Study: Most Needles for IM Injections Too Long

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Up to 61% of children getting intramuscular injections in the shoulder are probably receiving overpenetration injuries, because the recommended needles are longer than the average fat and muscle layer of the deltoid, according to results of an imaging study of 250 children.

"Our data suggest that the [national] recommendations for needle length for intramuscular injection in the shoulder will overpenetrate the muscle layer and strike bone or periosteum in 11%, 55%, and 61% of patients who receive 5/8-, 7/8-, or 1-inch needles," wrote William C. Lippert and his colleague, Dr. Eric J. Wall. "This could cause severe pain and also impair delivery to the intramuscular level."

Their imaging study of a subset of 250 children aged 2 months to 18 years concluded that weight and gender should guide needle selection for shoulder injections. Since girls have less muscle in the deltoid, they should generally receive shorter needles than boys (Pediatrics 2008 Aug. 11 [Epub doi:10.1542/peds.2008-0374]).

Mr. Lippert, of Tulane University, New Orleans, and Dr. Wall, of Cincinnati Children's Hospital Medical Center, used MRI and CT scans of the shoulders and thighs of the study population to determine the optimal needle lengths for boys and girls receiving intramuscular injections. All the children had normal shoulder and thigh anatomy; scans were collected as part of care they received at a large children's hospital.

The researchers used fat and muscle thickness, correlated to weight, age, and gender, to determine the safest needle lengths; they then compared their findings with the current recommendations by the Centers for Disease Control and Prevention. For thigh injections, the CDC recommends a 1-inch needle for infants aged 1-12 months and a 1- to 1¼-inch needle for toddlers aged 12-24 months. For shoulder injections, the CDC recommends a 5/8- to 1-inch needle in children aged 1-18 years.

Thigh scans were obtained for 100 patients aged 2 months to 6 years. Using the CDC recommendations, the researchers said, overpenetration would occur in 11% of those injected with a 1-inch needle and 39% of those injected with a 1¼-inch needle.

A total of 150 patients aged 12 months-18 years had scans of the shoulder. The risk for overpenetration with CDC-recommended needles was much greater for deltoid injections. Overpenetration would occur in 11% of children injected with a 5/8-inch needle, 55% of those injected with a 7/8-inch needle, and 61% of those injected with a 1-inch needle.

The investigators also compared muscle and fat thickness between boys and girls of different ages. On average, girls had more fat and muscle in the thighs than did boys of a similar age, and more fat but less muscle in the deltoid.

The researchers suggested that revisions of the CDC needle-length recommendations are in order. For thigh injections of children up to age 6 years, a 7/8- or 1-inch needle is the best option; it would underpenetrate only 2% and overpenetrate only 4% of these pediatric patients. "With these recommendations, 90% of all children who receive a vaccination in the thigh will be vaccinated into the intramuscular level, in comparison with the 64% intramuscular delivery rate if using the current CDC recommendations," the researchers said.

Their recommendations for the male and female shoulder are more complicated, because of the variance in tissue thickness between the genders. The investigators recommended a 1/2-inch needle for girls weighing 70 kg or less and boys weighing 75 kg or less. A 5/8-inch needle should be used for girls weighing 70-115 kg and boys weighing 75-140 kg. A 7/8-inch or longer needle should be used for girls weighing more than 115 kg and boys weighing more than 140 kg.

"With these recommendations, 90% of both female and male patients would be vaccinated safely at the intramuscular level. Also, these recommendations ensure a 0% overpenetration rate for all patients," they said.

Nonetheless, the researchers admitted their study had limitations: "Because of wide geographic variation in infant and child weight, it is difficult to make universal needle-length recommendations."

Neither of the investigators reported any financial disclosures with regard to the study. ■