Abdominal Wall Reconstruction Comprehensive Care Pathway

**NOTE: This comprehensive care pathway only applies to patients undergoing AWR/complex hernia repair, not patients undergoing routine hernia repair. If there is any question regarding patient management, please speak with the attending surgeon.*

Robert Martindale, MD PhD
Professor of Surgery

Sean Orenstein, MD
Assistant Professor of Surgery

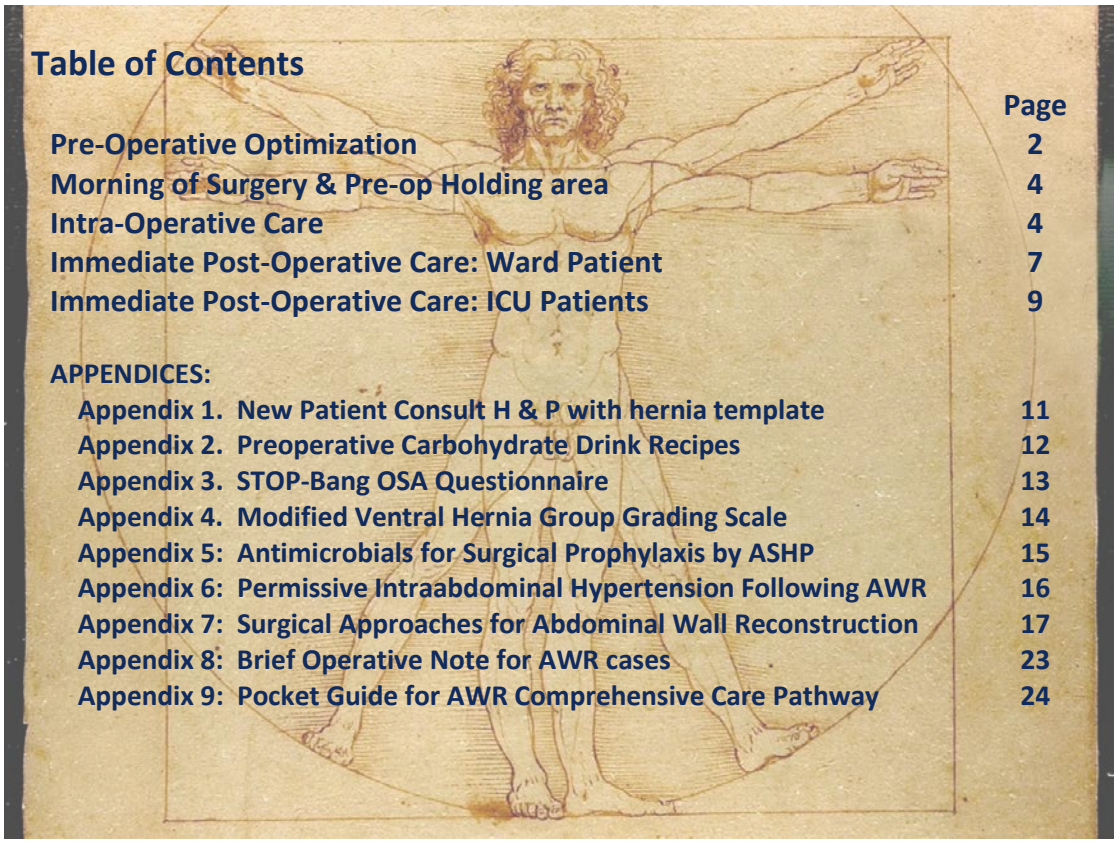


Table of Contents

Updated: 2017-04-07 SBO

Pre-Operative Optimization

1. **New Patient H & P, using the hernia template** (see Appendix 1)
2. **Nutrition**
    a. Preop Carbohydrate Drink – (see Appendix 2)
    b. Impact AR (Nestle Nutrition) – one TID (3 cartons per day 750cc total) for 5 days pre-op for any patient with: surrogate screening tools
        i. Weight loss >10 lbs
        ii. Albumin < 3 or Pre-albumin < 20
        iii. NRS 2002>5
3. **Exercise –** Ability directly observed in clinic (stair climbing, # of blocks able to walk).
    a. If diminished functional status on preop history/exam, unable to climb 2-3 flights of stairs, or if clinically suspect defunctionalized status→ consults to Pre-operative PT/OT (Prehabilitation Program at OHSU – 503-494-3151)
4. **Weight** – Obesity greatly increases the risk of repair failure, with increased recurrence and wound morbidity. Thus weight loss is crucial for successful outcomes.
    a. Hard stop for BMI >50*
        i. * Discussion for repair still necessary if small hernia neck with bowel incarceration and high risk for strangulation
        ii. Referral to bariatric surgery program
    b. Suggested weight loss for BMI 30-49
        i. How much weight to lose? Have patient/surgeon set a goal weight loss, return to clinic in 3 months. If close to or greater than goal weight loss → proceed with surgery. If weight gain or minimal loss → re-evaluate in 3-6 months. (these patients need support and need to feel we have not abandoned them, aggressively try to find them some solutions)
        ii. Encourage Medical weight loss program (though self-pay may limit availability). Even programs such as Weight Watchers and Web based programs are useful.
        iii. Surgical weight loss program (Consider referral to bariatric program if low risk of strangulation or if hernia symptoms only mild-moderate).
5. **Pulmonary**
    a. **Smoking Cessation** is discussed pre-operatively and any current smokers are advised that they must stop smoking at least 30 days prior to their scheduled operation, and warned that urine cotinine (nicotine metabolite) level will be drawn before their operation, and if greater than 2 ng/ml (Clinical Chemistry 48:9 1460-1471, 2002), their operation will be deferred until a value of less than 2 ng/ml has been achieved. Patients will be referred to:
        i. 1.800.QUIT.NOW (1.800.784.8669) or www.quitnow.net/oregon or 1.855.DEJELO-YA (1.855.335356.92) or www.quitnow.net/oregonsp
        ii. 1-800-QUIT-NOW or http://smokefree.gov or http://www.cdc.gov/tobacco/data_statistics/fact_sheets/cessation/quitting/index.htm
    b. **Obstructive Sleep Apnea (OSA) –** Given that many of our patients are obese and are at high risk for OSA, preoperative evaluation is necessary.

i. Screening with the STOP-BANG tool. Any persons with scores of ≥3 will be referred for a sleep study if not already performed. (see Appendix 3 for STOP-BANG)
ii. See OHSU OSA Guidelines for further information : https://ohsu.ellucid.com/documents/view/426

c. **Preop Consult to Pulmonology with PFTs** required if:
i. Use of home oxygen
ii. Suspected "loss of domain"

d. **Incentive Spirometer** training will be provided in clinic by RN.

6. **Alcohol Abuse Recognition –** Careful MD screening and guided weaning with discussion of risks of post-operative alcohol withdrawal. If patient is at high risk, this will be clearly documented in the pre-operative H&P with documented plan for post-operative CIWA protocol
7. **ECG** screen for patients with cardiac risk factors or older than 60 years, and **ECHO** screen for at-risk candidates (CAD, CABG, CHF, poor exercise tolerance)
8. **Diabetes Management** – Goal HbA1c between 7 and 8
   a. If Hgb A1c > 8 but < 10 referral to PCP, Diabetes Clinic or Endocrinology and postpone surgery for at least 1-2 months to allow optimal glycemic control prior to surgery.
   b. If Hgb A1c > 10, referral to Endocrinology and postpone surgery for 3 months.
9. **Preoperative Labs**
   a. CBC – assess hematologic status
   b. Type and Screen
   c. CMP – assess baseline renal function with Cr and nutritional status with Albumin
   d. If patient has chronic open wounds or chronic draining mesh infection consider addition labs to include; 25 OH Vit D, CRP, Zinc levels
10. **Perioperative Data Recording**
    a. Hernia characteristics (# previous abdominal surgeries, # previous hernia repairs, primary repair vs use of synthetic/biologic mesh, CDC wound classification, prior complications, etc)
    b. Hernia Grade – based on *Modified* VHWG Scoring (see Appendix 4)
    c. Patient characteristics (age, BMI, comorbidities, ASA score, tobacco use, etc)
11. **Perioperative Pain Management**
    a. Be sure to use the "Regional Pain Management" and "Surgeon-Anesthesia Communication" parts of the AWR order set to clarify any pain management needs with Anesthesia.
    b. For patients with chronic pain syndromes, consider having APS (Anesthesia Pain Service) evaluation for possible epidural vs TAP block vs other pain modalities.

5 days prior to surgery:

1. Patients at high risk for MRSA or Staph aureus colonization
   a. High risk patients include;
      i. Prior MRSA infection
      ii. Living in house with family having MRSA

iii. Recently in the hospital (last 6 month)
iv. Living in or recently residing in an LTAC, SNF, nursing home, or prison
v. Currently on broad-spectrum antibiotics

b. Chlorhexidine showers qDaily for 5 days
c. Mupirocin nasal swab BID x 5 days preop
i. Small amount (size of pea) in each nostril on Q tip

Morning of Surgery & Pre-op Holding area

1. **Chlorhexadine** prep shower or wipes if shower not available.
   a. **This is OHSU policy: RCT's supporting policy are controversial**
2. **Oral premedication**
   a. Acetaminophen (Tylenol; 1,000 mg PO)
   b. *Celecoxib (Celebrex; 400 mg PO) – *Contraindications include:
      i. Cardiac Hx or high risk of CV disease due to increased risk of MI/CVA with NSAIDS
      ii. Hx CKD or other renal disease
      iii. Hx of PUD/GI ulcers, bleeding, etc.
   c. Gabapentin (Neurontin; 600 mg PO, or home dose if higher) if no contraindications and not expecting upper tract surgery. Can use Pregabalin (300 mg PO) if Gabapentin intolerant.
3. **DVT prophylaxis -** 5,000 units unfractionated Heparin in preop holding area.
   a. Postop, switch to prophylactic dosing of Lovenox the evening of surgery (dosed as standard PM dosing on POD#0).
4. **Accelerated bowel function - Entereg (Alvimopan)** 12 mg PO x1 Pre-operatively, then BID until +documented bowel function or POD#7. **ONLY for complex AWR cases**
5. **(Thoracic epidural) – Not routinely used for AWR patients**
   a. Preop SQ Heparin is not contraindication for epidural, however, would need to wait ~1 hr after epidural placement for SQ heparin injection.
   b. OK for rare cases at the discretion of the surgeon. If epidural chosen, then be sure to hold SQ Heparin.
6. **(Lidocaine drip)**
   a. Must discuss with Anesthesia re: IV Lidocaine vs intraop TAP block, as only one of these should be done intraoperatively due to potential toxicity from excess local anesthetics.
   b. In general, TAP block preferred over IV Lidocaine, though no data to support this yet. If liposomal bupivacaine (Exparel) becomes available, then this would favor TAP blocks even more.

Intra-Operative Care

1. **Team Pause / Timeout**
   a. In addition to standard preoperative pause topics, please add/clarify the following:

   i. Antibiotics – type(s) & redosing; DVT prophylaxis – chemical and SCDs; Analgesics – TAP block vs Lidocine gtt, Airway pressures, possible need for prolonged intubation, SICU admission.

2. **Antibiotics** (see table in Appendix 5 for updated 2013 ASHP Guidelines)
   a. For routine cases or Grade 1-2 hernias defined by modified VHWG (see Appendix 4) treat with routine first generation cephalosporin
   b. Standard regimen is **2 g Cefazolin, or 3 g if >120kg, redosed q4 hours**
   c. If PCN allergic, substitute **Clindamycin 900 mg, redosed q6 hours**
   d. If +MRSA Hx, give **Cefazolin *PLUS* weight-based Vancomycin 15 mg/kg***
      i. *Should start Vancomycin in preop area as it takes longer to infuse to prevent "red man syndrome".
      ii. Need to redose Cefazlin, but not Vanco
   e. If bowel surgery, fistula, or Grade 3AB or C hernias (mVHWG), then give **Zosyn 3.375 g, redosed q2 hours *OR* Cipro 400 mg PLUS Metronidazole 500 mg** (no redosing for Cipro/flagyl).
   f. If infected mesh is present, cover according to pre-operative culture sensitivities, with MRSA coverage according to patient history.
3. **Standard intubation** per anesthesiologist preference.
4. **Orogastric tube** generally not needed unless upper tract surgery expected.
5. **Hemodynamics & Intravascular volume –** Goal is to maintain MAP>70 and euvolemic. ***Keep communication with anesthesia team open throughout case, with frequent MAP and volume updates as well as need for vasopressors.** Long surgeries involving extensive lysis of adhesions can lead to excessive evaporative fluid loss (estimated at 500 to 700 ml/h open at room temperature), and excision of infected mesh can induce a SIRS type response necessitating additional fluid resuscitation with or without pressors. Otherwise, minimal fluid administration is preferred to avoid post-operative fluid overload. First preference for crystalloid is lactated ringers.
   a. Arterial lines and central venous catheter placements are at discretion of Anesthesia team, but not routinely placed (i.e. Based off patient comorbidities, venous access, etc).
6. **(Epidural** for select cases only - use during the operation per anesthesiologist preference.)
7. **TAP Block – performed intraop only if TAR procedure performed.**
   a. Preferably, liposomal bupivacaine (Exparel) will be used, but is not currently available for use at OHSU.
      i. Use mixture of 0.25% Bupivacaine and Exparel in a 1:2 ratio. This allows ~immediate analgesia (standard bupivacaine) along with extended analgesia (Exparel) <<Need to double check with pharmacy regarding the specific quantities of each component, as it gets confusing to me since one is more immediate use (minutes-hours) while the other is longer (hours-days). The IFU also states that there is 266 mg of free base bupivacaine, but is equivalent to 300 mg regular bupivacaine.>>
      ii. https://www.exparel.com//hcp/how-to-use/dosing.shtml

iii. Final solution should be diluted with sterile injectable saline to approximately 150 mL TOTAL. (e.g. 30 mL 0.25% bupivacaine (=75 mg) + 10 mL liposomal bupivacaine (=150 mg) + 110 mL injectable saline.) <<NEED TO SEE IF WE CAN INCREASE THE AMOUNT OF EXPAREL WITHOUT INCREASING TOXICITY, AS THIS COMES IN A 20 ML VIAL, AND THE ABOVE CALCULATION ONLY USED 10 ML. If we can increase amount of Exparel, then it can be diluted more (can dilute up to 300 mL if using all 20 ml Exparel. >>

iv. If 150 mL total solution is used, then 75 mL will be injected each side. Using a 22-Ga spinal needle and large 50 ml syringes, mixture is infused under direct visualization within the TA plane. ~75 mL per side, divided in 2-3 spaces along the length of the TA plane.

b. If no Exparel, then use 60 mL plain 0.25% Bupivacaine (30 mL per side). Using a 22-Ga spinal needle, bupivacaine is infused under direct visualization within the TA plane. 30 mL per side, divided in 2-3 spaces along the length of the TA plane.

8. **Ventilatory Monitoring and Extubation Protocol**
   a. Within 15 minutes of skin incision, anesthesiologist to document the **plateau pressure**, peak inspiratory pressures, tidal volume, and respiratory rate.
   b. To check plateau pressure, change ventilator mode to SIMV and set a "pause" at 30%. Measure initial plateau pressure and note changes with closure (then continue with your written guidance around extubation, ICU, paralysis).
   c. After fascial closure, surgeon will notify anesthesiologist that fascia is closed and anesthesiologist will again document the **plateau pressure**, peak inspiratory pressures, tidal volume, and respiratory rate.
   c. For *changes* in <u>plateau pressures from opening pressures:</u>
      i. ≥ 6 cmH_2O → Remain intubated x 24 hrs in SICU
      ii. ≥ 9 cmH_2O → Remain intubated + Paralytics x 24-48 hrs in SICU
      iii. NOTE: [Note that Blatnik et al found that the odds ratio of respiratory complications in their patient population was 8.6 for a change in plateau pressure of 6 cm H2O or 11.5 for a change in plateau pressure of at least 9 cm H2O. **(Blatnik et al. Predicting severe postoperative respiratory complications following abdominal wall reconstruction. Plast Reconstr Surg. 2012 Oct;130(4):836-41. PubMed PMID: 22691844.)**
      iv. NOTE: Recent data has demonstrated that IAH (intra-abd hypertension) is commonplace in AWR, though is a different entity and much more mild than traditional abdominal compartment syndrome (See poster in Appendix 6)
   d. If the patient has a history of moderate to severe COPD or dyspnea at rest AND more than one of the following (recurrent incarcerated hernia, operative time >240 min, ASA score ≥4, Albumin <3.5), discussions will take place for leaving the patient intubated overnight unless otherwise determined by the staff anesthesiologist and surgeon. This will be discussed during the team pause with the disposition. [Note, this is based on Fischer et al's Respiratory Risk Score)
9. **Hematocrit goal** at the end of the case is >25%

End of Surgery in Operating Room

1. Surgeon and Anesthesiologist to discuss decision to extubate immediately postop or on POD 1 according to extubation protocol.
2. If respiratory distress in PACU following extubation, have low threshold to re-intubate. Avoid non-invasive respiratory Tx, as this may exacerbate gastric/bowel distention and not ameliorate underlying problem of intra-abd hypertension. Most intubated/reintubated patients get extubated in first 24 hours postop.
3. Anesthesia team to complete epidural order set as below and communicate with the acute pain service. Anticipate running epidural at 2 ml/hr if left intubated, or 6ml/hr if extubated, then titrated as directed by the pain service thereafter.
4. Transport to ICU (Sedated with analgesia) or PACU as indicated.

Immediate Post-Operative Care: Ward Patients

1. **Brief operative note** using "GSBRIEFOPNOTEHERNIA1" template (under Dr. Orenstein's SmartPhrase list) is completed before patient leaves the operating room.
2. **Activity:** Order placed to Ambulate at least TID
3. **Diet**: *Ensure proper diabetic version is ordered, if applicable.
    a. **POD#1 –** Unlimited Clear liq + TID clear liq protein supplements [**IsoPure**] (advise patient clear protein drink more desired than other clears)
    b. **POD#2** – Regular diet + TID Protein supplements (can switch to milk-based shakes, if desired).
    c. Nancy's yogurt or yogurt containing Lactobacillus plantarum, L. casei, L.rhamnosus, or L.reuteri should be ordered at least once daily started POD 1. (this is for prevention of Antibiotic associated diarrhea and C.difficile).
4. **DVT prophylaxis**
    c. POD#0: Switch to prophylactic dosing of Lovenox the evening of surgery (dosed as standard PM dosing on POD#0).
        i. NOTE: The patient receives a single preop dose of 5,000 units of unfractionated Heparin in the preop holding area.
5. **Postoperative Antibiotics** – No routine abx unless:
    a. High concern for infection, infected mesh removal, chronic MRSA infection, …
    b. Treat with abx until final intra-operative cultures are negative.
6. **Entereg (Alvimopan)*** → 12 mg PO x1 Pre-operatively, then BID until +documented bowel function or POD#7. *This may not apply to all AWR patients.
7. **Bowel regimen**
    a. Colace 100 mg PO BID (scheduled) + Senna 1 tab PO BID (scheduled)
    b. Milk of Magnesia 2 Tbsp (=30 mL) PO BID PRN (to start POD#4 if no BM)
    c. Dulcolax suppository 1 PR PRN* (*only give if documented flatus)
8. **Fluids**
    a. POD#1: D5 ½ NS w/ 20 KCl @75/hr
    b. POD#2: Cont MIVF; Heplock at end of POD#2 if tol PO
    c. POD#3: Heplock if not done on POD#2
9. **Foley catheter** should be removed on POD 1 unless needed for close monitoring of urine output.
10. **Analgesia – Multi-modal pain therapy**
    a. (If epidural is in place, this will be managed by the Acute Pain Service, but this will not be common).
    b. TAP (Transversus Abdominis Plane) Block – intraoperative nerve block performed either by surgeons during dissection, or by anesthesia using ultrasound guidance.
        i. (Awaiting approval of EXPAREL (liposomal bupivacaine) – 72-hour local analgesic.)
    c. Hydromorphone PCA until POD#3, then transition to oxycodone
    d. Oxycodone 5 mg PO 1-2 tabs q4-6 hrs PRN starting on POD#3
    e. Acetaminophen 1000 mg PO q 6 hours (scheduled, not PRN)
    f. Gabapentin 300 mg PO TID during hospitalization (scheduled; not for discharge)

   g. Diazepam* (for muscle spasm which is common with trans-abdominal sutures). Give 2.5 mg PO Q 6 hours x 48 hours (scheduled, not PRN with HOLDING PARAMETERS for sedation). *DON'T order if Hx OSA, age ≥65, or poor renal function. (not for discharge)

11. **Post-operative monitoring:** For patients with BMI >35 or anyone with OSA, post-op orders to include continuous pulse oximetry with remote telemetry until IV or epidural opioids have been discontinued.
12. **Abdominal binder** ordered for comfort only, to be discontinued if not well fitted or found to be inadequate. Most patients feel more comfortable if using binder during ambulation. No data to support changes in outcome or recurrence.
13. **Physical Therapy** to evaluate and treat on POD 1.
14. **Labs:** CBC, Renal function set and magnesium level to be ordered for POD 1, then only as indicated thereafter.
15. **Drains:** should be stripped twice daily on rounds by MD, and by RNs TID. To be removed sequentially once output is less than 30-50 ml/24 hours and non-bloody. If more than one drain is in place within a given space, then only one drain per space is to be removed at a time.
16. **Miscellaneous:**
    a. High rate of DVT/PE in these patients – have low threshold to get bilateral duplex and/or chest CTA

Immediate Post-Operative Care: ICU Patients

1. **Brief operative note** using "GSBRIEFOPNOTEHERNIA1" template (under Dr. Orenstein's SmartPhrase list) is completed before patient leaves the operating room and should includ the reason for ICU admission in the note.
2. **Primary team contacts the SICU team** for signout prior to the patient leaving the operating room
3. **Ventilator**
    a. Immediate post-operative portable chest x-ray to be performed in the ICU.
    b. SIMV 5-7mL/kg AIBW, Rate 16, PEEP 8, FiO2 100% on arrival. Wean FiO2 as appropriate, for O2 sats >92%. [Will discuss exact parameters with ICU consultants prior to finalizing the protocol]
    c. Paralytic use should only be used if necessary and based on plateau pressures and after discussion with attending surgeon (e.g. change in plateau pressure >9).
    d. Spontaneous Breathing Trial at 1000 if candidate, including cuff leak test
    e. Routine am chest x-ray to be reviewed prior to extubation.
    f. Extubation by SICU after 1000 if meets all criteria.
4. **Sedation**
    a. Propofol to be run at 10 mcg/kg/min.
    b. Sedation hold for SBT once paralytic has been off for 6 hours (typically about 1000)
5. **Monitoring** for abdominal compartment syndrome (ACS) (See Appendix 6 for Permissive Intra-Abdominal Hypertension)
    a. Despite elevated intra-abdominal pressures and intra-abdominal hypertension (IAH), ACS requiring an operation is exceedingly rare in abdominal wall reconstruction. IAH/ACS is transient following elective abdominal wall reconstruction with a theory of "permissive IAH." The transient IAH typically resolves within the first 12-24 hours as the tissues within the component separation undergo an almost "receptive relaxation" after early myofascial stretch. Most patients that leave the OR intubated are successfully extubated within the first 24 hours, and most by the next morning following surgery.
    b. The majority of our patients will have elevated bladder pressures even preoperatively, mostly due to their obesity. Therefore serial bladder pressures may not be an accurate surrogate for ACS.
    c. Urine output, plateau pressures, peak pressures, hemodynamics, and abdominal exam to be monitored by SICU RN, reported to SICU for any concern of IAH or ACS.
    d. Once SICU MD has determined that patient may have ACS, SICU to notify Green surgery resident on call to evaluate and discuss need for intervention with attending surgeon. **MOST** of the obese abdominal wall reconstruction patients will have low urine output the night after surgery and almost always respond well to volume.
6. **Activity:** Order placed to Ambulate at least TID once extubated
7. **Diet:** NPO until extubated, if no nausea, vomiting or bloating, okay to advance to regular diet and patient will self select diet. Nancy's yogurt should be ordered at least once

daily if not taking PO and enteral access is available place down NG or feeding tube as per ICU probiotic protocol.
    a. If extubation is not anticipated within 3 days, feeding tube to be placed and tube feeds started at trickle rate then titrated to goal according to nutritionist recommendations.
8. **Foley catheter** should be removed after extubation unless still needed for close monitoring of urine output.
9. **Analgesia**
    b. If epidural is in place, this will be run at a constant rate of 6 ml/hr if hemodynamics permits, but can be titrated as needed.
    c. Fentanyl gtt will be ordered and titrated to patient comfort
    d. IV acetaminophen 1000 mg Q 6 hours until able to take PO
    e. After extubation if epidural not in place, hydromorphone PCA will be ordered.
10. **Abdominal binder**: no abdominal binder until after extubation, then only for comfort when out of bed.
11. **Physical Therapy** to evaluate and treat on POD 1 or after extubation.
12. **Labs:** CBC, Renal function set and magnesium level to be ordered for POD 1, then only as indicated thereafter.
13. **Drains:** should be stripped twice daily on rounds by MD, and by RNs TID. To be removed sequentially once output is less than 30 ml/24 hours and non-bloody. If more than one drain is in place within a given space, then only one drain per space is to be removed at a time.
14. **DVT prophylaxis**
    a. POD#0: Switch to prophylactic dosing of Lovenox the evening of surgery (dosed as standard PM dosing on POD#0).
        i. NOTE: The patient receives a single preop dose of 5,000 units of unfractionated Heparin in the preop holding area.
15. **If infected mesh is excised**, patient to remain on IV antibiotics for total of 3-7 days according to known culture data or empiric broad spectrum with MRSA coverage as indicated.
16. **Transfer to ward once determined appropriate by both SICU team and Green Surgery Chief Resident.** Patient should be saturating >92% on less than 4 L nasal cannula with respiratory rate less than 20/min

Appendix 1. New Patient Consult H & P with hernia template

-Search specific SmartPhrases under Dr. Martindale ("DTLHPSHORT" or "DTLVHR") and Dr. Orenstein ("ORENCONSULTHERNIA")

→ These H&P consults include additional hernia-specific history and pertinent risk factors listed below

→ The consult form may also contain a list of risk factors for the AHSQC (Americas Hernia Society Quality Collaborative) database (not listed here in this document)

RISK FACTORS FOR HERNIA:

Smoking: {Smoking:352789}
GI or GU Issues: {YES/NO:351650::"No"}
Prior Hernia Repairs: {YES,NO,WHAT KIND:360263}
Total Number of Prior Hernia Repairs: ***
MESH: {YES,NO,WHAT KIND:360263}
Immune Suppression: {YES/NO:351650::"No"}
COPD: {YES/NO:10201}
Occupation requiring weight lifting: {YES/NO:351650::"No"}
Bleeding Disorders: {YES/NO:351650::"No"}
Diabetes: {YES/NO:350222::"No"}
Malnutrition: {YES/NO:10201}
History of Infection: {YES,NO,WHAT KIND:360263}
Post-Op Complications on Previous Surgery: {YES,NO,WHAT KIND:360263}
Normal Physical Activity: {YES-DEF/NO-:356533::"Yes"}. Can walk {NUMBERS TO TEN:5044} blocks.

Appendix 2. Preoperative Carbohydrate Drink Recipes

Preparing for Surgery – Nutrition RX

OHSU Digestive Health Services

Preoperative Carbohydrate Beverages

Consuming carbohydrate-rich drinks up to 3 hours before surgery has been shown to improve and promote earlier postoperative recovery. Data is available to show that carbohydrate drinks given preoperatively can decrease the insulin resistance commonly noted with major surgery. By decreasing the insulin resistance one can help maintain blood glucose levels within normal ranges, minimize protein losses and help maintain muscle strength. This concept has also been shown to decrease patient anxiety and improve patient comfort.

Carbohydrate Rich Recipes/Beverage Options

Beverage	Recipe
Gatorade® G Series Sports Drink + Gatorade® Prime Sachet	180 ml Gatorade® G Series Sports Drink (3/4 cup) 60 ml Gatorade® Prime (1 sachet) 1 tbsp sugar 180 ml water (3/4 cup)
Gatorade® G Series Sports Drink + Sugar	180 ml Gatorade® G Series Sports Drink (3/4 cup) 4 tbsp sugar 240 ml water (1 cup)
Vitamin Water® + Gatorade® Prime Sachet	360 ml Vitamin® Water (1 ½ cups) 60 ml Gatorade® Prime (1 sachet)
Boost® Breeze *	Dilute with Boost Breeze® with 160 ml water (~2/3 cup water) *Available at select grocery stores and pharmacies
Ensure® Clear *	Dilute Ensure Clear® with 200 ml water(~3/4 cup water) *Available at select grocery stores and pharmacies
Clearfast®	BevMD - Special order www.bevmd.com/clearfast

Appendix 3. STOP-Bang OSA Questionnaire

StopBang Questionnaire

Info from: http://www.stopbang.ca/screen.php

Yes / No	**S**noring ? Do you **Snore Loudly** (loud enough to be heard through closed doors or your bed-partner elbows you for snoring at night)?
Yes / No	**T**ired ? Do you often feel **Tired, Fatigued, or Sleepy** during the daytime (such as falling asleep during driving or talking to someone)?
Yes / No	**O**bserved ? Has anyone **Observed** you **Stop Breathing** or **Choking/Gasping** during your sleep ?
Yes / No	**P**ressure ? Do you have or are being treated for **High Blood Pressure** ?
Yes / No	**B**ody Mass Index more than 35 kg/m^2?
Yes / No	**A**ge older than 50 ?
Yes / No	**N**eck size large ? (Measured around Adams apple) For male, is your shirt collar 17 inches / 43 cm or larger? For female, is your shirt collar 16 inches / 41 cm or larger?
Yes / No	**G**ender = Male ?

For general population
OSA - Low Risk : Yes to 0 - 2 questions
OSA - Intermediate Risk : Yes to 3 - 4 questions
OSA - High Risk : Yes to 5 - 8 questions
or Yes to 2 or more of 4 STOP questions + male gender
or Yes to 2 or more of 4 STOP questions + BMI > 35kg/m^2
or Yes to 2 or more of 4 STOP questions + neck circumference 17 inches / 43cm in male or 16 inches / 41cm in female

Info from: http://www.stopbang.ca/screen.php
Modified from
Chung F et al. Anesthesiology 2008; 108: 812-821,
Chung F et al Br J Anaesth 2012; 108: 768-775,
Chung F et al J Clin Sleep Med Sept 2014.

Appendix 4. Modified Ventral Hernia Group Grading Scale

Kanters AE, Krpata DM, Blatnik JA, Novitsky YM, Rosen MJ. Modified hernia grading scale to stratify surgical site occurrence after open ventral hernia repairs. J Am Coll Surg. 2012;215:787-93

→ this study validated & modified the originally published VHWG scale (see below)

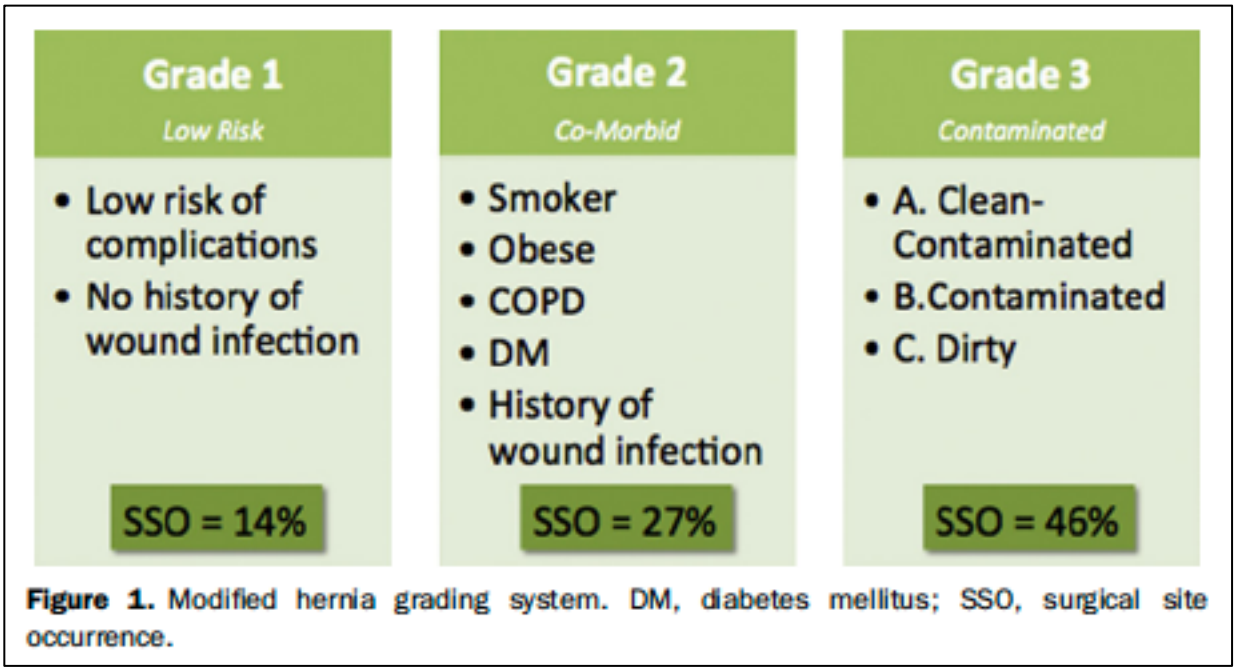
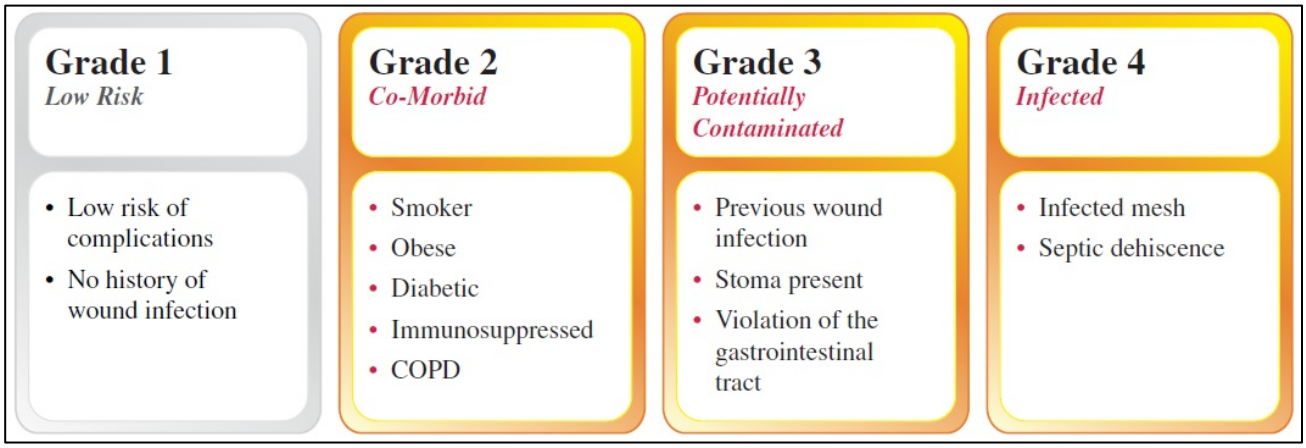


Figure 1. Modified hernia grading system. DM, diabetes mellitus; SSO, surgical site occurrence.

- - - - - - - - -

Original VHWG Hernia Grade – Consensus statement on hernia grading.

VHWG / Breuing et al. Incisional ventral hernias: Review & recommendations regarding the grading & technique of repair. SURGERY 2010



Appendix 5: Antimicrobials for Surgical Prophylaxis by ASHP

Bratzler DW et al. Clinical practice guidelines for antimicrobial prophylaxis in surgery. Am J Health Syst Pharm. 2013 Feb 1;70(3):195-283. doi: 10.2146/ajhp120568. PubMed PMID: 23327981

Table 1.
Recommended Doses and Redosing Intervals for Commonly Used Antimicrobials for Surgical Prophylaxis

Antimicrobial	Recommended Dose		Half-life in Adults With Normal Renal Function, hr[19]	Recommended Redosing Interval (From Initiation of Preoperative Dose), hr[c]
	Adults[a]	Pediatrics[b]		
Ampicillin–sulbactam	3 g (ampicillin 2 g/sulbactam 1 g)	50 mg/kg of the ampicillin component	0.8–1.3	2
Ampicillin	2 g	50 mg/kg	1–1.9	2
Aztreonam	2 g	30 mg/kg	1.3–2.4	4
Cefazolin	2 g, 3 g for pts weighing ≥120 kg	30 mg/kg	1.2–2.2	4
Cefuroxime	1.5 g	50 mg/kg	1–2	4
Cefotaxime	1 g[d]	50 mg/kg	0.9–1.7	3
Cefoxitin	2 g	40 mg/kg	0.7–1.1	2
Cefotetan	2 g	40 mg/kg	2.8–4.6	6
Ceftriaxone	2 g[e]	50–75 mg/kg	5.4–10.9	NA
Ciprofloxacin[f]	400 mg	10 mg/kg	3–7	NA
Clindamycin	900 mg	10 mg/kg	2–4	6
Ertapenem	1 g	15 mg/kg	3–5	NA
Fluconazole	400 mg	6 mg/kg	30	NA
Gentamicin[g]	5 mg/kg based on dosing weight (single dose)	2.5 mg/kg based on dosing weight	2–3	NA
Levofloxacin[f]	500 mg	10 mg/kg	6–8	NA
Metronidazole	500 mg	15 mg/kg Neonates weighing <1200 g should receive a single 7.5-mg/kg dose	6–8	NA

Table 1 (*continued*)

Antimicrobial	Recommended Dose		Half-life in Adults With Normal Renal Function, hr[19]	Recommended Redosing Interval (From Initiation of Preoperative Dose), hr[c]
	Adults[a]	Pediatrics[b]		
Moxifloxacin[f]	400 mg	10 mg/kg	8–15	NA
Piperacillin–tazobactam	3.375 g	Infants 2–9 mo: 80 mg/kg of the piperacillin component Children >9 mo and ≤40 kg: 100 mg/kg of the piperacillin component	0.7–1.2	2
Vancomycin	15 mg/kg	15 mg/kg	4–8	NA
Oral antibiotics for colorectal surgery prophylaxis (used in conjunction with a mechanical bowel preparation)				
Erythromycin base	1 g	20 mg/kg	0.8–3	NA
Metronidazole	1 g	15 mg/kg	6–10	NA
Neomycin	1 g	15 mg/kg	2–3 (3% absorbed under normal gastrointestinal conditions)	NA

[a]Adult doses are obtained from the studies cited in each section. When doses differed between studies, expert opinion used the most-often recommended dose.
[b]The maximum pediatric dose should not exceed the usual adult dose.
[c]For antimicrobials with a short half-life (e.g., cefazolin, cefoxitin) used before long procedures, redosing in the operating room is recommended at an interval of approximately two times the half-life of the agent in patients with normal renal function. Recommended redosing intervals marked as "not applicable" (NA) are based on typical case length; for unusually long procedures, redosing may be needed.
[d]Although FDA-approved package insert labeling indicates 1 g,[14] experts recommend 2 g for obese patients.
[e]When used as a single dose in combination with metronidazole for colorectal procedures.
[f]While fluoroquinolones have been associated with an increased risk of tendinitis/tendon rupture in all ages, use of these agents for single-dose prophylaxis is generally safe.
[g]In general, gentamicin for surgical antibiotic prophylaxis should be limited to a single dose given preoperatively. Dosing is based on the patient's actual body weight. If the patient's actual weight is more than 20% above ideal body weight (IBW), the dosing weight (DW) can be determined as follows: DW = IBW + 0.4(actual weight – IBW).

Appendix 6: Permissive Intraabdominal Hypertension Following AWR

-Poster presented at 2014 Americas Hernia Society Meeting, Las Vegas, NV March 2014

-Also, see: Blatnik et al. Predicting severe postoperative respiratory complications following abdominal wall reconstruction. Plast Reconstr Surg. 2012 Oct;130(4):836-41. PubMed PMID: 22691844.)

Permissive Intraabdominal Hypertension Following Open Incisional Hernia Repair: a novel concept.

Clayton C. Petro[1], Siavash Raigani[1], Sean B. Orenstein[1], John C. Klick[2], James R. Rowbottom[2], Yuri W. Novitsky[1], Michael J. Rosen[1]

Department of Surgery[1], Case Comprehensive Hernia Center, Department of Anesthesiology and Perioperative Medicine[2], University Hospitals Case Medical Center, Cleveland, OH

Introduction

- Intra-abdominal hypertension (IAH, intraabdominal pressure [IAP] ≥12mmHg) leading to abdominal compartment syndrome (ACS, IAP ≥20mmHg with associated organ dysfunction) can indicate the need for a decompressive laparotomy.
- Abdominal perfusion pressure (APP) <60mmHg is associated with decreased survival.
- The physiology and sequelae of primary IAH/ACS or APP <60mmHg following complex hernia repair are unknown.

Hypothesis

- Patients undergoing abdominal wall reconstruction frequently develop primary IAH/ACS and an APP <60mmHg.
- In the context of a complex hernia repair, elevations in intraabdominal pressure (IAP) are transient, resolve without reoperation, and are not associated with morbidity.

Methods

- 50 consecutive patients underwent elective incisional hernia repair by two surgeons.
- Bladder and plateau pressures (BP and PP) were measured immediately before and after hernia repair. BP was measured the next morning as well as PP if the patient remained intubated due to an increase in PP ≥6 after repair.
- Outcomes were rates of IAH/ACS, APP <60, and subsequent respiratory events (RE: re-intubation or transfer to a higher level of care) or development of AKI (Cr↑0.3).

$$APP = MAP - IAP$$

(MAP – mean arterial pressure)

Results

- Average hernia width: **14.4 cm**

Immediate Post-Op Measurements

- Incidence of IAH: **92%**
- Incidence of ACS: **18%**
- APP <60mmHg: **24%**

- AKI (20%) and RE (12%) after repair were not associated with IAP or APP (*Table 1*).
- Incidence of reoperation: **0%**

Figure 1: Bladder Pressure

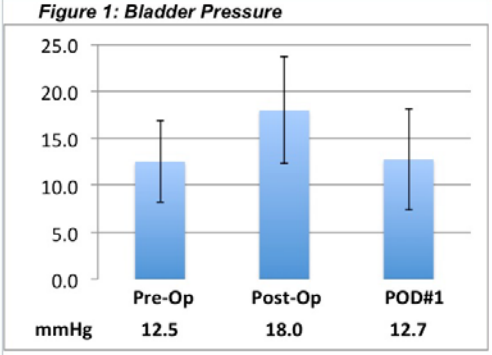


Figure 2: Plateau Pressure

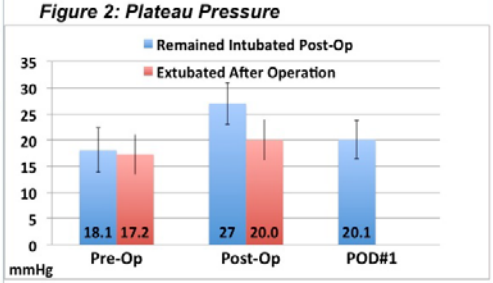


Figure 3: Abdominal Perfusion Pressure

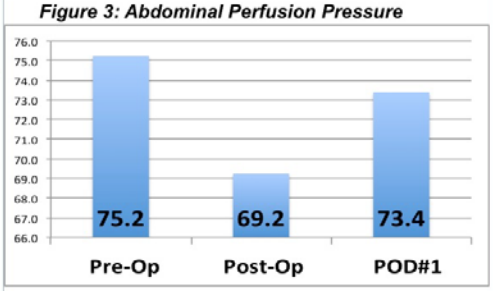


Table 1: Association between IAP/APP and AKI/RE

AKI n = 10	AKI	No AKI	p
Post-Op IAP	19.7 ± 4.6	18.2 ± 5.7	0.84
Post-Op APP	69.3 ± 16.1	69.7 ± 17.4	0.78
RE n = 6	**RE**	**No RE**	**p**
Post-Op IAP	19.8 ± 4.7	17.7 ± 5.8	0.58
Post-Op APP	67.5 ± 13.9	69.5 ± 17.3	0.23

Conclusion

- Transient IAH, ACS and APP <60 are common after elective incisional hernia repair.
- AKI and respiratory events after repair are not related to IAP or APP.
- IAH/ACS should be viewed as "permissive" in the context of elective hernia repair, and should rarely require reoperation.

Appendix 7: Surtical Approaches for Abdominal Wall Reconstruction

Retrorectus Repair

1. Type of mesh:
    1. Synthetic unless meet criteria for biologic. Midweight macroporous polypropylene mesh with weight > 35 gm/m^2 and < 80 gm/m^2
    2. Phasix mesh (absorbable synthetic) expected to be in tissue > 6 months then resorbs and excreted via ventilation as CO_2
        i. cut to shape if patient is enrolled in the Phasix study.
    3. Biologics if grade 3 or 4 (see appendix 4 VHWG grading system)
2. Posterior sheath closed with running 2-0 Maxon or PDS using GS-21 needle
    1. Any fascial defect or tear should be closed using absorbable suture (3-0 polysorb preferred)
    2. Two moist lap sponges and a single white radio-opaque towel folded to fit defect should be placed in the abdomen beneath the fascia to protect the bowel and the circulating nurse notified of this placement.
    3. The use of a wide malleable to further protect the bowel is advised when passing the Endoclose device.
    4. All foreign bodies are to be removed and the circulator notified prior to completing the closure of the posterior sheath.
3. Mesh Fixation: #1-Maxon trans-abdominal horizontal mattress sutures
    1. Minimum of three along the cephalad and caudal borders of the mesh
    2. One or two on each of the lateral borders of the mesh
    3. Additional fixation sutures can be placed as needed to ensure that mesh lays flat **without wrinkles** or folds. .
4. Anterior sheath closure: running 0-Maxon or # 1 Maxon (PDS can be substituted), non-looped,4-6mm bites progressing 5-7 mm with each throw. (see Israelson 2013 SCNA article)
5. Drain placement (‘*deep drains exit down’(caudad), shallow drains exit ‘up’ (cephalad*)
    1. 19 F round Blake drain (in nursing supply system as Fluted Hubless Channel drains) (two placed bilaterally for large defects) between the mesh and posterior surface of the rectus
        i. Should exit the skin in the **lower** quadrants
        ii. Excess drain tubing should be trimmed to approximately 18 inches in length
    2. 19 F round Blake drain (two placed bilaterally for obese patients with large skin flaps) in the subcutaneous space.
        i. Should exit the skin in the **upper** quadrants
        ii. Excess drain tubing should be trimmed to approximately 18 inches in length
6. If endoclose was used and holes are puckered this can be leveled off with release of offending suture from scarpa’s with a right angle clamp prior by pulling up sharply allowing release.
7. Skin is closed using skin stapler or subQ sutures for the midline incision and all stab incisions.

Intraperitoneal Underlay

1. Type of mesh: Biologic (Strattice® acellular porcine dermal matrix has most published data to support use), size at least 4 cm greater than measured diameters of the fascial defect
    i. For indications for biologic mesh see Ventral Hernia working group Surgery 2010. (see appendix 4) (VHWG or mVHWG can be used)
        1. Basically: contaminated and dirty cases, history of MRSA, multiple high risk co-morbidities including morbid obesity, smoking, poorly controlled DM, immune suppression. The higher the number of co-morbidities the greater the benefit of biologic.
2. Type of mesh synthetic
    i. Some anti-adhesive coating needs to be on mesh if used intraperitoneal
        1. At OHSU we have Ventralight (coated PP), Proceed (coated polypropylene), Paritex (coated braided polyester) (PTFE was available but determined to be too high risk for infection and was removed from the shelf) (Deeken C, Matthews B article)
3. Mesh Fixation: 0 or #1 Maxon or PDS horizontal mattress sutures placed at intervals of 2 cm with 1 cm bites. Insure fascial bites are 2 to 4 mm greater than mesh bites.
    i. Two or three moist lap sponges and a single white radio-opaque towel folded to fit hernia size should be placed in the abdomen beneath the fascia to protect the bowel and the circulating nurse should be notified of this placement so that she can note this on the OR whiteboard.
    ii. The use of a wide malleable to further protect the bowel is advised when passing the Endoclose device.
    iii. All foreign bodies are to be removed and the circulator notified prior to completing the final mesh fixation
    iv. Closing count to be completed prior to the completion of mesh fixation.
4. Fascial closure: running 0 or #1 Maxon or PDS non-looped on a GS-21 or 25 taper needle, 4-6mm bites progressing 5-7 mm with each throw.
5. Drain placement (‘*deep drains exit down, shallow drains exit up’*)
    i. 19 F round Blake drain (two placed bilaterally for large defects) between the mesh and posterior surface of the rectus
        1. Should exit the skin in the **lower** quadrants
        2. Excess drain tubing should be trimmed to approximately 18 inches in length
    ii. 19 F round Blake drain in the subcutaneous space (two placed bilaterally for obese patients with large skin flaps).
        1. Should exit the skin in the **upper** quadrants
        2. Excess drain tubing should be trimmed to approximately 18 inches in length
6. Fascial release of all stab incisions is to be performed using a right angle clamp prior to closing skin.
7. Skin is closed using skin stapler for the midline incision and all stab incisions.

Transversus Abdominis Muscle Release (TAR)

1. **Intro**: TAR is a method of component separation during abdominal wall reconstruction for complex abdominal wall, ventral, flank, parastomal, recurrent, etc hernias. It starts off with a retro-rectus dissection, followed by TAR posterior component separation.
2. **Anesthesia:**
    i. General endotracheal intubation
    ii. ** Monitor Plateau pressures (not as much peak P) at start of case and following fascial closure.
    iii. TAP (Transversus Abdominis Plane) Block - intraoperative nerve block directly into the transversus abdominis plane. Aided by use of 72-hour liposomal bupivacaine (Exparel)
        1. Performed after TAR dissection completed and prior to mesh placement
        2. Preparation: Combine 20 ml vial of Exparel with 280 ml sterile saline (total volume 300 ml)
        3. Use 2x 50-cc syringes (faster with two syringes) and 25-gauge SPINAL needles.
        4. **Make sure you aspirate before each injection as intravascular injection could be highly dangerous. Infuse 150 cc per side, injecting 10-20 ml sequentially from superior to inferior in the transversus abdominis plane.
3. **Prep:**
    iv. Shave from nipples down to thigh (incl bilat groin)
    v. ChloroPrep (2-3+)
4. **Drape:**
    vi. 6 disposable towels (paper w/ tape vs cloth & stapled to skin) in hexagonal fashion
        a. Superior: Starting above xiphoid
        b. Inferior: Down to pubis as low as possible
        c. Lateral: Almost down to table on each side
    vii. Marking pen (outline all scars)
    viii. Ioban (usually XXL)
    ix. **Universal Drape** w/ side pockets
5. **Procedure** (basic overview)**:**
    1. Midline incision
    2. Extensive lysis of adhesions
    3. XL white countable/radiopaque towel placement
    4. Retrorectus → TAR dissection – lots of Kochers vs Laheys, cautery
    5. Reapproximate posterior sheath – 2-0 Polysorb GS21 x 2
        a. May need more 2-0 Polysorbs to close any defects in posterior sheath
    6. Pulse-Vac retrorectus/retromuscular plane w/ 3 Liters of NS + triple antibiotics (3 g Ancef, 50,000 units Bacitracin sol'n, 240 mg Gentamicin)
    7. TAP Block (see above)

8. Mesh insertion
    i. Can use any type of non-coated mesh (medium weight macroporous polypropylene preferred, or Strattice vs Phasix for contaminated wounds)
    ii. One or more XL meshes can be sewn together as a large quilt for XXL defects
    iii. If one mesh, typically placed in diamond formation (corners to pubis, subxiphoid, and laterally).
    iv. If 2 meshes, homeplate formation (diamond inferiorly to pubis + upper mesh squared with upper straight edge under bilateral costal margins).
    a. Typically 30 x 30 cm soft/medium-weight polypropylene mesh
    b. Mesh fixation - 1-0 Maxon (?GS21) x 8 (this number may change)
        i. Leave needle on; Hemostat near ~ 1 inch from end (easier to grab w/ suture passer)
        ii. After placing suture in mesh, cut needle off and apply 2nd hemostat ~ 1 inch from new end
    c. Disposable suture passer used (e.g. Carter-Thomason or other type)
9. 19-Fr round Blake drains x 2 with Trocar
    a. Drain stitches – 2-0 prolene x2
10. Anterior sheath closure / Linea alba restoration – 1-0 Maxon (GS26) (NON-looped) x 2*
    a. *Typically closed with just 2 running sutures, but during times of difficult closure, I will used numerous Maxons to close in interrupted fashion.
11. Skin closure / Dressing:
    a. Deeper layer – 3-0 Polysorbs (?V20) x 2 (may need more)
    b. Superficial – 4-0 Biosyn (P12) x 2 (may need more) VS. Stapler (usually x2)
    c. Band-aids for all mesh fixation sites (~8), Drain dressings x2, Non-adherent tape dressing for midline

More surgical technique from original TAR paper:

Novitsky YW, Elliott HL, Orenstein SB, Rosen MJ. Transversus abdominis muscle release: a novel approach to posterior component separation during complex abdominal wall reconstruction. Am J Surg. 2012 Nov;204(5):709-16. PubMed PMID: 22607741

Surgical technique

(NOT ALL FIGURES ARE DISPLAYED HERE)

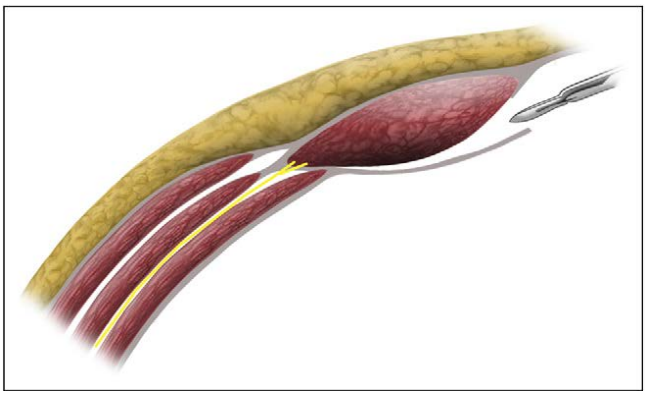


Figure 1

After a complete adhesiolysis via a generous midline laparotomy, the posterior rectus sheath is incised about 0.5–1 cm from its edge (Fig. 1). This typically is performed at the level of the umbilicus. The retromuscular plane then is developed toward the linea semilunaris, visualizing the junction between the posterior and anterior rectus sheaths (Fig. 2). The perforators to the rectus muscle branches of the thoracoabdominal nerves, penetrating the lateral edge of the posterior rectus sheath) are visualized and preserved (Fig. 2). Starting in the upper third of the abdomen, about .5 cm medial to the anterior/posterior rectus sheath junction, the posterior rectus sheath is incised to expose the underlying transversus abdominis muscle (Fig. 3).

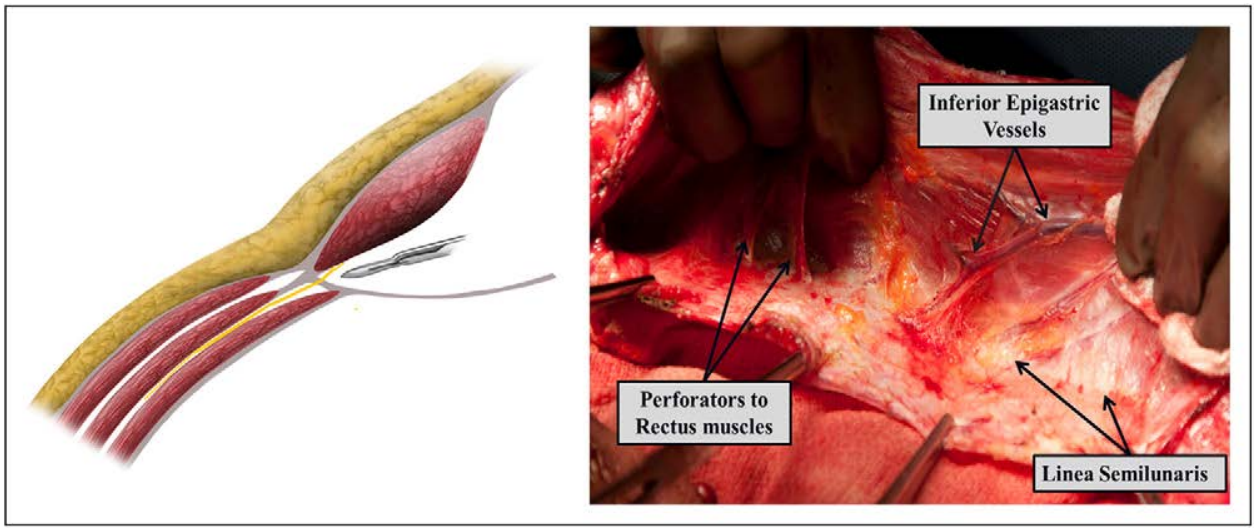


Figure 2

The muscle then is divided along its entire medial edge using electrocautery (Fig. 3). This step is initiated in the upper third of the abdomen where medial fibers of the transversus abdominis muscle are easiest to identify and separate from the underlying fascia. This step allows entrance to the space between the transversalis fascia and the
divided transversus abdominis muscle. This space is contiguous with the retroperitoneum and can be extended laterally to the psoas muscle, if necessary. Superiorly, the subxyphoid space is developed as previously described.[16,17] The retromuscular dissection plane can be extended cephalad to the costal margins and dorsal to the sternum by sweeping the peritoneum/transversalis fascia off the diaphragm (Fig. 4). Inferiorly, the space or Retzius (anterior to the urinary bladder) is entered to expose the pubis symphysis and both Cooper ligaments (Fig. 5). Below the arcuate line of Douglas, only transversalis fascia and peritoneum are medialized. This dissection results not only in the creation of a large retromuscular space beyond the linea semilunaris but also allows for

significant medial advancement of the posterior rectus sheaths (Fig. 6). The steps of the release are shown in sequence in Fig. 7. Once a similar release is performed on both sides, the posterior rectus sheaths are reapproximated in the midline with a running monofilament suture (Fig. 8A). In rare instances when the anterior

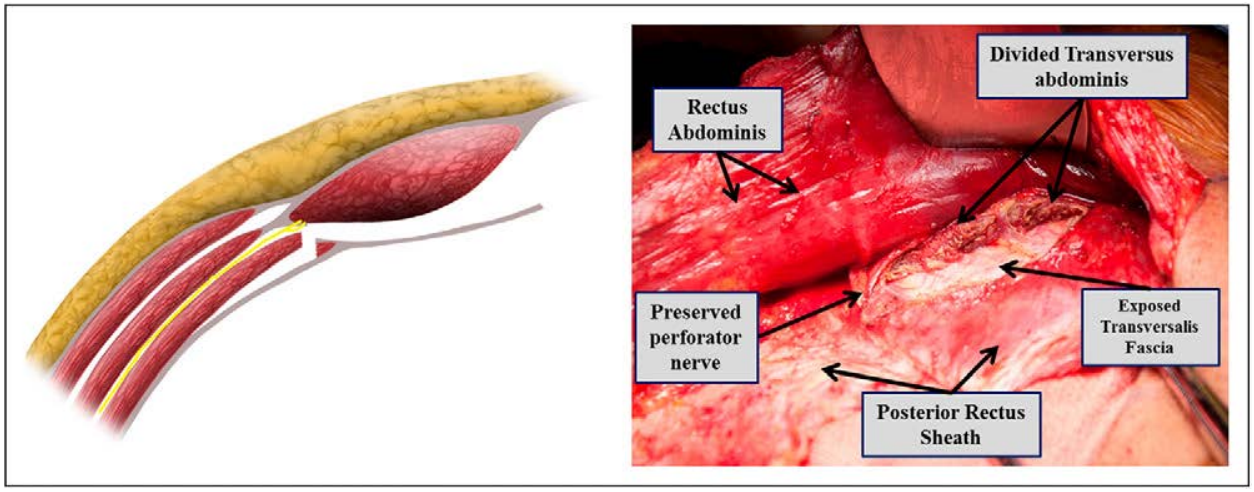


Figure 3

rectus sheath cannot be reapproximated, the gap could be bridged with remnants of the hernia sac or absorbable mesh. The mesh is placed as a sublay in the retromuscular space (Fig.8B) and secured with full-thickness, transabdominal sutures using a Reverdin needle.[12,16] In addition, the inferior edge of the mesh is secured to both Cooper ligaments using 2 to 4 interrupted monofilament sutures. Closed suction drains are placed on top of the mesh. The anterior rectus sheaths then are reapproximated in the midline to restore the linea alba ventral to the mesh (Fig. 9).

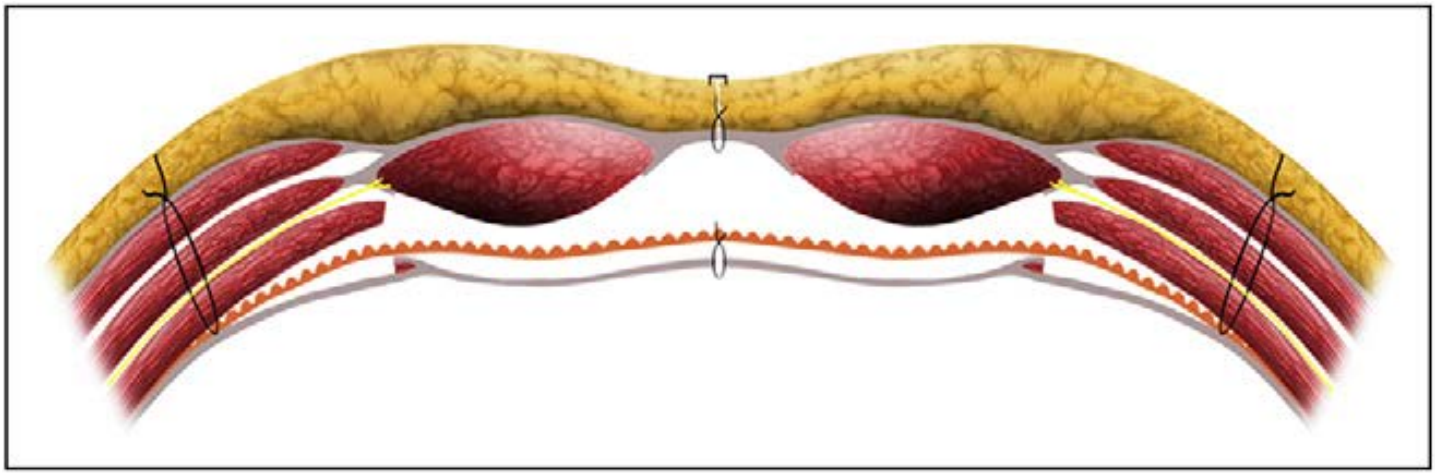


Figure 9

Appendix 8: Brief Operative Note for AWR cases

(Saved under. "GSBRIEFOPNOTEHERNIA1" under Dr. Orenstein's list)

BRIEF OPERATIVE NOTE - Ventral Hernia Repair
Procedure Date: @TD@
Author: @ME@

Attending Physician: ***
Assistants: ***

Preoperative Diagnosis: ***
Postoperative Diagnosis: ***
Procedures Performed: ***

Anesthesia: GETA ***+ TAP Block
Fluids: {fluids:343239}
Estimated Blood Loss: ***

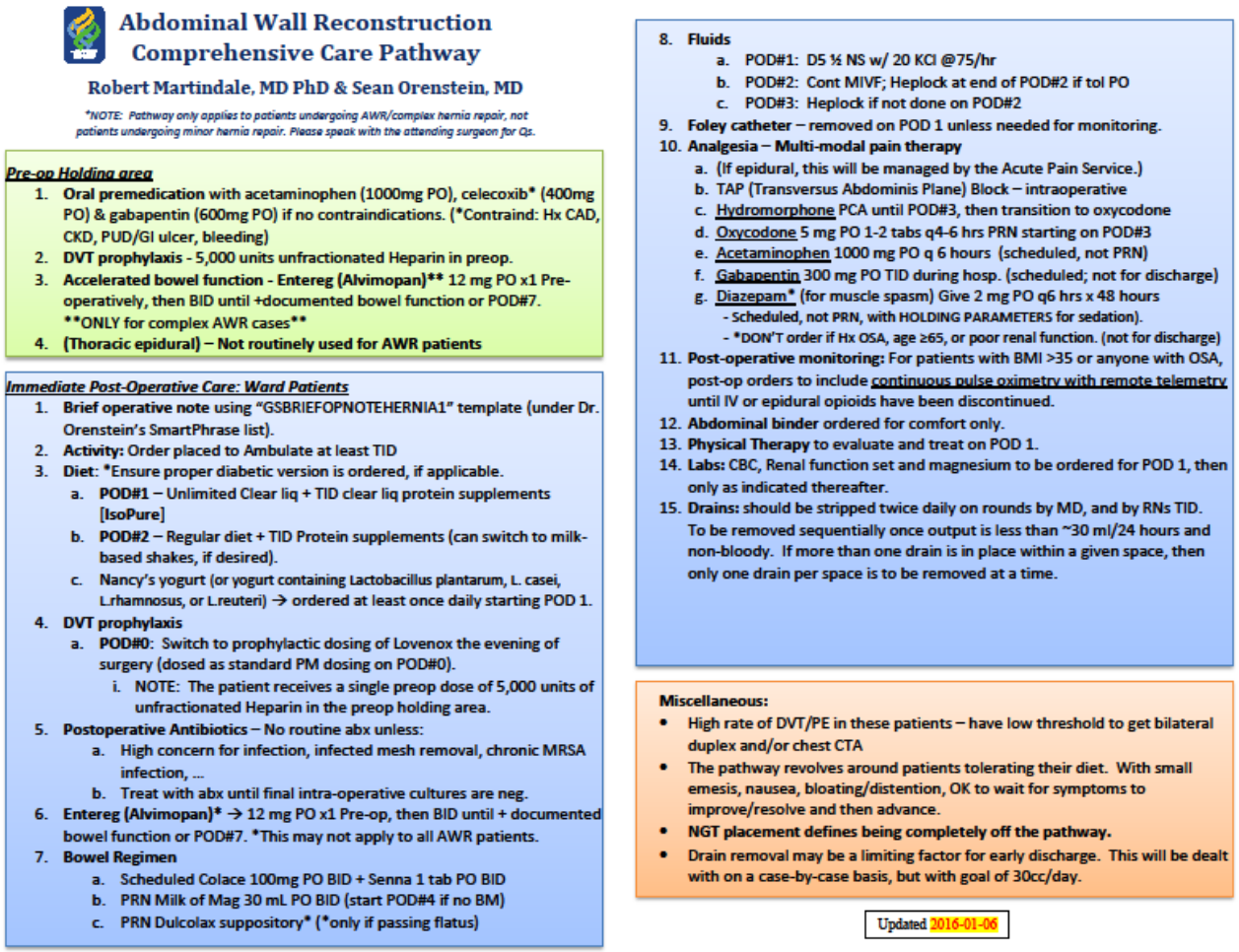
Findings: ***
Complications: ***
Specimens: {specimens:343241}
Drains: {Drains:343230}
Disposition: {PACU disposition:343231}

Postoperative Directives:
(please page Green surgery for any clarifications)

- Ventilator: Paralytics only if necessary and based on plateau pressures and after discussion with attending surgeon (e.g. change in plateau pressure >9).
- Activity: ***OOB to chair with ambulation TID (once extubated)
- Antibiotics: ***No further postoperative antibiotics ***or Continue ___ antibiotics until intraop cultures finalized.
- Diet: POD#1-Clear liquids + TID clear protein supplements. POD#2-Regular diet + TID protein supplements + Yogurt
- DVT Prophylaxis: Start prophylactic pm dosing of Lovenox the evening of POD#0 (evening of surgery). **NOTE: Patients receive a single preoperative dose of 5,000 units of standard unfractionated Heparin in the preop holding area.
- Entereg (Alvimopan): 12 mg PO/NGT BID scheduled
- Multi-modal Analgesia:
    f. Hydromorphone PCA until POD#3, then transition to oxycodone
    g. Oxycodone 5 mg PO 1-2 tabs q4-6 hrs PRN starting on POD#3
    h. Acetaminophen 1000 mg PO q 6 hours scheduled
    i. Gabapentin 300 mg PO TID scheduled
    j. Diazepam* (antispasmotic) 2 mg PO Q 6 hours scheduled x 48 hours (with HOLDING PARAMETERS for sedation). *DON'T order if Hx OSA, age ≥65, or poor renal function.
- Other: D/C foley POD#1 unless close monitoring required

Appendix 9: Pocket Guide for AWR Comprehensive Care Pathway

<< CLICK ON IMAGE BELOW TO OPEN UP HIGH-RES PDF FOR PRINTING, or Open up separate AWR Pathway POCKET GUIDE pdf >>



Abdominal Wall Reconstruction Comprehensive Care Pathway

Robert Martindale, MD PhD & Sean Orenstein, MD

**NOTE: Pathway only applies to patients undergoing AWR/complex hernia repair, not patients undergoing minor hernia repair. Please speak with the attending surgeon for Qs.*

Pre-op Holding area

1. **Oral premedication** with acetaminophen (1000mg PO), celecoxib* (400mg PO) & gabapentin (600mg PO) if no contraindications. (*Contraind: Hx CAD, CKD, PUD/GI ulcer, bleeding)
2. **DVT prophylaxis** - 5,000 units unfractionated Heparin in preop.
3. **Accelerated bowel function - Entereg (Alvimopan)**** 12 mg PO x1 Pre-operatively, then BID until +documented bowel function or POD#7.
   ONLY for complex AWR cases
4. **(Thoracic epidural) – Not routinely used for AWR patients**

Immediate Post-Operative Care: Ward Patients

1. **Brief operative note** using "GSBRIEFOPNOTEHERNIA1" template (under Dr. Orenstein's SmartPhrase list).
2. **Activity:** Order placed to Ambulate at least TID
3. **Diet**: *Ensure proper diabetic version is ordered, if applicable.
   a. **POD#1** – Unlimited Clear liq + TID clear liq protein supplements [IsoPure]
   b. **POD#2** – Regular diet + TID Protein supplements (can switch to milk-based shakes, if desired).
   c. Nancy's yogurt (or yogurt containing Lactobacillus plantarum, L. casei, L.rhamnosus, or L.reuteri) → ordered at least once daily starting POD 1.
4. **DVT prophylaxis**
   a. **POD#0**: Switch to prophylactic dosing of Lovenox the evening of surgery (dosed as standard PM dosing on POD#0).
      i. NOTE: The patient receives a single preop dose of 5,000 units of unfractionated Heparin in the preop holding area.
5. **Postoperative Antibiotics** – No routine abx unless:
   a. High concern for infection, infected mesh removal, chronic MRSA infection, …
   b. Treat with abx until final intra-operative cultures are neg.
6. **Entereg (Alvimopan)*** → 12 mg PO x1 Pre-op, then BID until + documented bowel function or POD#7. *This may not apply to all AWR patients.
7. **Bowel Regimen**
   a. Scheduled Colace 100mg PO BID + Senna 1 tab PO BID
   b. PRN Milk of Mag 30 mL PO BID (start POD#4 if no BM)
   c. PRN Dulcolax suppository* (*only if passing flatus)
8. **Fluids**
   a. POD#1: D5 ½ NS w/ 20 KCl @75/hr
   b. POD#2: Cont MIVF; Heplock at end of POD#2 if tol PO
   c. POD#3: Heplock if not done on POD#2
9. **Foley catheter** – removed on POD 1 unless needed for monitoring.
10. **Analgesia – Multi-modal pain therapy**
    a. (If epidural, this will be managed by the Acute Pain Service.)
    b. TAP (Transversus Abdominis Plane) Block – intraoperative
    c. Hydromorphone PCA until POD#3, then transition to oxycodone
    d. Oxycodone 5 mg PO 1-2 tabs q4-6 hrs PRN starting on POD#3
    e. Acetaminophen 1000 mg PO q 6 hours (scheduled, not PRN)
    f. Gabapentin 300 mg PO TID during hosp. (scheduled; not for discharge)
    g. Diazepam* (for muscle spasm) Give 2 mg PO q6 hrs x 48 hours
       - Scheduled, not PRN, with HOLDING PARAMETERS for sedation).
       - *DON'T order if Hx OSA, age ≥65, or poor renal function. (not for discharge)
11. **Post-operative monitoring:** For patients with BMI >35 or anyone with OSA, post-op orders to include continuous pulse oximetry with remote telemetry until IV or epidural opioids have been discontinued.
12. **Abdominal binder** ordered for comfort only.
13. **Physical Therapy** to evaluate and treat on POD 1.
14. **Labs:** CBC, Renal function set and magnesium to be ordered for POD 1, then only as indicated thereafter.
15. **Drains:** should be stripped twice daily on rounds by MD, and by RNs TID. To be removed sequentially once output is less than ~30 ml/24 hours and non-bloody. If more than one drain is in place within a given space, then only one drain per space is to be removed at a time.

Miscellaneous:

- High rate of DVT/PE in these patients – have low threshold to get bilateral duplex and/or chest CTA
- The pathway revolves around patients tolerating their diet. With small emesis, nausea, bloating/distention, OK to wait for symptoms to improve/resolve and then advance.
- **NGT placement defines being completely off the pathway.**
- Drain removal may be a limiting factor for early discharge. This will be dealt with on a case-by-case basis, but with goal of 30cc/day.

Updated 2016-01-06

Updated: 2017-04-07 SBO