Expanding eligibility and improving patient outcomes for pancreatic surgery

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Future perspectives in pancreatic surgery
In order to improve pancreatic cancer treatment, including pancreatic surgery, the four challenges described previously need to be addressed. First, improved understanding of the biological pathways of primary and metastatic lesions may lead to earlier detection (e.g. biomarkers) and new treatments strategies (e.g. immunotherapy). Second, improving patient eligibility for surgery through early detection, improved preoperative treatment (e.g. chemotherapy), or extended resection techniques may increase life expectancy for thousands of patients with pancreatic cancer or premalignant tumors. Third, minimizing the invasiveness of surgery may reduce postoperative recovery times and complication rates. Fourth, reduction of postoperative pancreatic fistula and bleeding rates through improved prevention measures will further reduce the surgical treatment burden for patients.

The first challenge could be addressed more thoroughly through routine collection of both clinical data and organic patient samples in large multi-institutional biobanks. This would enable sequencing of DNA/RNA or transcript products. These data could then be analyzed using pattern recognition by machine learning or artificial intelligence, which would catalyze the discovery of both biomarkers and new treatment targets. Eventually, improved understanding of the tumor biology and targeted treatment might reduce the need for tumor debulking and thus for pancreatic surgery.

The second challenge was partly addressed in this thesis by the renewed introduction and optimization of the DP-CAR for resecting locally advanced pancreatic cancer. Other standardized techniques, including vascular resection, may become mainstream with improved preoperative (systemic) therapy regimens. Besides surgical resection techniques, earlier tumor detection will improve the proportion of patients presenting without local or distant metastases, which leads to a dramatical improvement in surgical eligibility rates.

The third challenge was also addressed in this thesis, through the assessment and optimization of minimally invasive pancreatic surgery. The negative impact of distal pancreatectomy can readily be reduced using laparoscopic or robot assisted surgery. For pancreaticoduodenectomy, the evidence is less convincing and further technique improvements are required before its added value can be established. Further improvement of robot-assisted surgery could push the bar for minimally invasive pancreaticoduodenectomy. One potential improvement is virtually adding layers of vision (augmented reality), based on CT/MRI-imaging, to waypoint major vessels or tumor characteristics. Other improvements could be hyperflexible spider-arm graspers with haptic feedback. Even more futuristic solutions include pre-programmed procedure steps that guide the surgeon through the surgery.

The fourth challenge is perhaps the most arduous. Since the introduction of pancreatic surgery, surgeons have been struggling to reduce pancreatic fistula rates. Although this thesis described some risk factors of postoperative fistula, preventative strategies have not yet been very successful. Translational research on the pathophysiology or mechanical
etiology of pancreatic fistula is still warranted at this stage. If postoperative fistula could be prevented, minimally invasive approaches would likely reduce the negative physiological impact of pancreatic surgery much more effectively.