS-CoV-2 infection [11]. They hypothesized that the cytokines storm triggered by COVID-19 resulted in raised levels of Interleukin-4 (IL-4), Interleukin-6 (IL-6), Tumor Necrosis Factor-α (TNF-α), as well as a cellular immunity of CD8-positive T and NK cell-dependent cytotoxic response against the MHC class I of proximal outer root sheath, which could be up-regulated by type I interferon (IFN-I).

Previously, AA has been described after vaccination against influenza virus, hepatitis B virus, herpes zoster virus, human papillomavirus, Japanese encephalitis, and Clostridium tetani [6,7]. AA following SARS-CoV-2 vaccination was reported rarely, but its occurrence was increasing worldwide. An online search of the Vaccine Adverse Event Reporting System (VAERS) database from the Centers for Disease Control and Prevention (CDC) revealed that 288 cases of AA, 17 of alopecia totalis, and 20 of alopecia universalis were registered before May 13, 2022 [14]. Among these 325 cases, 253 (77.8%) were associated with the BNT162b2 vaccine and 68 (20.9%) with the COVID-19 mRNA-1273 vaccine, respectively (Table 1). Most of them were not reported in the literature. Only 20 patients of AA following SARS-CoV-2 vaccination were reported in the English literature (Table 2), 11 (55%) with BNT162b2 vaccine and 5 (25%) with COVID-19 mRNA-1273 vaccine, respectively. Among them, half (50%) developed AA after the 2nd dose injection, and 8 (40%) had previous AA medical history.

It is hypothesized by Rossi, et al., that SARS-CoV-2 vaccination can induce the activation of NF-kB and the release of various cytokines, including high levels of IFN and IL-6, which cause the up-regulation of MHC class I expression and the collapse of the hair follicle immune privilege, leading to T-cell immune reactions against the hair follicles [1]. Essam, et al., proposed another theory that molecular mimicry between the vaccine-induced spike proteins of SARS-CoV-2 and human follicular structure might trigger the formation of pathological auto-antibodies against the hair bulb under the adjuvants enhancement [12]. The possible role of SARS-CoV-2 vaccination in the pathogenesis of alopecia areata was illustrated in their report [12]. Because none of these reported cases received scalp biopsies, it is difficult to prove these concepts under pathological examination. The assessment of SARS-CoV-2 infection in our patient was not performed because she denied any other previous history of similar hair loss episodes, autoimmune diseases, thyroid disorders, infectious diseases, or contacts with COVID-19 patients. Because our patient developed alopecia one week after the first dose of the COVID-19 mRNA-1273 vaccine without previous AA history, her vaccine-induced autoimmunity may result from genetic predisposition, which is similar to the vaccine-induced thrombotic thrombocytopenia [15].

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

Trichoscopic findings of AA can be variable. According to Waśkiel, et al., the most frequently reported features of AA were yellow dots, black dots, broken hairs, exclamation mark hairs, and short vellus hairs [16]. Tapered hairs, upright regrowing hairs, pigtail hairs, and Pohl-Pinkus constrictions were rarely reported but may be helpful in the diagnosis of AA. The diagnosis of AA should be based on the coexistence of several trichoscopic findings because there is no definite pathognomonic marker. The previously reported trichoscopic findings of AA following SARS-CoV-2 vaccination were listed in Table 3. Black dots and broken hair were the most common features, followed by yellow dots and exclamation mark hairs. Cadaveric hairs, pigtail hairs, and Pohl-Pinkus constrictions were only reported once [6,11]. Our patient showed yellow dots, black dots, exclamation mark hairs, and vellus hairs, which were typical trichoscopic findings of AA. No other notable features were found.

Various treatments have been used to target the immunological dysregulation of AA. The treatment of AA after SARS-CoV-2 vaccination can be challenging because the differences in clinical courses and treatment responses between vaccine- and non-vaccine-related AA are unclear. The choices of dosages and treatment modalities are also limited, because the traditional immunosuppressants as well as newer biologics treatments may affect the production of desired antibody formation by SARS-CoV-2 vaccination. Most of the reported cases were treated with topical or intralesional corticosteroids (Table 2). Oral vitamin D, topical minoxidil, and topical immunotherapy with squaric acid dibutylester had been used without obvious clinical responses during the follow-up period [1,6]. Vazquez, et al., reported that a 28-year-old patient had complete resolution of his AA at a 6-month follow-up with only two sessions of advanced Platelet-Rich Fibrin (PRF) treatments at an 8-week interval [10]. They suggested that micronized PRF could be a possible future treatment for AA because it continuously releases large amounts of growth factors for up to 28 days. Scollan, et al., described 6 patients of AA following SARS-CoV-2 vaccination received tofacitinib 5 or 10 mg twice a day [7]. However, the treatment responses were not mentioned in their report. Our case was treated with systemic steroids for 2 weeks initially but her condition deteriorated. Currently, the clinical treatment response to traditional therapies or biologics like Janus Kinase (JAK) inhibitors in AA following SARS-CoV-2 vaccination is unknown due to limited cases and a relatively short follow-up period. There is no recommendation or consensus for the various clinical subtypes of AA following vaccination. Corticosteroids (topical or intralesional) and JAK inhibitors may be the best and most effective documented treatment options in alopecia areata following SARS-CoV-2 vaccination. Further studies are needed to evaluate the efficacy of these treatment modalities in this subset of patients.

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

Vaccines	BNT162b2			mRNA-1273			Others	
	1st dose	2nd dose	Total [a]	1st dose	2nd dose	Total [a]		Total
Alopecia areata	82	119	221	26	30	63	4	288
Alopecia totalis	4	9	14	1	1	3	0	17
Alopecia universalis	6	9	18	1	0	2	0	20
Total No.			253			68	4	325
a: The total numbers include 3rd dose and more doses in addition to 1st and 2nd dose vaccination.								

Table 1: AA following SARS-CoV-2 vaccination before May 13th, 2022 from the online VAERS search results [14].

Study	No	Age	Sex	Vaccine	Timing	Treatment	Underlying Dz
Essam et al.[12]	1	32	F	ChAdOx1	Few days after vaccination	NA[a]	AA[g]
Su et al.[13]	1	42	M	ChAdOx1	3 weeks after 1st dose	IL [b]	-
Rossiet al.[1]	2	29, 59	F	ChAdOx1	2-3 weeks after 1st dose	TC[c], oral Vit D	AA (2), Thyroid dz
	1	76	F	BNT162b2	2 weeks after 1st dose	TC	AA
Gallo et al.[9]	1	31	M	BNT162b2	3 weeks after 2nd dose	NA	-
May Lee et al.[6]	1	80	M	BNT162b2	1 week after 1st dose	SAD [d], TC, TM [e]	-
Bardazzi et al.[11]	2	NA	NA	BNT162b2	1-2 weeks after 1st dose	TC + oral steroids	AA (1)
	1	NA	NA	mRNA-1273	1-2 weeks after 1st dose	NA	NA
Scollan et al.[7]	6	15-61	3M 3F	BNT162b2	1 week-4 months after 1st (2) or 2nd dose (4)	Tofacitinib (3), IL (2)	AA (2), thyroid dz, arthralgia
	3	22-62	1M 2F	mRNA-1273	1-2 months after 2nd dose	Tofacitinib, bimatoprost (1),	AA (1), HBV [h], Thyroid dz

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

Vazquez et al.[10]	1	28	M	mRNA-1273	6 weeks after 1st dose	PRF [f]	COVID-19
Current case	1	27	F	mRNA-1273	1 week after 1st dose	oral steroids	-
a NA: Not Available; b IL: Intralesional Steroids Injection; c TC: Topical Corticosteroids; d SAD: Topical Squaric Acid Dibutylester; e TM: Topical Minoxidil; f PRF: Platelet-Rich Fibrin; g AA: Alopecia Areata; h HBV: Hepatitis B Virus							

Table 2: AA following SARS-CoV-2 vaccination in the English literature.

Trichoscopic findings	Ref
Dots: black dots Hairs: broken hairs	1
Dots: yellow dots, black dots Hairs: dystrophic hairs, vellus hairs	9
Hairs: exclamation point hairs, broken hairs, cadaveric hairs	6
Dots: yellow dots, black dots Hairs: broken hairs, pigtail hairs Others: Pohl–Pinkus restrictions	11
Dots: black dots Hairs: broken hairs, exclamation mark hairs, newly growing hairs	12
Dots: yellow dots, black dots Hairs: exclamation mark hairs, vellus hairs, tapering hairs	13
Dots: yellow dots, black dots Hairs: exclamation mark hairs, vellus hairs	Current case

Table 3: Trichoscopic findings of AA following SARS-CoV-2 vaccination.

Conclusion

In conclusion, we report a rare case of AA and its trichoscopic findings following COVID-19 mRNA-1273 vaccine injection. Besides its pathogenesis, treatment for AA following SARS-CoV-2 vaccination is also discussed extensively. The COVID-19 vaccines may play a role in various immune-related dermatologic conditions. Periodical follow-ups on patients with complications after COVID-19 vaccines are necessary. Further studies on the underlying mechanism of vaccine-induced hair loss are mandatory to confirm the causative link between AA and SARS-CoV-2 vaccination.

Wang CS | Volume 3; Issue 2 (2022) | JDR-3(2)-043 | Case Report

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212

Conflict of Interest

The authors declare that they have no conflict of interest.

Acknowledgments

We would like to thank Yan-Chen Yeh for editing and reviewing this manuscript for the English language.

References

1. Rossi A, Magri F, Michelini S, Caro G, Di Fraia M, Fortuna MC, et al. Recurrence of alopecia areata after COVID-19vaccination: A report of three cases in Italy. J Cosmet Dermatol. 2021;20(12):3753-7.
2. Sterkens A, Lambert J, Bervoets A. Alopecia areata: a review on diagnosis, immunological etiopathogenesis and treatment options. Clin Exp Med. 2021;21(2):215-30.
3. Juárez-Rendón KJ, Rivera Sánchez G, Reyes-López MÁ, García-Ortiz JE, Bocanegra-García V, Guardiola-Avila I, et al. Alopecia Areata Current situation and perspectives. Arch Argent Pediatr. 2017;115(6):e404-e11.
4. Trüeb RM, Dias MFRG. Alopecia Areata: A comprehensive review of pathogenesis and management. Clin Rev Allergy Immunol. 2018;54(1):68-87.
5. Rajabi F, Drake LA, Senna MM, Rezaei N. Alopecia areata: a review of disease pathogenesis. Br J Dermatol. 2018;179(5):1033-48.
6. May Lee M, Bertolani M, Pierobon E, Lotti T, Feliciani C, Satolli F. Alopecia areata following COVID-19 vaccination: vaccine-induced autoimmunity? Int J Dermatol. 2022;61(5):634-5.
7. Scollan ME, Breneman A, Kinariwalla N, Soliman Y, Youssef S, Bordone LA, et al. Alopecia areata after SARS-CoV-2 vaccination. JAAD Case Rep. 2022;20:1-5.
8. Aryanian Z, Balighi K, Hatami P, Afshar ZM, Mohandesi NA. The role of SARS-CoV-2 infection and its vaccines in various types of hair loss. Dermatol Ther. 2022;35(6):e15433.
9. Gallo G, Mastorino L, Tonella L, Ribero S, Quaglino P. Alopecia areata after COVID-19 vaccination. Clin Exp Vaccine Res. 2022;11(1):129-32.
10. Vazquez OA, Safeek RH, Komberg J, Becker H. Alopecia areata treated with advanced platelet-rich fibrin using micronization. Plast Reconstr Surg Glob Open. 2022;10(1):e4032.
11. Bardazzi F, Guglielmo A, Abbenante D, Sacchelli L, Sechi A, Starace MVR. New insights into alopecia areata during COVID-19 pandemic: When infection or vaccination could play a role. J Cosmet Dermatol. 2022;21(5):1796-8.
12. Essam R, Ehab R, Al-Razzaz R, Khater MW, Moustafa EA. Alopecia areata after ChAdOx1 nCoV-19 vaccine (Oxford/AstraZeneca): a potential triggering factor? J Cosmet Dermatol. 2021;20(12):3727-9.
13. Su HA, Juan CK, Chen YC. Alopecia areata following ChAdOx1 nCoV-19 vaccination (Oxford/AstraZeneca). J Formos Med Assoc. 2022;S0929-6646(22):00108-5.
14. United States Department of Health and Human Services (DHHS), Public Health Service (PHS), Centers for Disease Control (CDC)/Food and Drug Administration (FDA) [Internet]. The Vaccine Adverse Event Reporting System (VAERS), CDC WONDER online database. Last accessed on May 25, 2022] http://wonder.cdc.gov/vaers.html
15. Dotan A, Shoenfeld Y. Perspectives on vaccine induced thrombotic thrombocytopenia. J Autoimmun. 2021 ;121:102663.
16. Waśkiel A, Rakowska A, Sikora M, Olszewska M, Rudnicka L. Trichoscopy of alopecia areata: An update. J Dermatol. 2018;45(6):692-700.

Citation: Chen HH, et al. Diffuse Alopecia Areata and Its Trichoscopic Findings Following COVID-19 mRNA-1273 Vaccination: A Case Report and Literature Review. J Dermatol Res. 2022;3(2):1-9.

DOI: https://doi.org/10.46889/JDR.2022.3212