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Improving Outcomes in Hernia Repair

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Disclosures

- None

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Paradigm shifts in hernia surgery

- Suture-only repairs under tension → mesh, tension-free: ↓ recurrence rate
 - Type of mesh: absorbable, synthetic, biologic?
- Open → laparoscopic: less pain, less complications, faster return to work
 - Fixation methods: tacks, glue, self-gripping mesh?
 - Close defect or bridge?
- Evolution of robotics – expanding minimally invasive penetrance
- Perioperative management – less complications, optimize outcomes metrics
 - Preop – comorbid correction
 - Intraop
 - Postop

ERAS Protocols

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Perioperative management – how it used to be

- Preoperative
 - Comorbidity control
 - Smoking
 - Diabetes
 - Malnutrition
 - Obesity



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Perioperative management – how it is now

- | | | |
|---|--|--|
| <ul style="list-style-type: none"> • <u>Preoperative</u> <ul style="list-style-type: none"> ▪ Comorbidity control <ul style="list-style-type: none"> – Smoking – Diabetes – Malnutrition – Obesity ▪ No bowel prep ▪ Minimize preop fasting ▪ Preop shakes ▪ Preop pain meds ▪ Entereg | <ul style="list-style-type: none"> • <u>Intraoperative</u> <ul style="list-style-type: none"> ▪ TAP block ▪ Fluid management | <ul style="list-style-type: none"> • <u>Postoperative</u> <ul style="list-style-type: none"> ▪ Early mobilization ▪ Accelerated intestinal recovery ▪ Fluid management ▪ Multimodal pain control |
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Preop comorbidity control

- | | | |
|---|--|--|
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Comorbidity control: Smoking

The attributable risk of smoking on surgical complications.
Hawn, MT, et al. *Ann Surg* 2011;254:914-920

- Retrospective cohort study by VA Surgical QA Program from 2002 to 2008
 - 393,794 patients
 - All elective operations
 - Stratified by smoking status: current (35%), prior (18%) and never (47%)
 - Controlling for patient and procedure risk factors
- Current smokers, compared with prior and never smokers, had higher adjusted odds ratios of:
 - Postop pneumonias
 - Dose-dependent
 - Cost increase of \$52K*
 - SSI
 - Death within 1 year
 - $P < 0.001$ for all

	Never	Prior	Current
Pneumonia	1	1.22	1.77
SSI	1	1.11	1.18
Death <1 year	1	1.14	1.55



Comorbidity control: Smoking

Risk factors for postoperative wound infections and prolonged hospitalization after ventral/incisional hernia repair. Kaouizanis, C, et al. *Hernia* (2015) 19:113-123

- Retrospective cohort study of NSQIP from 2009 to 2010 to identify risk factors for SSI and increased LOS
 - 25172 cases
 - Controlling for patient and procedure risk factors
- Smokers and BMI >30 had higher odds ratio of SSI, and albumin <3.2 had higher odds ratio of increased LOS

	BMI >30	Smoking	Alb <3.2
OR after VHR	1.49 ($P < .001$)	1.46 ($P = .003$)	1.28 ($P < .001$)
Complication	SSI	SSI	> LOS



Comorbidity control: Smoking

Effect of preoperative smoking cessation interventions on postoperative complications and smoking cessation. Thomsen, T, et al. *Br J Surg*. 2009 May;96(5):451-61 19:113-123

- Meta-analysis of 11 RCT's containing 1194 patients
 - Smoking cessation interventions were intensive, medium intensity, less intensive
 - Smoking cessation included time before operation to 12 months postop
 - Smoking cessation interventions reduced occurrence of complications
 - Pooled risk ratio = 0.56 ($P < 0.001$)
- Conclusions:**
 - Intensive interventions significantly increased smoking cessation rates
 - Effect of medium and less intensive interventions were not significant
 - At least four weeks (several studies demonstrate failure of <3 weeks)
 - Nicotine replacement therapy is acceptable



Comorbidity control: Smoking

Abstinence from smoking reduces incisional wound infection: a randomized controlled trial.
Sorensen, LT, et al. *Ann Surg* 2003; 238:1-5

- Prospective study of 78 subjects (48 smokers and 30 never-smokers)
 - First week – smokers smoked 20 cigarettes per day
 - Then smokers randomized to continued smoking, patch, or placebo patch
 - Punch biopsy wounds made after week 1, week 4, week 8, and week 12
 - At same times, identical wounds made in 6 never-smokers
 - In 24 never-smokers, a wound was made only once
 - All wounds (228) followed for two weeks to assess for complications

Results

- Wound infection rate 12% (11/93) in smokers vs. 2% (1/48) in never-smokers ($P < .05$)
- Wound infection rate 21% (10/48) in continuous smokers vs. 1% (1/87) in abstinent smokers ($P < .05$)
- No difference seen between nicotine patch and placebo



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Comorbidity control: Smoking

Acute effects of nicotine and smoking on blood flow, tissue oxygen, and aerobic metabolism of the skin and subcutis. Sorensen, LT, et al. *J Surg Res.* 2009 Apr;152(2):224-30

- Eight healthy current male smokers and eight healthy male former smokers
 - Subjects given infusion 1 mg nicotine IV, then blood and breath measured, then smoked a single cigarette, then measured
 - Also arterial occlusion, reperfusion with measurements
 - Cutaneous and subcutaneous blood flow measured

Results:

	Before infusion	After infusion	P	Before smoking	After smoking	P
Cut blood flow	21.7 ± 8.6	22.7 ± 9.6	0.21	23.4 ± 9.2	20.3 ± 7.4	<.001
SQ blood flow	4.2 ± 2.0	3.1 ± 1.2	0.01	4.2 ± 2.0	2.7 ± 1.2	<.001



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Comorbidity control: Diabetes

The association of diabetes and glucose control with surgical-site infections among cardiothoracic surgery patients. R Latham, et al. *ICHE.* 2001 Oct;22(10):607-612

- Prospective cohort and case-control studies of all pts undergoing cardiac surgery between 11/98 and 09/99
- 1000 patients had A1c; 74 patients with SSI were identified
- Results
 - Diabetes independently associated with SSI (OR 2.76, $P < .001$)
 - Postop hyperglycemia independently associated with SSI (OR 2.02, $P = .007$)
 - A1c >8 is twice as likely to result in SSI

CT Surgery	DM	Non-DM	A1c >8	A1C <8
SSI %	5.8%	1.5%	7.9%	4.0%



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Comorbidity control: Diabetes

Quantification of the effect of diabetes mellitus on ventral hernia repair: results from two national registries. Huntington, C, et al. AmSurgeon 2016;82(8):661-671

- Retrospective cohort study of two national databases (NSQIP and NIS)
 - All patients undergoing VHR from 1998 to 2012
- Results
 - Worse outcomes DM vs. non-DM, IDDM vs. NIDDM
 - No significant delta with laparoscopic procedure

Open VHR - NSQIP	DM vs. non-DM	IDDM vs. NIDDM
Minor Cx	1.267	1.409
Major Cx	1.220	1.732
Wound Cx	1.360	1.422



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Comorbidity control: Nutrition

Risk adjustment of the postoperative mortality rate for the comparative assessment of the quality of surgical care: Results of the national VA surgical risk study. SF Khuri, et al. JACS. 1997;185(4):315-327

- Prospective cohort study involving 44 VA centers
 - 87078 noncardiac operations performed between 1991 and 1993
 - Main outcome was all-cause 30-day mortality
 - Multivariable logistic regression to identify variables associated with 30d MR
 - Patient- and procedure-specific factors controlled
- Results
 - Preop serum albumin level was the most important predictor of 30dMR
 - Top 5 variables for postop mortality:
 - Albumin > ASA class > Emergency operation > Disseminated CA > Age



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Comorbidity control: Nutrition

Wound risk assessment in ventral hernia repair: generation and internal validation of a risk stratification system using the ACS-NSQIP. JP Fischer, et al. Hernia. (2015) 19:103-111

- Retrospective cohort study using NSQIP
 - 60187 open VHR operations performed between 2005 and 2011
 - Main outcome was SSO (superficial, deep, organ space, or wound dehiscence)
 - Incidence of SSO was 6.2%
 - Multivariate logistic regression to identify risk factors of SSO
 - Risk factors weighted and subset chosen for risk scoring
- Results
 - Preop low serum albumin level was an intermediate risk factor for SSO ($P < .01$)

Mild RF	Intermediate	Moderate	Severe
DM, COPD, Class I obesity	Smoking, ASA-2, low albumin	Class III obesity, component separation	Dirty wound, long OR time (>70 min)



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Comorbidity control: Obesity

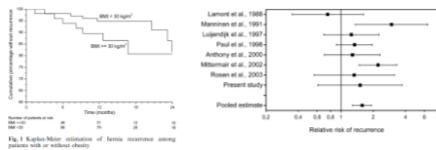
Impact of body mass index on open ventral hernia repair: a retrospective review.
L. Owei, et al. *Surgery*. (2017)Dec;162(6):1320-1329

- Retrospective cohort study using NSQIP
 - 102191 patients with open VHR operations performed between 2005 and 2015
 - Stratified by BMI (7 classes), reducible vs. incarcerated, primary vs. recurrent
 - Incidence of obesity = 58.5%
- Results
 - Higher complication rates with strangulated hernias than reducible ($P < .0001$)
 - Higher complication rates with recurrent hernias rather than primary ($P < .0001$)
 - The higher the BMI class, the higher the rate of all measured complications ($P < .0001$)
 - BMI >40 has greater than twice the risk of complications
 - OR increasing with increasing BMI class

Comorbidity control: Obesity

Obesity is a risk factor for recurrence after incisional hernia repair.
S. Sauerland, et al. *Hernia*. (2004)8:42-46

- Retrospective cohort study using NSQIP
 - 160 patients with open IHR, single center, Germany, followed up at 3, 6, 12, 24 months
- Results
 - Overall recurrence rate 11%
 - Obesity (BMI >30) was the only statistically significant RF for recurrence ($P = .03$)



Comorbidity control: What we do

- Smoking
 - No cigarettes for 4 weeks – preferably nicotine free
 - Some data re: cigarettes > patch/gum > no nicotine (vaping not sure yet)
- Diabetes
 - Laparoscopic – A1c <8
 - Open complex case – A1C <7
- Nutrition
 - Albumin >3.5
- Obesity
 - BMI <40
 - Bariatric surgery

Perioperative management

- **Preoperative**
 - Comorbidity control
 - Smoking
 - Diabetes
 - Malnutrition
 - Obesity
 - No bowel prep
 - Minimize preop fasting
 - Preop shakes
 - Preop pain meds
 - Entereg
- **Intraoperative**
 - TAP block
 - Fluid management
- **Postoperative**
 - Early mobilization
 - Accelerated intestinal recovery
 - Fluid management
 - Multimodal pain control

ERAS (Enhanced Recovery After Surgery)
Critical look at all steps of the perioperative continuum

- Old dogmatic anecdotal traditions
 - NGT, delayed feeding, bedrest, narcotics, epidurals, Foleys, IVF
- New evidence-based practices
 - Pathways defining each element of care
 - Education the most important



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ERAS Protocols – Big picture: Movement sweeping the nation

- Standardize care, accelerate recovery
 - Reduce inflammatory, neuroendocrine metabolic responses to surgery
 - Reduce morbidity, LOS, costs
- Started with colorectal surgery
 - Esophageal, bariatric, thoracic, hepatobiliary, gynecologic, etc..
 - Hernia new, but now well established, especially complex hernia cases



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ERAS: Preoperative

- No bowel prep
 - Dehydration → more perioperative IVF needs
- Minimize preop fasting
 - NPO 3 hours preop
- Preop shakes
 - Clearfast
- Start PO Alvimopan (Entereg)
 - Opioid mu receptor antagonist – shown to reduce narcotic-mediated intestinal ileus
 - Reduces LOS by 1-2 days
- PO Gabapentin
- IV Acetaminophen
- Educational video/content
- Other
 - Preop high-dose steroid




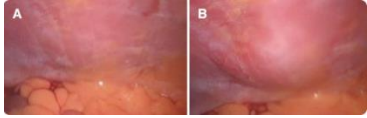
- Complex carbs
- Electrolytes
- All natural
- Selenium
- Zinc & L-citrulline
- Vitamin A



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ERAS: Intraoperative


- Minimize narcotics and paralytics
 - Improves intestinal recovery
- Judicious use of IV fluids
 - Reduced pulmonary problems, improved mobility
- Intraoperative TAP block
 - Dilute marcaine or liposomal bupivacaine on each side

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ERAS: Postoperative

- Early mobilization
 - OOB, Foley out POD1
- Accelerated intestinal recovery
 - Entereg – BID dosing until BM
 - Reduces LOS
 - Scheduled diet advancement
 - CL POD1, FL POD2
 - CL till flatus, FL till BM
 - No routine NG
- Fluid management
 - HL IV on POD2
- Multimodal pain control
 - “3 T’s”, Lyrica, Dilaudid



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ERAS in VHR – Data

Benefits of multimodal enhanced recovery pathway in patients undergoing open ventral hernia repair. A Majumder, et al. JACS. 2016;222:1106-1115

- Prospective cohort of 100 consecutive ERAS patients 12/13 – 01/15 compared with a historical cohort of 100 consecutive patients
 - Patient, hernia and operative characteristics were similar
 - Pathway failure = emesis and/or NGT placement, or severe nausea (4%)
- Results
 - Improvement in ERAS patients for all outcome metrics studied

Metric	ERAS	Control
Days to CL diet	1.1	2.7
Days to reg diet	3.0	4.8
Days to BM	3.6	5.2

Metric	ERAS	Control
LOS	4.0	6.1
Readmission rate	4%	16%

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ERAS in VHR – Data

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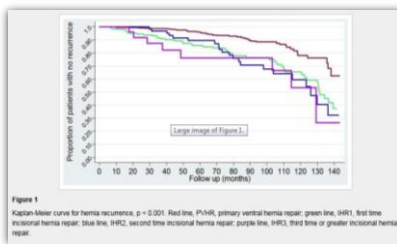
Readmission cause	ERAS	Control
Readmission rate	4	16
Surgical site infection (SSI)	2	1
Seroma	1	2
Hematoma		1
Bowel obstruction/ileus	1	3
Pulmonary embolism		2
DVT		2
Pneumonia		1
UTI		1
Other		3



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Why is this important?

Holihan, JL, et al. Adverse events after ventral hernia repair: the vicious cycle of complications. JACS. 2015;221(2):478-485



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Conclusions: Perioperative management in ERAS era

- **Preoperative**
 - Comorbidity control
 - Smoking (>4 wks)
 - Diabetes (A1C <7)
 - Malnutrition (alb >3.5)
 - Obesity (BMI <40)
 - No bowel prep
 - Minimize preop fasting
 - Preop shakes
 - Clearfast
 - Preop pain meds
 - IV Tylenol
 - Gabapentin
 - Entereg
- **Intraoperative**
 - TAP block
 - Fluid management
- **Postoperative**
 - Early mobilization
 - OOB, DC Foley
 - Accelerated intestinal recovery
 - Entereg
 - Scheduled diet
 - No routine NG
 - Fluid management
 - HL IV on POD2
 - Multimodal pain control
 - “3 T’s”, Lyrica, Dilaudid

Safer
+ Faster
+ Cheaper
= Better



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JAMES HENRY CLARK

Thank You!



First in Flight
GOT MESH
NORTH CAROLINA

Fix it well the first time!!!

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