

# Implementing Our Microsurgical Breast Reconstruction Enhanced Recovery after Surgery Pathway: Consensus Obstacles and Recommendations

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**Summary:** Enhanced recovery after surgery pathways are well established in other surgical specialties but are relatively new in plastic surgery. These guidelines focus on improving patient care by incorporating evidence-based recommendations. Length of stay is shorter, and overall hospital costs are lower without compromising patient satisfaction. When care is standardized, ambiguity is removed and physician acceptance is improved. Yet, implementation can be challenging on an institutional level. The Johns Hopkins microsurgical breast reconstruction team identified areas of dogmatic dissonance during 3 focus groups to formalize an enhanced recovery pathway for microsurgical breast reconstruction. Six microsurgeons used nominal group technique to reach consensus. Four discussion points were identified: multidisciplinary buy-in, venous thromboembolism (VTE) chemoprophylaxis, early feeding, and dietary restrictions. Evidence-based recommendations and our enhanced recovery after surgery protocol are provided. (*Plast Reconstr Surg Glob Open* 2019;7:e1855; doi: 10.1097/GOX.0000000000001855; Published online 4 January 2019.)

## BACKGROUND

ERAS pathways decrease length of stay, patient use of narcotics, and overall hospital costs.<sup>1–3</sup> Patients benefit by walking sooner, sleeping better, and reporting a better postoperative experience.<sup>4</sup> Until recently, a formalized ERAS Society–endorsed pathway for breast reconstruction did not exist.<sup>5</sup> Although these recommendations are now available to all, implementing them at an institutional level is not without challenges. Barriers to ERAS establishment have been published in specialties including colorectal, urology, and pediatric surgery.<sup>6–8</sup> The Johns Hopkins microsurgical breast reconstruction team identified areas of dogmatic dissonance during 3 focus groups to formalize an enhanced recovery pathway that included pre-, peri-, and postoperative care (Table 1). Nominal group technique

was used to reach consensus between the 6 microsurgeons involved.

## MULTIDISCIPLINARY BUY-IN

Understanding the science of quality improvement (QI) and barriers to successful execution can be helpful for combating the adage “people resist change.”<sup>9,10</sup> Change requires sound methodology, well-supported evidence, and a consensus of all members involved in the patient’s care.<sup>9</sup> Through thorough discussion with our pain specialists, a multi-modal cocktail of analgesics was agreed upon. Our preoperative analgesic regimen includes celecoxib, gabapentin, and oral acetaminophen. Intraoperative transversus abdominis plane blocks are performed by our anesthesia team during the microsurgical anastomosis (following harvest of second flap if bilateral). With the two teams working concurrently, length of operation is not extended. Subjectively, our patients report better pain control in the postoperative period and will be formally studied in the next phase of our QI.

## VTE CHEMOPROPHYLAXIS

Patency of anastomoses and prevention of venous thromboembolism are important components to consider during any microsurgical procedure. Unfractionated

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**Table 1. ERAS Protocol for Microsurgical Breast Reconstruction as Implemented at the Department of Plastic & Reconstructive Surgery at The Johns Hopkins Hospital**

| Orders                        | Prior to Surgery  | Day of Surgery – Preoperative Holding Area  | Intraoperative  |
|-------------------------------|---|---|---|
| <b>Labs Medications</b>       | Normal preoperative work-up   | <p><b>Anti-emetics:</b> Scopolamine patch (do not give with narrow/closed-angle glaucoma)</p> <p><b>Analgesics:</b> Acetaminophen 1 g PO (do not give with liver failure/elevated liver enzymes). Celecoxib 400mg PO (do not give with allergic-type reactions to sulfonamides). Gabapentin 600 mg PO (do not give with poor renal function).</p> <p><b>Anti-coagulation:</b> Heparin 5,000 units SC in preoperative holding area</p> | <p>As needed</p> <p><b>Anti-emetics (PRN):</b> Dexamethasone 4 mg IV after induction of anesthesia. Ondansetron 4–8 mg IV 30 minutes before end of case. Promethazine (Phenergan) 6 mg IV.</p> <p><b>Analgesics:</b> Fentanyl or hydromorphone IV PRN.</p> <p><b>Antibiotics:</b> Cefazolin 2g IV prior to incision, re-dose every 3 hours and 59 minutes or sooner. Clindamycin 600 mg IV for penicillin allergy, re-dose every 7 hours 59 minutes or sooner.</p> <p><b>Fluids:</b> Crystalloid IV 20–30 mL/kg minimum during case, avoid overload.</p> <p><b>Anesthesia:</b> Avoid nitrous oxide. Avoid inhalational agents. Total IV anesthesia if possible. Circuit humidified low oxygen (&lt;2 l/min). Anesthesia head turning guidelines for patients undergoing prolonged surgery. Transversus abdominis plane (TAP) blocks performed with ultra-sound guidance</p> |
| <b>Nursing and treatments</b> |   |   | Foley catheter, warming blanket, SCD's to lower extremities, padding to protecting all prominent surfaces, pillow behind knees.   |
| <b>Activity</b>               |   |   |   |
| <b>Nutrition</b>              |   |   |   |
| <b>Consults</b>               | Preoperative anesthesia consultation  |   |   |
| <b>Teaching</b>               | ERAS free flap education booklet provided to patient, which includes risks, benefits, and alternatives to surgery, expected length of stay, and postoperative course. |   |   |

\*Guided by published ERAS pathways<sup>4,5,17,27,28</sup>

BID, twice a day; DVTp, deep vein thrombosis prophylaxis; IV, intravenous; PO, by mouth; POD, postoperative day; PRN, when necessary; SCD, sequential compression devices; TAP, transversus abdominis plane; TID, three times a day.

| Postoperative Day 0<br>(T)  | Postoperative Day 1<br>(T + 1)   | Postoperative Day 2<br>(T + 2)   | Postoperative Day 3<br>(T + 3)  | Discharge   |
|---|--|--|---|---|
| <p><b>Anti-emetics (PRN):</b> Ondansetron (Zofran) 4mg IV/PO q8h. Promethazine (Phenergan) 5–12.5mg IV (administer 15 minutes after ondansetron dose if patient has persistent nausea).</p> <p><b>Analgesics:</b> Routine medications: Acetaminophen 1g PO q8h. Gabapentin 100mg PO TID. Celecoxib 200mg PO BID; <i>PRN IV pain medications:</i> Fentanyl 50 mcg IV q3h PRN for severe pain (pain scale rating 7–10 out of 10). Hydromorphone 0.5mg IV q3h PRN for severe pain (pain scale rating 7–10 out of 10). <i>PRN PO pain medications</i> Oxycodone 5mg PO q4h PRN for moderate pain (pain scale rating 4–6 out of 10) Tramadol 50mg PO q4h PRN for mild pain (pain scale rating 1–3 out of 10)</p> <p><b>Antibiotics:</b> Cefadroxil 1g IV q8h x 24 hrs, administer 8 hours after last intraoperative dose. Clindamycin 600mg q8h IV for penicillin allergy, administer 12 hours after last intraoperative dose.</p> <p><b>Fluids:</b><br/>Crystalloid IV at maintenance, discontinue when drinking.</p> | <p><b>Anti-emetics:</b> Ondansetron (Zofran) 4mg IV/PO q8h PRN.</p> <p><b>Analgesics:</b> As before</p> <p><b>Anti-coagulation:</b> Each patient assessed individually for DVTp risk: enoxaparin (Lovenox) 30mg SC q12h</p> <p><b>Stool softener:</b> Docusate sodium (Colace) 100mg PO BID. Senna (Senekot) 8.6mg tabs – take two tablets qhs PRN. Glycerin suppository rectally once PRN.</p> <p>Foley out by 16:00 (nurses to activate order if appropriate).</p> <p>Provide total assistance, transfer to chair in morning. Ambulate with one person assist until ambulating independently.<br/>Advance diet as tolerated -<br/>Regular diet<br/>Physiotherapy</p> | <p><b>Anti-emetics:</b> As before</p> <p><b>Analgesics:</b> As before</p> <p><b>Anti-coagulation:</b> Continue DVTp</p> <p><b>Stool softener:</b> As before</p> <p>As before</p> <p>Ambulate three times per day, progress as tolerated<br/>Regular diet</p> | <p><b>Anti-emetics:</b> As before</p> <p><b>Analgesics:</b> As before</p> <p><b>Anti-coagulation:</b> Continue DVTp</p> <p><b>Stool softener:</b> As before</p> <p>Remove marking suture and Viop-tix probe prior to discharge.</p> <p>As before</p> <p>Regular diet</p> <p>Physiotherapy outpatient referral<br/>No bra, drain care teaching, verify postoperative follow-up appointment scheduled within 7 days of discharge.</p> | <p><b>Discharge with following prescriptions:</b> Acetaminophen 650mg PO q6h PRN for 7 days, ibuprofen 600mg q6h PRN for 7 days. Tramadol 50mg PO q4h PRN or oxycodone 5mg q4h PRN (30 tabs max). Gabapentin 100mg PO TID for 7 days (if tolerating well).</p> <p><b>Discharge with following prescriptions:</b> +/- prescription for extended DVTp if high risk</p> <p><b>Discharge with following prescriptions:</b> Docusate sodium (Colace) 100 BID for 7 days.</p> |
| <p>Flap checks q1h x 24 hours, q2h x 24 hours, q4h onward while in hospital. SCD's to be worn when patient is in bed or chair, remove when ambulating. Record ins and outs including drain. Prime and empty drain PRN – 3 to 4 drains, right and left abdomen plus right and/or left breast. Inspect IV, drain and surgical sites as per nursing protocol.</p> <p>Hip flexion – continuous. Bedrest overnight.</p> <p>Sips of water</p>   |  |  |   |   |

or low-molecular weight heparin can be administered in the preoperative holding area or can be given before or after the anastomosis is complete. Variations in this practice are often attributed to the surgeon's previous training and experience or can be altered based on intraoperative events.<sup>11,12</sup> There is no randomized control trial or comparative cohort study to discern a clinical difference in patient outcome and no clear algorithm exists for microsurgery.<sup>11</sup> Our microsurgical team now routinely administers 5,000 units of subcutaneous heparin in the preoperative holding area. Following surgery, the patient is assessed using the 2005 Caprini VTE Risk Assessment Model Score, which is validated for plastic surgery.<sup>13</sup> Typically, our patients have some of the risks factors in this model: increased age, major surgery (>45 minutes), or present or previous malignancy.<sup>14</sup> Because of these factors and others such as difficulty ambulating in the postoperative period and potentially decreased venous return from the lower extremities due to tightened abdominal fascial closure, our free flap breast reconstruction patients are carefully considered for extended low molecular weight heparin treatment following discharge.<sup>15,16</sup> Current recommendations for high risk patients suggests pharmacologic anticoagulation to continue at least 7 days.<sup>5,17,18</sup> Self-administration can be easily taught to the patient before discharge. Although all of our microsurgeons use heparinized saline during vessel preparation and anastomosis, some of our microsurgeons start by flushing the flap despite no proven influence on flap failure.<sup>12</sup> This particular maneuver likely has little influence on overall patient outcome and thus was not standardized amongst the surgical team members.

### EARLY FEEDING

Resistance to early feeding was an identified discussion point. This hesitation stems mostly from the concern that flap compromise most commonly occurs in the acute period.<sup>19,20</sup> Sips of water or ice chips the evening following surgery would not preclude a rapid return to the operating room should there be a flap concern. In other specialties, no benefit was found in maintaining nil per os the evening following surgery and even showed a reduction in complications and mortality when early feeding was initiated.<sup>21,22</sup> Formally advancing the diet as tolerated in the morning after surgery is accepted as part of our enhanced recovery.

### CAFFEINE AND CHOCOLATE

Caffeine's mechanism of action on vascular tissue is complex and multi-faceted.<sup>23</sup> To date, there is no conclusive evidence to support caffeine or chocolate as contributors to vasospasm and subsequent free flap compromise.<sup>20</sup> On a cellular level, caffeine induces greater expression of nitrous oxide, a vasodilator, on vascular endothelium<sup>20</sup> and cocoa may have a suppressive effect on platelet reactivity.<sup>24</sup> In a 2015 study by Noguchi et al.,<sup>25</sup> however, caffeine intake was associated with decreased finger blood flow assessment by laser Doppler flow probe. Many surgeons continue to maintain

a caffeine and chocolate-free diet in the postoperative period following free-flap reconstruction.<sup>17</sup> One reason is that there is little harm to the patient in asking to modify their diet. There is increasing evidence suggesting vasopressor use in free flap surgery is safe, and these medications have a profound effect on vasoconstriction, and much more so than the effects of dietary caffeine.<sup>26</sup> Consensus for a caffeine and chocolate-tolerated diet was not achieved for our free flap pathway following evidence-based group discussion.

### RECOMMENDATIONS

Although ERAS is a reality for many specialties, it is relatively new for plastic surgery.<sup>27,28</sup> As with every new protocol, there is resistance to change. Microsurgical breast reconstruction does not have the surgical case volume of colorectal surgery nor its complications and length of stay. That, in part, may contribute to difficulties in reaching a consensus on a particular ERAS pathway. Implementing an ERAS pathway is the ultimate QI practice, but to truly be an effective intervention, measuring success is crucial. A paucity in robust evidence of effectiveness may also hinder buy-in for certain individuals.

Our ERAS team consisted of 6 microsurgeons, a general surgeon, a clinical pathway nurse specialist, and an anesthesiologist. The proposed pathway required approval by the Johns Hopkins ERAS Steering Committee, the Patient Family Advisory Counsel, and Pharmacy and Therapeutics Committee. The proposed protocol was then incorporated into our electronic order sets (Epic Systems Corporation© – Epic Hyperspace 2017). Creating an enhanced recovery pathway that suits the needs of all team members can mean breaking tradition for some. Invited discussion regarding each attending's concerns should take place with opportunity to introduce high-quality literature concerning proposed changes. Lastly, our recommendation includes prioritizing evidence-based practices to support high-value patient care and ensuring buy-in from all perioperative team members.

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