CORRECTION

Correction to: Tissue Resistance during Large-Volume Injections in Subcutaneous Tissue of Minipigs

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Table 2 of the article ‘Tissue Resistance during Large-Volume Injections in Subcutaneous Tissue of Minipigs’ encountered formatting errors in the (original) pdf version with misplacement of text and columns. The pdf version of the article was updated to correct for formatting issues. The online version was correct.

The online version of the original article can be found at <https://doi.org/10.1007/s11095-020-02906-9>

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Table 2 Comparison of literature data on tissue resistance data during subcutaneous injection. Values in mbar are estimated from published graphs

Reference	Test sample	Instrumental set-up	Injection volume	Viscosity	Injection rate	Injection site	Tissue resistance	No. (N) of subjects
Comley et al. [16]	PBS	5 mL syringe, 21/27G needle (l=20/25 mm)	tensile test machine	1 mL	0.1 mL/s – 0.1 mL/s	ex vivo, porcine adipose tissue (20x20x10 mm)	~200 – 1200 mbar	–
<i>Findings:</i>	Linear increase in tissue resistance with increasing injection rate. Injection forces exhibit a plateau upon injection.							
Patte et al. [17]	Saline solution	3 mL syringe; AccuCheck® Rapid-D infusion set; Medfusion® syringe pump	Deltran® pressure transducer behind syringe reservoir	0.18 – 0.48 mL	Dynamic; 0.0002 – 0.008 mL/s	human abdomen; 12 diabetics and 13 healthy subjects	~10 – 60 mbar; max 250 mbar	N=3 (25 randomized subjects, 4 study days)
<i>Findings:</i>	Increase in tissue resistance (median, maximum, standard deviation) with injection rate.							
Thomsen et al. [18]	Insulin (NovoRapid UI100)	FlexTouch® InsulinPen NovoNordisk (31G, l=16.4 mm)	Resistance calculated from flow rate depending on pressure at syringe outlet	0.18 – 0.48 mL	Dynamic; ~0.07 – 0.15 mL/s	human abdomen; 11 diabetics patients (male)	Median ~500 mbar; min 175 mbar; max 900 mbar	N=8
<i>Findings:</i>	Defined injection sites.							
Allmendinger et al. [13]	Dextran solutions; saline solution	Injection pump; 5 mL syringe; 26G 3/8" needle	force sensor	2.5 and 4.5 mL	1 – 100 mPa·s	in vivo; inguinal SC tissue minipig	50 mbar – 400 mbar; min 10 mbar; max 1.2 bar	N=10 (10 randomized minipigs; 3 study days)
<i>Findings:</i>	Injection forces <i>in vivo</i> reach plateau for all conditions tested. Linear dependence of tissue resistance on viscosity and injection rate. Variability in tissue resistance increases with increasing viscosity and injection rate. Warming of test sample in injection needle during injection. Well-defined injection sites. No difference in tissue resistance between 2.5 and 4.5 mL.							
Doughty et al. [19]	PBS; povidone solution	Injection pump; 10 and 30 mL syringe; 25G 1/2" Sureflo winged butterfly set	pressure sensor in fluid path of infusion set	1 – 10 mL	1 and 14 mPa·s	in vivo; abdomen of Yorkshire swine	80 mbar (10 mL at 0.02 mL/s); 240 mbar (1 mL at 0.1 mL/s); max 800 mbar	N=3 (9 randomized pigs; 3 study days)
<i>Findings:</i>	The subcutaneous pressures increased with increasing flow rate but not with increasing dose volume. Pressure graphs reached a plateau. Increasing variation with increasing flow rate.							
Present study	Dextran solutions; saline solution	Injection pump; 5 and 20 mL syringe; 26G 3/8" needle	force sensor	11 mL, 4.5 mL	1 – 20 mPa·s	in vivo; inguinal SC tissue minipig	120 mbar (10–11 mL); max 300 mbar EFG applied: 200 – 500 mbar; max 1000 mbar	N=10 (12 randomized minipigs; 3 study days)
<i>Findings:</i>	Tissue resistance reaches constant value of ~120 mbar when injection volume goes as high as 11 mL, independent on viscosity and injection rate. Plateau for all injection profiles. Artificial pressure leads to per se higher tissue resistance independent the absolute value for the range tested, but not translated 1:1. Well defined injection rates for all conditions tested.							