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Innovations in the Care of Postoperative Hysterectomy Patients

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1. Introduction

Hysterectomy, removal of the uterus, has traditionally been regarded as the definitive surgical treatment for heavy menstrual bleeding. And is one of the most commonly performed operations in the UK. (Marjoribanks, 2006) Whilst menstrual disorders are the most frequent reasons for performing hysterectomy other common indications include chronic pelvic pain, fibroids, malignancy of the uterus, cervix or ovaries and genital prolapse. Hysterectomy is a major surgical procedure with potential for significant physical and emotional complications. It also carries additional social and economic costs. (Lethaby, 1999)

Hysterectomy rates have been decreasing in recent years, but there remain large variations in population-based rates of hysterectomy across primary care organisations in England, from fewer than 10 per 100,000 to 100 per 100,000 in female populations. (Information for hospital episode statistics) Although hysterectomies were originally all performed via the abdominal route, alternative types of hysterectomy (for example vaginal and laparoscopic hysterectomies) are increasingly popular, particularly when carried out for benign disease. Vaginal hysterectomy is the procedure of choice for uterovaginal prolapse amongst practitioners in the UK. (Jha, 2007) This move away from abdominal surgery is in part due to the less invasive nature of the vaginal and laparoscopic procedures which, as a result, produce arguably better outcomes: an effect most marked when considering post-operative recovery. Current evidence on the safety and efficacy of laparoscopic techniques for hysterectomy (including laparoscopic-assisted vaginal hysterectomy, laparoscopic hysterectomy, laparoscopic supracervical hysterectomy and total laparoscopic hysterectomy) appears adequate to support their use, provided arrangements are in place for consent, audit and clinical governance.

Although hysterectomy is generally considered safe several possible complications are associated with the procedure. These complications can result in mild to severe morbidity and even (in rare cases) mortality. Although their incidence is low, it is important to be aware of the immediate and longer-term complications that may arise from hysterectomy. Immediate complications include haemorrhage, bladder and ureteric injury, bowel injury, infection and venous thromboembolism. Long-term complications include the psychological and emotional aspects of such surgery in addition to complications arising from the surgical menopause and the use of hormone replacement therapies.

In recent years there has been increasing pressure on the health service for faster return to normal activity following major surgical procedures including hysterectomy, irrespective of the route of surgery. Demand for these changes has been driven not only by economic considerations but also by the healthcare needs of working population. There is also greater awareness among women undergoing major surgery, presumably due to increased health education, about the need for faster recovery. In order to ensure a safe and quick recovery after surgery effective preoperative preparation and intraoperative planning are essential and it is important that the patient play an active role in this pathway. It is against this background that enhanced recovery after surgery (ERAS) has been discussed in this chapter, with special emphasis on hysterectomy.

2. ERAS overview

In recent years the concept of 'Enhanced Recovery After Surgery' (ERAS), initially pioneered in colonic surgery by Kehlet et al. (2008) has led to great improvements in postoperative recovery.

Enhanced Recovery after Surgery (or 'Fast-track' surgery) is an evidence-based, multidisciplinary approach to perioperative care. It aims to empower the patient to take an active role in their own care and integrates preoperative, intraoperative and postoperative techniques to reduce the stress response to surgery. These interventions help to lessen the degree of organ dysfunction postoperatively. This can lead to reduced complication rates and better overall recovery from surgery which in turn allows earlier hospital discharge without an increase in perioperative morbidity. As well as being an indicator of quicker postoperative recovery, and therefore earlier return to normal activity, reduced hospital stay also increases NHS productivity and reduces the risk of hospital acquired infection. (NHS Better Care, 2011 & Delgado- Rodriguez, 1990)

2.1 The stress response

It is thought that one of the primary causes of postoperative morbidity in an otherwise uncomplicated surgical procedure is the system of reactive changes to injury or trauma known as the surgical stress response. (Kehlet M, 1997) This is a complex neuroendocrine response mediated by the sympathetic autonomic nervous system and hypothalamic-pituitary axis and involving activation of several biological cascade systems (See below). The stress response is commenced within minutes of hysterectomy, first with adrenocorticotrophic hormone (ACTH) stimulating increased cortisol production, and within the next few hours with increased interleukin levels in the circulation. The magnitude of the reaction is dependent on the degree of trauma meaning that significant differences in the response are seen between vaginal or laparoscopic hysterectomies and open procedures. We will now discuss in more detail the various constituents of the stress response resulting from hysterectomy procedures.

2.2 Constituents of the stress response

2.2.1 Initiation

Somatic and autonomic afferents from the area of trauma (or surgery) activate both the sympathetic nervous system and the hypothalamic-pituitary axis initiating both systems of response.

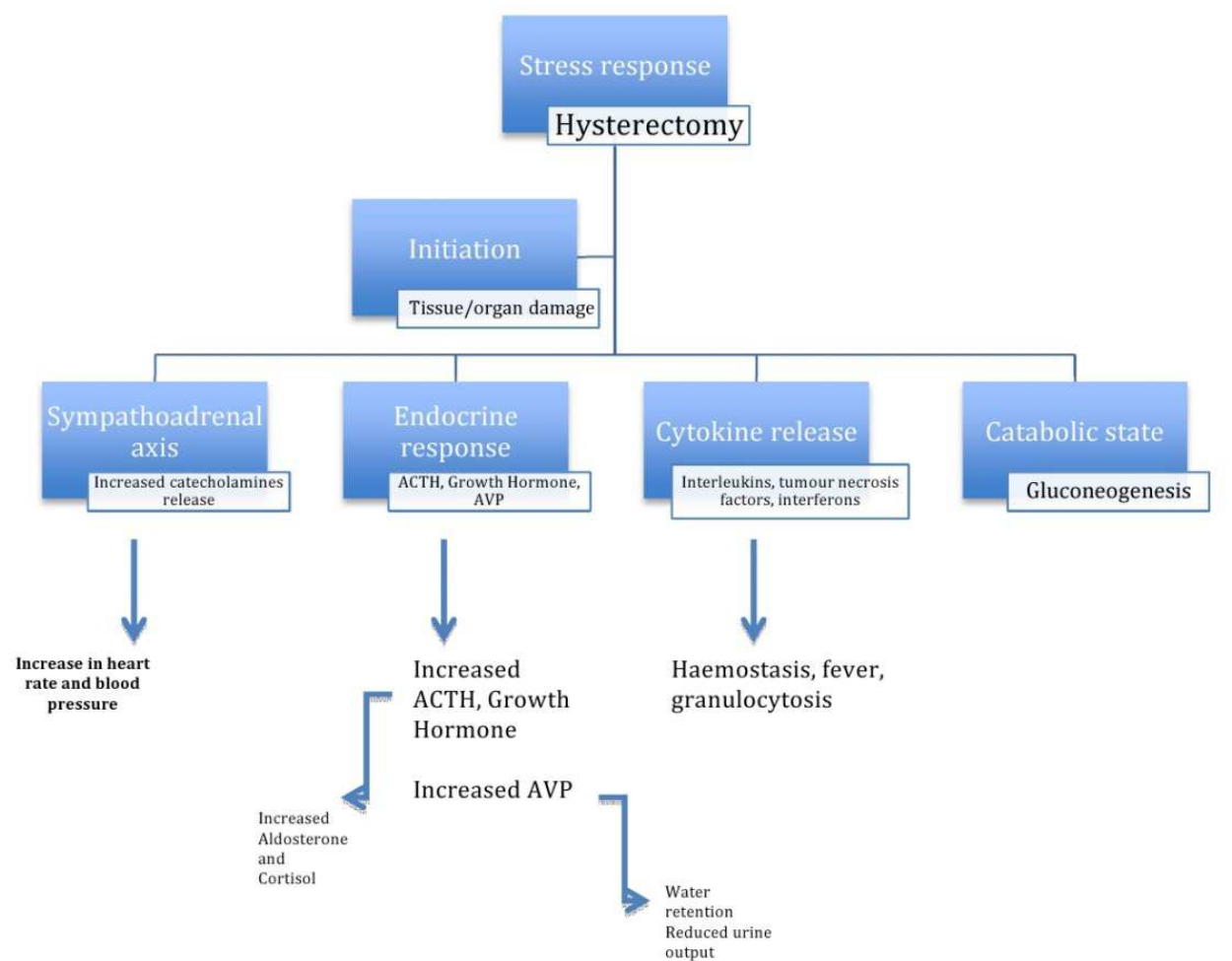


Fig. 1. The Stress Response in Hysterectomy

2.2.2 Sympathoadrenal response

Hypothalamic activation of the sympathetic nervous system leads to increased catecholamine secretion from the adrenal medulla. There is also spillover of norepinephrine into the circulation from the presynaptic nerve terminals. This results in cardiovascular effects such as tachycardia and hypertension as well as modifications in end organs, namely the liver, pancreas and kidneys.

2.2.3 Endocrine response

There is increased secretion of ACTH and growth hormone from the anterior pituitary gland and arginine vasopressin (AVP) from the posterior pituitary. These hormones have effects on target organs including increased cortisol and aldosterone secretion from the adrenal cortex. Furthermore, the usual negative feedback mechanism between ACTH and cortisol fails postoperatively and there is a persistent rise in the concentrations of both hormones. A catabolic state results in which substrates are mobilised to release energy sources and salt and water are retained to increase the intravascular fluid volume. Specifically, cortisol promotes protein catabolism and gluconeogenesis and reduces glucose use by cells thus creating an increase in blood glucose levels. These actions are augmented by an inhibition of

insulin secretion from the β cells of the pancreas during surgery and a postoperative state of insulin resistance in the cells. A reduction in the effects of insulin means reduced uptake of glucose into adipose tissue and muscle and reduced glucose storage in the form of glycogen and triglycerides as well as additional catabolic effects on protein and lipids. Glucagon release from the pancreas results in further breakdown of glycogen and muscle. Growth hormone, mainly mediated through insulin-like growth factors (IGFs) such as IGF-1, also has anti-insulin effects and promotes lipolysis, furthering the general catabolic state during and after surgery.

Increased secretion of AVP by the posterior pituitary gland in response to trauma promotes water retention in the kidneys resulting in more concentrated urine. Increased renin secretion by the juxtaglomerular apparatus of the kidneys (partly due to sympathetic activation) adds to this effect by converting angiotensin I to angiotensin II which then stimulates aldosterone secretion from the adrenal cortex. Aldosterone amplifies sodium and water reabsorption by the kidneys.

This osmotic diuresis combined with the hypoinsulinaemia and relative insulin resistance occurring intra- and postoperatively is particularly problematic in diabetic patients who can suffer perioperatively from ketoacidosis or hyperosmolar syndrome.

Changes in the thyroid hormones, gonadotrophins, prolactin and β -endorphin also take place in response to surgery but these are not central to the present discussion.

Cytokines are a group of low molecular weight proteins including the interleukins (IL), interferons and tumour necrosis factor (TNF). They play a major role in immunity and inflammation, acting on target cell receptors both locally and systemically. Initially, IL-1 and TNF- α are released from activated macrophages and monocytes in damaged tissues. This triggers further cytokine release, particularly IL-6, the main cytokine causing the systemic changes comprising the acute phase response. Production of IL-6 increases within 30 to 60 minutes of the start of surgery and its serum concentration is in direct proportion to the degree of tissue damage occurring. Cytokines also mediate other effects such as fever, granulocytosis and haemostasis.

2.2.4 Summary

The stress response is characterised by catabolism, fluid retention, pain, immunosuppression and coagulatory system changes favouring coagulation and thrombosis. In addition, there is increased cardiac work due to autonomic activation, impaired pulmonary function and gastrointestinal dysfunction including nausea and ileus.

In terms of development the changes described above were likely to have evolved to help survival of an injured animal, mobilising stored body fuels and activating repair processes. In modern medicine, however, it is argued that these systems are more likely to have negative effects, catabolising cell mass and disrupting physiological reserve. These factors could greatly impede the recovery process after hysterectomy. In recent years research has been done into perioperative interventions to modify the response in an attempt to reduce postoperative morbidity. Addressing the stress response to surgery constitutes a major part of the ERAS system. We go on to discuss these in more detail in the next section.

2.3 Components of the ERAS system

Enhanced recovery after surgery is a comprehensive programme combining many facets, each of which has been individually explored and validated. (Enhanced Recovery Partnership Programme, 2010) The system relies on full cooperation of the multidisciplinary team throughout. This allows a smooth operative journey from patient preparation (starting prior to hospital referral) to a proactive approach to analgesia, nutrition and mobilization on the hospital ward postoperatively.

2.3.1 Preoperative factors

2.3.1.1 Preoperative assessment/optimization

As shown by the American Society of Anesthesiologists' (ASA) grading system, a patient's preoperative physical status plays a key role in predicting their overall perioperative outcome. A normal healthy patient (ASA I) has an absolute surgical mortality risk of 0.1%. This risk increases to 1.8% for patients with severe systemic diseases such as chronic obstructive pulmonary disease (COPD), who would be graded ASA III. (ASA Task Force publication, 2002) It is therefore vital to optimise women's physical (as well as psychological) condition prior to undertaking the hysterectomy procedure. The first step in doing this is to quantify each individual woman's risk from the surgical procedure planned: an assessment which may involve further investigations depending on the patient's comorbidities. Women with asthma or COPD, for example, may need specialist tests of pulmonary function; women with known heart murmurs or a degree of cardiac failure may need cardiac investigations. Optimising comorbidities is a key step in hysterectomy planning. Patients undergoing hysterectomy due to menorrhagia or malignancy may require correction of anaemia with iron therapy, blood transfusion or other measures. Similarly, optimisation of diabetic control and nutritional status preoperatively can yield benefits in operative outcome.

In all cases complete risk assessment must be carried out for venous thromboembolism (VTE) and appropriate measures must be in place for thromboprophylaxis prior to commencing surgery, in accordance with national guidance. (NICE Guidance CG92, 2011)

Lastly, as part of the preoperative evaluation process, the type and route of surgery planned must be carefully considered, along with the indications for surgery and any alternatives to surgery in each case. This involves full discussion with the patient, ensuring their understanding and consent at each stage. Patient education, including information regarding the anticipated postoperative course (in particular, analgesia mobilisation and discharge) is central to improving postoperative recovery and reducing length of stay. Studies have shown that preoperative patient education programmes can work to improve patient outcomes after surgery, including significant reductions in the length of hospital stay, and increase patient satisfaction with the surgical experience. (Kruzik, 2009 & Jones, 2011)

2.3.1.2 Preoperative hydration status

Patients for elective surgery under general anaesthetic are traditionally fasted overnight with a view to reducing the volume and acidity of the gastric contents and minimising the risk of aspiration. However, it is important that patients are adequately hydrated before surgery and research on the subject has found that fasting from midnight is not only

potentially unnecessary for most patients but may also have negative effects on postoperative recovery. (Nygren, 2007) Guidance from anaesthetic associations agrees that, in general, clear fluids should be allowed up to two hours before administration of general anaesthesia, and light meals up to six hours before and recent ASA guidelines made no changes to this recommendation. (ASA Guideline, 2011 & Powell-Tuck, 2008). A Cochrane review supports this advice stating that there was no evidence to suggest that shortened fasting times for fluids results in increased risks of aspiration, regurgitation or related morbidity compared with the standard 'nil by mouth from midnight' policy, and encourages clinicians to evaluate the evidence for themselves, adjusting existing fasting policies where necessary. (Brady, 2003)

A traditional overnight fasting regime, apart from producing dehydration, also heightens the insulin resistance which, as discussed above, constitutes a key element of the surgical stress response. It has been found in many settings that an oral carbohydrate load administered prior to surgery reduces postoperative insulin resistance and is associated with improved postoperative wellbeing. This has, in addition, translated to reduced hospital stays postoperatively. (Ljungqvist, 2002 & 2009, Noblett, 2006)

2.3.1.3 Premedication

In the enhanced recovery setting, consideration is given to premedication with a view to further reducing the surgical stress response. Research initially focused on β -blockers, which aim to reduce the catecholamine response to surgery and therefore improve cardiovascular function. However the POISE trial demonstrated an increased death rate with perioperative commencement of high-dose β -blockers (Devereaux, 2008) so the use of β -blockers as premedication has largely been discontinued. Work is now focusing on α_2 -agonists such as clonidine which mainly have opioid-sparing effects, but have also been found to have positive effects on blood loss, nausea and vomiting. (Goyagi, 1999, Wu, 2004, Mohseni, 2011 & Oddby-Muhrbeck, 2002)

2.3.2 Intraoperative factors

2.3.2.1 Surgical technique

It is known that minimally invasive surgery leads to less of a systemic immune response than open access surgery and that it is generally associated with shorter hospital stays and reduced pain postoperatively. (Fuchs, 2002)

Looking specifically at hysterectomy procedures for benign indications, a Cochrane review reported improved recovery from vaginal hysterectomy compared with abdominal and laparoscopically assisted procedures. Laparoscopic procedures were found to be similarly advantageous compared with abdominal hysterectomy. With comparison of overall, particularly longer-term, outcome measures, however, there is not necessarily a clear advantage to minimal access surgery (Nieboer, 2009 & Kehlet, 2006) over open surgery when considered apart from other aspects of a fast-track programme.

Consideration must be given to the type of incision employed: transverse incisions tend to reduce postoperative pain and should be used preferentially where all other factors are equal. Lastly, surgeons must bear in mind that wound drains can hinder pain control and slow recovery. Their use must therefore be judicious and any drains or urinary catheters

which are used must be removed at the earliest possible stage postoperatively to minimise the potential for negative effects.

In general, it is important to evaluate each case individually when making decisions regarding surgical technique and to integrate components of a multimodal enhanced recovery programme to yield significant benefits.

2.3.2.2 Anaesthetic technique

Detailed discussion of anaesthetic techniques is outside the remit of this chapter, however, enhanced recovery programmes aim, in general, to achieve good pain control with minimal opioid 'hang-over' effects postoperatively. For this reason short acting anaesthetics and analgesics are preferred. Regional blocks can be useful, reducing the dose of opioids required and minimising the stress response to surgery as well as providing postoperative analgesia and expediting recovery of bowel function thereby reducing the occurrence of postoperative ileus, as shown by a recent study. (Wodlin, 2011) Other benefits from epidural use include a reduction in the rates of respiratory failure and venous thromboembolism, as shown by the MASTER trial. (Rigg, 2002) Research does not, however, draw any definite conclusions regarding superiority of one anaesthetic technique over another and the optimal approach remains to evaluate anaesthetic choices on a case-by-case basis.

2.3.2.3 Fluid management

A good balance must be struck when managing patients' hydration status perioperatively. Adequate hydration is effective in minimising postoperative nausea and vomiting and drowsiness. The effects of good hydration have been found to include reductions in postoperative complication rates and in length of hospital stay. (Walsh, 2008) Overhydration could, however, be harmful carrying risks of pulmonary and cardiac dysfunction and potentially impeding wound healing. These effects could potentially be inflated by the effects of the surgical stress response leading to increased salt and water retention. Perioperative fluid balance is dependent on many factors including nature and magnitude of the surgery. A radical open hysterectomy would create more opportunity for evaporative fluid loss than a vaginal or laparoscopic procedure and if bowel became involved further oedema and third-spacing of fluids would be more likely. The ideal approach, therefore, is that of tailored, goal-directed fluid therapy. Consensus guidance on operative fluid therapy suggests intravenous fluid administration to achieve optimal values of stroke volume in certain types of orthopaedic and abdominal surgery. (Powell-Tuck, 2008) This is achieved using either central venous pressure monitoring or the less invasive oesophageal Doppler ultrasound intraoperatively to guide fluid management. Evidence for such 'goal-directed' fluid therapy evidence shows benefits including reduction of complications and shortening of hospital stay where it is used in more major surgery. (Giglio, 2009 & Wakeling, 2005) It is not, however, currently suggested for use during routine hysterectomy procedures, although it could be useful in more extensive hysterectomy surgery (for example in cancer surgery) or in cases requiring more precise fluid management.

2.3.2.4 Temperature control

Hypothermia, even if mild, can exacerbate the stress response to surgery by sympathetic activation and there is evidence that it can impair coagulation and wound healing and predispose to infection. (Frank, 2001) These effects become more pertinent as the operative

time increases as thermoregulatory heat-preserving mechanisms are impaired by anaesthetic and patients' behaviour responses to cold are lost. NICE guidelines on perioperative temperature regulation are extensive, recommending, amongst other measures, close monitoring of patient temperatures intraoperatively, warming of intravenous fluids if more than 500ml are given intraoperatively and use of a forced air warming device if patients are under anaesthetic for more than half 30 minutes. (NICE Guideline 29, 2011)

2.3.2.5 Avoidance of postoperative nausea and vomiting (PONV)

Nausea and vomiting following surgery is a common complication and can be highly distressing for patients. Furthermore, it can interfere with oral intake and analgesia creating further problems with postoperative recovery. It is recommended that patients are risk-assessed for postoperative nausea and vomiting and given prophylactic antiemetic therapy if they are found to be at moderate or high risk. (Lassen, 2009) Risk stratification is commonly carried out using the 'Apfel' scoring system which awards a point for each of the following four risk factors: female sex, history of motion sickness or postoperative nausea and vomiting, non-smoker status and planned opioid use. (Apfel, 1999) This demonstrates that most hysterectomy patients are at moderate if not high risk of PONV due to their female gender and the frequent use of opioid analgesia in the immediate postoperative period.

2.3.3 Postoperative factors

2.3.3.1 Balanced analgesia

Effective pain relief postoperatively is vital in minimising the surgical stress response as well as easing return to normal activity (mobilisation, oral intake, etc) thus further improving recovery. The central aim of balanced (or multimodal) analgesia as a constituent of the enhanced recovery system is to maximise analgesic efficacy and minimise side effects by combining various modes of analgesia. The use of paracetamol and non-steroidals can help to reduce the doses of opioids and therefore minimise opioid side effects such as sedation, ileus and respiratory complications. Other opioid-sparing adjuncts which can be helpful include gabapentin and pregabalin. For major surgical procedures techniques such as transversus abdominis plane (TAP) blocks and epidural analgesia may also be used. (Petersen, 2010 & Kehlet, 1997)

2.3.3.2 Early enteral nutrition

The catabolic response to surgery is known to reduce muscle mass, compromise immune function and delay the healing process as well as increasing patient fatigue which itself further impedes recovery. (Wilmore, 2000) It has been traditional to delay oral intake after major abdominal surgery, mainly due to concerns over ileus and nausea and vomiting, however, recent work has demonstrated the safety of early feeding, even after major bowel surgery. (Andersen, 2006) A Cochrane review comparing early and delayed feeding after major gynaecological surgery also illustrated benefits of early oral intake in terms of shorter times to the presence of bowel sounds; shorter times to first solid diet and, ultimately, shorter hospital stays. Early feeding was defined as having oral intake of fluids or food within the first 24 hours after surgery regardless of the presence or absence of the signs that indicate the return of bowel function and delayed feeding was defined after first 24 hours following surgery and only after clinical signs of resolution of postoperative ileus. There was an increased risk of

nausea noted with early feeding and it was recommended that the decision regarding commencement of oral intake should be individualised. (Charoenkwan, 2007)

There is some evidence that routine provision of laxatives postoperatively also improves gastrointestinal function after procedures such as hysterectomy. (Hansen, 2007) This is not yet an established element of the fast-track programme, however, and in most cases laxatives are reserved for use on an 'as required' basis.

2.3.3.3 Early mobilisation

Mobilisation helps to reduce the catabolic effects of surgery on skeletal muscle, improves pulmonary function and stimulates the circulation, thus improving oxygen delivery to tissues and reducing chances of venous thromboembolism. In terms of the gastrointestinal system ambulation promotes the return of gut function and can help to prevent postoperative ileus. Early postoperative mobilisation is a key part of the fast-track system. It should be discussed preoperatively to allow the patient to create positive goals in recovery and adequate analgesia should be maintained to allow the patient to mobilise comfortably. Multidisciplinary teams are important with physiotherapy staff playing major roles in aiding early mobilisation. This facilitates a smooth postoperative journey towards a planned, criteria-based discharge in which the patient is a partner throughout their rehabilitation.

3. Enhanced recovery after surgery with reference to hysterectomy

Enhanced recovery is a relatively new concept in gynaecological surgery although it has been in vogue in colorectal and other surgeries for a few years. The authors reviewed the current literature and present the existing evidence regarding the use of enhanced recovery techniques with hysterectomy. The authors will discuss the findings of nine papers published after 1990, with clear endpoints addressing aspects of enhanced recovery programmes in use for hysterectomy. It is felt that enhanced recovery programmes applied to other aspects of obstetrics and gynaecological surgery, i.e. caesarean sections and prolapse surgery, are beyond the scope of this chapter.

We looked first at the study by Borendal Wodlin et al. for the 'GASPI' study group. This was a multicentre randomised controlled trial initially involving 180 women scheduled for benign hysterectomy, although only 162 of these patients completed the study. The patients were randomised and allocated to either spinal (82 women) or general anaesthetic (80 women) for the procedure. A range of outcome measures were assessed using the 'Swedish Postoperative Symptoms Questionnaire'. These outcomes were reported separately as discussed above. The first paper we examined was entitled 'The impact of mode of anaesthesia on postoperative recovery from fast-track abdominal hysterectomy: a randomised clinical trial' (Wodlin, 2011a). This compared the duration of stay postoperatively between the two groups as well as postoperative morphine requirements. It was found that duration of hospital stay after any fast-track abdominal hysterectomy was less than 50 hours, regardless of the mode of anaesthetic used. No significant difference was detected between the two groups with regard to this endpoint. It was noted, however, that there was a reduced need for postoperative morphine with hysterectomy performed under spinal anaesthesia compared with general anaesthesia.

The next paper we considered was 'Mode of anaesthesia and postoperative symptoms following abdominal hysterectomy in a fast-track setting' (Wodlin, 2011b) which reported

the differences in postoperative symptoms within the first 5 weeks post-hysterectomy found between the two groups in the 'GASPI' study described above. The main findings here were that, in general, spinal had advantages over general anaesthetic in terms of postoperative symptoms and recovery. It was found that abdominal pain, drowsiness and fatigue occurred significantly less often and with lower intensity with spinal anaesthesia but that there were more episodes of vomiting after spinal anaesthetics.

A later paper in the same journal issue entitled 'Health-related quality of life and postoperative recovery in fast-track hysterectomy' (Wodlin, 2011c) reported differences in health-related quality of life and duration of sick leave between the two study groups in the 'GASPI' study. Faster postoperative improvements in health-related quality of life and shorter sick leave were seen after surgery under spinal anaesthetic than with general anaesthetic although it was noted that these outcomes were influenced by complications in both groups. Finally the 'GASPI' study group published an article entitled 'Cost-effectiveness of general anesthesia versus spinal anesthesia in fast track abdominal benign hysterectomy'. (Wodlin, 2011d) This compared total healthcare costs between the two groups as described previously and concluded that the surgery was more cost effective under spinal than under general anaesthesia.

The next study examined at was 'The effect of accelerated rehabilitation on recovery after surgery for ovarian malignancy' by Marx et al. (Marx, 2006) This was a case control study looking at surgery for ovarian malignancy (undertaken according to guidelines from the International Federation of Gynecology and Obstetrics). A total of 141 women were included: 72 patients receiving conventional perioperative care were compared with 69 patients receiving multimodal, fast-track rehabilitation. The main outcome measures were postoperative hospital stay and morbidity during the first postoperative month. In this study the fast-track programme was found to reduce the median postoperative hospital stay as well as the rate of severe medical complications and the readmission rate. There was, however, no significant difference in overall complication rates between the two groups.

An article by Møller et al. entitled 'Fast track hysterectomy' (Moller, 2001) was found very interesting in this context. It was a prospective descriptive study involving 32 women and aimed to identify factors limiting early discharge after Laparoscopically Assisted Vaginal Hysterectomy (LAVH) and abdominal hysterectomy in a fast track setting. Outcome measures analysed included length of postoperative hospital stay and resumption of work. This study found no significant benefits to either surgical route in terms of convalescence or hospitalisation and concluded that further studies involving active rehabilitation would be required to demonstrate any such differences.

A later paper on the topic by Kroon et al. was entitled 'Fast-track hysterectomy: a randomised, controlled study'. (Kroon, 2010) This was a randomised controlled trial in which 53 women undergoing hysterectomy were randomised to receive either patient-controlled analgesia (PCA) combined with anaesthesia based on volatile anaesthetics or intrathecally administered morphine combined with a low-dose mode of total intravenous anaesthesia (TIVA). A few outcomes were considered, all related to accelerated recovery: the primary endpoints being length of stay on the postoperative ward and total length of hospital stay. Other outcomes included time to commencement of oral fluids, time to removal of catheter, postoperative nausea and complication rates. Significant advantages

were demonstrated with TIVA in all outcomes except complication rates which were not significantly different between the two groups.

The next study was 'Effect of laxatives on gastrointestinal functional recovery in fast-track hysterectomy: a double-blind, placebo-controlled randomized study' by Hansen et al. (Hansen, 2007) This double-blind, placebo-controlled study involved the allocation of 53 women undergoing fast-track radical hysterectomy to postoperative osmotic laxative or placebo. Amongst the various endpoints those considered primary outcomes were postoperative pain and time to first defaecation postoperatively (considered a marker for recovery of gastrointestinal function). The main conclusion drawn by this study was that postoperative laxative administration improves recovery of gastrointestinal function after fast-track hysterectomy (demonstrated by a significant reduction in the median time to first defaecation in the laxative group compared with the placebo group). No differences were seen, however, in postoperative pain or nausea and vomiting between the two groups.

The final article considered was 'Perioperative care of patients with stage IIIC ovarian cancer' by Jakobsen et al. (Jakobsen, 2010) This was a retrospective audit involving 90 patients across 6 centres undergoing surgery for stage IIIC ovarian cancer. Its stated aim was to assess multimodal evidence-based perioperative care within the fast track programme and to determine whether it enhanced postoperative recovery and reduced morbidity. Outcomes included mobilization, nutrition, nausea and pain. The paper had no clear conclusions but stated that optimised perioperative care was required, including a procedure-specific, evidence-based clinical guideline for patients receiving extensive surgery.

4. Discussion

Enhanced Recovery after Surgery (or "Fast-track" surgery) is an evidence-based, multidisciplinary approach to perioperative care in which patient empowerment is central, encouraging active involvement of patients in their care. It is multimodal in nature integrating preoperative, intraoperative and postoperative techniques to reduce complication rates and improve overall recovery from surgery. The studies that have been discussed in this chapter addressed various components of the enhanced recovery programme, either individually or in combinations. These components have been discussed in detail above but are outlined in box 1 for reference.

We continue the discussion with an analysis of the studies with reference to aspects of the programme addressed by each.

No studies were found to specifically evaluate the effects of preoperative fast-track interventions. One study compared different routes of hysterectomy (abdominal vs. laparoscopically assisted vaginal hysterectomy) in a fast-track setting. (Moller, 2001) This was a relatively small study comprising 16 women in each group. The selection of patients for each group was not randomised and was done by a gynaecologist, almost certainly in view of factors leading to suitability for open or laparoscopic surgery in each case. Apart from route of hysterectomy the two groups experienced the same fast-track approach to perioperative care, specifically in terms of preoperative information-giving, postoperative mobilisation and oral food intake and pain management throughout. With reference to routes of hysterectomy the study does not create a medium for fair comparison of the two, indeed, no advantages were reported in either route above the other. This maintains the

<u>Preoperative factors</u>
Preoperative assessment/optimisation
Preoperative hydration status
Premedication
<u>Intraoperative factors</u>
Surgical technique
Anaesthetic techniques
Fluid management
Temperature control
Avoidance of postoperative nausea and vomiting
<u>Postoperative factors</u>
Balanced analgesia
Early enteral nutrition
Laxative use
Early mobilisation

Box 1. Components of the ERAS system

principle, as discussed earlier, that route of surgery is a factor best decided on an individual basis by the surgeon in discussion with the patient and multidisciplinary team. The report did, however, quote the benefits in terms of postoperative recovery from employing the fast-track programme in both groups.

Two studies addressed mode of anaesthesia for hysterectomy. (Wodlin, 2011a, 2011b, 2011c, Kroon, 2010) The work by the 'GASPI' study group was a multicentre randomised controlled trial involving a total of 162 women undergoing total or subtotal hysterectomy for benign indications. The patients were relatively fit: contraindications to participation in the trial included an ASA score of ≥ 3 , gynaecological malignancy and physical or psychiatric disability. They were randomised to two groups for the different modes of anaesthesia as described above but all patients received identical fast-track care. The main components taken up in this study included, preoperatively, patient information, paracetamol premedication and a two-hour fluid fast and postoperatively, approaches to feeding, mobilisation and analgesia in keeping with enhanced recovery principles. It was concluded that the duration of hospital stay, the stated primary aim of the study, was reduced in both groups as a result of the fast-track techniques with no significant difference in this measure between the two groups. Other findings reported from this work suggested benefits with spinal over general anaesthesia for some endpoints, for example, the opioid-sparing effects of regional anaesthesia and resultant faster recovery of gastrointestinal function in the

patients receiving spinal anaesthetic. Side effects of spinal anaesthetic were, however also clearly demonstrated with increases in vomiting and pruritis after spinal anaesthetic. (Wodlin, 2011b, 2011c, 2011d)

The second trial looking at mode of anaesthesia, by Kroon et al. (2010), compared different anaesthetic methods (PCA and volatile anaesthesia vs. intrathecally administered morphine and TIVA) in 53 randomised patients undergoing abdominal hysterectomy for benign indications. It was noted that most of the uteri in the study were oversized as normal practice in the unit in question was to opt for vaginal hysterectomy for normal-sized uteri. As a result 11 of the 26 or 27 women in each group required midline incisions. Preoperatively the patients in both groups experienced fast-track interventions including information-giving and premedication. Patients in the TIVA group were encouraged to drink clear fluids two hours preoperatively. Postoperatively, outcomes related to accelerated recovery were focal findings of the study. The outcome of hospital discharge after two days in the TIVA group compared with three days in the volatile anaesthesia group constituted a significant improvement. Other fast-track-related outcomes which were superior in the TIVA group included length of stay on postoperative ward, time to commencement of oral fluids, time to removal of catheter and postoperative nausea. (Kroon, 2010) Detailed discussion of these anaesthetic techniques falls outside the remit of this chapter, however, this paper appears to support the use of intrathecal morphine and TIVA in the fast-track approach to hysterectomy.

Perhaps surprisingly given the important role of postoperative care in the enhanced recovery system, the only postoperative intervention addressed was that of laxative administration. The article in question was a study by Hansen et al. (Hansen, 2007) This was a double blind, placebo-controlled study that looked at the effects of postoperative administration of magnesium oxide and disodium phosphate on gastrointestinal function and postoperative symptoms after fast-track abdominal hysterectomy. A total of 53 women were involved in the completed study, which was the only one of its kind in terms of the intervention assessed. The results were encouraging in that the median time to first defecation was significantly reduced in the group given laxatives evidencing a quicker normalisation of gastrointestinal function. Postoperative hospitalization showed a trend towards reduction in the laxative group but this did not reach significance. Other endpoints again failed to demonstrate significant benefits in laxative administration with similar pain scores and incidences of nausea and vomiting in the two groups.

The two last papers both discussed hysterectomy for ovarian malignancy and both considered the fast-track programme as a whole. (Marx, 2006 & Jakobsen, 2010) The first of these, published in *Acta Obstetrica et Gynecologica* in 2006, was a case control study involving a total of 141 women. One group (comprising 72 women) received conventional care and were analysed retrospectively whilst the second group (69 women) received multimodal rehabilitation and were studied prospectively. Surgery in all cases was carried out by the same the surgeons and according to international (Federation Internationale Gynecologie et Obstetrique) guidelines. Patients in the accelerated recovery group received a complete bundle of care in keeping with enhanced recovery principles and outlined in detail in the paper. This included preoperative information, a well defined programme of nursing care postoperatively and a criteria-driven plan for discharge on the fourth postoperative day (although patients were actually discharged on the fifth

postoperative day). This trial showed significant advantages to the fast-track system with reductions in postoperative stay, severe medical complication rates and readmission rates in the fast-track group. In addition it was noted that none of the readmissions of the fast-track patients were connected with acute life-threatening conditions whereas the reasons for readmission in the conventional care group were potentially life threatening in six out of the seven cases.

Finally, a further paper examining fast-track perioperative care in patients undergoing surgery for ovarian cancer was found in the Danish journal, *Ugeskr Laeger*. (Jakobsen, 2010). This was a fairly large study, involving a total of 90 consecutive patients across six Danish centres, but was a retrospective audit which obtained data from patient files to assess the fast-track principles of perioperative care employed in these cases. The patients were divided into two groups according to the extent of surgery carried out and endpoints measured included hospital stay, postoperative mobilisation and recommencement of oral intake postoperatively. The nature of the work (a retrospective audit) made it difficult to draw any firm conclusions, as there was no control group for comparison to assess the effects of the interventions. This was compounded by the fact that, due to language restrictions, it was not possible to access the full article so information could only be gained from the article abstract. The results mainly addressed the differences between outcomes in the patients with and without extensive surgery. These included, predictably, longer hospital stays and slower return to mobilisation postoperatively in the extensive surgery group). No conclusions relating to the effects of the fast-track interventions could be drawn. The authors concluded that procedure-specific; evidence-based clinical guidelines should be produced for patients undergoing extensive surgery to optimise perioperative care.

Three further articles were studied which showed some relevance to the subject in question. The first of these was a prospective study entitled 'fast-track vaginal surgery'. (Ottesen, 2002) This initially appeared pertinent to the literature search but, on closer analysis, was found to discuss vaginal surgery for uterovaginal prolapse: only 46% of the procedures carried out (19 of the total of 41) involved hysterectomy. This paper did, however, explore fast-track surgery with generally favourable results.

The next paper, though descriptive in nature, took an interesting look into the introduction of the enhanced recovery system to a gynaecology ward and the impact on ward nursing practices. (Sjetne, 2009) Positive outcomes were reported including reductions in mean length of hospital stay and in time spent on nursing activities per patient stay. This demonstrated that the expected gains of implementing an enhanced recovery system may be achieved without compromising the workload or work environment of ward nursing staff.

The last article was an examination of patient and staff experiences of fast-track hysterectomy. (Wagner, 2004) This, again, was exploratory and descriptive in nature with no objective outcome measures. Conclusions from the authors included recommendations that, in the future, staff must be fully informed regarding the system and that a new unit be set up dedicated to the recovery programme.

Two reviews from the Cochrane database of Systematic Reviews displayed some relevance to our discussion and their contents will be discussed forthwith. (Charoenkwan, 2007 & Nieboer, 2009)

The first of these reviews was regarding early versus delayed oral fluids and food for reducing complications after major abdominal gynaecologic surgery. (Charoenkwan, 2007) The review looked into the presence of multiple postoperative parameters in patients recommencing oral food and fluid intake within the first 24 hours after surgery and those in whom it was delayed beyond 24 hours. No significant differences were found between the two in most parameters including postoperative ileus, vomiting and first passage of flatus and stool postoperatively, although there was an associated increase in postoperative nausea associated with early feeding. A possibility of shorter hospital stay in patients with early oral intake was raised in the review although this would require further research. It was concluded that early feeding after major abdominal gynaecologic surgery is safe but that the approach must be individualised.

The other Cochrane review examined the subject of surgical approach to hysterectomy for benign gynaecological disease. (Nieboer, 2009) Studies comparing vaginal, abdominal and laparoscopic hysterectomy were included and, again, various outcome measures were taken into account. It was found, predictably, that the different routes of hysterectomy each carried their own benefits and risks. In conclusion it was stated that vaginal hysterectomy would be preferable to abdominal hysterectomy where possible, and that laparoscopic hysterectomy may have advantages in cases where vaginal hysterectomy was not possible. The route of hysterectomy must, however, be decided on an individual basis after discussion between the patient and surgeon.

5. Conclusion

The Enhanced Recovery after Surgery programme was first introduced and is now commonly used in colorectal surgery. It is increasingly becoming a part of the surgical system in many hospitals in disciplines including gynaecology, urology and orthopaedics. In gynaecology some of the elements of the programme already constitute established practice in many hospitals, but the complete system requires a smooth flowing process from preoperative patient preparation to postoperative measures, including engagement of patients and staff throughout. In the UK the aim is for this programme of care to be delivered in all surgical specialties over the next 18 months. This, however, requires more widespread evidence of the type considered in this review to demonstrate the potential benefits of the enhanced recovery programme to patients and staff across the country.

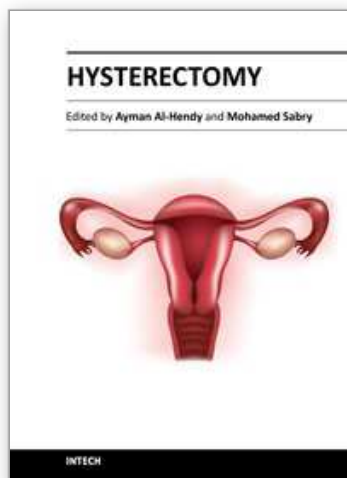
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This book is intended for the general and family practitioners, as well as for gynecologists, specialists in gynecological surgery, general surgeons, urologists and all other surgical specialists that perform procedures in or around the female pelvis, in addition to intensives and all other specialties and health care professionals who care for women before, during or after hysterectomy. The aim of this book is to review the recent achievements of the research community regarding the field of gynecologic surgery and hysterectomy as well as highlight future directions and where this field is heading. While no single volume can adequately cover the diversity of issues and facets in relation to such a common and important procedure such as hysterectomy, this book will attempt to address the pivotal topics especially in regards to safety, risk management as well as pre- and post-operative care.

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