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Skin and subcutaneous thickness at injecting sites in children with diabetes: ultrasound findings and injecting recommendations

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Introduction:

Children who inject insulin need clear guidelines as to the length of needle best for them. We studied the distance from surface to muscle in children in order to make needle choices which are evidence-based.

Methods:

101 children with type 1 diabetes were divided into three groups according to age: 2-6 years, 7-13 years and 14-17 years (Table 1).

Table 1. Demographics by age group			
	2-6 years	7-13 years	14-17 years
n	31	49	21
Males/Females	18/13	29/20	10/11
Mean Age (±SD)	5.4 (±1.5)	10.6 (±1.8)	15.8 (1.4)
Mean BMI (±SD)	16.9 (±2.0)	19.9 (±3.0)	21.4 (±3.8)
Mean HbA1c (±SD)	7.58 (±0.8)	7.48 (±0.8)	7.51 (±1.1)

The thickness of skin and subcutaneous (SC) tissue was measured by ultrasound on the left and right sides of all children in the four main injection sites: arm, thigh, abdomen and buttocks.

Results: Skin thickness varied from a mean of 1.58 mm in the arm of the youngest children to 2.29 mm in the buttocks of the adolescents (Table 2). Values increase progressively based on age (2-6 < 7-13 < 14-17) and on body site (arm < thigh < abdomen < buttocks). Skin + SC thickness varied in a similar fashion (Table 3).

Table 2. Mean skin thickness (mm ±SD) by age group			
	2-6 years	7-13 years	14-17 years
ARM	1.58 ±0.23	1.71 ±0.29	1.92 ±0.42
THIGH	1.71 ±0.25	1.89 ±0.30	2.14 ±0.35
ABDOMEN	1.71 ±0.27	2.07 ±0.31	2.18 ±0.50
BUTTOCKS	1.97 ±0.27	2.11 ±0.35	2.29 ±0.41

Table 3. Mean skin + SC thickness (mm ±SD) by age			
	2-6 years	7-13 years	14-17 years
ARM	4.89 ±1.47	6.02 ±1.86	6.31 ±1.94
THIGH	6.05 ±2.44	7.36 ±2.31	7.49 ±2.10
ABDOMEN	6.12 ±3.47	7.98 ±3.40	7.75 ±2.91
BUTTOCKS	6.53 ±2.26	8.73 ±3.18	8.12 ±2.81

Nearly 10% of children had surface to muscle distances which were less than 4 mm, especially in the 2-6 year group. In this group the rate of intramuscular (IM) injections with the 4 mm pen needle when inserted straight-in (90°) without a pinch-up would be 20.2%. This rate of IM injections doubles with the 5 mm needle when injections are given under similar conditions and triples with the 6 mm needle. In the older age groups, needle length also meaningfully impacts IM risk; with the 5 mm and 6 mm needle lengths posing IM risks of 16 to 38% (Table 4).

Table 4. Calculated IM risk based on needle length and age (90° insertion, no raised skin fold)			
	2-6 years	7-13 years	14-17 years
4 mm	20.2%	4.6%	2.4%
5 mm	46.0%	18.4%	16.1%
6 mm	66.5%	38.0%	34.5%

Conclusions: It seems medically appropriate for all children to use short needles where possible to minimize inadvertent IM injections which may increase glycemic variability. Currently the safest needle for all children is the 4 mm pen needle. However, injections in children aged 2-6 with the 4 mm needle should be given into a pinched skin fold.

KEY REFERENCES

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