Injection Techniques Questionnaire (ITQ)
WorldWide Results

2014-2015

Correct Site Rotation

BD

BACKGROUND

Available online at
SciVerse ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

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Original article

Prevalence and risk factors of lipohypertrophy in insulin-injecting patients with diabetes

M. Blanco [a], M.T. Hernández [b], K.W. Strauss [c,*], M. Amaya [d]

[a] *Novartis Pharma, Barcelona, Spain*
[b] *A.G.S. Campo de Gibraltar, Algeciras, Cádiz, Spain*
[c] *BD, POB 13, Erembodegem-Dorp 86, 9320 Erembodegem-Aalst, Belgium*
[d] *Diabetes Service Puerta de Europa, Hospital Algeciras, Cádiz, Spain*

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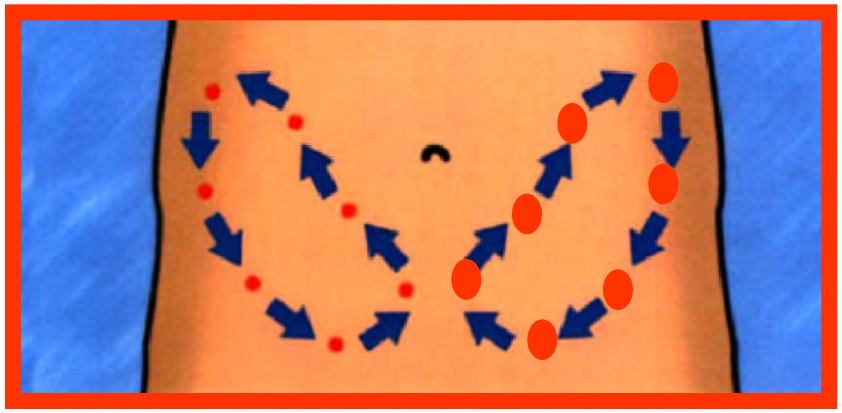
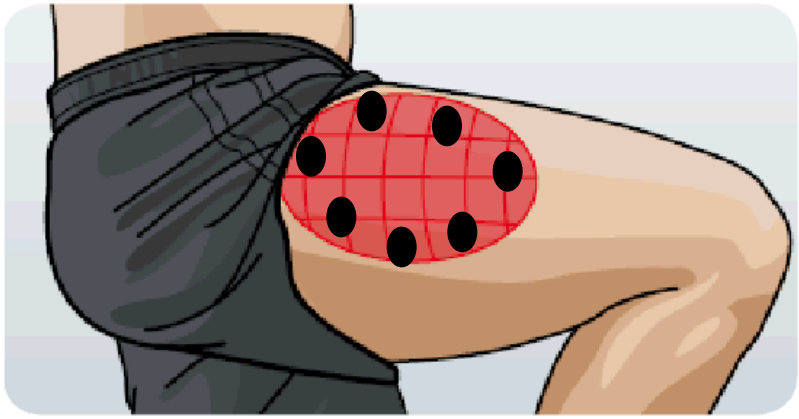
Correct Rotation = at least 1 cm between successive injections





Lipohypertrophy and Observed Correct Rotatio

	Lipo	No Lipo	Total
Correct	6	100	**106**
Not	262	18	**280**
Total	**268**	**118**	**386**

p= 0.0001

DESCRIPTIVE STATISTICS

On nurse's inspection was the patient rotating sites? If so, was the rotation done correctly?*

Rotates?	N	%
Yes	6889	**83.9**
No	1318	**16.1**

Correctly?	N	%
Yes	5643	**70.6**
No	2350	**29.4**

***Correct site rotation** is defined as always injecting at least 1 cm from a previous injection

COMPARATIVE STATISTICS

Is correct rotation associated with age category of respondent?

Respondent	Correct rotation		Total
	Yes	No	
Adult	4831	1930	6761
	71.5%	28.5%	100.0%
Adolescent	298	149	447
	66.7%	33.3%	100.0%
Child	139	72	211
	65.9%	34.1%	100.0%
3rd Party	130	73	203
	64.0%	36.0%	100.0%

p = 0.007

Is Correct rotation associated with type of DM?

DM type	Correct rotation		Total
	Yes	No	
T1DM	1869	792	2661
	70.2%	29.8%	100.0%
T2DM	3601	1519	5120
	70.3%	29.7%	100.0%
GDM	71	11	82
	86.6%	13.4%	100.0%

p = 0.921 between T1DM and T2DM

Is Correct rotation associated with type of device?

Device	Correct rotation		Total
	Yes	No	
Syringe	709	345	1054
	67.3%	32.7%	100.0%
Pen	4391	1898	6289
	69.8%	30.2%	100.0%
Other (Pump)	102	24	126
	81.0%	19.0%	100.0%

p = 0.551 between Syringe and Pen

Is correct rotation associated with type of insulin?

Type of insulin	Correct rotation		Total
	Yes	No	
Rapid-acting human	111	37	148
	75.0%	25.0%	100.0%
Fast-acting analogues	210	73	283
	74.2%	25.8%	100.0%
NPH	315	134	449
	70.2%	29.8%	100.0%
Basal analogues	731	220	951
	76.9%	23.1%	100.0%
Premixes	1031	478	1509
	68.3%	31.7%	100.0%

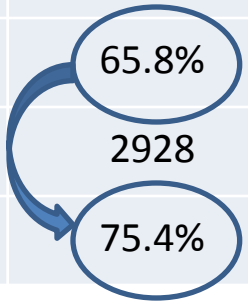
Is correct rotation associated with age?

Correct rotation	Mean Age	SD	N
Yes	49.0	19.5	5599
No	49.9	20.8	2337
Total	49.3	19.9	7936

p = 0.620

Is correct rotation associated with hyperglycemia?

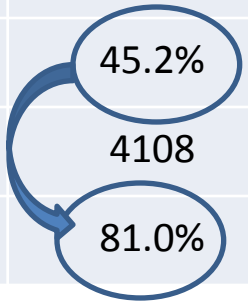
		Correct rotation		Total
		Yes	No	
Hypers	Yes	2530	1317	3847
	%	65.8%	34.2%	100.0%
	No	2928	957	3885
	%	75.4%	24.6%	100.0%



p < 0.000

Is correct rotation associated with LH?

		Correct rotation		Total
		Yes	No	
LH	Yes	1023	1238	2261
	%	45.2%	54.8%	100.0%
	No	4108	966	5074
	%	81.0%	19.0%	100.0%



p < 0.000

Is correct rotation of sites associated with absence of LH?

LH		Correct Rotation	
		Yes	No
	Yes	1023	1238
	%	45.2%	54.8%
	No	4108	966
	%	81.0%	19.0%

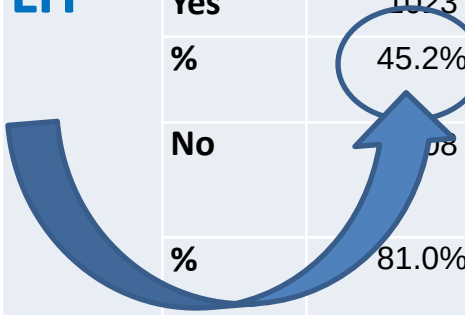
4-fold difference

p <0.000

Do some people who correctly rotate still get LH?

Yes, so there must be other factors at play

		Correct Rotation	
		Yes	No
LH	Yes	1023	1238
	%	45.2%	54.8%
	No	[illegible]	966
	%	81.0%	19.0%



p <0.000

Is there an association between LH and Reuse of pen needles as reported by patients?

LH	Reuses the Pen Needle	
	Yes	**No**
Yes	1144	927
	55.2%	44.8%
No	2057	2409
	46.1%	53.9%

p <0.000

Is there an association between LH and Reuse of pen needles as reported by nurses?

LH	Reuses the Pen Needle	
	Yes	No
Yes	1306	1013
	56.3%	43.7%
No	2395	2824
	45.9%	54.1%

p <0.000

Is LH associated with the number of times a needle is used?

Times Needle Used	LH	
	Yes	**No**
2 times	346	675
	33.9%	66.1%
3 – 5 times	463	855
	35.1%	64.9%
6 – 10 times	177	334
	34.6%	65.4%
> 10 times	195	250
	43.8%	56.2%
TOTAL	1181	2114
	35.8%	64.2%

p = 0.002

Is the size of LH associated with the number of times a needle is used?

Times Needle Used	Abdominal LH		
	Mean Diameter (mm)	N	SD
2 times	39.1	183	29.1
3 – 5 times	45.1	317	29.4
6 – 10 times	39.0	142	30.4
> 10 times	54.0	131	40.6
TOTAL	44.1	773	32.1

p = 0.002

Is the size of LH associated with the number of times a needle is used?

Times Needle Used	Thigh LH		
	Mean Diameter (mm)	N	SD
2 times	34.6	65	25.5
3 – 5 times	42.5	112	34.9
6 – 10 times	45.3	43	41.7
> 10 times	54.8	32	53.4
TOTAL	42.5	252	37.2

p = 0.002

Is LH associated with sub-optimal site rotation?

Rotation Practices	Lipohypertrophy	
	Yes	No
I move back and forth from right side of my body to left	523	1084
	32.5%	67.5%
I move from one injection site to another	521	918
	36.2%	63.8%
I inject a finger's breadth (1 cm) from previously injection	257	861
	23.0%	77.0%
My injections describe a circle around my injection sites	149	326
	31.4%	68.6%
My injections describe lines across my injection sites	54	169
	24.2%	75.8%

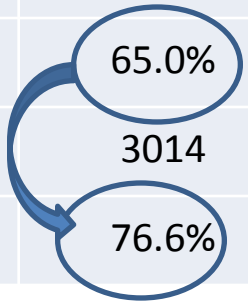
p <0.000

What is the weight of association with LH for each of these factors?

Coefficients[a]						
Linear Regression Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.157	.026		81.477	.000
	Incorrect Rotation	-.349	.013	-.341	-27.881	.000
	Needle Reuse	.026	.011	.028	2.272	.023
	Years on Insulin	-.008	.001	-.146	-11.987	.000
a. Dependent Variable: Presence or not of LH						

Is correct rotation associated with reuse of needles?

		Correct rotation		Total
		Yes	No	
Reuse	Yes	2561	1379	3940
	%	65.0%	35.0%	100.0%
	No	3014	919	3933
	%	76.6%	23.4%	100.0%



p < 0.000

Is correct rotation associated with unexplained hypos?

		Correct rotation		Total
		Yes	No	
Unexplained hypos	Yes	910	586	1496
	%	60.8%	39.2%	100.0%
	No	4578	1704	6282
	%	72.9%	27.1%	100.0%

p < 0.000

Are Unexplained Hypos associated with correct rotation?

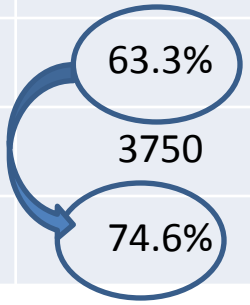
	Unexpected Hypos	
Correct Rotation	**Yes**	**No**
Yes	910	4578
%	16.6%	83.4%
No	586	1704
%	25.6%	74.4%

Greatly reduces the risk

p <0.000

Is correct rotation associated with glucose variability?

		Correct rotation		Total
		Yes	No	
Glucose variability	Yes	1732	1006	2738
	%	63.3%	36.7%	100.0%
	No	3750	1277	5027
	%	74.6%	25.4%	100.0%



p < 0.000

Is Glycemic Variability associated with Correct Rotation?

	Glucose Variability	
Correct Rotation	**Yes**	**No**
Yes	1732	3750
%	31.6%	68.4%
No	1006	1277
%	44.1%	55.9%

Significantly reduces the risk

p <0.000

Is HbA1c associated with correct rotation?

Correct Rotation	Mean HbA1c	N	SD
Yes	8.28	5187	1.787
No	8.85	2123	2.012
Total	8.44	7310	1.873

Δ = 0.53

p <0.000

Is correct rotation associated with TDD of insulin?

Appropriate rotation	Mean TDD	SD	N
Yes	47.2	31.8	5220
No	51.9	33.1	2164
Total	48.6	32.3	7384

Δ = 4.7 IU

p < 0.000

Is Needle Length associated with correct rotation?

		Needle Length			
		4	**8**	**6**	**8**
Correct Rotation	**Yes**	1625	1084	1084	1290
	%	76.3%	71.1%	71.6%	63.9%
	No	504	440	430	728
	%	23.7%	28.9%	28.4%	36.1%

?More adherent with 4 mm, $p < 0.000$

Is Needle Gauge associated with Correct Rotation?

		Needle Gauge			
		29	**30**	**31**	**32**
Correct Rotation	**Yes**	85	496	1818	1459
	%	52.1%	68.7%	70.0%	73.9%
	No	78	226	778	514
	%	47.9%	31.3%	30.0%	26.1%

$p < 0.000$

Is frequency of checking injection sites associated with Correct Rotation?

Correct Rotation	Frequency of Checking Sites			
	Routinely	Yearly	'As Needed'	Never
Yes	77.9%	70.9%	67.2%	63.2%
No	22.1%	29.1%	32.8%	36.8%

p <0.000

Is Timing of Latest Instruction associated with Correct Rotation?

Correct Rotation	Last time received/reviewed instructions on injections				
	Last 6 months	6-12 months	1-5 years	6-10 years	Never
Yes	75.5%	72.8%	65.1%	61.9%	61.3%
No	24.5%	27.2%	34.9%	38.1%	38.7%

p <0.000

Is there an association between leakage and correct rotation?

		Leakage		Total
		Yes	No	
Correct rotation	Yes	1901	3620	5521
	%	34.4%	65.6%	100.0%
	No	1026	1269	2295
	%	44.7%	55.3%	100.0%

p < 0.000

Is less pain associated with correct rotation?

		Pain	
		Yes	No
Correct Rotation	Yes	2495	2679
	%	48.2%	51.8%
	No	1177	891
	%	56.9%	43.1%

p <0.000

Conclusions (1)

- 5 out of 6 injectors claim to rotate injection sites. Of these, 2/3 were found by nurses to be rotating correctly.
- Those who rotate correctly tend to have
  - Less hyperglycemia
  - Lower HbA1c
  - Less LH
  - Less Unexplained Hyperglycemia
  - Less Glucose Variability
  - Lower TDD insulin

Conclusions (2)

- Risk factors for LH are:
  - Incorrect rotation of injection sites
  - Using smaller injecting zones
  - More years on insulin and
  - Reusing pen needles.
- By Linear Regression analysis, incorrect rotation and years on insulin are the most important factors associated with LH ($p<0.001$), while pen needle reuse is significantly, but slightly less strongly associated ($p=0.023$).
- HbA1c values are approximately 0.5 higher in injectors with LH (in both T1DM and T2DM) and are significantly higher with incorrect rotation of sites.

Conclusions (3)

- The frequency of unexpected hypoglycemia and glucose variability are significantly higher with LH, with injecting into LH and with incorrect rotation of sites.
- Checking sites routinely is associated with lower HbA1c levels, less LH and more correct rotation.
- Patients are also more likely to rotate correctly if they have received injection instruction in the last 6 months.

Conclusions (4)

- Lower TDD of insulin is associated with correct rotation of injections.
- Correct rotation seems to increase in frequency
  - As the needle shortens
  - As the gauge thins
  - As the site inspection and injection training become more routine.