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Avoiding shoulder injury from intramuscular vaccines

With the roll-out of COVID-19 vaccination programmes to tens of millions of people, some individuals might receive vaccines, which have received rigorous safety checks and approval from regulatory bodies, via intramuscular injection. However, the safety around the technique used and the site of injection, in particular, has received little attention. As recommended by the Joint Committee on Vaccination and Immunisation (JCVI), adults aged 16 years or older will be the main population receiving the intramuscular vaccine. The JCVI recommends the deltoid muscle as the optimal injection site, shown graphically as a triangle with the base starting around 1–3 cm below the acromion (appendix).¹ However, this site is not universally accepted as the most appropriate; other organisations advocate alternative sites, such as a triangular region with the base around 5 cm below the acromion and the apex at the level of the axilla apex (approximating the middle third of the deltoid muscle),² or midway between the acromion and the deltoid tubercle.^{3,4}

The site closest to the acromion and origin of the deltoid has several anatomical structures within its vicinity, including the posterior circumflex humeral artery, the anterior branch of the axillary nerve (located 5 cm below the acromion lateral border), and the subacromial-subdeltoid bursa.² The subdeltoid bursa can extend to 4.0 cm below the acromion and 1.3 cm below the skin.

A range of injuries have been reported to the Vaccine Adverse Event Reporting System database in the USA following vaccination (mostly for influenza). Injuries were predominantly shoulder pain and dysfunction (due to pain, joint-range restriction, bursitis, and stiff

shoulder), and patients reported that the vaccines were administered “too high” on the arm.⁵ Spanish pharmacovigilance organisations have similarly reported bursitis and other shoulder injuries following intramuscular vaccination administered in the deltoid.

Anthropometric studies of the optimal site of vaccination have identified that the safest anatomical site in adults of both sexes would be approximately (varying by size and sex) 7–13 cm below the mid-acromion, anatomically midway between the acromion and the deltoid tuberosity (appendix). This region avoids the anterior branch of the axillary nerve or the subacromial-subdeltoid bursa.^{3,4} The risk of injury can be further reduced by the recipient placing their hand on the ipsilateral hip (ie, abducting the shoulder to 60°) when receiving the injection. This manoeuvre reduces exposure of the subacromial-subdeltoid bursa to injury. An injection administered at 90° to the skin's surface with a 25 mm needle routinely penetrates at least 5 mm of muscle in men and women.

Updating policy and training vaccinators to safely administer the vaccine in the appropriate intramuscular site will be essential for ensuring efficacy of the vaccine, as placement in a bursa or joint will prevent immune system exposure, and for increasing comfort and reducing pain in vaccine recipients.

We declare no competing interests.

*R H Behrens, Vipul Patel
ron.behrens@lshtm.ac.uk

London School of Hygiene & Tropical Medicine, London WC1E 7HT, UK (RHB); South West London Elective Orthopaedic Centre, London, UK (VP)

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Time to revise the strategy for Gavi funding of rabies vaccine?

The Global Burden of Disease cause and risk summary on rabies shows the 13 700 deaths worldwide in 2019, close to the estimated 12 700 furious rabies cases in India alone.¹ Figure 4 of this summary is misleading, especially the key. As there is no surveillance in many of the poorest countries, the global annual deaths quoted by WHO² of 59 000 is derived from extensive extrapolation. Rabies encephalomyelitis is always fatal in Asia and Africa. Although prevention of infection by correct vaccination after dog bites is extremely effective, vaccines are often inaccessible in most African countries.

Gavi, the Vaccine Alliance, has committed to conditional funding of post-exposure rabies vaccine in Asia and Africa starting in 2021.³ Preparatory surveys in several African countries show a widespread lack of infrastructure and public health provision. For example, in Chad, only 42% of health clinics surveyed had cold facilities for vaccine storage.⁴ Effective distribution and use of vaccines would be difficult and take many years to achieve. The realistic costs of implementation in rural areas were not considered in recent evaluations of possible approaches.⁵

The COVID-19 pandemic has dramatically changed the situation. Innovative concepts, plans, and



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For the **Global Burden of Disease cause and risk summary on rabies** see <https://www.thelancet.com/pb-assets/Lancet/gbd/summaries/diseases/rabies.pdf>
See Online for appendix

For more on the **Vaccine Adverse Event Reporting System database** see <https://wonder.cdc.gov/vaers.html>