The Obese Trauma Patient: Special Considerations and Outcomes

Ladislav Mica
Division of Trauma Surgery
University Hospital of Zürich

Introduction

- The incidence of overweight and obesity increased over the last two decades[1]
- Major public health concern in industrial nations[2]
- Trauma is the most frequent reason for death in the productive age of 24-44 years[3]

1. Mokdad AH, *et al.* JAMA. 2001; 12:286(10):1195-1200.
2. WHO 2003
3. Bundesamt für Statistik: https//www.bfs.admin.ch

Introduction

- Wide variety for the role of fatty tissue in trauma: from the 'cushioning effect'[1] to infectious protection by aromatase activity by oestrone and oestradiol-17β[2]
- Overweight and obese patients have a higher mortality after trauma[3]
- Obese and overweight patients suffer more rib fractures after motor vehicle crashes[4]

1. Wang, et.al. Annu Proc Assoc Adv Automot Med. 2003; 47:545-559.
2. Acherman , et al. J Clin Endocrinol Metab 1981;53:412-17.
3. Mock CN, *et al.* Accid Anal Prev. 2002; 34:221-228.
4. Boulanger BR, *et al.* J Trauma. 1992; 33:228-232.

Material and Methods

- Retrospective cohort studies
- Data retrievement form the trauma databank of the University Hospital of Zürich (*"Retrospektive Analysen in der Chirurgischen Intensivmedizin"* Nr. StV 01-2008)
- Statistical analysis by SPSS® version 20.0
- Totally 651 patients were included into this analysis
- ISS ≥ 16, Age ≥ 16 years

Material and Methods

- **Three groups: BMI 18.5-25, BMI 25-30, BMI >30**
- **The scores: Murray[1],Goris[2], Marschall[3], and SOFA[4] were calculated from the retrieved data**
- **No exclusions due to preexisting diseases**
- **Infection: Clinical symptoms and positive bacteriology**
- **14 patients were excluded due to BMI < 18,5 kg/m²**

1. Murray JF, et al. Am Rev Respir Dis 1988;138:720-723.
2. Goris RJ. World J Surg 1983;7:12-18.
3. Marshall JC, et al. Crit Care Med 1995;21:1698-1652.
4. Vincent JL, et al. Intensive Care Med 1996;122:707-710.

Results

Characteristics	Total	BMI 18.5 < 25	BMI 25–30	BMI > 30	*P*
Patients [n]	637 (100%)	363 (57%)	224 (35.2%)	50 (7.8%)	
Male [n]	482 (75.7%)	252 (52.3.7%)	188 (39%)	39 (8.1%)	<.001*
Female [n]	155 (24.3%)	108 (69.7%)	36 (23.2.1%)	11 (7.1%)	<.001*
Age [years]	41.4 ± 17.4	38.6 ± 17.8	44.2 ± 16.3	48.5 ± 15.4	<.001†
BMI	24.9 ± 3.6				
AIS head	2.3 ± 2.0	2.3 ± 2.0	2.2 ± 2.1	1.9 ± 2.1	.367†
AIS face	0.5 ± 1.0	0.6 ± 1.0	0.53 ± 1.0	0.2 ± 0.6	.069†
AIS thorax	1.7 ± 1.7	1.6 ± 1.7	1.9 ± 1.8	1.5 ± 1.6	.090†
AIS abdomen	1.2 ± 1.9	1.1 ± 1.8	1.3 ± 1.9	1.1 ± 1.8	.315†
AIS spine	0.7 ± 1.4	0.8 ± 1.4	0.7 ± 1.3	0.5 ± 1.0	.200†
AIS extremities	1.7 ± 1.5	1.7 ± 1.5	1.8 ± 1.5	1.8 ± 1.7	.590†
AIS pelvis	0.7 ± 1.2	0.7 ± 1.2	0.7 ± 1.3	0.7 ± 1.3	.977†
AIS skin	0.4 ± 0.8	0.4 ± 0.8	0.4 ± 0.9	0.2 ± 0.6	.217†
ISS	28.2 ± 12.3	27.7 ±12.0	29.6 ± 13.2	25.3 ± 9.2	<.05†
NISS	38.1 ± 15.3	37.1 ± 15.1	39.6 ± 15.8	37.4 ± 14.0	.140†

*χ², †ANOVA, Mean ± SD

Results

Physiology score	Total	BMI 18.5 < 25	BMI 25–30	BMI > 30	*P*
Murray (admission)	0.9 ± 0.8	0.8 ± 0.8	0.9 ± 0.9	1.0 ± 0.8	<.05†
Goris (admission)	4.0 ± 2.1	4.0 ± 2.1	4.2 ± 2.3	4.4 ± 2.2	.416†
Marshall (admission)	4.5 ± 3.3	4.2 ± 3.0	4.9 ± 3.6	4.8 ± 3.2	.065†
SOFA (admission)	6.1 ± 4.0	5.9 ± 3.9	6.2 ± 4.2	6.5 ± 3.8	.517†
Murray (max.)	1.4 ± 0.9	1.2 ± 0.9	1.6 ± 1.0	1.5 ± 0.9	<.001†
Goris (max.)	4.6 ± 2.3	4.4 ± 2.3	4.9 ± 2.4	5.1 ± 2.4	<.05†
Marshall (max.)	5.8 ± 3.9	5.2 ± 3.5	6.5 ± 4.3	6.2 ± 3.8	<.001†
SOFA (max.)	7.6 ± 4.5	7.1 ± 4.3	8.2 ± 4.8	7.9 ± 4.5	<.05†

†ANOVA. Mean ± SD

Results

	Total	*BMI 18.5–25*	*BMI 25–30*	*BMI > 30*	*P-value*
Pneumonia [% of each group]	**18.8**	**16.3**	**20.1**	**30.6**	**<.05†**
Day of pneumonia [d]	**7.1 ± 0.5**	**6.6 ± 0.7**	**7.6 ± 0.9**	**7.7 ± 1.8**	**.650***
Ventilator days	**6.7 ± 9.4**	**5.8 ± 7.6**	**7.7 ± 11.4**	**8.1 ± 11.0**	**<.05***
Increase of Murray score	**0.6 ± 0.0**	**0.5 ± 0.0**	**0.7 ± 0.1**	**0.7 ± 0.1**	**.003***

†Kruskal-Wallis, *ANOVA, Mean ± SD

Results

	BMI 18.5-25 kg/m²	BMI 25-30 kg/m²	BMI >30 kg/m²	*P*-value
Maximal SIRS score	3.4 ± 0.42	2.3 ± 0.08	2.47 ± 0.17	<.0001*
Day of maximal SIRS [d]	7.3 ± 0.33	1.8 ± 0.21	2.24 ± 0.52	<.0001*
Development of Sepsis [N] (% of all)	171 (46.1%)	5 (0.2 %)	0 (0%)	<.0001†
Day of Sepsis [d]	9.0 ± 0.47	4.6 ± 0.75		<.0001*

†Kruskal-Wallis, *ANOVA, Mean ± SEM

Results

BMI group	Infection	CNS Infection	Pneumonia	Abdominal Infection	Urinary Tract Infection	Wound Infection	Catheter Infection	Male	Female
18.5–25kg/m²	31.0%	4.1%	17.7%	2.4%	4.5%	7.1%	6.6%	69.8%	30.2%
25–30kg/m²	29.0%	3.5%	15.6%	0.4%	3.5%	7.1%	4.9%	85.3%	14.7%
>30kg/m²	24.5%	4.0%	12.2%	2.0%	10.2%	4.1%	6.1%	81.6%	18.4%
Total	29.8%	4.0%	16.6%	1.7%	4.6%	6.9%	6.0%	76.0%	24%
P-value	.519*	.924*	.438*	.172*	.146*	.667*	.563*	<.001*	<.001*

*Kruskal-Wallis

Summary

- Obese patients develop thoracic/pulmonary complications without relation to injury severity of the thorax.
- The pneumonia rate increases according to the BMI.
- SIRS is less pronounced in overweight and obese patients, and the onset is (seems to be) earlier.
- Females are protected to infetious complications after a polytrauma

Conclusion

- The fatty tissue as a non-controlled mass may lead to an obstructive hypoventilation and bronchial clearance
- However, a 'cushion effect' may be present
- Obesity might protect from developing of severe SIRS, by oestrone and oestradiol-17β?