



The Rostov State Medical University

ESTIMATION RISK MODEL AS A NEW METHOD OF INSULIN INDUCED LIPOHYPERTROPHY DIAGNOSTICS IN DIABETIC PATIENTS

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Objectives:

to develop the estimation risk model of insulin induced lipohypertrophy (LH) in diabetic patients

Material and methods:

140 diabetic patients, who had been under the treatment with insulin a mean 8 years

2 groups:
I - 117 patients with LH
II - 23 diabetics without pathologic areas of subcutaneous fat

28 LH risk factors (RF)
- 14 all known RF
- 14 additional RF

Statistics:
- rank correlation coefficients
- binary logistic regression
- ROC-analysis and measure AUC, $p < 0,05$

Results:

I stage

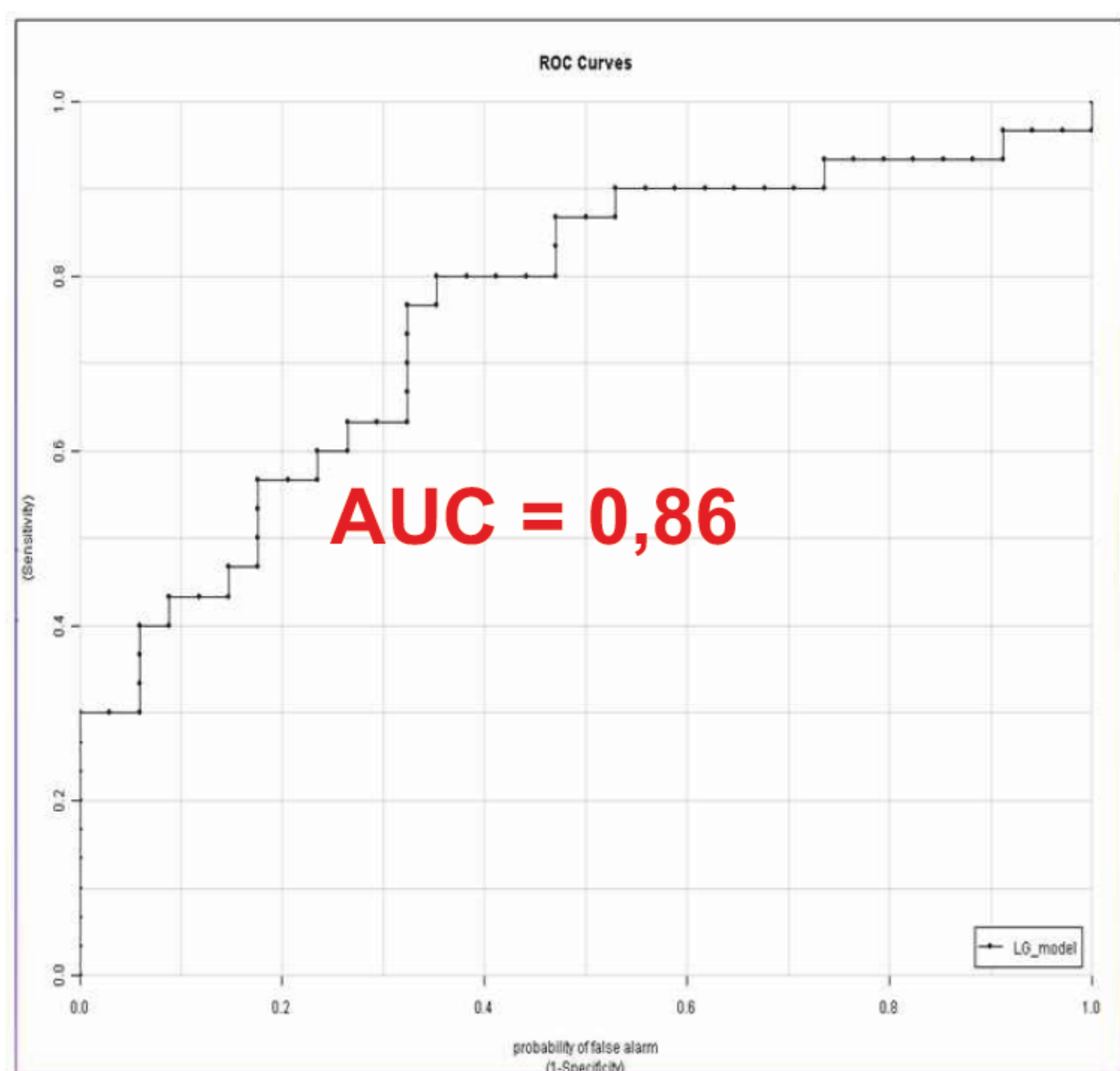
Risk factor	AUC	95% CI
Painfulness of injections	0,686	0,598 to 0,766
Quantity of injection by one needle	0,666	0,577 to 0,747
Duration DM	0,656	0,566 to 0,738
Duration of insulinotherapy	0,656	0,567 to 0,739
Presence of drop on the tip of the needle	0,632	0,542 to 0,716
Rotation of injection sites	0,623	0,532 to 0,707
Needle retention in skin after injection	0,644	0,554 to 0,726
Body mass index	0,640	0,549 to 0,723
Diabetic mellitus education	0,542	0,451 to 0,631
Usage of human insulin	0,571	0,480 to 0,659

II stage

Risk factor	Prediction coefficient	Value
Painfulness of injections	1,62	K_6
Quantity of injection by one needle	0,76	K_7
Duration DM	0,31	T_1
Duration of insulinotherapy	0,27	T_2
Presence of drop on the tip of the needle	0,13	K_4
Rotation of injection sites	-0,04	K_3
Needle retention in skin after injection	-0,21	K_5
Body mass index	-0,22	IMT
Diabetic mellitus education	-1,46	K_1
Usage of human insulin	-11,38	K_2

$$p = \frac{e^z}{1 + e^z} \quad z = 17 - 0,22 \times T_1 + 0,27 \times T_2 + 0,31 \times \text{IMT} - 11,38 \times K_1 - 0,21 \times K_2 - 0,04 \times K_3 + 0,76 \times K_4 - 1,46 \times K_5 + 1,62 \times K_6 + 0,13 \times K_7$$

III stage



$p < 0,5$
low LH risk

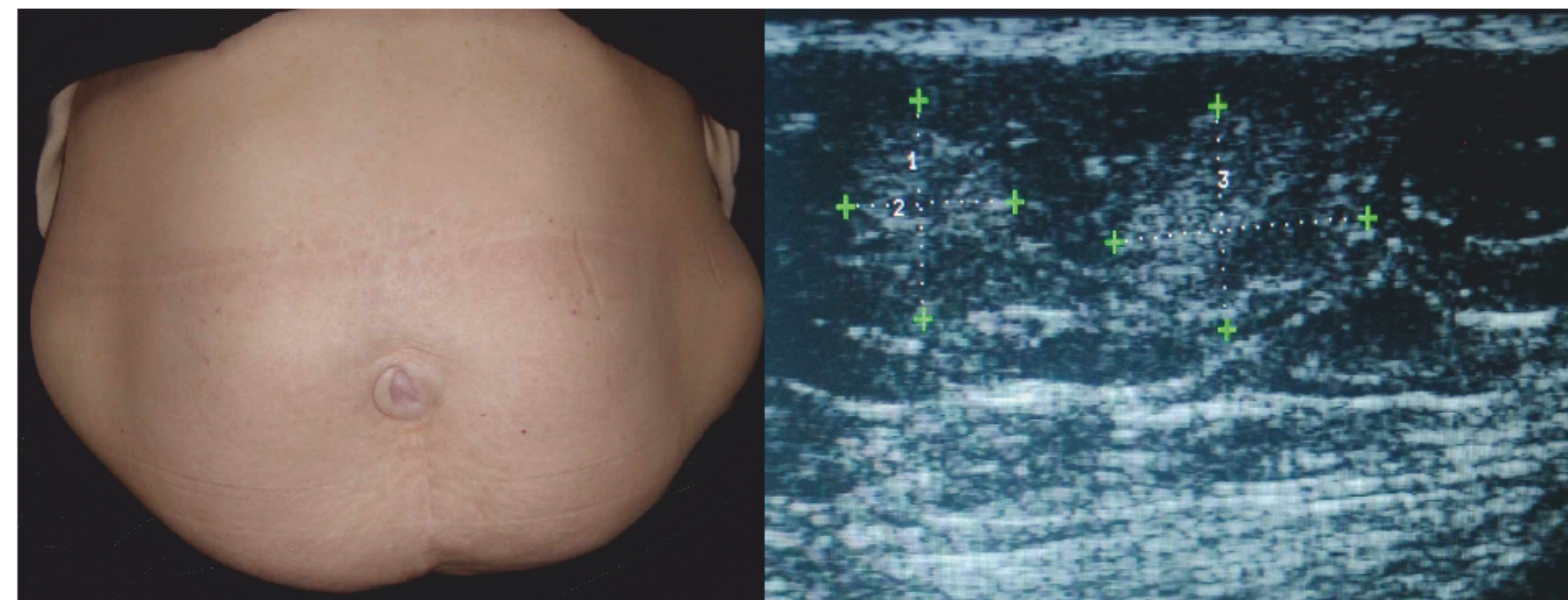
$p \geq 0,5$
high LH risk

Clinical case

Woman L., 59 years, is diabetic patient during 8 years, who is under the treatment with insulin last 2 years. She was successfully studied Diabetic mellitus education 2 years ago. Patient uses human insulin, rotation of injection sites is haphazardly, needles change once in day, needle retention in skin after injection is less than 5 second. Sometime insulin injection is painful. There is a presence of drop on the tip of the needle after injection. Physical examination: there is no palpable and visible site of LH, body mass index is 28 kg/m²

T_1	T_2	IMT	K_1	K_2	K_3	K_4	K_5	K_6	K_7	p
-0,22	0,27	0,31	-11,38	-0,21	-0,04	0,13	0,76	-1,46	1,62	
8	3	28	1	1	5	3	1	1	3	0,88

$$p = 0,88 \geq 0,5$$



Conclusions:

Nowadays, LH remains severe insulinotherapy complication. Primary prevention is necessary for diabetic patients with pathologic areas of subcutaneous fat.

Therefore, we developed the estimation risk model with good quality and high predictive value (86%) for diabetic patients who are under the treatment with insulin.

