

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

6,900

Open access books available

185,000

International authors and editors

200M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



# Fast Recovery in Esthetic Body Contouring Surgery

*Héctor Durán, Lazaro Cardenas Camarena, Jorge Bayter,  
Juan Carlos Zambrano, Marcelo Uriarte  
and Alejandro López Echaury*

## Abstract

Body contouring surgery is worldwide accepted as one of the most successful esthetic surgeries. Lipectomy, liposuction, and buttock fat infiltration are among the most frequent procedures realized, but also, they are not free of complications as any other surgery. A strategy to overcome these complications is to provide the patient with a good perioperative care, to improve every aspect of recovery. The areas to be improved are nutrition, immunology, pain and inflammation, hemodynamics, early mobilization, patient education and communication, and leadership to evaluate if it is correctly been done. The implementation of these fast recovery strategies is the best approach for our patients, with cost-efficiency optimization, a better experience, and a high overall satisfaction during the whole process. It constitutes a paradigm shift from the traditional steps around the well-being of the patient. If all the areas are covered and improved, the patient should have a fast recovery and a good experience of the surgery.

**Keywords:** body contouring surgery, fast recovery, enhanced recovery in esthetic surgery, esthetic body contouring

## 1. Introduction

A surgery is an intervention that generates damage in an area of the human body in order to obtain a greater good. In cosmetic surgery, the objective of this controlled damage is to obtain greater beauty. But for this to happen, the damage will have to be controlled so that the body can recover. These procedures are usually performed on patients who must have optimal medical conditions. Therefore, recovery should be quick and smooth and is very desirable in all surgeries, especially in body contouring surgery. The goals of this work are to:

- share strategies to provide high quality indications, innovating in perioperative care [1];
- provide guidelines for a patient's rapid recovery;
- reduce the risk and frequency of complications from body contouring surgery [2]; and
- reduce hospitalization costs through a fast recovery.

## **2. Main text**

According to ISAPS latest global report, body contouring surgeries (BCS) are among the top four procedures worldwide [3], with a tendency to increase every year; different techniques and technologies have been implemented to optimize the surgical act and improve the patient's esthetic outcome [4]. We recently searched for literature and realized that we could not find anything specific about optimizing the perioperative management in BCS, although we found some for breast augmentation and microvascular reconstruction [5, 6]. Therefore, we must first understand the problems and complications derived from BCS (mainly lipectomy and liposuction with buttock fat infiltration). By knowing the complications, we can develop strategies to prevent, mitigate, or avoid these complications. Fortunately, there are well-defined strategies for other surgery protocols, which can be used since they present similar complications [7].

The principles we used to select these strategies were that they could be grouped by systems (to facilitate their management), have a defined objective and scientific support, without interacting with the other recommendations, are cost-effective, and are easy to understand for patients. Based on the above principles, we consider that some points are highly relevant to achieve this rapid recovery, and we identified the following seven areas:

- Nutrition
  - An excellent preoperative diet and a quick restart
- Immunology
  - An adequate immunological function to decrease infections
- Pain and inflammation
  - Avoiding pain with strategies that promote comfort and mobility
- Hemodynamics
  - Hydration and response to bleeding, preventing thrombosis
- Early mobilization
  - To avoid complications and rapid reintegration
- Education and communication
  - Adequate patient education for active participation
- Leadership
  - Effective decision making and re-evaluation for improvement

## **3. Nutrition**

Body contouring surgeries sometimes require more than 3 hours of surgical time, management of large surgical areas, and a large exchange of fluids (as in the

case of liposculpture). Therefore, it is important to consider the management of perioperative nutrition as a fundamental pillar for a good recovery, as well as the multimodal management [2, 5–8]. Some of the possible benefits of adequate perioperative nutrition management such as decreased perioperative anxiety and thirst, controlled nausea and vomiting, decreased morbidity and mortality, and shortened hospital stay have been reported in different protocols [2, 5, 7, 9].

### **3.1 Preoperative management**

In order to properly apply the recommendations, a patient undergoing body contouring surgery must be selected according to specific parameters [4] and preferably without comorbidities. Increased metabolic stress and insulin resistance are closely associated with fasting long periods [10], which may result in nausea, vomiting, and increased morbidity and mortality, including prolonged hospital stay and longer recovery period [1]; there are several perioperative guidelines and protocols published in order to avoid them [5, 6, 8]. In the case of body contouring surgeries, they are particularly useful and can be divided into:

- perioperative nutrition;
- fast to solid food; and
- fluid and carbohydrate loading.

### **3.2 Perioperative nutrition**

The patient who undergoes elective body contouring surgeries must comply with the specific indications to improve his postoperative period, optimize recovery times, provide optimal conditions for healing, and prevent possible complications. Obese patients can also be malnourished; we suggest a complete nutritional evaluation, and the patient follows the appropriate and specific indications before surgery [9]. It is important to work on the patient's good eating habits and physical activity, since obesity is undoubtedly a factor that increases perioperative morbidity and mortality, wound dehiscence and infections, venous thromboembolism, and other complications. We would even recommend the surgeon to postpone surgery if the patient's weight is not adequate, seeking to perform elective surgeries on body mass indexes below 30 kg/m<sup>2</sup> ideally [11, 12]. It is important to integrate a group of professionals that includes a nutritionist and a psychologist, working together to improve our patient's behaviors and bad habits.

Alcoholic beverages should also be avoided. An intake of five or more alcoholic beverages in 1 day or five or more days in the last 30 days is considered high consumption and should be recommended to be suspended 1 month before surgery, since it is considered a risk factor frequently associated with wound infection [11].

Adequate preoperative intake should be monitored, and foods rich in protein and energy can be recommended 7 to 10 days before surgery [13, 14]. Supplements rich in arginine, fatty acids, and nucleotides have been shown to be effective in improving tissue oxygenation by promoting healing and overall recovery [13].

### **3.3 Preoperative fasting**

Preoperative fasting is intended to prevent perioperative bronchoaspiration, which has a relatively low incidence but high mortality [15]. But fasting along with surgery can trigger increased insulin resistance and catabolic stress. Catabolic stress produces

homeostasis alterations leading to an increase in the occurrence of nausea, vomiting, pain, and general postoperative discomfort that prolongs hospital stay [5, 13].

To avoid this, we recommend patients with BCS, a 6-hour fast for solid foods may be considered. Patients with underlying gastroduodenal pathology [5, 13, 14] and with evidence of delayed gastric emptying will need an 8-hour fast or an overnight fast.

Preoperative administration of carbohydrates (loading) is an option that should be considered 2 hours before the procedure and may be administered in clear liquids (maltodextrin, 12.5%, 285 mOsm/kg, 800 ml the evening before surgery and 400 ml 2–3 hours before induction of anesthesia) [5, 8, 9, 14]. In patients with delayed gastric emptying, carbohydrate loading should be avoided. These measures have been reported to decrease preoperative anxiety, in addition to suppressing thirst and postoperative discomfort [13, 14].

### **3.4 Postoperative nutritional management**

Resuming an early oral intake after major surgery has shown many benefits, such as decreased nausea, faster return of bowel motility, and shorter hospital stay. It is generally recommended to start 4 hours after surgery, preferably with a low-residue diet. The addition of high-calorie and high-protein supplements will compensate for post-metabolic surgical stress [14].

Undoubtedly, nutrition is an important factor in improving critical postoperative aspects such as wound healing and infection prevention [5, 8, 13, 16]. Once the patient is at home, it is important to start a diet with supplementation of amino acids such as arginine and glutamine in addition to fatty acids, antioxidants, and nucleotides, since these are the most necessary nutrients for the body's metabolic response to surgical stress.

Several studies attribute benefits to arginine supplementation, which is associated with an improvement in vasodilation and oxygenation, in addition to normalizing T-lymphocyte function in tissues, enhancing the body's immune response, and accelerating biological recovery processes [13, 14].

Consuming protein-rich supplements has also been observed to reduce infection rate and hospital stay [13]. Similarly, supplementation with protein, iron, and vitamin B12 and supplementation with vitamin A, C, as well as zinc, calcium, and magnesium should be considered [17].

### **3.5 Reactivation of intestinal function**

The consumption of coffee when started orally and gum (three times a day for 1 hour) has been widely studied to quickly reactivate the intestinal function, being these measures inexpensive and available in any recovery environment. Attempts have also been made to counteract the effect of opiates on intestinal motility by using alvimopan for its antagonistic effect on u-blockers in the gastrointestinal tract, as well as mosapride and its serotonin agonist action to enhance recovery from ileus [5, 13].

## **4. Immunology**

### **4.1 Antimicrobial prophylaxis**

It is important to note that surgical infections are rare in body contouring procedures [11, 18, 19], but adequate prophylaxis covering both aerobic and anaerobic bacteria is mandatory [20].



The appropriate time for antibiotic administration, according to current guidelines, is intravenous administration 60 minutes before the surgical procedure. The use of first-generation cephalosporins (Cefazolin 1 g) is preferred because of its wide coverage, low cost, and low allergenic potential [20–22].

The administration of oral antibiotics in the subsequent postoperative period lacks scientific support to demonstrate its efficacy in preventing infections, and its role in eliminating intestinal bacterial flora can be questioned [11, 20, 22].

## 4.2 Surgical area decontamination

It is recommended to clean the skin with alcohol and chlorhexidine solutions to eliminate the bacterial flora. Its use decreases the presence of surgical site infection by up to 40%. Studies have shown that they are more effective compared to povidone-iodine [11].

Preoperative bathing with chlorhexidine-based soaps remains questionable [20]; however, it can be considered useful as BCS works in large surgical areas, and this theoretically allows for more adequate preparation before the surgical procedure [11, 21].

## 5. Pain

### 5.1 Prevention and treatment of pain

One of the pillars of the comprehensive approach to surgical patient recovery is the management of analgesia. With this in mind, the first step is precisely to establish an appropriate analgesia management scheme even before the procedure. There is evidence that reducing pain during the intraoperative and postoperative processes will allow patients to have a faster nutritional, psychological, and motor recovery [23]. Among the results, a significant decrease in postoperative pain from day 0 to day 3 has been found. Another reason within rapid recovery protocols is to limit the use of opiates, thereby achieving the goal without increasing complications. On the other hand, opioids reduction is also part of the postoperative strategy to limit nausea and vomiting and avoid postural hypotension. These symptoms are a common cause of longer hospitalizations [11, 23, 24]. Among the recommendations for postoperative analgesia, treatment with ketorolac and then with paracetamol, nonsteroidal anti-inflammatory drugs, and gabapentin are recommended [25, 26].

Multimodal management is chosen to act on the different pain mechanisms and thus reduce them in the postoperative period [25]. As preoperative planning, celecoxib (200–400 mg), gabapentin (300–600 mg), and ondansetron (8 mg) are started as premedication one night before surgery and the surgery morning. Intraoperatively, dexamethasone (8 mg) and promethazine (25 mg) are added after induction, either intravenously or in suppository [26], in addition to fentanyl and propofol per kilogram of weight [23]. In breast surgery, the protocols also include regional anesthesia by paravertebral blocks [25] and in abdominoplasty the use of liposomal bupivacaine [27] (0.25–0.5%) below the rectus abdominis sheath [25] or transverse abdominal plane block. Ropivacaine as a pain control measure within the breast pocket in breast surgeries has also been reported efficiently by Durán-Vega [28]. In all cases, 1 g of paracetamol is applied intravenously at the end of surgery and just before extubation. In the recovery area, gabapentin can be used before discharge or during the hospital stay. For outpatient management, celecoxib and gabapentin are indicated for 5 to 7 days (**Table 1**) [26].

Moment	Drug
Night before surgery	Celecoxib
	Gabapentin
	Ondansetron
Morning of surgery	Celecoxib
	Gabapentin
	Ondansetron
Induction	Dexamethasone
	Promethazine (suppository)
Intraoperative	Acetaminophen
	Bupivacaine injection or ropivacaine pocket irrigation site (Duran's technique) [28]
Recovery	Gabapentin
Postoperative	Acetaminophen
	Celecoxib
	Gabapentin
	Methylprednisolone
	Tramadol (rescue)

**Table 1.**  
*Options for pain management.*

6. Hemodynamics

The accelerated recovery protocol after surgery originated in the 1990s after findings from major research groups in elective surgery [29] demonstrated improved hydration, reduced incidence of bleeding, transfusions, and complications of thrombosis [1].

The strategies carried out in the perioperative period emphasize the application of management in the different stages of surgery, and one of the main objectives is to avoid the non-rational use of fluids to avoid water overload [30]. It has been shown that water overload is one of the main risk factors that increase morbidity and mortality. Inadequate use of intravenous fluids in quality and quantity favors tissue edema, increased body weight, and fluid leakage into the third space. This also translates into cardiorespiratory complications and, at abdominal level, into a delay in the recovery of adequate peristalsis, since it favors the presence of mesenteric edema and ascites.

Fluid restriction and the use of adequate intravenous fluids have resulted in less interstitial and visceral edema; however, the beneficial effects of such water restriction have not been fully demonstrated through various studies. Some meta-analyses even concluded that there is no decrease in complications or hospital stay [31]. Other randomized controlled studies report a decrease of up to 59% in complications in abdominal surgeries [32]. Optimizing water balance begins with the intake of clear liquids up to 2 hours before surgery [32]. Regarding solid food, it is recommended to be 6 hours before surgery.

But what is the volume that they consider ml/kg/hour within the (non-standardized) definition of water restriction? The range is from 4 to 9 ml/kg/hour compared to non-restriction of 18 ml/kg/hour. It is also important to consider the type and

quality of the liquids used for a proper hydroelectrolyte balance ideally with balanced crystalloid solutions instead of saline solutions. Most of the studies are still inconclusive in this topic. Some multicenters report a 20% decrease in postoperative complications and others report a 40% decrease. However, a key element in the success of trans- and postsurgical care continue being continuous hemodynamic monitoring, including surveillance of variables as simple as urine volume per hour, being a very effective and minimally invasive tool. Hydration must always adjust the insensitve losses and the blood losses with crystalloids in each surgical procedure. It is recommended to keep IV fluids at a rate of 6 to 8 ml/kg/hour, the mean arterial pressure above 60 mmHg and the urinary output greater than 0.5 ml/kg/hour.

Patients treated with target-administered fluid therapy (TAFT) has shown in meta-analysis significantly lower morbidity ( $p = 0.002$ ); therefore, the decrease in hospital stay, hospital costs, as well as lower mortality specifically due to major cardiovascular complications, in this case without being statistically significant ( $p = 0.370$ ). It was demonstrated in all cases that managed with TAFT globally, less intraoperative fluids were administered compared to their controls [33]. We all recognize the need to replace water in surgery; however, the exact amount for a given procedure remains unknown, and the ideal volume should be identified in an attempt to avoid postoperative complications. Optimal management using conventional heart rate, blood pressure, and urine output parameters is difficult; so, TAFT was proposed; however, the beneficial effect is inconsistent. Nevertheless, TAFT is currently recommended in the context of protocols to improve postoperative recovery. The use of vasopressors is recommended to support fluid management and has no negative effect in the case of free flap surgery [12].

Regarding bleeding, studies by Zakhaleva and others, relate the use of less fluid, with less surgical morbidity [34]. Hemoglobin before surgery should ideally be greater than 13 g/dl [35] in an attempt to decrease morbidity and mortality from bleeding in our elective surgeries. In the case of anemia identified preoperatively, it should be corrected regardless of whether the cause is due to iron deficiency or some previously unidentified disorder [36].

Every patient will prove to be a different challenge in relation to bleeding. This can be related to factors like age, sex, medical history, comorbidities, type and duration of surgery, intraoperative and especially postoperative bleeding, drains use, etc. Also, anesthesia-related factors will have to be analyzed, such as hemodynamic monitoring technique, hemodynamic optimization, and fluid infusion solutions selected, among others [37].

The protocolization of the approach to fluid management will result in adequate perioperative water management, which will reduce costs, morbidity, and mortality, as well as the prompt recovery of our patients, avoiding high rates of postoperative morbidity and mortality dependent on water management by the anesthesiologist [38].

A fundamental element for the prevention of complications and an adequate perioperative evolution is venous thromboembolism prophylaxis. This becomes more relevant when the surgery includes abdominoplasty, a surgery that is usually known to have a higher risk of deep vein thrombosis and pulmonary embolism [18]. In these cases, it is essential to carry out a risk scale from the first contact in the office before elective surgery. There are several scales, and each team must determine which is the most appropriate to work with, although the best known is the scale of Caprini and Davidson [39]. The use of low-molecular-weight heparins is recommended in high-risk patients, unless the procedure is contraindicated and there is a high risk of postoperative bleeding. Among prophylactic measures, the use of graduated compression stockings, as well as intermittent mechanical pneumatic compression devices until the patient's discharge, is confirmed in different



meta-analyses. Early ambulation is undoubtedly one of the main objectives of the rapid recovery process. Mobilization within the first 24 hours after the end of surgery is imperative.

## **7. Early mobilization**

Early mobilization after any surgery is the key to rapid recovery from any surgery. This is desirable even in those surgeries where such mobilization would normally be thought to be contraindicated (for example, in the case of skin grafting) [40]; but in the case of body contouring surgery, mobilization is highly indicated. It is considered the most important general care measure in postoperative care to avoid complications [41]. Early mobilization also reduces hospital stay and hospitalization costs and improves the psychological well-being of patients; it promotes circulation, improves muscle tone, adds coordination and independence, improves bowel and urinary functions, and reduces the risk of pulmonary embolism and pneumonia. We owe this knowledge to Dr. Canavarró since World War II, who made the wounded walk from day 1, reporting a 50% reduction in complications in general [40].

Complications from not having early mobilization include muscle weakness, predisposition to lower extremity thrombosis and embolism, and impaired lung function [42]. For this reason, it is always desirable for the patient to move quickly. Also, mobilization is in full relation with the rest of the indications. For example, if anesthesia does not result in adequate recovery, the patient will not be able to mobilize properly. Or if the patient is in a lot of pain, mobilization will be extremely restricted. Similarly, nausea, cold, and other factors may prevent early mobilization.

One of the fears any doctor may have after surgery is that early mobilization will cause more bleeding. However, studies have shown that it is possible and indicated after surgeries even though when the risk of bleeding is thought to be higher. Southwell showed that there was neither any difference in graft integration nor was it necessarily associated with a higher risk of bruising, bleeding, infection, or slower integration [40]. Similarly, Yang after reconstructions [43] with maxillofacial free flap, considered mobilization as safe and that it could even have a better impact on patient comfort and sleep. Shakil [44] after orthopedic surgeries demonstrated that mobilization is not only desirable but also necessary, as it significantly reduces the rate of wound infection. Miyamoto [45] showed that early mobilization is possible after free anastomosis of the lower limbs. And Krauss [46] mentioned that in patients after hip arthroplasty surgery, it is possible to use tranexamic acid as an adjuvant to prevent bleeding and promote early mobilization.

## **8. Education and communication**

A very important element is the adequate communication and information of patients through education and counseling of patients throughout the perioperative process. Human, physical, and digital resources can be used for this purpose. Knowing the complete perioperative procedure will help the patient to make the best decisions and to prepare physically and mentally in an adequate way for the surgery, as well as to know the process that will be presented during the recovery phase that starts from the postoperative recovery area.

Within this information, it is fundamental to inform the aspects that can interfere in the evolution and the result of the surgery, as well as those elements and factors that can increase the risk of some complications. The patient must change

or suspend some behaviors like the habit of smoking, suggesting the complete abstinence from tobacco, both actively and passively, 4 weeks before the date of the surgery and at least 4 weeks after surgery [11].

Education and information about the perioperative process will allow the patient to collaborate with behaviors and attitudes that seek early recovery and the best outcome, since they will understand in detail the key elements that can prevent complications. The patient must know the importance of immediate ambulation (within the first 24 hours after surgery), the need and procedure for physical therapy, and postoperative rehabilitation.

Immediate postoperative follow-up with clear and precise indications and recommendations promotes early physical and emotional recovery. Adequate follow-up have been shown to promote better mobility, decrease pain scales, and promote the overall quality of life in the recovery process [47]. Appropriate follow-up includes supervised physical activation programs and other care and support initiatives to be implemented after discharge, which have been shown to accelerate recovery and mobility and improve patient self-confidence [48].

The central objective of educating a patient about the process he will face in surgery will be to have a proactive patient who understands what is happening. This patient will be able to differentiate between what is normal and what is not and will know the alarm data so that he can communicate with the surgeon on time in case of any eventuality. This will allow the surgeon to avoid or treat complications in a timely manner thanks to the cooperation of the patient, eliminating ignorance as an impediment to timely treatment.

## **9. Team leader and follow-up**

For the correct application of these protocols, it is essential to establish a lead director of the indications, who within his functions will also ensure the socialization and compliance with the steps, and will monitor and establish the improvements or changes necessary for each group. Therefore, it is of great importance that the processes and successes are audited by a professional and multidisciplinary team [27].

As a major milestone, it is proposed that the patient can be discharged when the following conditions are met: oral fluid and solid tolerance, audible peristalsis, controllable pain with oral medications, assisted or independent mobilization, and absence of complications requiring hospitalization [27].

Rapid recovery protocols after surgery have shown that, even with variable surgeries and different populations, perioperative care determines outcome and success more than the surgical procedure itself [18]. The principles of these practices allow shorter stays and early mobility without increased morbidity [27]. Despite the numerous reports and solid literature on the benefits of rapid recovery protocols, differences in populations and access to resources and elements described above, patient comorbidities [27] involving behavioral changes among so many other variables should be identified by the team leader who should be sensitive to these differences and seek a solution for the different usual scenarios.

Lack of willingness to implement changes, non-standardization of processes and the execution without inspectors [49] are barriers that prevent the proper implementation of these strategies. For this reason, it is very important to be a leader who can work with barriers, such as general resistance to change, lack of time and team availability, and poor communication, collaboration, and coordination between departments [50].

## **10. Conclusion**

The implementation of these fast recovery strategies is the best approach for our patients, with cost-efficiency optimization, a better experience, and a high overall satisfaction during the whole process [27]. It constitutes a paradigm shift from the traditional steps [24] around the well-being of the patient. It is possible to develop a management protocol that, although standardized, can be adapted to the different surgical groups performing BCS. In the area of nutrition, appropriate support should be sought to adequately nourish the patient so that the patient can have the least amount of fasting and a rapid tolerance to food. In the area of immunology, care must be taken to ensure that the patient has adequate immunological competence to keep inflammation under control and reduce infectious complications. Maintaining and taking care of an adequate hemodynamic function will help to avoid problems of postural hypotension, besides taking care of hemorrhage and adequate hydration, without it being minor or major. In the area of pain, try to make the patient feel as little discomfort as possible so that he or she can move and recover. Early mobilization will bring immediate benefits to the entire body. Proper patient education will help you understand the challenges you will face and communicate properly with the team to achieve a rapid response and avoid complications. And having a team leader who monitors the processes and implements the changes needed to make them truly effective will give the patient success for rapid recovery after BCS.

## **Acknowledgements**

We would like to acknowledge Dra. Diana Cecilia Popoca for the translation of this document.

## **Conflict of interest**

None of the authors declare any conflict of interest.

## Author details

Héctor Durán<sup>1,2,3,4,5,6\*</sup>, Lazaro Cardenas Camarena<sup>1,2,3,4,6</sup>, Jorge Bayter<sup>6,7,8,9,10,11</sup>,  
Juan Carlos Zambrano<sup>5,12</sup>, Marcelo Uriarte<sup>13,14</sup> and Alejandro López Echaury<sup>2,3,4</sup>

1 ASAPS – American Society for Aesthetic Plastic Surgery, New York, USA

2 ASPS – American Society of Plastic Surgeons, Illinois, USA

3 AMCPER – Asociación Mexicana de Cirugía plástica estetica y reconstructive, Mexico

4 FILACP – Federación Ibero Latino Americana de Cirugía Plástica, Panama City, Panama

5 SAPS – South American Plastic Surgery, Bogota, Colombia

6 LATAM Safety Task Force is a Mexico-Colombia Union 14 FACS is Fellow of American College of Surgeons, USA

7 Universidad Industrial de Santander, Colombia

8 Reanimation Critical and Intensive Care, Universidad la Sabana in Bucaramanga, Colombia

9 Society of Ambulatory Anesthesia (SAMBA), Overland Park, Kansas

10 Colombian Society of Anesthesia and Reanimation (SCARE), Bogota, Colombia

11 Clínica “EL Pinar”, Colombia


12 Pontificia Universidad Javeriana, Bogota, DC, Colombia

13 Uriarte Aesthetics, La Paz, Bolivia

14 FACS

\*Address all correspondence to: [hcdv@hotmail.com](mailto:hcdv@hotmail.com)

## IntechOpen

© 2020 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

## References

- [1] Bartlett EL, Zavlin D, Friedman JD. Enhanced recovery after surgery; the plastic surgery paradigm shift. *Aesthetic Surgery Journal*. 2018;**38**(6):676-685
- [2] Ljungqvist O, Scott M, Fearon KC. Enhanced recovery after surgery: A review. *JAMA Surgery*. 2017;**152**(3):292-298
- [3] International Society of Aesthetic Plastic Surgeons. ISAPS Global Survey Report. 2018. Available from: <https://www.isaps.org/wp-content/uploads/2019/12/ISAPS-Global-Survey-Results-2018-new.pdf>
- [4] Ahmad J, Eaves FF III, Rohrich RJ, Kenkel JM. The American Society for Aesthetic Plastic Surgery (ASAPS) survey: Current trends in liposuction. *Aesthetic Surgery Journal*. 2011;**31**(2):214-224
- [5] Batforf NJ, Lemaine V, Lovely JK, et al. Enhanced recovery after surgery in microvascular breast reconstruction. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2015;**68**(3):395-402
- [6] Dumestre DO, Webb CE, Temple-Oberle C. Improved recovery experience achieved for women undergoing implant-based breast reconstruction using an enhanced recovery after surgery model. *Plastic and Reconstructive Surgery*. 2017;**139**(3):550-559
- [7] Kehlet H. Multimodal approach to control postoperative pathophysiology and rehabilitation. *British Journal of Anaesthesia*. 1997;**78**(5):606-617
- [8] Fayeziadeh M, Petro CC, Rosen MJ, Novitsky YW. Enhanced recovery after surgery pathway for abdominal wall reconstruction: Pilot study and preliminary outcomes. *Plastic and Reconstructive Surgery*. 2014;**134**(4 Suppl 2):151S-159S
- [9] Ljungqvist O, Jonathan E. Rhoads lecture 2011: Insulin resistance and enhanced recovery after surgery. *JPEN Journal of Parenteral and Enteral Nutrition*. 2012;**36**(4):389-398
- [10] Bardram L, Funch-Jensen P, Jensen P, Crawford ME, Kehlet H. Recovery after laparoscopic colonic surgery with epidural analgesia, and early oral nutrition and mobilization. *Lancet*. 1995;**345**(8952):763-764
- [11] Temple-Oberle C, Shea-Budgell MA, Tan M, Semple JL, Schrag C, Barreto M, et al. Consensus review of optimal perioperative care in breast reconstruction: Enhanced Recovery after Surgery (ERAS) Society recommendations. *Plastic and Reconstructive Surgery*. 2017;**139**(5):1056e-1071e. DOI: 10.1097/PRS.00000000000003242
- [12] Lee KT, Mun GH. Effects of obesity on postoperative complications after breast reconstruction using free muscle-sparing transverse rectus abdominis myocutaneous, deep inferior epigastric perforator, and superficial inferior epigastric artery flap: A systematic review and meta-analysis. *Annals of Plastic Surgery*. 2016;**76**:576-584
- [13] Van Der Hulst RR, van Kreel BK, von Meyenfildt MF, et al. Glutamine and the preservation of gut integrity. *Lancet*. 1993;**342**(8857):1363-1365
- [14] Nygren J, Thorell A, Jacobsson H, et al. Preoperative gastric emptying: Effects of anxiety and oral carbohydrate administration. *Annals of Surgery*. 1995;**222**(6):728-734
- [15] Balteskard L, Unneberg K, Mjaaland M, Jenssen TG, Revhaug A. Growth hormone and insulin like growth factor 1 promote intestinal uptake and hepatic release of



glutamine in sepsis. *Annals of Surgery*. 1998;**228**(1):131-139

[16] Lassen K, Hannemann P, Ljungqvist O, et al. Patterns in current perioperative practice: Survey of colorectal surgeons in five northern European countries. *BMJ*. 2005;**330**(7505):1420-1421

[17] Thorell A, MacCormick AD, Awad S, et al. Guidelines for perioperative care in bariatric surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. *World Journal of Surgery*. 2016;**40**(9):2065-2083. DOI: 10.1007/s00268-016-3492-3

[18] Somogyi RB, Ahmad J, Shih JG, Lista F. Venous thromboembolism in abdominoplasty: A comprehensive approach to lower procedural risk. *Aesthetic Surgery Journal*. 2012;**32**(3):322-329. DOI: 10.1177/1090820X12438896

[19] Chia C, Neinstein R, Theodorou S. Evidence-based medicine: Liposuction. *Plastic and Reconstructive Surgery*. 2017;**139**(1):267e-274e

[20] Gustafsson UO, Scott MJ, Hubner M, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS®) Society recommendations: 2018. *World Journal of Surgery*. 2019;**43**(3):659-695

[21] Nelson G, Bakkum-Gamez J, Kalogera E, Altman A, Meyer LA, Scott M, et al. Guidelines for perioperative care in gynecologic/oncology: Enhanced Recovery after Surgery (ERAS) Society recommendations—2019 update. *International Journal of Gynecological Cancer*. 2019;**29**(4):651-668

[22] Melloul E, Lassen K, Roulin D, Grass F, Perinel J, Adham M, et al. Guidelines for perioperative care for pancreatoduodenectomy: Enhanced

Recovery After Surgery (ERAS) recommendations. 2019. *World Journal of Surgery*. 2020. ISO 690

[23] Dumestre DO, Redwood J, Webb CE, Temple-Oberle C. Enhanced recovery after surgery (ERAS) protocol enables safe same-day discharge after alloplastic breast reconstruction. *Plastic Surgery*. 2017;**25**(4):249-254. DOI: 10.1177/2292550317728036

[24] Offodile AC, Gu C, Boukovalas S, et al. Enhanced recovery after surgery (ERAS) pathways in breast reconstruction: Systematic review and meta-analysis of the literature. *Breast Cancer Research and Treatment*. 2019;**173**(1):65-77. DOI: 10.1007/s10549-018-4991-8

[25] Parikh RP, Myckatyn TM. Paravertebral blocks and enhanced recovery after surgery protocols in breast reconstructive surgery: Patient selection and perspectives. *Journal of Pain Research*. 2018;**11**:1567-1581. DOI: 10.2147/JPR.S148544

[26] Bartlett EL, Zavlin D, Friedman JD, Abdollahi A, Rappaport NH. Enhanced recovery after surgery: The plastic surgery paradigm shift. *Aesthetic Surgery Journal*. 2018;**38**(6):676-685. DOI: 10.1093/asj/sjx217

[27] Jogerst K, Thomas O, Kosiorek HE, et al. Same-day discharge after mastectomy: Breast cancer surgery in the era of ERAS®. *Annals of Surgical Oncology*. 2020. DOI: 10.1245/s10434-020-08386-w

[28] Durán-Vega HC, Ramírez-Montañana A, Galindo OG, Gutierrez AM, González AZ, Galindo EG, et al. Ropivacaine in breast augmentation surgery. *Plastic and Reconstructive Surgery*. *Global Open*. 2018;**6**(5):1-4

[29] de Jesús Sánchez-Zúñiga M. *Medicina Crítica*. 2016;**39**(Suppl 1): 10-14

- [30] Carrillo-Esper R, de los Monteros-Estrada E, Pérez-Calatayud A. Una nueva propuesta de la medicina perioperatoria. El protocolo ERAS. *Revista Mexicana de Anestesiología*. 2013;**36**(S1):296-301
- [31] Abraham-Nordling M, Hjern F, Pollack J, Prytz M, Borg T, Kressner U. Randomized clinical trial of fluid restriction in colorectal surgery. *The British Journal of Surgery*. 2012;**99**:186-191
- [32] Brandstrup B, Tønnesen H, Beier-Holgersen R, et al. Effects of intravenous fluid restriction on postoperative complications: Comparison of two perioperative fluid regimens. A randomized assessor-blinded multicenter trial. *Annals of Surgery*. 2003;**238**:641-648
- [33] Hamilton MA, Cecconi M, Rhodes A. A systematic review and meta-analysis on the use of preemptive hemodynamic intervention to improve postoperative outcomes in moderate and high-risk surgical patients. *Anesthesia and Analgesia*. 2011;**112**:1392-1402
- [34] Zakhaleva J, Tam J, Denoya PI, Bishawi M, Bergamaschi R. The impact of intravenous fluid administration on complication rates in bowel surgery within an enhanced recovery protocol: A randomized controlled trial. *Colorectal Disease*. 2013;**15**:892-899
- [35] Ripollés-Melchor J. Association between use of enhanced recovery after surgery protocol and postoperative complications in colorectal surgery: The postoperative outcomes within enhanced recovery after surgery protocol (POWER) study. *JAMA Surgery*. 2019;**154**(8):725-736
- [36] Batchelor TJP, Rasburn NJ, Abdelnour-Berchtold E, Brunelli A, Cerfolio RJ, Gonzalez M, et al. Guidelines for enhanced recovery after lung surgery: Recommendations of the Enhanced Recovery After Surgery (ERAS®) Society and the European Society of Thoracic Surgeons (ESTS). *European Journal of Cardio-Thoracic Surgery*. 2019;**55**(1):91-115
- [37] ERAS Compliance Group. The impact of enhanced recovery protocol compliance on elective colorectal cancer resection: Results from an international registry. *Annals of Surgery*. 2015;**261**:1153-1159
- [38] Lagarda-Cuevas J. Terapia de líquidos dirigida por metas en cirugía mayor no cardíaca: metaanálisis y revisión de la literatura. 2018;**41**(2):105-116
- [39] Cuenca-Pardo J, Ramos-Gallardo G, Morales Olivera M, Bucio-Duarte J, Caravantes-Cortés I. Stratification of the risk of thrombosis and prophylaxis: What is the best score to stratify the risk of thrombosis in patients of plastic surgery? What is the best prophylaxis? Evidence based medicine. *Cirugía Plástica*. 2020;**29**(1):32-47
- [40] Southwell-Keely J, Vandervord J. Mobilisation versus bed rest after skin grafting pretibial lacerations: A meta-analysis. *Plastic Surgery International*. 2012;**2012**:1-6. DOI: 10.1155/2012/207452
- [41] Morris BA, Benetti M, Marro H, Rosenthal CK. Clinical practice guidelines for early mobilization hours after surgery. *Orthopaedic Nursing*. 2010;**29**(5):290-316. DOI: 10.1097/NOR.0b013e3181ef7a5d
- [42] Kitching AJ, O'Neill SS. Fast-track surgery and anaesthesia. Continuing Education in Anaesthesia Critical Care & Pain. 2009;**9**(2):39-43. DOI: 10.1093/bjaceaccp/mkp006
- [43] Yang Y, Wu HY, Wei L, Li PJ, Cai ZG, Shan XF. Improvement of the patient early mobilization protocol

after oral and maxillofacial free flap reconstruction surgery. *Journal of Cranio-Maxillofacial Surgery*. 2020;**48**(1):43-48. DOI: 10.1016/j.jcms.2019.11.016

[44] Shakil S, Rehman U, Danish K. The role of early mobilization in the prevention of post operative wound infection after lower extremity orthopedic surgeries. *Journal of the Islamic International Medical College*. 2012;**7**(January):63-66

[45] Miyamoto S, Kayano S, Fujiki M, Chuman H, Kawai A, Sakuraba M. Early mobilization after free-flap transfer to the lower extremities: Preferential use of flow-through anastomosis. *Plastic and Reconstructive Surgery Global Open*. 2014;**2**(3):1-7. DOI: 10.1097/GOX.0000000000000080

[46] Krauss ES, Cronin MA, Suratwala SJ, Enker P, Rosen L, Segal A. Use of intravenous tranexamic acid improves early ambulation after total knee arthroplasty and anterior and posterior total hip arthroplasty. *American Journal of Orthopedics (Belle Mead, N.J.)*. 2017;**46**(5):E314-E319

[47] Testa A, Iannace C, Di Libero L. Strengths of early physical rehabilitation programs in surgical breast cancer patients: Results of a randomized controlled study. *European Journal of Physical and Rehabilitation Medicine*. 2014;**50**:275-284

[48] Cho HS, Davis GC, Paek JE, et al. A randomised trial of nursing interventions supporting recovery of the postmastectomy patient. *Journal of Clinical Nursing*. 2013;**22**:919-929

[49] Ament SM, Gillissen F, Moser A, et al. Identification of promising strategies to sustain improvements in hospital practice: A qualitative case study. *BMC Health Services Research*. 2014;**14**(1):641

[50] Pearsall EA, Meghji Z, Pitzul KB, et al. A qualitative study to understand the barriers and enablers in implementing an enhanced recovery after surgery programs. *Annals of Surgery*. 2015;**261**(1):92-96