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EVALUATION OF NEEDLE LENGTH AND INJECTION SITE TO MAXIMIZE SUCCESSFUL INTRAMUSCULAR INOCULATIONS AND MINIMIZE OVERPENETRATION DURING INTRAMUSCULAR DELTOID VACCINATIONS

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Background: Current recommendations for needle length and vaccination site for intramuscular deltoid vaccinations are backed by minimal data. We aimed to determine the ideal needle length and vaccination site for intramuscular deltoid vaccine administration.

Methods: 120 shoulder CT scans were evaluated and grouped by patient weight and sex as recommended by the United States CDC: Group 1, <60 kg, Group 2, 60-70 kg, Group 3, females 70-90 kg and males 70-118 kg, and Group 4, females >90 kg and males >118 kg. For each group, distance from skin to deltoid fascia and deltoid muscle width were measured at 2, 4, and 6 cm distal to the posterolateral corner of the acromion for 5 unique trajectories. Needle lengths of 0.625″, 1.0″, and 1.5″ were simulated at each site to determine inoculation location relative to the deltoid.

Results: For Group 1, a 0.625″ needle in the mid-lateral (ML) trajectory 4 cm distal to the posterolateral corner provided a perfect rate of successful inoculations (100%). For Groups 2-3, a 1″ needle in the posterolateral (PL) trajectory 4 cm distal provided high rates (>80%) of successful intramuscular inoculations with low rates of overpenetration (<15%) while minimizing risk to the axillary nerve. For Group 4, a 1.5″ needle using the same strategy provided the highest rate of successful inoculations (96%) and minimal overpenetration (4%). Overpenetration was associated with more anterior and superior injection sites ($P < 0.001$ for both) for all needle lengths.

Conclusions: The overall ideal injection site to maximize successful intramuscular vaccine administration, minimize overpenetration, and avoid axillary nerve injury is 4 cm distal to and in line with the posterolateral corner of the acromion, a site more posterior and inferior than current CDC recommendations. We caution against use of a 1.5″ needle for patients <118 kg due to high predicted rates of overpenetration.