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Pain sensitivity and pain scoring in patients with severe obesity

There are indications that pain perception is altered in patients with obesity, which complicates postoperative pain treatment. An essential part for adequate pain treatment is the capacity of the patient to grade pain.

Methods
Forty-one patients with severe obesity (body mass index 42.9 ± 4.9 kg/m^2) and 35 control subjects (body mass index 23.2 ± 2.8 kg/m^2) received multiple random thermal and electrical stimuli to the skin, in intensity in-between pain threshold and tolerance. The consistency of scoring was assessed by a penalty score system and stratified into cohorts good, moderate and poor.

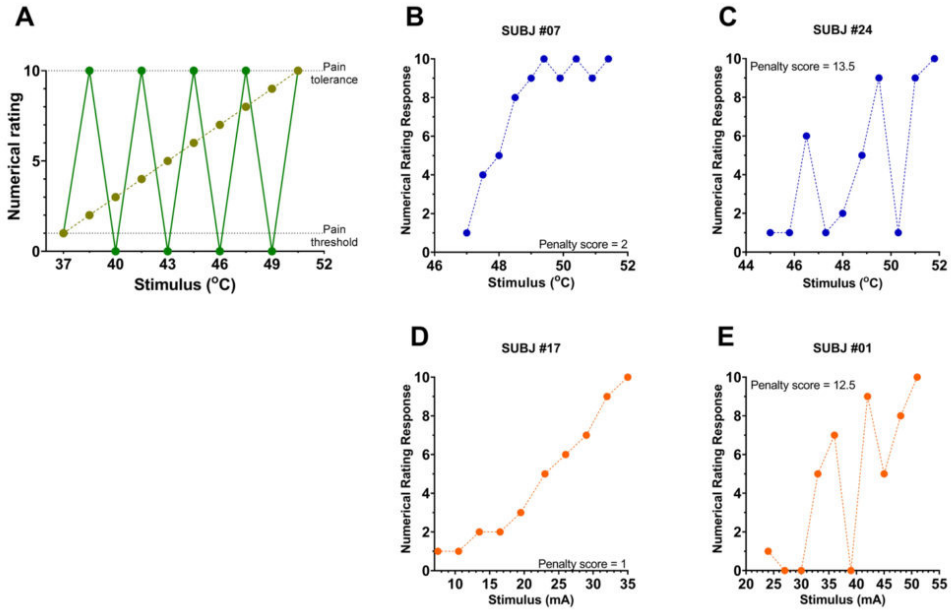

Fig. 1.

Results
In Figure 1 examples of NRS profiles with best and worst penalty scores are given for thermal stimuli (panels B and C) and electrical stimuli (panels D and E). In patients with obesity the penalty scores ranged from 1.5 to 13.5 (heat pain) and from 1.0 to 12.5 (electrical pain). The penalty scores differed significantly between patients with obesity and controls with higher penalty scores in patients with obesity for both nociceptive assays (heat pain: p = 0.01, electrical pain: p = 0.03). The penalty score distribution differed significantly between study groups for electrical pain with 47.3% (patients with obesity) *versus* 22.9% (controls) of scores > 3.5 (χ^2-Fisher's exact test p = 0.049), but not for heat pain (scores > 3.5 in 46.2% of patients with obesity *versus* 28.6% of control subjects, p = 0.15). Patients with obesity were less consistent than healthy controls in their scoring of heat and electrical pain. Patients with obesity and control subjects had 42% (27.8% in cohort good) and 66% (57.1% in cohort good) overlap, respectively. The combined patients with obesity and control data sets showed a significant correlation between body mass index and

penalty scores with higher scores at higher BMIs for electrical pain ($\rho = 0.29$, $p = 0.01$) but not heat pain ($\rho = -0.04$, $p = 0.7$; Fig. 1A). A correlation between age and penalty scores was observed for electrical pain ($\rho = 0.29$, $p = 0.01$) but not heat pain ($\rho = -0.05$, $p = 0.7$). Chronic pain did not affect penalty scores or its distribution in patients with obesity (Mann-Whitney U-test penalty scores in subjects with pain ($n = 13$) *versus* scores in subjects without pain ($n = 28$) $p = 0.49$ for heat and $p = 0.48$ for electrical pain tests).

Morbidly obese participants

		Penalty scores heat pain		
		0-3.5	**4-7**	**>7**
Penalty scores electrical pain	**0-3.5**	27.8%	13.9%	8.3%
	4-7	19.4%	8.3%	11.1%
	>7	2.8%	2.8%	5.6%

Control participants

		Penalty scores heat pain		
		0-3.5	**4-7**	**>7**
Penalty scores electrical pain	**0-3.5**	57.1%	14.3%	5.7%
	4-7	11.4%	8.6%	-
	>7	2.9%	-	-

Tab. 1. Contingency table of good (0-3.5), mediocre (4-7) and poor (>7) penalty scores in obese and control subjects.

In patients with obesity the response curves for electrical pain were shifted to the right by 5.4 mA compared to controls (N5 patients with obesity 22.9 ± 1.7 mA versus N5 control 17.8 ± 1.3 mA, $p < 0.05$). For heat pain the N5 did not differ between patients with obesity and control subjects (N5 = 46.4 ± 0.2 ^{o}C in both groups). This indicates hypoalgesia to electrical pain but not heat pain in the patients with obesity. An important difference between the two populations was the 30-60% larger within-subject variability observed in the patients with obesity for both pain tests (heat pain SD 1.8 ± 0.1 (patients with obesity) *vs* 1.5 ± 0.1 (control), $p < 0.05$; electrical pain SD 1.6 ± 0.1 (patients with obesity) *vs.* 1.0 ± 0.05 (control), $p < 0.01$), indicative of their lesser ability to consistently score the random stimuli.

Conclusions

Individuals with severe obesity displayed hypoalgesia to noxious electrical stimuli together with difficulty in grading experimental noxious thermal and electrical stimuli in between pain threshold and tolerance. We argue that the latter may have a significant effect on pain treatment, and consequently needs to be taken into account when treating the patients with obesity for acute or chronic pain.

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