During the past several years numerous articles were published concerning the novel perioperative management method, the so-called "fast track surgery". The above-mentioned terminology was first used in case of colon surgery by Prof. Henrik Kehlet from the Department of Gastroenterological Surgery, Hvidovre Hospital in Copenhagen (currently section of Pathophysiological Surgery in Rigshospitalet). The following terminology is also used concerning the issue: Enhanced Recovery After Surgery (ERAS), multimodal rehabilitation, or Pathway of Controlled Rehabilitation with Early Ambulation and Diet (CREAD).

The so-called “fast track” parameters can be allocated to three groups: preoperative, perioperative and postoperative. The former consists of an oral and written consent for perioperative management, a carbohydrate drink two hours before the procedure, administration of synbiotics, resignation from mechanical bowel preparation and premedication, as well as the limitation of intravenous fluids. Intraoperative factors include oxygenation, hypothermia prevention, high thoracic epidural anesthesia, minimally invasive surgery, resignation from the use of a nasogastric tube and abdominal drains. The latter group consists of rehabilitation and nutrition on the day of the operation, avoidance of opioids, the use of laxatives, early urinary bladder catheter removal, resignation from intravenous fluids and gum chewing.

Management consists in the following: 1) better understanding of the pathophysiology of the injury- reduction of the number of postoperative complications, 2) management according to Evidence Based Medicine guidelines- elimination of factors negatively influencing the patients quality of life, 3) shorter hospitalization which leads towards lower costs.

In 1997, prof. Kehllet published the pathophysiological assumptions of the proposed strategy (1). However, two years earlier Bardram et al. (2) described nine elderly patients subject to laparoscopic resection of the colon. Most were discharged from the hospital two days after the procedure. In 1999, the founder of fast track surgery published an article concerning a two-day hospitalization after open sigmoidectomy (3). Literature data presented review articles containing actual data concerning fast track surgery (4, 5). One of the most recent publications concerning fast track parameters was elaborated by Counihan and Favuzza (6). One must not forget about the ERAS group, which was created by 5 university centers from Denmark, Norway, Sweden, Scotland, and Holland. The consensus review was published in 2005 (7) and 2010 (8). There also exist individual studies present in the Polish literature (9, 10).

The study presented the main factors of “fast track surgery” based on recent literature data, according to Evidence Based Medicine. Novel investigations were selected from each field published after 2000. Data was collected from the Pub Med database and analysis of the British Journal of Surgery articles published between 2008 and 2010. Meta-analyses with the highest reliability predominated.
Articles and references obtained from the Workshop on Fast track colonic surgery organized by Hvidovre Hospital in September 2009 were also used. Additionally, experience obtained during training with the team of professor Jens Hillings from Rigshospitalet, and doctor Henrik Harling from Bispebjerg Hospital in Copenhagen proved helpful.

Pain therapy

The basic element of ERAS (Enhanced Recovery After Surgery) is optimal anesthesia. Although some authors tried to administer parenteral opioid drugs (11), epidural anesthesia seems to be the method of choice considering pain control. Anesthesia is initiated in the operating room just before surgery and continued for a period of 48-72 hours after the procedure. Simultaneously, short-lasting opioids and propofol are used during the operation. However, after the operation oral paracetamol and non-steroid anti-inflammatory drugs are additionally used. Such management is based on the pathophysiology of operative pain. Epidural anesthesia inhibits the conduction of pain and the sympathetic reflex reaction (metabolic-endocrine). Catheter placement in the thoracic segment is important for two reasons: the abdominal cavity is innervated by segments of the thoracic spinal cord (lumbar segments innervate the lower extremities). Secondly, the sympathetic trunk responsible for stressful reactions is localized in the thoracic segment. In case of high epidural anesthesia one should not forget about the possibility of blood pressure reduction. In such cases parenteral ephedrine is used (not additional fluid supplementation). The efficacy of epidural anesthesia was confirmed by a meta-analysis (12). The authors of the above-mentioned used an analogue scale of pain evaluating (in case of abdominal operations) the differences between both types of anesthesia, collected from 16 randomized trials. Values amounted to 10.9 mm with p<0.001. In case of lumbar anesthesia the above-mentioned was even greater (17.8 mm). When only an opioid drug was used worse results were observed.

Conduction and local anesthesia also limit the endocrine-metabolic response following perioperative trauma. The above-mentioned types of anesthesia, in addition to non-steroid anti-inflammatory drugs and paracetamol are designed to reduce to a minimum the systemic use of opioids. The use of the above-mentioned is connected with the following: delayed return of peristalsis, which inhibits the early introduction of oral nutrition, general symptoms and consciousness disturbances impeding early rehabilitation. Limited mechanical trauma influences the inflammatory component of the stress reaction. Minimally invasive surgery seems to best fulfill the above-mentioned role.

Fluid therapy

An important role in perioperative care is attributed to proper fluid management. It is well-known that the insufficient administration of fluids might lead towards microvascular disturbances and thus, multiorgan failure. On the other hand, fluid excess might lead to circulatory insufficiency, edema of the wound and anastomosis impeding healing and return of peristalsis. Numerous articles have been published comparing different methods of fluid supplementation. Due to the lack of a single definition concerning liberal and restrictive fluid management the comparison of both strategies seems difficult (13). Rahbari et al. systematized the above-mentioned issue (14). The authors presented both fluid supplementation strategies on the basis of Miller’s anesthesia textbook. Perioperative fluid supplementation amounted to 1750 ml (without blood supplementation). The administration of intravenous fluids exceeding 10% of values presented in the textbook was considered as liberal, while less than 10% as restrictive. Thus, the authors were able to perform a meta-analysis consisting of 4 randomized trials. There were no statistically significant differences between both groups, considering mortality, occurrence of infections, and anastomotic leakage. Differences were observed in case of the number of complications, in favor of the restrictive fluid balance (OR=0.41, p=0.005, NNT=6). In case of Departments favoring fast track surgery patients that received 1000ml of intravenous fluids were encouraged to continue oral fluid supplementation.

Apart from the benefits of restrictive fluid therapy the authors of the above-mentioned study also investigated fluid management monitoring methods. Such parameters as arte-
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Intraoperative factors

The meta-analysis of three randomized investigations showed that the reduced number of complications was observed in case of transesophageal Doppler ultrasound performed intraoperatively (OR=43, p=0.001, NNT=5). This enables to cease fluid supplementation in the absence of an increase in the ejection fraction volume.

Preoperative factors

One of the most controversial issues is the resignation of the mechanical preparation of the bowel for surgery. Until now it was thought that such behavior, consisting in the elimination of the fecal contents from the intestine reduced the risk of intraabdominal infection and possible anastomotic dehiscence. However, in the seventies of the past century the first studies were published, which undermined the above-mentioned view, and since the nineties, first meta-analyses. Wysocki and Leśniak (15) presented a translated summary of one of such meta-analyses. Slim et al. (16) and the Cochrane Database (17) presented a systematic review and meta-analysis of the randomized clinical trials. The Authors of the former study showed that in the absence of benefits, risk of water-electrolyte disturbances, and patient discomfort routine mechanical bowel preparation may be abandoned. The above-mentioned does not concern rectal surgery or laparoscopy. In case of the latter case being extended to rectal surgery similar conclusions were obtained. The comfort for the surgeon is also an interesting issue. A translated summary was presented by Wysocki and Leśniak (18). They presented similar rates considering the use or not of bowel preparation (42% of cases).

Perioperative factors

The understanding of the pathophysiology taking place in the human body leads to the optimization of perioperative care. The reduction in the area of tissue damage during surgery leads to the decrease in the inflammatory reaction and perception of pain. Laparoscopic surgery seems to best fulfill the criterion for limiting surgical trauma. However, the comparison of results between laparoscopic surgery and classical operations showed no advantage in favor of the former method. M. Vlug et al. performed a systematic review of laparoscopic versus open surgery randomized trials (23). A statistically significant difference was only observed in particular studies. Considering laparoscopy, in case of two of the above-mentioned trials one observed shorter hospitalization, in one fewer hospital readmissions, and in one a reduced complication rate. There was no statistically significant difference considering mortality. Data meta-analysis was not performed.

One blinded study, which showed the functional recovery after open versus laparoscopic surgery is worth mentioning (24). The patients' abdomen was covered by two similar dressings and patients were subject to the fast track surgery protocol. There were no statistically significant differences in case of multi-factorial rehabilitation. However, the study group was small in number. The LAFA trial (25) authors performed a systematic review of the problem. In 2006, they initiated a multi-center, double-blinded study, randomizing patients to four groups: those subject to traditional care and laparoscopy or open surgery, and those subject to the ERAS pathway undergoing laparoscopy or open surgery. Results will prob-
ably be interesting. One of the factors of the above-mentioned strategy consists in oxygen therapy. Komorowski and M. Bała summarized a meta-analysis comprising 5 trials (26), where 3001 patients were randomized to one group, either receiving a 30-35% oxygen mixture, or 80% oxygen. In case of the latter, one observed a statistically significant risk reduction of operative wound infections, considering all patients (NNT=30) including those subject to colorectal resections (41% of patients). An increased number of pulmonary complications related to hyperoxia, was not observed.

Another systematic review determined the role of perioperative warming in surgery (27). 1785 patients from 19 clinical trials were randomized to two groups: one group comprised patients who were not subject to warming techniques, while the second group comprised those subject to warming. In case of the latter group one observed fewer complications (SMD=-2, p=0.11), infections (SMD=-0.32, p=0.0001), and blood loss (SMD=2.1, p=0.0007). Considering other techniques used to maintain normothermia, one must mention the transfusion of warm fluids, the use of carbon fiber sheets, and transesophageal heat exchangers. Poor postoperative results in case of patients with reduced temperatures can be attributed to increased inflammatory incidence (vascular contraction and reduced oxygen supply), coagulopathies (poor platelet aggregation), inhibited metabolism (longer drug activity), presence of chills, and coronary ischemia (vascular contraction). Many physicians pose the question whether nasogastric tubes should be left after the operation. The answer is based on the systematic review and meta-analysis of 37 trials, which randomized more than 5 thousand patients to the group with or without the nasogastric tube (28). Pulmonary complications were more often observed in the former group (p=0.00083). Hospitalization was also prolonged in the former group, although without statistical significance. There were no significant differences observed between the occurrence of wound infections (p=0.3), anastomotic leakage (p=0.58), and postoperative hernias (p=0.91). Vomiting occurred less often in the group with the nasogastric tube. Thus, the argumentation that prophylactic nasogastric tube insertion reduces the risk of pulmonary complications, preventing from anastomotic dehiscence seems hard to justify.

Prophylaxis of postoperative nausea and vomiting and their treatment

Due to the early introduction of oral nutrition and resignation from the use of the nasogastric tube, prevention and postoperative therapy of vomiting are an essential issue in case of fast track surgery. During the past several years Cochrane’s database presented two meta-analyses evaluating the medication used. Dexamethasone in combination with ondasetron (RR=0.33 (0.22;0.49), 95%CI) seem most effective in the prevention of nausea and vomiting (29). Good results were also obtained in case of separate use of the above-mentioned drugs: dexametasone (RR=0.48 (0.43;0.54), 95%CI), and ondansetron (RR=0.56 (0.5;0.62), 95%CI). In case of metoclopramid the observed efficacy is worse (RR=0.76 (0.7;0.82), 95%CI). Considering therapy of postoperative ileus (30) some hope is connected with lidocaine and neostigmine. The efficacy of alvimopan was also confirmed (selective antagonist of peripheral type mu opioid receptors): time to the appearance in first stool- HR=1.7 (95% CI: 1.43; 2.02), time to diet tolerance – HR=1.25 (95% CI: 1.06; 1.48), hospitalization– HR=1.33 (95% CI: 1.24; 1.43). However, such drugs as metoclopramid or erythromycin proved ineffective.

Even more controversy is connected with the prophylactic maintenance of abdominal drains after the operation. The above-mentioned is considered to play a diagnostic (presence of blood in case of bleeding, fecal content in case of anastomotic dehiscence) and conservative role (before infection and compression) facilitating peritoneal cavity fluid outflow. On the other hand, the drain is prone to possible inflammation leading towards internal organ injuries and thus, increased feeling of pain. During the past years, two systematic reviews combined with a meta-analysis were published. One review (31) evaluated complications in 1394 patients after colorectal operations, randomized in 8 clinical trials. Statistically significant differences were not observed considering anastomotic leakage, pulmonary complications, or wound infections. Some aspects of diagnostic value of the contents of the drain in case of complications were questioned. The second meta-analysis (32) comprised 1140 patients from 6 trials. No statistically significant difference was
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observed in case of the occurrence of wound infections, anastomotic leakage, extra-abdominal complications, reoperations, and mortality. The authors of both reviews demonstrated that there is no evidence favoring abdominal cavity drainage in colon surgery. Additionally, the presence of the abdominal drain in the strategy of fast track surgery makes rehabilitation difficult.

Postoperative parameters

One of the main aspects of postoperative care in case of fast-track surgery is early rehabilitation. The above-mentioned should begin on the day of the procedure with the following role:

- reduce the number of pulmonary complications through better ventilation with patients in the standing position and increase the respiratory rate during physical exercise,
- prevent muscle loss and progressive lassitude,
- reduce the incidence of thromboembolic disease by increasing the functioning of the cardiac muscle during walking, preventing deep venous stasis of the lower legs and thrombus development.

Proper anesthesia plays the key role in case of early rehabilitation. Literature data mentioned the term “prehabilitation” (33). Preoperative exercise serves to prepare the organism for increased exertion (similarly to the training of a sportsman before competition). An important issue in case of postoperative care is the initiation of oral fluids and a proper diet. So far such management was postponed, due to fear of vomiting and anastomotic dehiscence. However, in case of patient malnutrition during postoperative catabolism which may lead to weakness, wound healing and anastomosis disturbances, and decreased immunity, some surgeons introduced early nutrition. The meta-analysis (34) comprised 1173 patients (subject to colorectal procedures) which were randomized in 13 clinical trials too one of the two following groups: the first group comprised patients who received food during the initial 24 hours after surgery, while the second group remained fasting until the return of peristalsis. No statistically significant differences were observed considering postoperative complications (anastomotic leakage, pulmonary complications, intraabdominal abscesses, vomiting, and wound infections).

Mortality (p<0.05) and hospitalization (p=0.011) in the second patient group were higher, while the frequency of vomiting was decreased (p=0.045). Thus, there is no evidence as to limit nutrition in these patients. An intriguing factor considered as a postoperative parameter is gum chewing. Imitating the presence of food in the oral cavity it stimulates peristalsis and digestive secretion (cephalovagal stimulation and neurohormonal mediator secretion). The systematic review and meta-analysis of the above-mentioned problem (35) considered 437 patients from 9 randomized, clinical trials subject to colorectal surgery. In case of patients chewing gum after surgery hospitalization and time required for defecation was statistically shorter, as compared to non-gum chewing patients (25, 14 and 21 hours, respectively). The rate of inflammatory complications was also reduced. Thus, the implementation of the above-mentioned element into postoperative care seems justified, including its low costs.

Implementation

There exist meta-analyses of controlled trials evaluating the use of rehabilitation programs considering the above-mentioned factors, in comparison to traditional care. One program (36) comprised 1021 patients from 4 randomized and 7 controlled studies. Considering the „fast track group” we observed a statistically significant shorter hospitalization period, including re-hospitalizations, by 2.35 days, and reduced amount of complications (RR=0.56).

The risk of readmission and nasogastric tube placement between both groups was statistically insignificant. A meta-analysis of 6 randomized, controlled trials comprising 452 patients was undertaken by Varadhan et al. (37). In case of the fast track group statistically significant differences were observed considering shorter hospitalization (average-2.51 days), and reduced risk of complications (RR=0.53).

When evaluating ERAS guidelines one should not forget about three important aspects: firstly, surgeons fear the increased number of admissions. However, Andersen et al. (38) showed that the readmission rate can
be similar to that observed in case of traditional patient care. Secondly, there is lack of scientific data implemented into clinical practice. The authors of a previously cited study (4) demonstrated that reasons for such a state of the art are as follows:
1) absence of awareness or acceptance of proven data,
2) logistic limitations (lack of time, personnel, and means to implement the strategy),
3) problems in determining the responsibility for possible complications during the implementation of the program.

One should not forget about the financial aspect of fast track surgery. During the traditional hospitalization of patients amounting to 10-12 days, three patients can be cured according to the fast track surgery method. The mentioned problem is more complex. Stephen et al. (39) presented the economic advantage of fast track surgery.

Conclusions

Based on the analysis of the presented investigations it seems justified to mention that the use of Enhanced Recovery After Surgery guidelines is not the only alternative to patient treatment. Such management shortens the duration of postoperative rehabilitation (fewer complications) without influence on the number of hospitalizations. The financial aspect of the “fast track surgical” pathway should not be forgotten. Thus, improvement in perioperative care should be continued in Polish hospitals.

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Adress correspondence: 02-097 Warszawa, ul. Banacha 1a