

Identifying cachexia and sarcopenia associated risk in gastrointestinal and hepato-pancreato-biliary surgery

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The previous chapter focused on the main findings of this thesis whilst placing them in the context of current literature. This concluding paragraph will give a reflection on the practical, societal, and scientific impact of the results described in this thesis.

Early identification

Cachexia and sarcopenia profoundly impact short- and long-term outcome in oncological surgery [1-6]. Our work underlined the importance of nutritional risk screening in a surgical cohort, thus adding to the basis of evidence that early recognition with the aid of nutritional risk screening, as well as early clinical identification of sarcopenia using physical activity testing is of clinical importance.

Pulmonary morbidity & myosteatorsis

Pulmonary morbidity, especially postoperative pneumonia, is of particular importance in surgery and has been shown to prolong hospital admission and increase in-hospital mortality following a range of surgical interventions, most notably after major abdominal and upper gastro-intestinal surgery [9-13]. Our research showed that myosteatorsis of the thoracic and abdominal compartments is associated with increased postoperative pneumonia. Our work adds to current evidence regarding the importance of myosteatorsis by indicating that myosteatorsis can be measured in other body compartments than abdominal at the third lumbar vertebrae, and that this holds clinical value. This study brought to light a shortcoming of CT body composition analysis in the context of the prediction of pulmonary morbidity, which is that in our experience, it is not practicable to use CT-imaging for the purpose of investigating diaphragm morphology or function. This knowledge led to the design of a prospective study. This currently ongoing study hypothesizes that reduced muscle function in the context of wasting disorders as myosteatorsis and sarcopenia effect pulmonary function as a consequence of reduced diaphragm function. The study uses trans-costal ultrasound for the perioperative investigation of diaphragm function. The results of this trial will contribute to the understanding of the role of the diaphragm in pulmonary morbidity following major liver resection, and will contribute to identifying patients who are at risk for reduced pulmonary function following major liver resection.

Myosteatorsis and liver disease

Numerous studies have described the pathophysiological and clinical relationships between liver dysfunction and sarcopenia and myosteatorsis [14-18]. Our work added to this by showing that myosteatorsis negatively impacts patients undergoing liver transplantation. More specifically, that myosteatorsis is associated with increased postoperative complications, ICU-stay, admission-time, mortality, and healthcare costs following liver transplantation. Future studies should focus on this aspect of wasting disorders in this patient population. As the MELD-score is still the most common tool used

for organ allocation, efforts should be made to investigate the added value of myosteatosis in the form of a modified MELD-myosteatosis score to potentially include patient physical condition and wasting disorders in organ allocation algorithms.

Radiomics

The field of radiomics uses advanced image analysis to capture additional information not currently used in conventional medical imaging. We investigated whether radiomics-based body composition features can discriminate between patient groups with improved or reduced overall survival following curative resection of the pancreatic head for the treatment of PDAC (Pancreatic Ductal Adenocarcinoma). Our work indicated that it is feasible to implement a radiomics approach to body composition imaging, and we were able to extract radiomics features which seem to hold similar predictive value compared to conventional body composition variables for the prediction of overall survival of PDAC patients undergoing primary resection. These findings constitute a novel approach to body composition imaging, and thus will contribute to the discussion whether radiomics analysis holds merit, and whether it may have a place in academic and or daily clinical practice.

Impact on the healthcare system & future perspectives

Cachexia, sarcopenia, and myosteatosis reflect the frailty of our patients. It is well established that the frail patient greatly impacts our health care system in terms of resources and costs. Yet, not all western European healthcare systems have been able to diligently implement basic tools such as nutritional risk screening and sarcopenia screening as a part of standardized practical treatment protocols. This has been shown in a cross-sectional nutritional survey of 21,007 patients over 1217 units from 325 hospitals in 25 countries. A screening routine existed for 93% of units in the United Kingdom while less than 33% of units in Austria, Germany and the South Eastern region reported that they regularly screened patients for malnutrition on admission [19]. Although these data are over a decade old and may therefore not reflect the current state of screening, it is plausible to consider that regional differences in diligent implementation of nutritional risk screening exist and this should be addressed in order to ensure an optimal treatment potential. It also underscores the need for a more up-to-date European cross-sectional nutritional survey.

The work put forward in this thesis does not directly impact patients or the healthcare system as such. However, it does illustrate the importance of a holistic approach to patient care. It emphasizes the need to identify our most fragile patients, who carry the greatest amount of risk. Our currently ongoing study using trans-costal ultrasound for the perioperative investigation of diaphragm function may enable us to identify patients who are at risk for reduced diaphragm function preoperatively, possibly allowing early

preconditioning of patients and therewith an improvement in postoperative pulmonary function. Preconditioning of patients may also be the next step for sarcopenic and myosteatotic patients undergoing liver transplantation. Evaluation of such treatment regimens should be the next step in improving outcome for our most fragile patients.

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