

PAVEL ZONČA<sup>1</sup>, JERZY RUDNICKI<sup>3</sup>, ADAM GÓRALCZYK<sup>2</sup>, DARIUSZ HOUDAIL<sup>3</sup>,  
JAKUB WACHNIK<sup>3</sup>, RENATA THOMA-JANCEWICZ<sup>3</sup>

## One-Day Surgery and Fast-Track Principles

### Program działań optymalizujących opiekę okołoooperacyjną i jego zastosowanie w chirurgii jednego dnia

<sup>1</sup> Zentrum für Minimal-Invasive Chirurgie, Allgemeinchirurgie, Viszeralchirurgie und Unfallchirurgie, Wesseling, Germany

<sup>2</sup> Lagan Valley Hospital, Antrim, Ireland

<sup>3</sup> Department of Minimally Invasive Surgery and Proctology, Wrocław Medical University, Poland

#### Abstract

**Objectives.** The aim of the study was to show the current view on fast-track programs optimizing perioperative care and its application in one-day surgery. The authors show the possibilities of fast-track principles in all surgical fields.

**Material and Methods.** Fast-track principles identified and confirmed in trials were applied in one-day surgery. Ninety patients (39 men and 51 women, average age: 52.4 years) who underwent elective laparoscopic cholecystectomy as a planned one-day procedure were involved in the study.

**Results.** Elective laparoscopic cholecystectomy was performed in 89 patients without operative or postoperative complications. Eighty-two patients were discharged on the same day the surgery was performed. Drainage was used in 6 patients. These patients were discharged on the first postoperative day. One patient underwent open cholecystectomy as a conversion of laparoscopic cholecystectomy because of difficult anatomical findings with firm adhesions. This patient was discharged on the fourth postoperative day. No postoperative complications were observed in any patient. No patient required readmission.

**Conclusions.** The authors focused on adequate treatment of postoperative pain, early mobilization, and early introduction of oral nutrition. Other principles of the enhanced recovery program were applied as well. The fast-track approach optimizes perioperative care and allows its application in both minimally invasive and traditional major surgery. It is considered a safe method according to current literature (*Adv Clin Exp Med* 2010, 19, 2, 227–232).

**Key words:** one-day surgery, fast-track, perioperative care, elective laparoscopic cholecystectomy.

#### Streszczenie

**Cel pracy.** Przedstawienie aktualnych poglądów na program działań („szybka ścieżka”) optymalizujących opiekę okołoooperacyjną i jego zastosowanie w chirurgii jednego dnia. Autorzy badania wskazują na możliwości zastosowania tej procedury we wszystkich dziedzinach chirurgii.

**Materiał i metody.** Zasady programu zostały wytyczone i potwierdzone na podstawie badań prowadzonych na bazie „chirurgii jednego dnia”. 90 pacjentów zakwalifikowanych do badania zostało poddanych elektywnej laparoskopowej cholecystektomii jako planowemu jednodniowemu zabiegowi chirurgicznemu. Badaną grupę stanowiło 39 mężczyzn i 51 kobiet w średnim wieku – 52,4 lat.

**Wyniki.** Elektywną laparoskopową cholecystektomię wykonano u 89 pacjentów. 82 pacjentów zostało wypisanych z oddziału w dniu wykonania zabiegu. 6 operowanych wymagało drenażu jamy otrzewnowej. Otwartą cholecystektomię jako konwersję metody laparoskopowej wykonano u 1 pacjenta z powodu licznych zrostów powodujących trudności operacyjne. Pacjent ten został wypisany z oddziału w 4. dobie po zabiegu. Nie zaobserwowano powikłań śród- i pooperacyjnych u żadnego z obserwowanych pacjentów.

**Wnioski.** Autorzy badania podkreślają potrzebę odpowiedniego leczenia bólu pooperacyjnego, wczesnej mobilizacji pacjenta oraz wczesnego wdrażania żywienia doustnego. „Szybka ścieżka” opieki okołoooperacyjnej optymalizuje i standaryzuje opiekę okołoooperacyjną i pozwala na jej zastosowanie zarówno w chirurgii małoinwazyjnej, jak i w tradycyjnych dużych zabiegach chirurgicznych. Jest bezpieczną metodą opartą na najnowszych doniesieniach z literatury światowej (*Adv Clin Exp Med* 2010, 19, 2, 227–232).

**Słowa kluczowe:** chirurgia jednego dnia, „szybka ścieżka”, opieka okołoooperacyjna, elektywna laparoskopowa cholecystektomia.

The application of minimally invasive and advanced anesthetic techniques has changed surgical procedures. Trends require the best treatment effect with minimized risk for the patient. The main issue is to reduce the stress response. Many operations which in the past required hospitalization can now be performed using in- an outpatient settings or with short hospitalization and fast recovery. The fast-track technique, which is sometimes referred to as ERAS (enhanced recovery after surgery) has been introduced and is closely connected with a better understanding of perioperative pathophysiological processes. This technique, with the application of sophisticated processes, leads to a reduction of perioperative organ dysfunction. It can be applied before, during, and after surgery. An important part is aggressive postoperative rehabilitation, including early oral nutrition. This technique also involves an up-to-date approach to common principles of perioperative care, such as the usage of drains, monitoring, and the like. Generally speaking, fast-track principle shorten the duration of hospitalization and recovery and results in lower morbidity connected with pulmonary, cardiac, tromboembolic, and infectious complications [1].

This technique has been successfully introduced in a number of hospitals in Scandinavia, the USA, and Great Britain. They are established in Germany as well. It is routinely used in all surgical specialties, including general surgery, cardiothoracic surgery, urology, gynecology, and others. The authors focused on the application of fast-track principles in cases in which cholecystectomy was performed as a one-day procedure.

## Material and Methods

Fast-track principles identified and confirmed in trials were applied in one-day surgery. Ninety patients who underwent elective laparoscopic cholecystectomy as a one-day procedure were involved in this study. There were 39 men and 51 women with an average age of 52.4 years operated between July and December 2006.

The following factors of the fast-track program were applied. In the preoperative period, glucose solution was orally applied two hours before surgery. Perioperatively, short-term anesthetics were used. Special focus was made on adequate liquid volume in the perioperative period. A very important factor was the prevention of preoperative hypothermia and special equipment was used. A high concentration of O<sub>2</sub> was applied and continued after surgery as well. No routine drainage was used. Postoperatively, non-opioid analgesia

was given (a combination of NSAID drugs). An important factor was early mobilization after surgery. Preoperatively, all patients were well informed and agreed to participate in the trial.

## Results

All patients were without operative or postoperative complications. Elective laparoscopic cholecystectomy was performed in 89 patients without operative or postoperative complications. Eighty-two patients were discharged on the same day the surgery was performed. Drainage was used in 6 patients. These patients were discharged on the first postoperative day. One patient underwent open cholecystectomy as a conversion of laparoscopic cholecystectomy because of difficult anatomical findings with firm adhesions. This patient was discharged on the fourth postoperative day. No postoperative complications were observed in any patient. No patient required readmission. Adequate analgesia after the patients' discharge was provided.

## Discussion

The authors focused on all possible factors of the fast-track program, not only those applied in patients with cholecystectomy, but generally in other operations as well. The pioneer of the multimodal fast-track program in Europe is Prof. Kehlet. Fast track includes many factors. These factors were identified in randomized trials or in meta-analyses. Wind summarized 17 factors according to single studies [2]. These 17 factors participating in multimodal fast track are different in single studies, but all authors highlighted accelerated mobilization and early postoperative oral nutrition.

### Preoperative Education of the Patient

Patient information about perioperative care and the advantage of fast track is essential. The necessary anesthesia and decreased anxiety are required. Active cooperation and the patient's interest are essential conditions for the successful application of fast track.

### Bowel Preparation Before Surgery

Preoperative mechanical bowel preparation is considered an effective tool in leak prevention and a factor which decreases infection of patients in colorectal surgery. This dogma is based on observation and expert opinion only. There is no evi-

dence that patients benefit from mechanical bowel preparation according to randomized trials. The dogma about the necessity of preoperative bowel preparation in colorectal surgery should be considered [13].

### **Premedication**

Some authors, for example Basse, showed the possibility of skipping premedication. It is possible to skip premedication with good patient education [4]. However, most authors keep premedication.

### **Symbiotics Before Surgery**

The application of probiotics before surgery leads to better postoperative convalescence and shortened postoperative ileus. Probiotics stabilize bacterial bowel flora and decrease bacterial translocation [5, 6].

### **Prevention of Starvation Before Surgery and Application of Glucose Solution Two Hours Before Surgery**

There is evidence that preoperative starvation leads to decreased glycogen reserves and the induction of postoperative insulin resistance. This resistance type is similar to untreated diabetes type 2. The output of energy during surgery is comparable to the energetic output during sport performance by sportsmen and it is well established that every sportsman renews his sugar reserves. It is possible to reduce postoperative insulin resistance with preoperative oral or intravenous sugar administration [7–10]. Glucose application two hours before surgery leads to increased glycogen reserves, reduced stress reaction, reduced discomfort, and reduced exhaustion. It was shown in the past that 400 ml of clear fluid does not increase the risk of aspiration during intubation. The evacuation of clear fluid from the stomach takes less than 90 minutes [11, 12].

### **Anesthesia Optimization**

The introduction to the market of short-term volatile anesthetics with fast-starting short-acting opiates (e.g. remefentanil) and short-acting muscle relaxants allowed shorter convalescence after anesthesia [13]. There is an effort to decrease the stress response, what was demonstrated after smaller operations but not after major surgery. Local anesthetic techniques bring another advantage by reducing the endocrinological and meta-

bolic response after surgery. A meta-analysis of randomized trials evaluated local anesthesia in patients after surgery in the lower part of the body and found that morbidity was 30% lower compared with general anesthesia [14]. This effect was not found after major surgery of the thorax and abdomen [15].

### **Adequate Fluid Volume**

Fluid excess increases cardiopulmonary morbidity and prolongs postoperative ileus. The results of some trials show that adequate and non-excessive fluid application leads to a 50% decrease in common complications. An adequate fluid substitution depends on how major the surgery is, the preoperative preparation, and other factors [16, 17]. Peri- and intraoperative normovolemia is an essential condition for a good postoperative result. It is important to emphasize that a restriction of fluid volume does not increase morbidity. Fluid restriction was supported by some authors. It is important to individually optimize the fluid volume [18].

### **Short Incision, Minimally Invasive Surgery**

The classic access for many abdominal operations is midline laparotomy. Recent studies show that this approach is connected with greater postoperative pain, difficulties with wound healing, and more pulmonary complications compared with horizontal incisions. There is a higher incidence of hernia as well. Mini-invasive access or transversal incisions are preferred [19]. Mini-invasive access is connected with a better immunological response and better healing [20].

### **Hypothermia Prevention**

The maintenance of intraoperative normothermia is very important. Hypothermia influences coagulation and leukocyte function. Normothermia decreases intraoperative blood loss, postoperative cardiac morbidity, catabolism, and surgical infections [21].

### **The Application of a High O<sub>2</sub> Concentration in the Perioperative Period**

Additional oxygen supply has a positive effect on wound healing and decreases wound infection. O<sub>2</sub> supply decreases postoperative nausea and

vomiting as well as the incidence of cardiac complications [22].

### **Non-Opioid Analgesia, Adequate Postoperative Analgesia**

Postoperative pain is very often treated inadequately. Quality management of postoperative pain is essential for optimal mobilization and oral nutrition. Multimodal analgesia including NSAIDs and other drugs is important [23]. Epidural and spinal analgesia significantly contribute to successful multimodal rehabilitation. Percutaneous anesthesia is also very important [24].

### **Without Routine Drain Usage and Without a Nasogastric Tube**

Drains after elective surgery such as cholecystectomy, colorectal resection, thyroidectomy, radical hysterectomy, or pancreatic resection offer only very small benefit according to randomized trials [25]. Drains have their role after mastectomy, where they prevent serum formation. Drains hinder mobilization and present a psychological barrier. They should be utilized only selectively, not routinely.

### **Early Uro catheter Removal**

Catheterization of the urinary bladder is not recommended after colorectal surgery excluding the lower part of the rectum for more than 24 hours.

### **Prokinetics, Nausea Treatment, Vomiting, and Postoperative Ileus Treatment**

The ability to consume a normal oral diet after surgery is essential. Postoperative nausea, vomiting, and ileus should be reduced. A combination of antiemetics is profitable. Proper analgesia, early mobilization, minimally invasive operative access, and other factors decrease postoperative nausea and contribute to an early restoration of bowel kinetics. The principles for rational prophylaxis of nausea are based on systematic reviews. Receptor antagonists 5-HT<sub>3</sub>, droperidol, and dexamethasone are effective. Metoclopramide seems to be ineffective [26].

### **Early Postoperative Oral Nutrition**

Early postoperative nutrition is essential for the patient's self-sufficiency. Early postoperative oral nutrition reduces infections and decreases the length of hospitalization without increasing the risk of anastomosis dehiscence according to a meta-analysis by Lewis from 2001. Early oral nutrition also shortens the length of postoperative ileus [27].

### **Early Mobilization**

Postoperative bed rest is undesirable. It leads to increased muscle loss and decreased strength, compromises pulmonary function and tissue oxygenation, and leads to venostasis and thromboembolism. It contributes to postoperative ileus and increases infections [28].

Local anesthesia, minimally invasive surgery, and pharmacological intervention are the basic tools of stress response. The neuronal block reduces endocrinological and metabolic activation and sympathetic stimulation. There is no relevant effect on the inflammatory response [29]. Minimally invasive surgical techniques reduce postoperative pain and the inflammatory response, but they have only a very small influence on the endocrinological and metabolic response [30, 31]. Other possibilities, besides the mentioned factors, are being searched for. New possibilities could lead to decreased stress response. The influence of pharmacological intervention after the application of glucocorticoid and B-blockers has been studied. It seems that B-blockers can reduce cardiac morbidity and also reduce catabolism [32, 33]. The organ functions of patients should be optimized before any surgery. This concerns cardiac illnesses, chronic pulmonary obstruction, diabetes, and others.

The authors concluded that the primary aim of the fast-track program is not to shorten the hospital stay, but to ensure better recovery after surgery and reduce morbidity. The fast-track program is based on scientific and clinical research. Its value is in better and more effective healthcare. The principles contributing to the fast-track approach were identified more than 10 years ago, but their practical application into daily praxis has not yet taken place. The firmly fixed traditional approach opposes this new approach. Good organization is essential for a successful accelerated fast-track program. Good cooperation between surgeon, anesthesiologist, physiotherapist, nurse, and, above all, the patient is necessary. All factors leading to accelerated patient recovery should be involved. Many operations will be performed in the future as out-

patient procedures or during short hospitalization. This will lead to higher quality and the rationalization of healthcare. The application of fast-track

principles in patients with cholecystectomy is only an example. A wide application of this program in other fields of surgery is possible.

## References

- [1] **Kehlet H, Wilmore DW:** Multi-modal strategies to improve surgical outcome. *Am J Surg* 2002, 183, 630.
- [2] **Wind J, Polle SW, Fung Kon Jin HP, Dejong CHC, von Meyenfeldt MF, Ubbink DT, Gouma DJ, Bemelman WA:** Systematic review of enhanced recovery programmes in colonic surgery. 2006 *BJS*, 93, 800–809.
- [3] **Wille-Jørgensen P, Guenaga KF, Matos D, Castro AA:** Pre-operative mechanical bowel cleaning or not? an updated meta-analysis. *Colorectal Dis* 2005, 7, 4, 304–310.
- [4] **Basse L, Thorbol JE, Lossel K, Kehlet H:** Colonic surgery with accelerated rehabilitation or conventional care. *Dis Colon Rectum* 2004, 47, 271–278.
- [5] **Anderson AD, McNaught CE, Mafie J, Ring I, Barker P, Mitchell CJ:** Randomized clinical trial of multimodal optimization and standard perioperative surgical care. *Br J Surg* 2003, 90, 1497–1504.
- [6] **Gatt M, Anderson AD, Reddy BS, Hayward-Sampson P, Tring IC, Mafie J:** Randomized clinical trial of multimodal optimization of surgical care in patients undergoing major colonic resection. *Br J Surg* 2005, 92, 1354–1362.
- [7] **Thorell A, Nygren J, Ljungqvist O:** Insulin resistance: a marker of surgical stress. *Curr Opin Clin Nutr Metab Care* 1999, 1, 69–78.
- [8] **Thorell A, Guntiaik M, Efendic S, Haggmark T, Ljungqvist O:** Insulin resistance after abdominal surgery. *Br J Surg* 1994, 81, 59–63.
- [9] **Pearse R, Rajakulendran Y:** Preoperative fasting and administration of regular medication in adult patients presenting for elective surgery. Has the new evidence changed practice? *Eur J Anaesthesiol* 1999, 16, 565–568.
- [10] **Ljungqvist O, Nygren J, Thorell A:** Insulin resistance and elective surgery. *Surgery* 2001, 128, 757.
- [11] **Ljungqvist O, Sereide E:** Preoperative fasting. *Br J Surg* 2003, 90, 400–406.
- [12] **Nygren J, Thorell A, Jacobsson H, Larsson S, Schnell PO, Hylen L, Ljungqvist O:** Preoperative gastric emptying. Effects of anxiety and oral carbohydrate administration. *Ann Surg* 1995, 222, 728–734.
- [13] **White PF:** Ambulatory anesthesia – advances into the new millennium: *Anesth Analg* 2000, 98, 1234.
- [14] **Rodgers A, Walker N, Schug S et al.:** Reduction of post-operative mortality and morbidity with epidural or spinal anesthesia: results from an overview of randomized trials. *BMJ* 2000, 321, 1493.
- [15] **Rigg JR, Jamrozik K, Myles PS et al.:** Epidural anesthesia and analgesia and outcome of major surgery: a randomized trial. *Lancet* 2002, 359, 1276.
- [16] **Lobo DN, Bostock KA, Neal KR et al.:** Effect of salt and water balance on recovery of gastrointestinal function after elective colonic resection: a randomized controlled trial. *Lancet* 2002, 359, 1812–1818.
- [17] **Brandstrup B, Tonnesen H, Beier-Holgersen R, Hjortso E, Ording H, Lindorff-Larsen K, Rasmussen MS, Lanng C, Wallin L, Iversen LH, Gramkow CS, Okholm M, Blemmer T, Svendsen PE, Rottensten HH, Thage B, Riis J, Jeppesen IS, Teilmann D, Christensen AM, Graungaard B, Pott F:** Danish Study Group on Perioperative Fluid Therapy. Effects of intravenous fluid restriction on postoperative complications: comparison of two perioperative fluid regimens: a randomized assessor-blinded multicenter trial. *Ann Surg* 2003, 238, 5, 641–648.
- [18] **Holte K, Foss NB, Andersen J, Valentiner L, Lund C, Bie P, Kehlet H:** Liberal or restrictive fluid administration in fast-track colonic surgery: a randomized, double-blind study. *Br J Anaesth* 2007, Aug 6.
- [19] **Grantcharov TP, Rosenberg J:** Vertical compared with transverse incisions in abdominal surgery. *Eur J Surg* 2001, 167, 260–267.
- [20] **Whelan RL, Franklin M, Holubar SD, Donahue J, Fowler R, Munger C, Dobrman J, Balli JE, Glass J, Gonzalez JJ, Bessler M, Xie H, Treat M:** Postoperative cell mediated immune response is better preserved after laparoscopic vs. open colorectal resection in humans. *Surg Endosc* 2003, 2003, 972–978.
- [21] **Kurz A, Sessler DI, Lenhardt R:** Perioperative normothermia to reduce the incidence of surgical-wound infection and shorten hospitalization. *N Engl J Med* 1996, 334, 1209–1215.
- [22] **Whitney JD, Heiner S, Migrant BI, Wood C:** Tissue and wound healing effects of short duration postoperative oxygen therapy. *Biol Res Nurs* 2001, 2, 206–215.
- [23] **Shang AB, Gan TJ:** Optimizing postoperative pain management in the ambulatory patient. *Drugs* 2003, 63, 855.
- [24] **Rodgers A, Walker N, Schul S, McKee A, Kehlet H, van Zundert A, Sage D, Futer M, Seville G, Clark T, MacMahon S:** Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomized trials. *BMJ* 2000, 321, 1493–1497.
- [25] **Conlon KC, Labow D, Leung D et al.:** Prospective randomized clinical trial of the value of intraperitoneal drainage after pancreatic resection. *Ann Surg* 2001, 234, 487.
- [26] **Gan TJ, Meyer T, Apel CC et al.:** Consensus guidelines for managing postoperative nausea and vomiting. *Anesth Analg* 2003, 97, 62.
- [27] **Lewis SJ, Egger M, Sylvester PA et al.:** Early enteral feeding versus 'nil by mouth' after gastrointestinal surgery: systematic review and meta-analysis of controlled trials. *BMJ* 2001, 323, 773.
- [28] **Schwenk W, Raue W, Haase O, Junghans T, Miller JM:** Fast track colonic surgery – first experience with a clinical procedure for accelerating postoperative recovery. *Chirurg* 2004, 75, 508–514.
- [29] **Holte K, Kehlet H:** Epidural anaesthesia and analgesia: effects on surgical stress responses and implications for postoperative nutrition. *Clin Nutr* 2002, 21, 199.
- [30] **Kehlet H:** Surgical stress response: does endoscopic surgery confer an advantage? *World J Surg* 1999, 23, 801.

- [31] **Gupta A, Watson DI:** Effect of laparoscopy on immune function. *Br J Surg* 2001, 88, 1296.
- [32] **Schmidt M, Lindenauer PK, Fitzgerald JL et al.:** Forecasting the impact of a clinical practice guideline for peri-operative beta-blockers to reduce cardiovascular morbidity and mortality. *Arch Intern Med* 2002, 162, 63.
- [33] **Herndon DN, Hart DW, Wolf SE et al.:** Reversal of catabolism by beta-blockade after severe burns. *N Engl J Med* 2001, 345, 1223.

**Address for correspondence:**

Jakub Wachnik  
Department of Minimally Invasive Surgery and Proctology  
Wrocław Medical University  
Borowska 213  
50-566 Wrocław  
Poland  
Tel.: +48 693 438 196  
E-mail: [jwach@poczta.fm](mailto:jwach@poczta.fm)

Conflict of interest: None declared

Received: 13.11.2009

Revised: 8.02.2010

Accepted: 7.04.2010