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Distribution of the Subcutaneous Fat Tissue in Patients with Type 2 Diabetes Mellitus

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The aim of the present study is to determine the deposition and distribution of the subcutaneous fat tissue in patients with type 2 diabetes mellitus. Female (n=69) and male (n=36) patients with type 2 diabetes mellitus were examined. The mean age of the females was 65.2 years and of the males 65.5 years. All patients were of Bulgarian ancestry. Nine skin folds in the upper and lower limbs, thorax and abdomen were measured with skin fold calipers type Lange. The data obtained allow determining the tendency of distribution of the subcutaneous fat tissue. In the females the skin folds were thicker in the abdomen than in the thorax and in the lower limbs thicker than in the upper limbs. Males have greater deposition of subcutaneous fat tissue in the thorax than in the abdomen and in the lower limbs than in the upper limbs.

Key words: skin folds, subcutaneous fat tissue, type 2 diabetes mellitus.

Introduction

Diabetes mellitus attracts greatly the interest in the modern society [3, 5]. The relation between age, overweight, distribution of the subcutaneous fat tissue and risk of type 2 diabetes mellitus is widely discussed. The hypothesis of the relationship between type pear and type "apple" obesity in type 2 diabetes mellitus patients and severity of the associated cardiovascular syndromes has been recently proposed [1, 2, 4, 5].

The aim of the present study is to establish the deposition of distribution of the subcutaneous fat tissue in patients of both sexes with type 2 diabetes mellitus.

Material and Methods

Female (n=69) and male (n=36) patients with type 2 diabetes mellitus were examined. The mean age of the females was 65.2 years and of the males 65.5 years. All patients were of Bulgarian ancestry. Skin folds were measured with skin fold calipers type Lange in nine body areas — over the triceps and biceps brachii, in the

forearm, subscapular region, over the 10th rib, abdomen, iliac crest, in the thigh and leg. The data were analyzed in SPSS 11.0. The level of significance was accepted at $p<0.05$.

Results and Discussion

Females

The results of the descriptive statistics of the skin fold thickness are shown in Table 1.

Skin folds of the thorax and upper limb

The skin folds over the 10th rib and in the subscapular region are thickest and the difference between them does not reach statistical significance ($p>0.05$). The thickness of both skin folds is significantly greater than that over the triceps brachii, biceps brachii and in the forearm ($p<0.001$). The skin fold over the triceps is significantly greater than the skin folds over the biceps brachii and in the leg. There is no statistically significant difference between the skin folds over the biceps brachii and in the forearm ($p>0.05$).

Table 1. Descriptive statistics of the skin folds in the female patients (mm)

Variable	*n*	Mean	S.D.	max	min
sf Triceps	69	18.2913	7.6889	40.2	5.2
sf Biceps	69	11.1536	4.5528	24.4	3
sf Antebrach.	69	10.3420	3.7489	21.2	3.8
sf Subscapul.	69	23.7449	8.5139	50	9
sf Xcosta	69	24.4	7.5920	47.4	11.4
sf Abdomen	69	27.78	8.5661	42	7.8
sf Cr. Iliaca	69	18.2261	6.2219	34	5.6
sf Femur	69	17.3739	10.9906	41	4.2
sf Crus	69	17.1783	8.5239	39.2	3.3

Skin folds of the abdomen and lower limb

The skin fold of the abdomen is the thickest and significantly greater than the skin folds over the iliac crest, in the thigh and leg ($p<0.001$). The second in thickness is the skin fold over the iliac crest, which however does not differ significantly from the skin folds in the thigh and leg ($p>0.05$). The last two skin folds are of almost equal thickness.

Comparison between the skin folds of the upper and lower half of the body

The skin fold of the abdomen is the thickest and statistically greater than the skin folds in the upper part of the body and upper limbs ($p<0.001$). The difference between the skin fold of the abdomen and over the 10th rib is of moderate statistical significance ($p<0.01$). The skin folds over the 10th rib and subscapular region are significantly greater than those of the lower limb ($p<0.001$). The skin fold in the thigh is significantly greater than that over the biceps brachii ($p<0.001$) and almost equal

with that over the triceps brachii ($p>0.05$). The skin fold in the leg is almost equal with that over the triceps brachii ($p>0.05$) and significantly thicker that the skin folds over the biceps brachii and in the forearm ($p<0.001$).

The skin fold in the forearm is of lowest thickness followed by that over the biceps. Our findings show an indistinct tendency of deposition of subcutaneous fat tissue in the region of the abdomen and lower limbs. Some authors report that the subcutaneous fat in females with type 2 diabetes mellitus is laid down exclusively in the upper part of the body with tendency to "super apple" [5, 6].

Conclusions

1. The subcutaneous fat tissue deposition in the upper part of the body is greater in the thoracic region and more expressed in the chest than in the back. The subcutaneous fat deposition is less expressed in the upper limbs and especially on the back of the arm.
2. The amount of subcutaneous fat tissue is significantly greater in the region of the abdomen than in the lower limbs.
3. The subcutaneous fat tissue deposition shows a tendency to a downward decrease on the body and is more expressed in the lower than in the upper limbs.

Males

The results of the descriptive statistics of the skin fold thickness are shown in Table 2.

Skin folds of the thorax and upper limb

The thickest is the skin fold over the 10^{th} rib followed by that in the subscapular region and the difference between them does not reach statistical significance ($p>0.05$). The difference between both skin folds and the other skin folds (triceps, biceps and forearm) is statistically significant ($p<0.001$). The upper limb skin folds are of lower thickness and the difference between them and those of the thorax reaches statistical significance. The thickest is the skin fold over the triceps, which is statistically greater than the skin folds over the biceps and in the forearm ($p>0.001$).

Table 2. Descriptive statistics of the skin folds in the male patients (mm)

Variable	*N*	Mean	S D	maxi	min
sf Triceps	36	9.2472	3.3494	18.6	3.2
sf Biceps	36	6.3222	2.5738	12.4	2.6
sf Antebrach.	36	6.1583	2.9292	14	2.6
sf Subscapul.	36	19.0806	7.1612	35.8	7.8
sf Xcosta	36	21.3306	7.3925	40.2	9.8
sf Abdomen	36	19.6583	9.1793	42.4	6.2
sf Cr. Iliaca	36	11.1583	5.7402	31	4
sf Femur	36	11.5361	6.8540	27.8	4
sf Crus	36	7.2667	3.3860	19.6	3.2

Skin folds of the abdomen and lower limb

The skin fold of the abdomen is the thickest and significantly greater than the skin folds over the iliac crest, in the thigh and leg ($p<0.001$). The skin fold in the leg is of lowest thickness and the difference with the other skin folds is statistically significant ($p<0.001$). The skin folds over the iliac crest and in the leg are of almost equal thickness and significantly thinner than the skin fold of the abdomen ($p<0.001$).

Comparison between the skin folds of the upper and lower half of the body

The skin fold over the 10th rib is the thickest followed by those of the abdomen, subscapular region, thigh, iliac crest, triceps, leg, biceps and forearm.

The skin fold over the 10th rib is insignificantly greater than that of the abdomen ($p>0.05$) and significantly greater than the skin folds in the lower limb ($p<0.001$).

The subscapular skin fold is almost equal in thickness to the skin fold of the abdomen ($p>0.05$) and significantly thicker than the skin folds in the lower limb ($p<0.001$).

The skin fold in the thigh is slightly thicker than that over the triceps brachii ($p>0.05$), significantly thicker than the skin folds over the biceps brachii and in the forearm but significantly thinner than the skin folds over the 10th rib and in the subscapular region ($p<0.001$).

The skin fold in the leg is significantly thinner than that over the triceps brachii, 10th rib and subscapular region ($p<0.001$), slightly thicker that the skin fold in the forearm ($p>0.05$) and almost equal to the skin fold over the biceps brachii.

Our findings show an indistinct tendency to a greater deposition of subcutaneous fat tissue in the upper parts of the body. Horejsi et al. have reported that the subscapular and midaxillar skin folds are significantly thicker in male patients with type 2 diabetes mellitus [3]. Hence, there is a tendency to an "apple" type deposition of the subcutaneous fat tissue.

Conclusions

1. The subcutaneous fat tissue deposition in the upper part of the body is greater in the thoracic region and almost equal in the chest and in the back. The subcutaneous fat deposition in the upper limbs is more expressed on the back of the arm.
2. The amount of subcutaneous fat tissue is significantly greater in the region of the abdomen and proximal part of the lower limbs.
3. The subcutaneous fat tissue is greater in the region of the thorax than in the abdomen. The skin folds are thicker in the lower than in the upper limbs. The subcutaneous fat tissue shows a tendency to an "apple" type deposition.

Intergender differences in the skin folds

The examined skin folds are significantly greater in the female than in the male patients with type 2 diabetes mellitus ($p<0.001$). The only exception is the skin fold over the 10th rib with intergender difference failing to reach statistical significance ($p>0.05$).

It could be concluded that the deposition of the subcutaneous fat tissue is greater in the female than in the male type 2 diabetes mellitus patients.

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