Effect of Obesity in critically ill patients; muscle quality as an explanatory outcome for the “Obesity Paradox”

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Introduction:
Quantifying muscle responses to ICU stay and ascertaining the relevant histologic parameters could be a crucial step to forming personalized guidance for both mobilization- and nutrition-status. A feasibility study was performed, to assess the muscle wasting patterns of obese and non-obese patients within different subgroups upon admittance ICU.

Around 20% of the patients admitted to the ICU are obese (1). Obesity and overweight are associated with an increased risk of death in the general population (2), but in specific disease conditions a decrease in mortality has been reported in ARS and septic shock (3). This counterintuitive phenomenon is referred to as the "Obesity Paradox" (4).

The "Obesity Paradox":

• Rational Obesity Paradox 1:
  Fat mobilized from excess adipose tissue during critical illness provides energy more efficiently than exogenous macronutrients and could prevent lean tissue wasting (5).

• Rational Obesity Paradox 2:
  "Pre-Conditioning Cloud"; Low grade inflammation gives protective response (6)

• Opposed Rational Obesity Paradox 3:
  "A Paradox within a Paradox" Obese have higher Muscle-Quality corrected for muscle thickness.

Patients and Methods:
In a longitudinal observational study (n=26) different muscle histologic parameters were assessed, through the use of quantitative ultrasound (MuscleSound®) of the m. rectus femoris during sepsis, ARDS, neurotrauma, and after Lotx/LVAD. A total of 8 where catagorised as obese (BMI>30); n=4 ARDS/sepsis, Lotx/LVAD n=4 , and 6 non-obese ARDS/sepsis where compared to healthy metabolic obese (n=6). Assessment of Skeletal-Muscle-Quality-Index (SMQI) of the m. rectus femoris was taken every day at the same time. SMQI algorithm is based on the amount of intramuscular fat tissue (IMAT)/(7), muscle density/fibrosis, and corrected for the muscle thickness.

Discussion / Conclusion:
The results show that the speed of decline of the SMQI is extremely high in the non-obese ARDS/sepsis, compared with the obese ARDS/sepsis. SMQI upon admittance shows an distinctive higher value for the obese (control, ARDS/sepsis) and therefore could be a preditor of mortality in the critically ill.

References: