

Inadvertent injection of COVID-19 vaccine into deltoid muscle vasculature may result in vaccine distribution to distance tissues and consequent adverse reactions

Ng recently raised an important concern about the inadvertent subcutaneous injection of COVID-19 vaccines that may lead to poor vaccine efficacy and adverse reactions.¹ It is correct that the COVID-19 vaccines (such as AstraZeneca, Pfizer, Moderna, Janssen/J&J) are designed for administration by intramuscular injection and should not be injected intravascularly, subcutaneously or intradermally. However, the author further explained that due to the good vascularity in the muscles, the injected vaccine will reach systemic circulation quicker whereas the poor vascularity in the subcutaneous tissue can lead to vaccine failure, this is incorrect.

Most drugs injected into the muscles are meant for sustained absorption through the muscle vasculature and consequent distribution to body tissues is imperative for drugs to reach their target sites to exhibit their pharmacological and therapeutic effects. Unlike many drugs that are injected into the muscles, vaccines are not designed for absorption and distribution to systemic circulation. Once injected into the muscles, the COVID-19 vaccines spur an immune response against vaccine transfected cells. The antigen, lymphocytes and antigen-presenting cells drain through lymphatics into lymph nodes leading to humoral and cellular immune responses following vaccination. The COVID-19 vaccines absorption into systemic circulation may lead to vaccine distribution

and transfection in distant tissues beyond injection site, that can cause rare serious adverse effects including autoimmune reactions against distance tissues.²

It has been recently demonstrated that direct administration of vaccine into—and distribution through systemic circulation may be responsible for platelets-adenoviral vector interaction, platelets aggregation and activation.³ This may also explain vaccine-induced immune thrombotic thrombocytopenia, also known as the thrombosis with thrombocytopenia syndrome, leading to postimmunisation rare fatal thrombotic events like cerebral venous sinus thrombosis or the splanchnic vein thrombosis.⁴ Other adverse reactions of concern, such as postvaccine myocarditis/pericarditis⁵ and Guillain-Barré syndrome² may also be associated with inadvertent vaccine distribution and transfection to tissues beyond injection site.

It was, therefore, cautioned that intramuscular injection of vaccine should be done with aspiration technique to avoid inadvertent vaccine administration into deltoid muscle vasculature that may lead to vaccine distribution to distance tissues which increases the risk of developing severe adverse reactions to COVID-19 vaccines. Poor injection technique may also cause a direct injury to the axillary nerves adjacent to the injection site in deltoid muscle that may lead to peripheral neuropathy. The consequent vaccine transfection and translation in the nerves may spur an immune response against nerve cells potentially causing an autoimmune nerve damage, for instance Guillain-Barré syndrome. All COVID vaccinators should be made aware of potential complications of poor injection technique; competency-based assessments may be considered for all vaccinators to improve COVID vaccine safety.

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Correction notice This article has been corrected since it was first published. Correspondence address postcode has been corrected to HD1 3DH.

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Contributors HM conceived the concept, wrote, revised and approved the final version of the manuscript.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; internally peer reviewed.

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To cite Merchant H. *Postgrad Med J* 2022;**98**:e5.

Accepted 18 September 2021

Published Online First 29 September 2021

Postgrad Med J 2022;**98**:e5.

doi:10.1136/postgradmedj-2021-141119

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