



How appropriate are the lengths of syringe needles used for subcutaneous injections to the children at school age

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There has been a rapid increase in the development of pharmaceutical products. The transdermal route and subcutaneous injection methods of parenteral drug application. It was reported (1,2) that the skin thicknesses change was correlated with age and gender; while further studies showed that these thicknesses do not seem to be correlated with age, gender, body weight and ethnic groups (3,4). Nonetheless, these studies were performed on small sample sizes. It is known that the subcutaneous tissue thicknesses change considerably as a function of gender and body mass (5,6). There exist many studies performed on large sample sizes which investigated the skin fold thicknesses with a caliper. However, there exist very few studies, which measured the skin and subcutaneous tissue thicknesses with ultrasonography and these studies were performed on a small sample space. Thus, this is an area requiring further investigation. There are also no data published from our country, which determined the reference ranges in among children and adolescents. In this study, we had several objectives. Firstly, we aimed to obtain percentile curves for the thicknesses of the skin, subcutaneous tissue and skin-subcutaneous tissues congruent with age, gender by employing an evidence-based methodology through measurements of the skin and subcutaneous tissue-thicknesses in adolescents and children with ultrasonography. Secondly, we wanted to determine whether the current syringe needle-lengths used for the subcutaneous injections were appropriate.

Material and methods and Results

Material-methods

The thicknesses of the skin and subcutaneous tissues of 2244 students were measured at the left arm using ultrasonography. Patients were divided into three groups based on age: 6 to 8, 9 to 12 and 13 to 17 year.

Results

The thicknesses of the skin, subcutaneous tissue and skin-subcutaneous tissue were found to be positively correlated with age, body mass index and body surface area (BSA). All these were observed to be gender related. There is a possibility to make intramuscular injections for the 50%, 25% and 25% percent of boys with age groups of 6 to 8, 9 to 12 and 13 to 17 year, respectively. For the girls, the risk of intramuscular injection is 25% percent for all age groups.

Table 1. The percentiles of the thicknesses of the cutaneous tissue, subcutaneous tissue and cutaneous-subcutaneous tissue as a function of age groups

Tissue Thickness	Boy						Age Groups	Girl						
	10 p.	25 p.	50 p.	75 p.	90 p.	95 p.		5 p.	10 p.	25 p.	50 p.	75 p.	90 p.	95 p.
0,70	0,71	0,80	1,00	1,10	1,30	1,30	6-8	0,70	0,80	0,90	1,00	1,20	1,30	1,50
0,70	0,80	0,90	1,00	1,20	1,30	1,50	8-12	0,80	0,80	0,90	1,00	1,20	1,40	1,50
0,70	0,80	0,90	1,20	1,40	1,60	1,90	12-19	0,80	0,90	1,00	1,30	1,40	1,60	1,70
Subcutaneous Tissue Thickness														
1,70	2,02	2,50	2,90	3,60	4,68	5,14	6-8	1,70	2,10	2,70	3,30	4,10	5,00	5,70
1,70	2,00	2,42	2,90	3,70	4,60	5,79	8-12	1,80	2,20	2,60	3,20	4,00	5,03	6,01
1,70	1,90	2,30	2,90	3,60	4,90	6,40	12-19	2,10	2,40	2,90	3,80	4,75	6,00	6,73
C+S.C.Thickness														
2,70	2,92	3,40	3,90	4,60	5,70	6,04	6-8	2,51	3,00	3,70	4,40	5,22	4,10	6,88
2,60	3,00	3,40	4,00	4,77	5,80	6,99	8-12	2,78	3,20	3,60	4,20	5,10	6,40	7,53
2,70	3,00	3,50	4,10	4,90	6,40	8,40	12-19	3,10	3,40	4,00	5,20	6,10	7,50	8,60

Table 2. Meanvalues of the thicknesses of cutaneous tissue, subcutaneous tissue and cutaneous+subcutaneous tissue as a function of body surface area

BSA(m ²)	Cutaneous Tissue Thickness		Subcutaneous Tissue Thickness		Meanc.+s.c. tissue thickness	
	G	B	G	B	G	B
	$\mu \pm \sigma$ (mm)	$\mu \pm \sigma$ (mm)	$\mu \pm \sigma$ (mm)	$\mu \pm \sigma$ (mm)	$\mu \pm \sigma$ (mm)	$\mu \pm \sigma$ (mm)
0,7	0,91±0,33	1,00±0,31	2,90±0,12	3,45±0,14	3,81±0,14	4,46±0,15
0,8	0,96±0,17	0,96±0,17	2,92±0,07	3,23±0,84	3,88±0,71	4,20±0,90
0,9	0,96±0,15	0,95±0,15	3,00±0,07	3,38±0,75	3,97±0,74	4,33±0,81
1	1,04±0,54	1,03±0,44	3,15±0,09	3,17±0,96	4,20±0,10	4,20±0,11
1,1	0,97±0,17	1,07±0,20	3,16±1,11	3,26±0,10	4,14±0,11	4,33±0,11
1,2	1,02±0,28	1,05±0,22	3,40±1,13	3,29±0,11	4,42±0,14	4,34±0,11
1,3	1,05±0,28	1,22±0,21	3,18±0,13	3,64±0,12	4,24±0,14	4,87±0,13
1,4	1,16±0,30	1,34±0,41	3,66±0,26	4,26±0,15	4,83±0,26	5,60±0,16
1,5	1,34±0,37	1,33±0,24	3,38±0,20	4,50±0,17	4,72±0,21	5,84±0,18
1,6	1,74±0,29	1,51±0,11	3,75±0,45	5,11±0,23	5,49±0,51	6,62±0,28
1,7	1,76±0,22	1,38±0,67	3,88±0,38	5,79±0,36	5,64±0,47	7,17±0,38
1,8	1,43±0,81	1,45±0,15	4,47±0,75	6,55±0,95	5,16±0,51	8,00±1,10

Conclusion

Our study has shown that the skin and skin-subcutaneous tissue thicknesses varies as a function of age, gender, body mass index and body surface area

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