

# Complex abdominal wall hernias

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## Summary

### Chapter one

Patients with complex abdominal wall hernias constitute both a notable and neglected group of patients, with a decreased quality of life and considerable risk of hernia-related complications. The rationale, and first steps, to improve quality of care for these patients is described in the introduction. Details of our complex hernia program, which were formalized in the multidisciplinary care pathway, are highlighted. Publication of our opinion piece 'Complex hernia patients deserve attention' (2015) fueled the volume of referred patients in our hospital. This thesis is a recapitulation of the results of multiple clinical quality improvements, performed to optimize the care pathway and quality of care for these patients.

### Chapter two

'Attention' improves quality of any process. Similar subjective factors, like inter-disciplinary cooperation and external endorsement, were necessary to implement objective measurements like a business case, a database, or hernia slots in the care pathway. However, the results of these measurements on delivered quality were unknown. Dutch benchmark data on quality, and information, which components of the care pathway were essential, were lacking.

In 2019, evidence-based requirements for accreditation as a hernia center were published: high volume, experienced surgeons, use of a database and quality control. Governmental data were combined with the results of a representative survey with 426 respondents (27%) of all (1.554) Dutch general surgeons, working in all 75 hospitals. The four requirements were present in 51% (volume), 97% (experience), 39% (database), and 15% (quality control) of all Dutch hospitals. Only, two hospitals (3%) met all four criteria. This study demonstrated that the presence of essential quality components across Dutch hospitals was very dispersed and that quality of (complex) hernia surgery is still largely unknown in The Netherlands.

That same year (2019) two important quality measures were implemented in the Netherlands: publication of the Incisional Hernia Guideline, distinguishing non-complex from complex hernias, and formal assignment of incisional hernia surgery to certified Gastro-Intestinal surgeons. Participation in a national (com-plex) hernia registry is still not mandatory in The Netherlands. Formal accreditation of 'Hernia centers of excellence' commenced in 2023.

## Optimizing the preoperative care pathway: risk stratification

### Chapter three

High risk patients need to be identified during the multidisciplinary team (MDT) meeting. The MDT decides whether a postoperative ICU bed needs to be planned for such a patient. Risk-stratifying tools like the Fischer score (predicting postoperative respiratory failure) and HPW classification (predicting postoperative wound complications) support decision-making. A justified ICU admission was a patient that actually needed an ICU intervention within the first 24 hours postoperatively. Whether the decisions were correct, could only be established postoperatively.

In a cohort of 232 operated complex hernia patients, the MDT decided ICU admission in 38%. Intra-operative events changed the MDT decisions in 15%. Ultimately, 42% of all patients went to the ICU,

and 27% of all patients proved justified ICU patients. Backward stepwise multivariate logistic regression analysis demonstrated that the MDT's decision for a planned ICU admission (76%) was more accurate than any of the other risk-stratifying tools (Fischer score 70%, HPW 69%). This study demonstrated the added value of an MDT in risk stratification of patients with complex abdominal wall hernias.

#### **Chapter four**

The risk of pulmonary complications, after repairing patients with large hernias and much evisceration, was not well defined. Although some studies have de-scribed a correlation between hernia volume and pulmonary changes, none provided strong evidence to identify hernia volume as a risk factor for pulmonary complications. This relation was studied in 35 patients who underwent eCST (n = 20) or Ramirez (n = 15). The median defect volume was 474 cm<sup>3</sup>, calculated by Multiple Plane Reconstruction of standard abdominal CT-scans. Ten patients developed respiratory complications. Uni- and multivariate analysis demonstrated that pulmonary complications were strongly associated with 'hernia volume' (p = 0.045). This study demonstrated unambiguously that hernia volume is correlated with postoperative pulmonary complications.

### **Optimizing the preoperative care pathway: prehabilitation**

#### **Chapter five**

Patients with complex hernias have an increased risk of postoperative complications. Improving a patient's physical capacity by preoperative exercise therapy, as part of prehabilitation, may lead to a faster recovery after repair. But, obese patients with large hernias are often reluctant to perform sports, fearing complications of the large hernia. A feasibility study was performed in 11 patients with a median BMI of 32 and hernia width of 16.0 cm. The intervention consisted of a three month lasting exercise program consisting of cardiovascular-, strength and respiratory muscle training under direct supervision of a physiotherapist. All patients completed the training program. Physical capacity (VO<sub>2</sub>max) and QoL im-proved, while no adverse events, like strangulation, occurred. All patients had subsequently a successful hernia repair. This study demonstrated that prehabilitation by intensive exercise therapy is feasible in patients with large complex hernias.

#### **Chapter six**

Prehabilitation of modifiable risk factors, like smoking, excessive weight, or low physical training status, may prevent complications in patients after complex hernia repair. Outcomes of 133 healthy patients were retrospectively compared to 126 comorbid patients with modifiable risk factors, who were operated after a preconditioning program. The prehabilitated group had a higher median BMI (p < 0.001), higher HbA1c (p = 0.014), more smokers (p < 0.001) and higher HPW classes (p < 0.003). All risk factors improved after prehabilitation. There were no significant differences in type of myofascial repairs between the groups. Ultimately, wound and systemic complications, as well as length of stay did not differ between the groups. This study demonstrated that prehabilitation facilitates patients with modifiable risk factors in achieving the same results as patients without those risk factors.

#### **Chapter seven**

Primary midline closure of very large hernias may induce systemic and wound complications in complex hernia patients. A more stretchable abdominal wall may prevent these complications. Evidence that Botulinum, injected in the lateral abdominal wall muscles, increases the extensibility

(compliance) is scarce. A systematic review comprising 14 studies (377 patients) with a median hernia width of 12 (10-15) cm was performed. The primary prehabilitation effect was a muscle elongation of median 4.0 cm per side, without reported complications of the Botulinum injection. The median primary midline closure rate was 100%, wound-related complications 19%, medical complications 18% and recurrence 0% (14 studies). This study demonstrated that, in patients in whom midline closure is expected to be difficult, Botulinum safely elongates the abdominal wall muscles.

## **Optimizing the perioperative care pathway: tailored surgery**

### **Chapter eight**

The endoscopic Component Separation Technique (eCST) was introduced in 2014 in our hospital as an endoscopic alternative for the open Ramirez technique. Indications, technical details and results of the eCST are described in 36 patients. Patients with a longitudinal midline abdominal wall defect within the lateral borders of the rectus abdominus muscle should be selected. Postoperative complications were limited: seroma (22%), hematoma (8%), wound dehiscence (3%) or recurrence (8%). This study demonstrated that eCST is useful in selected patients with good results.

### **Chapter nine**

A systematic literature review of the posterior component separation technique with transversus abdominis release (TAR) was performed to estimate its position within the scope of abdominal wall hernia repair techniques. Five studies, describing 646 TAR patients with large midline hernias (mean surface 509 cm<sup>2</sup>) demonstrated wound complications in 15% (20-35% after anterior CST) and two-year hernia recurrences in 4% (13% after anterior CST). This review demonstrates that the transversus abdominis release is a very good alternative for anterior CST in terms of wound complications and recurrence, especially in very large midline ventral hernias.

## **Optimizing the postoperative care pathway: evaluation**

### **Chapter ten**

Five years results of the transversus abdominis release (TAR) were evaluated, after this technique was introduced in our hospital in 2016. After each 20 procedures, outcome parameters were evaluated and new quality measurements implemented. Primary outcome was Textbook Outcome (an uneventful clinical postoperative course after TAR) and the institutional learning curve (number of Textbook Outcome patients compared to the total number of consecutively performed TARs). Three successive cohorts of each 20 TARs demonstrated that both Textbook Outcome (10%, 30% and 55%) and the rate of surgical site events (45%, 15% and 10%) significantly improved with more experience. Overall Text-book Outcome was 35%, and the institutional learning curve did not flatten after 69 consecutive TAR patients. This study demonstrated that TAR has a long learning curve, only partially determined by the technical aspects of the operation.