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Shoulder injury related to vaccine administration reported more frequently

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Shoulder injury related to vaccine administration (SIRVA) is believed to be caused by an immune response following inadvertent, direct injection of a vaccine into the deltoid bursa or joint space.

The presentation of SIRVA typically includes rapid onset of severe, long-lasting shoulder pain following vaccination in the deltoid muscle, resultant limited range of motion and absence of infection. Data from the Vaccine Adverse Event Reporting System suggest SIRVA is being reported with increasing frequency.

Which of the following statements regarding vaccine administration are correct?

a) The suggested route of administration for each vaccine is recommended by the manufacturer and is based on studies showing maximum safety and immunogenicity.

b) The presence or absence of an adjuvant is not a factor when considering vaccine administration.

c) For most infants younger than 12 months of age, the anterolateral thigh muscle is the preferred site because it has more muscle mass than the deltoid muscle.

d) The buttock generally should not be used for active immunization because of limited absorption from gluteal fat.

Answer: a, c and d are correct

Vaccines should be administered in an anatomic area where neural, vascular or tissue injury is unlikely to occur. For intramuscular injections, the needle length should be long enough to ensure injection occurs in the muscle mass. Too long a needle length increases the risk that injection may involve nerves, blood vessels or skeletal structures. Suggested needle lengths are presented in the 2015 *Red Book* (Table 1.7, page 28, http://bit.ly/2tgo990). Most intramuscular injections are performed with a 22- to 25-gauge needle.

Injectable vaccines are administered by the intramuscular, subcutaneous or intradermal routes except for the smallpox vaccine, which is administered by the percutaneous route using a bifurcated needle (scarification).

Selection of the proper injection site and needle length depends on the amount of muscle and adipose tissue at the selected site, the child's age and the volume to be injected. Inactivated vaccines containing an adjuvant should be injected into muscle to avoid the risk of local irritation, skin discoloration and granuloma formation that may be associated with subcutaneous injection.

For infants less than 1 month of age, a 5/8-inch needle is suggested for injection in the anterolateral thigh. For term infants 1 through 12 months of age, a 1-inch needle is suggested. For toddlers and children, either the anterolateral thigh or deltoid muscles are suggested. If two vaccines are administered in the same limb at the same visit, they should be spaced 1-inch apart.

Transient, mild shoulder discomfort following immunization in the deltoid muscle is a common side effect of vaccination. Severe, persistent shoulder pain in association with prolonged limitation of function is rare.

SIRVA identifies a specific condition that is associated with vaccine inadvertently administered into the deltoid bursa or joint space. Patients with SIRVA experience shoulder injury that is more severe than would be expected from just needle trauma. One theory suggests that an immune reaction to one or more components of the vaccine may be responsible for signs and symptoms of SIRVA.

In a series of 13 cases among adult patients published by the Vaccine Injury Compensation Program (Atanasoff S, et al. *Vaccine*. 2010;28:8049-8052), shoulder pain was noted immediately after vaccination in 50% of cases, and pain developed in 90% within 24 hours. The most common findings on physical examination were painful and limited range of motion. Arm weakness and sensory changes were uncommon. Deep tendon reflexes were normal. Symptoms persisted six months to several years, and 30% of patients required surgery.

Several theories have been proposed to explain why SIRVA is reported less frequently in children, despite the number of vaccines administered. Administration in the anterolateral thigh avoids the risk of joint involvement; bunching of the subcutaneous and deltoid tissue prior to vaccination may increase the distance to the shoulder; and the developing subacromial bursa may be less developed (smaller) in children.

Most cases in adults occur after administration of a vaccine to which some immunity already exists because of previous immunization such as influenza or tetanus-containing vaccines. This may result in a greater inflammatory response following inadvertent injection into the skeletal structures of the shoulder.

The number of people for whom compensation for SIRVA was awarded by the Vaccine Injury Compensation Program in 2016 was 202 cases. Many instances of SIRVA may be avoided by proper vaccination technique and positioning.

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