Complications in hepato-pancreato-biliary surgery

Multidisciplinary and interdisciplinary approach

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Introduction and general outline of this thesis
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Surgical care is a large and essential component in healthcare worldwide. The World Health Organisation (WHO) estimates that, while intending to save lives, major surgery is associated with a mortality rate of 0.1-5% and a morbidity rate of 25%.(1, 2) More importantly, it has been suggested that nearly half of surgical complications can be avoided.(3, 4)

Within the field of surgery, abdominal surgery is known to have the highest rates of postoperative complications and hospital readmissions.(5) For major liver or pancreas resections, major complication rates are as high as 30-40%.(6, 7) This may be due to a number of factors, including the extent of the resection, the anastomoses that may be required during these surgeries, and the anatomical position of these organs (especially the pancreas, which is located deep in the abdomen, behind the stomach). Patient factors also play a role, with many patients undergoing resection for malignant tumours, meaning their general condition is often poor.

The impact of postoperative complications on the individual patient is more than just a prolonged hospital stay and additional invasive treatments. An unexpected postoperative course can cause a large amount of stress.(8, 9) Furthermore, for patients who underwent resection for a malignancy and require adjuvant chemotherapy, prolonged recovery from surgery delays the start of this additional treatment, thereby significantly reducing their chances of survival.(10) In addition to this large impact to patient lives, adverse outcomes also have their impact on healthcare organisation and costs.(11)

Needless to say, it is of utmost importance to continue to improve outcomes in surgical care. There are many strategies to improve surgical care and lessen the burden of postoperative complications. In the outpatient department, prior to surgery, it is important to adequately select those patients who will actually benefit from a surgical procedure, in order to make the risk acceptable. Furthermore, prevention of complications is of course crucial. Prevention can be pursued on all kinds of levels, as described below. And third, when a complication does occur, effective treatment of this complication is of major importance. If treatment of complications can be optimized, this may contribute to a rapid recovery.

Selection of patients

In the course of planning a surgery, it is self-evident that one should be aware of the risks associated with the procedure, the clinical condition of the patient, but also the benefit that can be achieved with an operation. For a cancerous tumour, the most important benefit of surgery is increased survival. This survival benefit must of course be weighed against the morbidity and mortality associated with the procedure. For premalignant conditions, whether or not a resection is worth the risk depends on how many malignant transformations will be prevented by performing the surgery.
Prevention
There are several ways to prevent a postoperative complication. Standardized training of surgical skills, implementation of safety checklists, and technical advances are recent developments in perioperative care that may prevent adverse outcomes.\(^{(12)}\) But also in postoperative care, there are several ways to help prevent complications. For example, simple acts such as early mobilization, breathing exercises, and oral hygiene are known to reduce the incidence of pulmonary complications, delirium and nosocomial infections.\(^{(13, 14)}\) The value of these acts is widely recognized; they are an important part of the Enhanced Recovery After Surgery (ERAS) principles.\(^{(15, 16)}\) However, although these acts may seem simple, hectic day-to-day business in the ward may hinder their execution.\(^{(17)}\) This may be an opportunity for further improvement of postoperative care.

Bile duct injury, a much feared complication after cholecystectomy
In the Western world, gallstone disease is fairly common with an estimated prevalence of 13% for asymptomatic cholelithiasis.\(^{(18, 19)}\) Of these patients, approximately 22% develop symptomatic cholelithiasis within 10 years.\(^{(19)}\) Consequently, cholecystectomy is one of the most frequently performed surgeries in Western countries. In the Netherlands, a country with 16 million inhabitants, approximately 25,000 cholecystectomies are performed per year, the majority being done laparoscopically.\(^{(20)}\) After the introduction of the laparoscopic cholecystectomy in 1987 and its broad adoption thereafter, an evident rise in the occurrence of bile duct injury was observed.\(^{(21)}\) Nowadays this “learning curve effect” has long passed and the incidence of bile duct injury following cholecystectomy has dropped to approximately 0.3%,\(^{(22, 23)}\) Hence, bile duct injury remains a much feared complication following cholecystectomy. Although this is a surgical complication, the treatment of this complication is highly multidisciplinary, involving hepato-pancreato-biliary surgeons, gastro-enterologists and interventional radiologists.\(^{(24, 25)}\) Minor injuries may generally be treated by endoscopic stenting or percutaneous transhepatic interventions, whilst major injuries ultimately require surgical reconstruction. However, often a combination of procedures is required to restore bile duct continuity: percutaneous biliary drainage catheters may be used in order to optimize a patient’s clinical condition prior to surgical reconstruction, endoscopic stents or percutaneous dilatation may be required for anastomotic strictures after surgical treatment. A relatively new treatment entails collaboration of the endoscopist and interventional radiologist, in the form of a percutaneous-endoscopic rendezvous procedure.\(^{(26)}\) Despite good functional outcomes following (multidisciplinary) treatment of bile duct injury, patient reported outcomes are often discordantly low.\(^{(27)}\) This reflects the high burden this complication has on patients’ lives.
General outline of this thesis

As outlined above, selection of patients and the procedures they are exposed to along with preventive peri-operative measures are key to improving patient outcomes. The aim of this thesis was to contribute to improved surgical outcomes for patients undergoing hepatopancreato-biliary surgery in a cross-disciplinary manner. For this, we assessed treatment options of bile duct injury (part 1), patient selection in biliary surgery (part 2), and developed an out-of-the-box method to help prevent postoperative complications (part 3).

Part 1 – Multidisciplinary management of bile duct injury

The first part of this thesis (chapter 1-4) focuses on the treatment of a much feared complication in hepatobiliary surgery: bile duct injury. Chapter 1 gives an overview of literature on the long-term impact of bile duct injury, as well as a consideration of treatment options for patients who develop an anastomotic stricture after surgical treatment of bile duct injury. In Chapter 2, a rare complication following cholecystectomy is described: the migration of surgical clips through the bile duct wall, and consequently the formation of bile stones around these migrated clips. In Chapter 3 we retrospectively analysed short-term and long-term outcomes of the percutaneous-endoscopic rendezvous procedure, a collaboration between the endoscopist and the interventional radiologist. In Chapter 4, the optimal timing for hepatojejunostomy in BDI patients who require surgical treatment is assessed by means of a meta-analysis of current literature.

Part 2 – Selecting the right procedure for the right patient

In the second part of the thesis (chapter 5-8), we aimed to weigh risks and benefits of several surgical procedures on the biliary tract. In Chapter 5 we evaluated outcomes of the choledochoduodenostomy in patients with various benign biliary diseases. As this type of biliary-digestive anastomosis is nowadays only performed in selected cases, we matched patients who underwent a choledochoduodenostomy to patients with similar medical history who underwent a hepatojejunostomy for similar indications. Chapter 6 is a multicentre, retrospective cohort study of all patients who underwent surgical resection of a choledochal malformation in all (eight) academic centers in the Netherlands. In this chapter, we weighed the risk of malignancy in patients with a choledochal malformation against the risk of perioperative morbidity and mortality, including long-term complications. Chapter 7 is a meta-analysis of morbidity and mortality after major hepatectomy for perihilar cholangiocarcinoma, in which we addressed differences in outcomes between Western and Asian series and explored underlying causes (such as differences in patient characteristics, treatment strategies
and hospital volume). In Chapter 8, we retrospectively analysed patients undergoing surgery for cholangiocarcinoma of the middle part of the extrahepatic bile ducts. We compared patients who underwent a local resection for these tumours with patients who underwent pancreatoduodenectomy, a more extensive procedure with higher surgical risk.

**Part 3 – An interdisciplinary approach towards prevention of postoperative complications**

The third part of this thesis (Chapter 9-11), focusses on a program we developed to involve relatives of patients undergoing major surgery in postoperative care. In this program, relatives participate in care under the supervision of a nurse, focusing on basic care activities that are known to reduce the risk of certain postoperative complications. **Chapter 9** describes the results of a systematic literature review for existing interventions that include the active involvement of relatives in care. **Chapter 10** is a ’logic model article’ explaining the development and rationale of our multicomponent intervention. The aim of the program, available evidence, possible facilitators and barriers for implementation, and results of focus groups with involved health care professionals are discussed. After the development of our program, we performed a pilot study in which we assessed its’ feasibility in 20 patients and their relatives who attended the program (and 20 patients in a control group). The results of this pilot study are described in **Chapter 11**.
References


