General introduction and outline of the thesis
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Minimally invasive surgery (MIS) is now part of daily surgical practice. A few years ago the Dutch Health Care Inspectorate (DHI) published a critical report on its widespread use and subsequent severe complications. Criticism was expressed because the use of laparoscopy had been started without a proper implementation phase or structured analysis of the obtained results at the introduction as a novelty in daily surgical care.

The endoscopic surgeons, united in the Dutch Society of Endoscopic Surgeons (Nederlandse Vereniging van Endoscopisch Chirurgie (NVEC)) published their plan of action which contained important steps, to be worked out by the endoscopic surgical community itself.

Beside improvements in the quality assurance of MIS equipment, the education of laparoscopic surgeons needed to be improved with clear requirements in teaching and training.

Paediatric endosurgery is also gaining more acceptance and an increasing number of centres are starting with MIS in children. Potentially more complications will occur in the absence of a structured implementation of MIS in children.

In the Netherlands a structured module of education in paediatric MIS is part of the curriculum for trainees. However, it consists of only 2 days training in 2 years which is obviously not enough. It has not been established at which stage a (future) paediatric surgeon is adequately skilled in MIS.

Aim of the thesis

The aim of this thesis is to study the implementation and consequences of new endoscopic techniques (i.e. thoracoscopy and laparoscopy) in the area of paediatric surgery. The available literature concerning the implementation and use of new endoscopic techniques and its indications will be analysed. The results obtained in our hospital during the implementation of several new endoscopic techniques (i.e. thoracoscopic lobectomy, laparoscopic pyloromyotomy & laparoscopic splenectomy) will be evaluated with special focus on learning curve aspects, methods of implementation and recommendations for future developments and endoscopic treatments.

PART I

Overview of literature concerning implementation in paediatric minimally invasive surgery

The International Pediatric Endosurgery Group (IPEG) was founded in 1991. Currently IPEG is the biggest and most important forum for paediatric MIS in the world. One of the goals of IPEG is “to encourage and support development of standards of training and practice in
Pediatric Minimal Access Surgery "which includes safe implementation and application of MIS in children. For this purpose, several guidelines based on the best available evidence are written by the Clinical & Practice Guidelines Committee of IPEG. In Chapter 1 a review is performed to collect best evidence on criteria to assess which mediastinal masses can be approached by MIS for diagnostic procedures. In addition, an analysis is performed to identify criteria for the MIS treatment of benign as well as malignant mediastinal lesions. Based on these results a new IPEG guideline will be formulated.

To assess the consequences of the implementation of an innovative technique the literature was also evaluated on available comparative studies between a minimally invasive and a traditional open procedure.

Esophageal atresia is seen as one of the cornerstones of the success of paediatric surgery. Esophageal Atresia with Tracheo-Esophageal fistula (EA-TEF) was seen as a fatal condition until Ladd and Leven in 1939 treated independently two patients who became the first to survive this condition by a staged repair of the EA-TEF after a gastrostomy placement on the first day of life. In 1943 Haight was the first who performed a successful primary anastomosis. Nowadays survival has increased from then 0% to approximately 95% in the modern era 4.

After the introduction of MIS in 1999 also the first thoracoscopic repair of EA-TEF was done successfully 5. A systematic review to evaluate differences in outcomes between the open and minimally invasive approach of EA-TEF is presented in chapter 2.

Hyperthrophic pyloric stenosis (HPS) occurs 1-3 per 1000 live births. The type of approach changed over time from a right upper quadrant incision to the semicircular umbilical incision 6. In 1992 Alain introduced the laparoscopic pyloromyotomy (lp) 7. Several systematic reviews have been performed to analyse whether LP is superior to open pyloromyotomy (OP). So far, no clear benefits have been shown regarding one of these procedures. However, the outcome parameters analysed in these reviews are often not relevant from a clinical point of view. Therefore, in chapter 3 a systematic review is presented focussing on major complications of surgical treatment of HPS which bear clinical relevance.

There is an ongoing flow of RCT’s comparing OP and LP in HPS. In these RCT’s the primary outcomes and methodological design are sometimes debatable. In order to have an honest debate whether one of the compared procedures is indeed superior over the other, the methodological set up needs to be flawless. Therefore in chapter 4 a letter to the editor is written in which criticism on a RCT of Siddiqui 8 is stated.
PART II

The implementation of MIS in our center of several new endoscopic techniques (i.e. thoracoscopic lobectomy, laparoscopic pyloromyotomy & laparoscopic splenectomy) is described and evaluated. From these results recommendations are given regarding the safe implementation and application of these new techniques.

The results of the implementation of LP in HPS are described in chapter 5. A retrospective study was performed to identify a learning curve of LP in HPS. In 229 patients the outcome of OP and LP focusing on postoperative complications were compared.

In the literature a further flattening of the learning curve is described which is called the tail of the curve. After the learning curve was defined in chapter five, the question arose if the lowest possible complication rate was reached or whether a further reduction of complications is possible in our series. A study is performed in 163 patients in chapter 6 to analyze if there is a tail of the learning curve in LP for HPS.

Laparoscopic splenectomy is an advanced laparoscopic technique which benefits the patient in terms of cosmesis and shorter length of stay. However, it is a more demanding laparoscopic operation than the HPS because the risk of bleeding due to the necessity of dividing vessels of the enlarged spleen. Further portal vein thrombosis (PVT) is a serious but known procedure-specific complication after splenectomy. A possible relation between PVT and implementation of laparoscopic splenectomy is studied in chapter 7.

Thoracoscopic lobectomy is a procedure proven to be safe for several types of lung pathology in children. However it is a demanding operation to be performed in a small confined space with specific equipment and risks. No box trainers and virtual reality trainers are available for this specific procedure. Our experience with the implementation of the thoracoscopic lobectomy using the master apprentice model is presented in chapter 8.
References


