Eastern Association for the Surgery of Trauma

Advanced Practitioners in Trauma Workshop

January 17, 2013
JW Marriott Camelback Inn
Scottsdale, Arizona

Workshop Faculty:
William Hoff, MD – Workshop Director
Corinna Sicoutris, CRNP – Workshop Director
Raquel Forsythe, MD
John J. Gallagher, MSN, RN, CCNS, CCRN, RRT
David R. Renner, PA-C
Babak Sarani, MD

Eastern Association for the Surgery of Trauma
633 N. Saint Clair Street, Ste 2600
Chicago, IL 60611
Ph: 312-202-5508 • Fax: 312-202-5064
Email: managementoffice@east.org • Web: www.east.org

Concepts and Strategies in Mechanical Ventilation

John J Gallagher MSN, RN, CCNS, CCRN, RRT
Trauma Program Manager/Clinical Nurse Specialist
Division of Traumatology, Surgical Critical Care and Emergency Surgery
Hospital of the University of Pennsylvania

Objectives

- Describe the standard ventilation modes as well as initial ventilator settings in the critically-ill patient.
- Describe the differences between volume and pressure targeted ventilation modes and the benefits of each.
- Describe the purpose of lung protective ventilation and alveolar recruitment in patients with ARDS.

Evolution of Mechanical Ventilators

Case

40 y.o. male, URD involved in an MVC

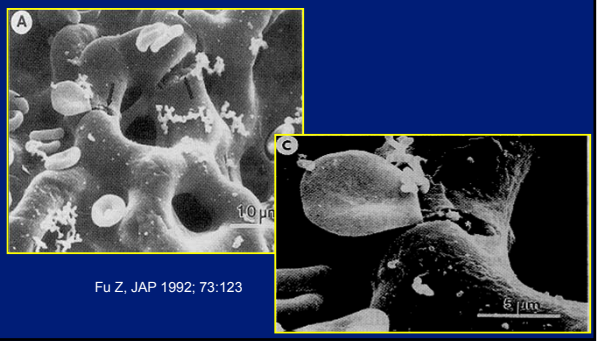
- **One hour extrication time & hypovolemic shock**
- **Injuries**
  - » **Multiple mesenteric bleeders**
  - » **Ruptured spleen**
  - » **Multiple liver lacerations**
- **Damage control laparotomy**
- **ICU for resuscitation**

Case continued…

48 hours later…….

- Febrile
- HR 142
- Increasing oxygen requirement
  - P/F ratio: 80 (PaO_2 80 on 1.0 FIO_2)
- Rising peak inspiratory pressures

Capillary Leak



Fu Z, JAP 1992; 73:123

Acute Lung Injury

Epithelial/Endothelial Damage

↓

Alveolar flooding with proteinacious fluid

↓

Surfactant inactivation

↓

Atelectasis

↓

Shunting

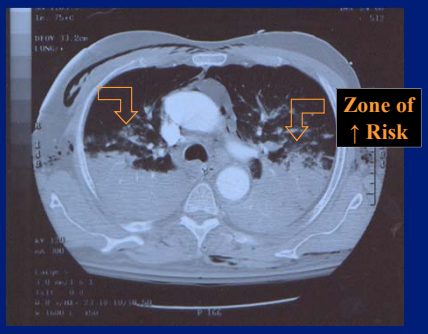
ARDS Continuum

Mild ARDS → **Moderate ARDS** → **Severe ARDS**

PaO_2/FiO_2 Ratio		
Mild	Moderate	Severe
200 – 300	100 - 200	< 100

ARDS Definition

- Acute onset (within 7 days)
- Bilateral opacities (CXR or CT)
- Alveolar edema is not fully explained by cardiac failure or fluid overload
  - – *Does not* require normal PCWP
  - – *Does not* require absence of LA hypertension



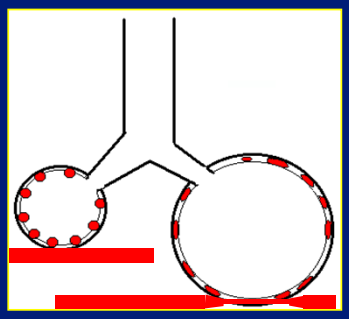
Ventilator Induced Lung Injury (VILI)

"Volutrauma"

Caused by the over-expansion (over- distention) of alveoli from ventilation with volumes in excess of relative lung capacity

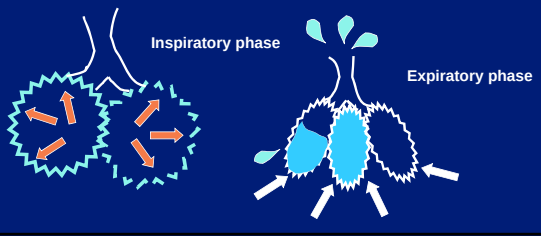
- Correlated with transalveolar pressure > 30 cmH2O (Static "plateau" pressures of > 30 cm H2O)

Ventilator Induced Lung Injury



Collapsed Alveoli

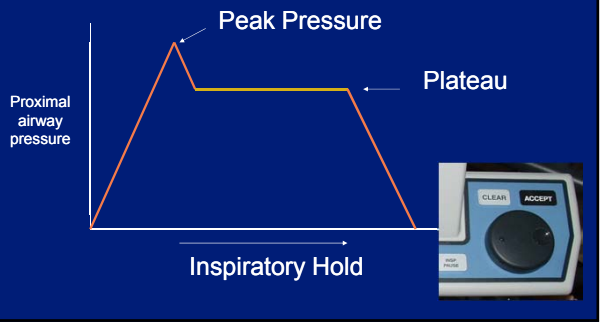
- End-tidal collapse/shearing force
- "Milking" of surfactant from alveoli with repeat closure



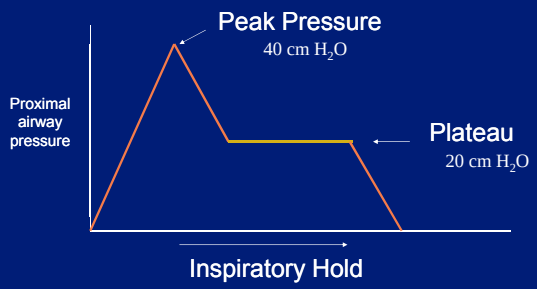
Lung Protective Principles

- Maintain safe transalveolar pressures
  - Plateau pressure < 30 cm H_20
- Prevent end-tidal alveolar collapse
  - PEEP

Inspiratory Hold: PIP and Plateau pressures (VC)



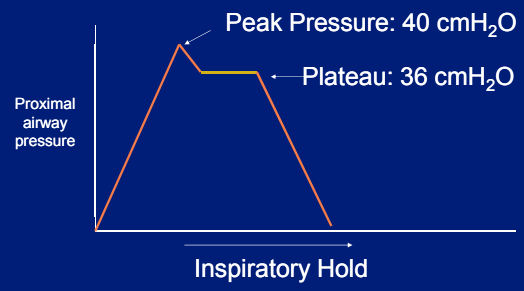
PIP Elevated and Plateau Normal



Airway Pressures

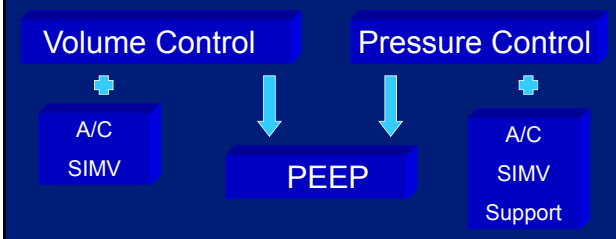
- Peak Inspiratory Pressure High and Plat unchanged:
  (Greater than 10 cmH2O difference between)
  - Tracheal tube obstruction
  - Airway obstruction from secretions
  - Acute bronchospasm
- Rx: Suctioning and Bronchodilators

PIP Elevated and Plateau Elevated



Airway Pressures

- Pip and Plat are both increased
  (less than 10 cm H_2O difference)
  - Pneumothorax
  - Lobar atelectasis
  - Acute pulmonary edema
  - Worsening pneumonia
  - ARDS
  - Dynamic hyperinflation Asthma/COPD
  - Increased abdominal pressure (ACS)
  - Asynchronous breathing



Volume Targeted (Control)Ventilation (VCV)

- Guaranteed tidal volume with each breath
- *Pressure* during the delivered breath *varies* based on resistance and compliance of the lung

Ventilator Settings

- Tidal Volume (Vt) / Inspiratory pressure
- Respiratory Rate (RR)
- Inspiratory : Expiratory Ratio (I:E)
- Flowrate (Flow)
- Oxygen percentage (FiO2)
- Positive End Expiratory Pressure (PEEP)
- Mode

Respiratory Rate (frequency)

Number of breaths delivered by the ventilator in one minute

– Set to approximate the normal rate of breathing
  » Adults 12 - 16 breaths per minute

Breath Cycle

A. TRIGGER

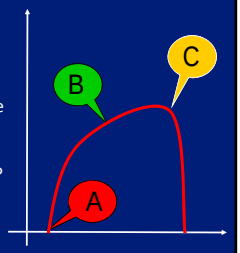
- What causes the breath to *begin*?
  - Machine Controlled – Time
  - Patient Spontaneous – Flow or Pressure

B. LIMIT

- What regulates gas flow during the breath?
- Volume, Flow or Pressure

C. CYCLE

- What causes the breath to end?
- Flow, Volume, Pressure or Time



Flowrate

Determines the speed in which each ventilator breath is delivered to the patient

– Usually set between 40 to 60 liters per minute

– The higher the flow, the faster the breath is delivered

Inspiratory Variables

- Inspiratory Time (percentage)
  – 33% normal = I:E ratio of 1:3
- Rise Time (percentage)
  – Short- faster breath delivery
  – Long- slower delivery

Oxygen Percentage (FiO_2)

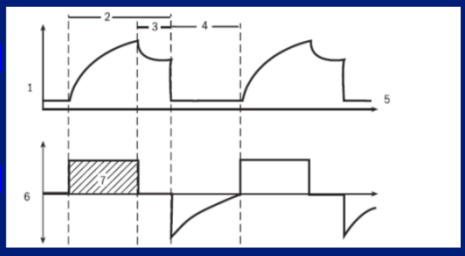
The percentage of oxygen given to the patient through the ventilator

- Range 21% to 100%
  - 21% is what we are breathing in this room
  - 100% is the maximum you can go
- Usually the patient is placed on 100% to start

Volume Targeted (Control) Ventilation (VCV)

Pressure

Flow



Tidal Volume

Conventional Volumes
- 10 – 12 ml / kg predicted body weight (PBW)

Low Tidal Volume (LTV)
- 5 - 8 ml / kg predicted body weight (PBW)

Predicted Body Weight Calculation

- Male PBW in lb: 106 + [6 x (height in inches – 60)]
- Female PBW in lb:105 + [5 x (height in inches – 60)]

Acute Respiratory Distress Syndrome Network ARDSNET

- Comparison of "traditional" tidal volume (12 ml/kg) versus "low" tidal volume (6 ml/kg)

861 patients at 30 centers

Low Tidal Volumes (432)	**Traditional Tidal Volumes (429)**
25-30 cmH2O plateau	45-50 cmH2O plateau

ARDSNET (2000). Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. NEJM, 342(8), 1301-1308.

Acute Respiratory Distress Syndrome Network ARDSNET

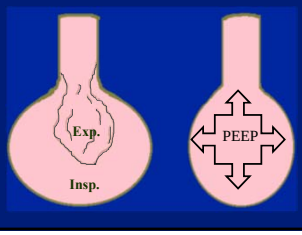
Low tidal Volume Ventilation

- Lower mortality
- Lower levels of IL-6 (lung inflammation)
- Higher number of days without organ or system failure

ARDSNET (2000). Ventilation with lower tidal volumes as compared with traditional tidal volumes for acute lung injury and the acute respiratory distress syndrome. NEJM, 342(8), 1301-1308.

Positive End Expiratory Pressure (PEEP)

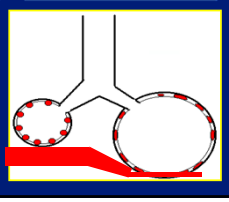
- Maintains the alveoli open at the end of the breath
- Reduces shear force injury to alveoli
- Displacement of lung H_2O



Pulmonary Pitfalls of PEEP

Overdistension of normal alveoli

Shunt | Alveolar Injury | Deadspace



Cardiovascular Pitfalls of PEEP

Increased Intra-thoracic Pressure

↓Venous Return (RV filling)

↑RV Afterload

↓Cardiac Output

False Elevations of CVP-PAP-PCOP

Lung Protection is Not Enough

Recruitment

- OPEN
  - Overcome the Trans-alveolar Opening Pressure
- MAINTAIN
  - Positive End Expiratory Pressure

Recruitment Maneuver Patient Selection

- *Early ARDS (<72 hrs)* vs. Late ARDs
- Intra-pulmonary vs. *Extra-pulmonary* lung Injury
- Hemodynamic stability
- Absence of Contraindications

Alveolar Recruitment Strategies

- Recruitment Maneuvers (episodic)
- Pressure Control Ventilation
- Manipulation of I: E ratio
- Airway Pressure Release Ventilation (APRV)
- High Frequency Oscillation Ventilation (HFOV)

Improving Oxygenation

- Manipulation of FiO_2
- Manipulation of Mean Airway Pressure ($\overline{Paw}$)

Mean Airway Pressure ($\overline{Paw}$)

Definition: the MAP is the area under the curve during inspiration and expiration divided by the duration of the cycle

$$MAP = \frac{\text{area under the pressure curve}}{\text{duration of the cycle}}$$

Adapted from Pilbeam, 2006

Increase Mean Airway Pressure

- PEEP
- I:E Ratio Manipulation
  - Inverse Ratio Ventilation (IRV)
  - Respiratory Rate
- Inspiratory Pause
- Square Waveform

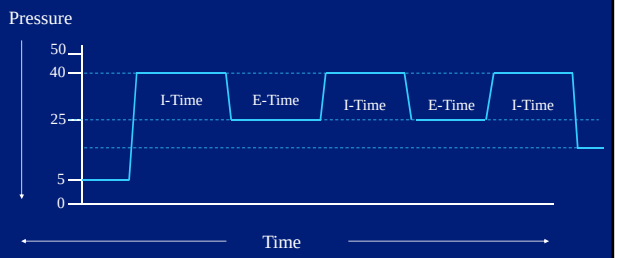
Intermittent Recruitment Maneuver

Brief application of high inspiratory pressures to recruit collapsed alveoli

- Inspiratory pressure application
  - CPAP 40- 50 cm H_2O for 30 - 40 seconds
- *Optimal PEEP application to prevent collapse*
- Repeat maneuver after a ventilator disconnect

Recruitment

Recruitment with PCV



Decremental PEEP Trial

- PEEP set at 20 cm H_2O
- PEEP decreased 2 cmH_2O every 5-20 min
  - Monitoring oxygenation
  - Compliance
- Until Optimal PEEP is achieved
  - the lowest PEEP associated with the best compliance/oxygenation
- Recruitment maneuver repeated
- PEEP set 2 cm H_2O above the Optimal PEEP

Recruitment Maneuver Cautions

- Pulmonary blebs, bullae, existing barotrauma
- Hemodynamic instability
  - Hypovolemia
  - Impaired RV function
- Increased intracranial pressure (relative)

Pressure Targeted (Control) Ventilation (PCV)

An inspiratory pressure limit, rather than a tidal volume is set by the practitioner.

- Inspiratory pressure & inspiratory time*
- Airway resistance
- Lung compliance

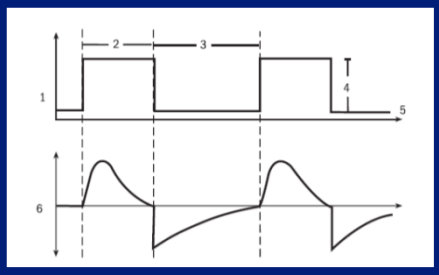
* Practitioner controlled

Volume is variable

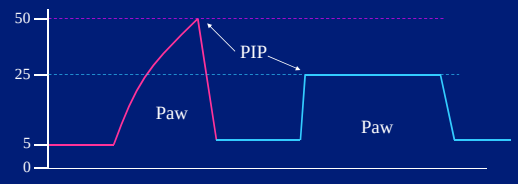
Pressure Control Ventilation (PCV)

Pressure

Flow

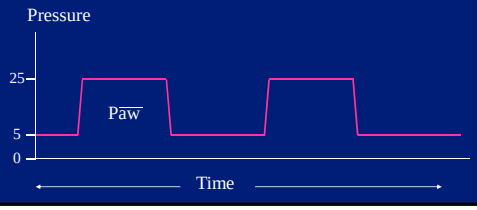


Volume Control vs. Pressure Control Waveform

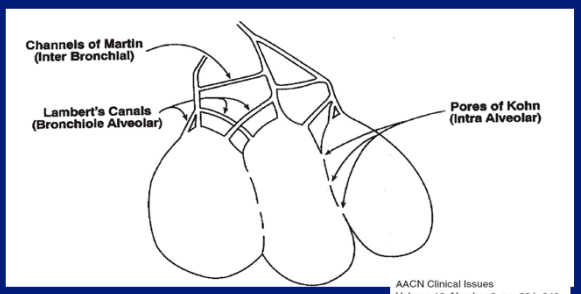


PCV Waveform Advantages

- Controlled, constant inspiratory pressure
- Better distribution of tidal volume to collapsed alveoli
- Optimal increase in $\overline{Paw}$

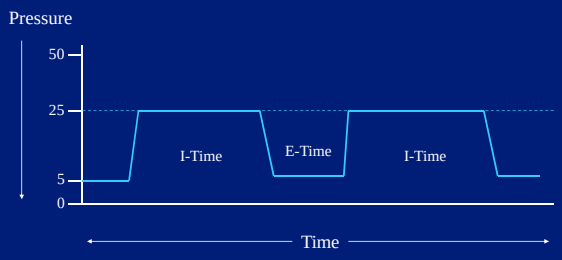


Collateral Ventilation Channels

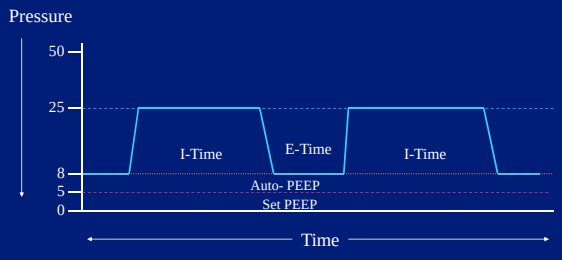


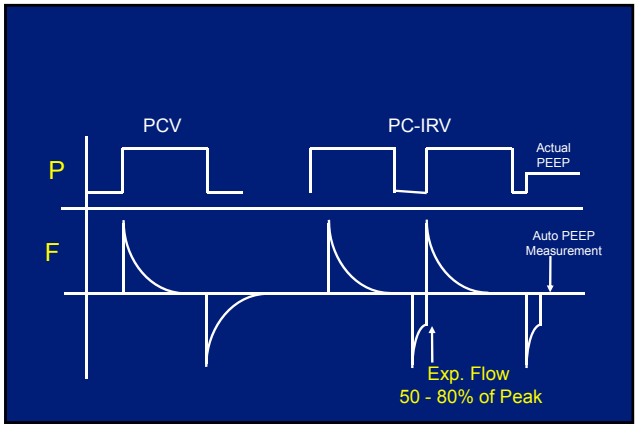
AACN Clinical Issues
Volume 12, Number 2, pp. 234–246
© 2001, AACN

Pressure Control Inverse Ratio (PCIRV)



Auto-PEEP





Volume Assured Pressure Modes

Pressure Limited + *Minimum Volume Guarantee*

Machine adjusts to changing lung mechanics to provide tidal volume within pressure limit

Volume Assured Pressure Modes

Also known as……

- *Adaptive Pressure Control Modes*
- *"Dual Control" Modes*

Volume Assured Pressure Modes

- Combine *pressure supported (limited) ventilation* with a *decelerating flow* pattern and a *guaranteed minimum volume.*
- Settings vary with ventilator
- All require selection of a "target volume"
- Spontaneous versus control modes determined by selection of settings

Volume Assured Pressure Modes

- Pressure Regulated Volume Control (PRVC)
  - Volume Support
- Volume Control Plus (VC+)
  - Volume Support
- Pressure Control Volume Guarantee (PCVG)
- Volume Targeted Pressure Control (VTPC)
- Adaptive Pressure Ventilation
  - Adaptive Support Ventilation
- Pressure Augmentation

Control Mode Settings

- Rate (fx)
- Inspiratory time (Ti)
- FiO_2
- PEEP

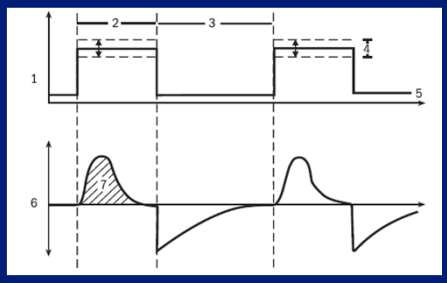
Support Mode Settings

- Target tidal volume
- FiO_2
- PEEP

Pressure Regulated Volume Control

Pressure

Flow



Points to Remember

- Guaranteed minimum tidal volume but not a constant tidal volume!!
- Tidal volume may not be achieve if lung compliance becomes low or pressure limit is set too low
- Excessive tidal volume if the patient generates excessive inspiratory efforts

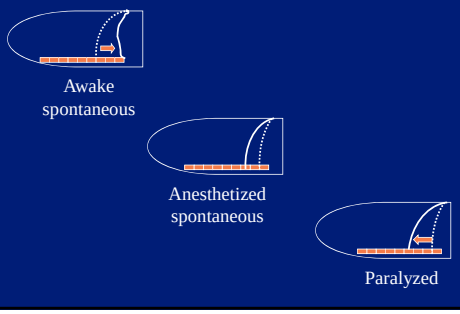
Pressure Control
Spontaneous Breathing Modes

Provides ventilatory support while allowing the patient to perform some work of breathing

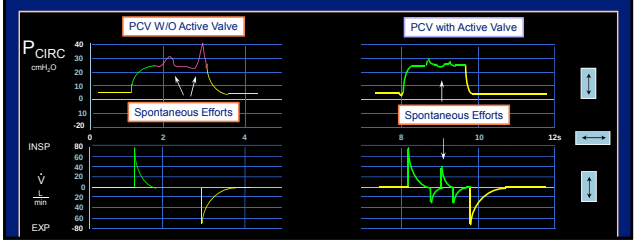
Benefits of Spontaneous Breathing

- Improved ventilation/perfusion matching
- Lower airway pressures
- Reduced hemodynamic side effects
- Improved organ perfusion
- Less need for sedation/neuromuscular blockade
- New pressure modes have exhalation valves and other technology that allow for patient interaction throughout the respiratory cycle.

Diaphragm Excursion



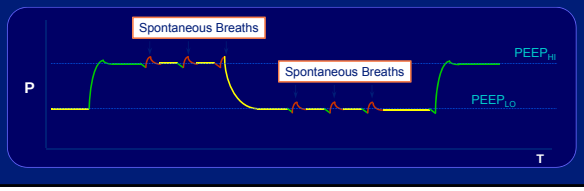
Active Exhalation Valve



Biphasic Ventilation

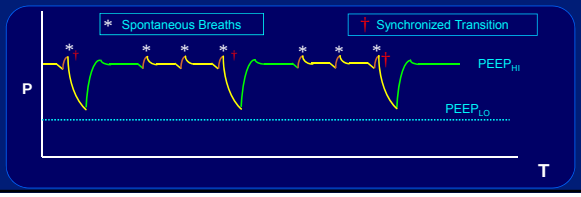
- **Inspiratory Pressure Limit ($PEEP_{HI}$)**
- **PEEP ($PEEP_{LOW}$)**
- **Inspiratory time (T_I)**
- **Rate (f_x)**
- **Pressure Support**

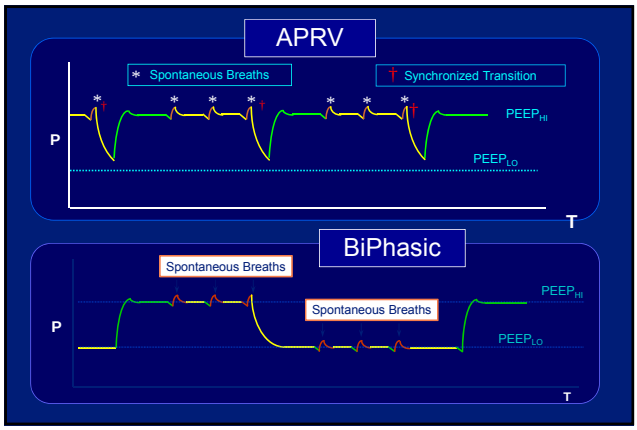
- Biphasic
- Bi-level
- Bi-Vent
- BIPAP
- Duo PAP



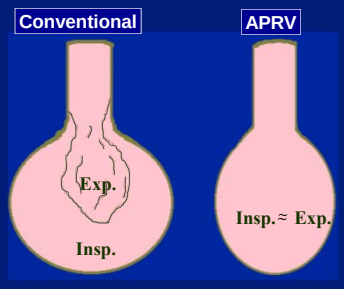
APRV Characteristics

- ***High CPAP level with a short expiratory releases at set intervals (rate).***
- ***APRV always implies an inverse I:E ratio***
- ***All spontaneous breathing is done at upper pressure level***





Alveolar Volumetric Changes



Bi-level/APRV Considerations

- Tidal volume changes with lung compliance
- Over-sedation/NMB may reduce minute ventilation
- Caution in patients requiring longer expiratory time (COPD, Asthma)
- Elevated ICP in TBI
  - Hypercapnea/ Cerebral venous congestion

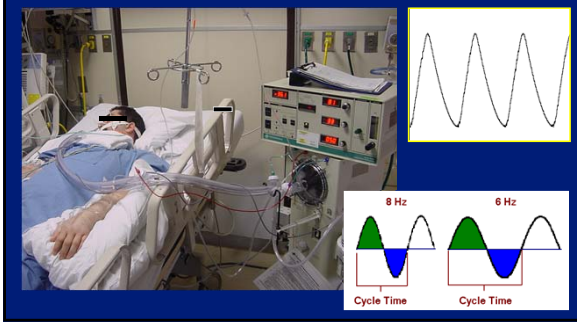
General Considerations

- Avoid disconnection of the circuit
- Closed system suctioning
- Transport on the ventilator

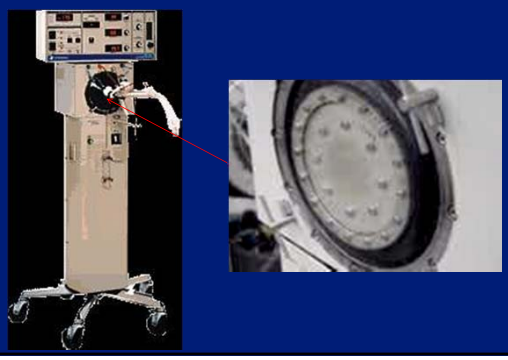
High Frequency Ventilation

- Jet Ventilation
  - – Up to 600 bpm
- Oscillation
  - – 300 to 3000 bpm
    - Small tidal volumes
    - Combined applied and intrinsic (Auto-PEEP) to recruit alveoli

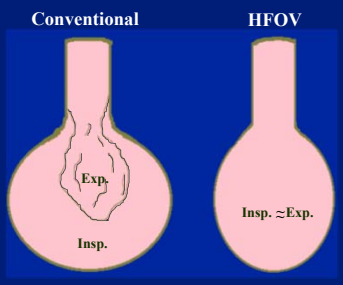
Oscillator

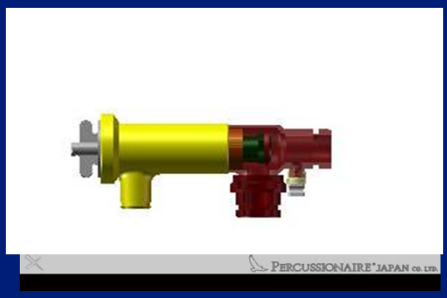


3100B Oscillator



Alveolar Volumetric Changes During HFO

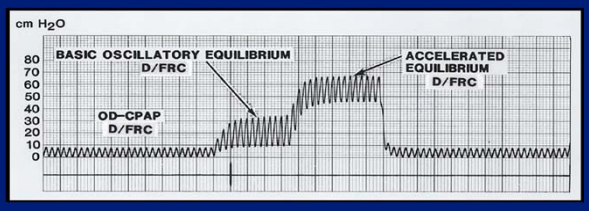




Volumetric Diffusive Respiration (VDR)

Images courtesy of Percussionaire Corporation

VDR Waveform



Images courtesy of Percussionaire Corporation

So…how should you approach patient management?

- Protect the lung (low volume) and support oxygenation/ventilation
- Recruit the lung
- Know the mode you select!

Thank You

john.gallagher@uphs.upenn.edu

UPMC LIFE CHANGING MEDICINE

Acute Care Surgery

Common Procedures and Important Concepts

Raquel M. Forsythe, MD FACS
University of Pittsburgh Medical Center
Division of Trauma and Acute Care Surgery
EAST Advanced Practice Provider Workshop

What is Acute Care Surgery?

- **Commonly called Acute Care Surgery (ACS) or Emergency General Surgery (EGS)**
  - **Acute General Surgery problems**
  - **Often combined with Trauma and/or an elective General Surgery Practice**
- **ACS is still evolving**
- **Minimal literature defining ACS**

Creation and Implementation of an Emergency General Surgery Registry Modeled after the National Trauma Data Bank

Robert D Becher, MD, J Wayne Meredith, MD, FACS, Michael C Chang, MD, FACS, J Jason Hoth, MD, PhD, FACS, H Randall Beard, MD, Preston R Miller, MD, FACS

UPMC LIFE CHANGING MEDICINE

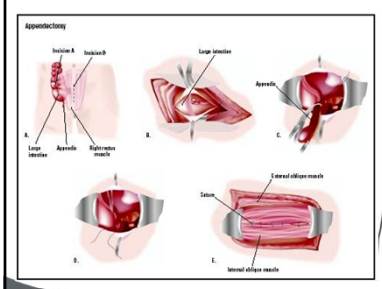
ACS Problems

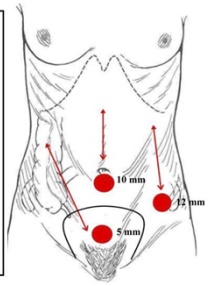
Appendicitis	Cholecystitis
Vascular insufficiency of the intestine	Intestinal Obstruction
Hernia	Diverticulitis
Peptic Ulcer Disease	Peritonitis
Pancreatitis	Enteric fistula
Perianal/Perirectal abscess	Skin abscess
Hematoma	Gastrostomy/Jejunostomy
Tracheostomy	Enterostomy/colostomy

UPMC LIFE CHANGING MEDICINE

Appendicitis

- Appendectomy – open versus laparoscopic



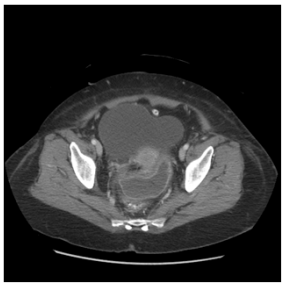


UPMC LIFE CHANGING MEDICINE

4

Appendicitis

- Postoperatively, most patients with an uncomplicated (nonperforated) lap appendectomy can go home within 24h
- For more complicated appendicitis (perforation or gangrene) duration of hospitalization and antibiotics are variable
- Major postop risks: abscess, wound infection, stump leak, fistula

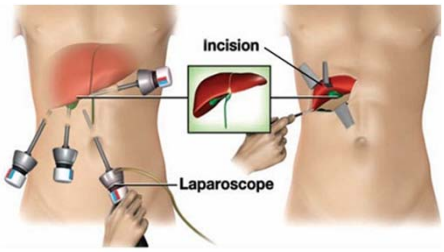


UPMC LIFE CHANGING MEDICINE

5

Cholecystitis

- Laparoscopic versus open cholecystectomy



Laparoscopic Cholecystectomy Open Cholecystectomy

UPMC LIFE CHANGING MEDICINE

6

Postoperative cholecystectomy

- Many people with elective lap CCY (for biliary colic or biliary dyskinesia) go home the day of surgery
- For acute cholecystitis
  - more common on most EGS/ACS services
  - Often need to stay in the hospital postoperatively
  - Follow LFTs and WBC
  - If bilirubin is elevated postoperatively may represent:
    - Retained stones in the CBD
    - Bile leak (cystic duct, ducts of Lushka)
    - Common duct injury

UPMC LIFE CHANGING MEDICINE

7

Postoperative cholecystectomy

- If there are **retained stones**
  - ERCP is both diagnostic and therapeutic
- If there is a **bile leak**
  - Confirm with HIDA scan and/or CT scan
  - Percutaneous drain in fluid collection
  - ERCP for sphincterotomy and stenting of the ampulla
  - Antibiotics
- If there is a **common duct injury**
  - Requires reoperation either a direct repair, choledochoenterostomy or hepaticoenterostomy

UPMC LIFE CHANGING MEDICINE

8

ERCP with Cystic Duct Stump Leak

UPMC LIFE CHANGING MEDICINE

9

Vascular Insufficiency of the Intestine

- May be acute or chronic, occlusive or nonocclusive
- May be caused by thrombosis of a chronically diseased vessel or embolus from a distant site
- Most EGS contacts will be for acute mesenteric ischemia
- Most are from acute SMA embolism (50%) generally from the heart
  - Hx of atrial fibrillation
- May see underlying coagulation deramgements

UPMC LIFE CHANGING MEDICINE

10

Vascular Insufficiency of the Intestine

- Diagnosis
  - Pain out of proportion to physical exam
  - Sudden onset in embolic disease
  - Lower abdominal pain with BRBPR more likely colon ischemia
  - Elevated lactate (but may be absent with venous occlusion)
- Rapid diagnosis and treatment important as mortality is high

UPMC LIFE CHANGING MEDICINE

11

Vascular Insufficiency of the Intestine

- Treatment
  - Goal is to restore blood flow as soon as possible
  - Resuscitation, Abx, NGT
  - Heparin
  - Mesenteric angiogram may be diagnostic and therapeutic (possibility of embolectomy, papaverine, thrombolytics…)
  - Surgery for suspicion of bowel infarction
  - Resection of necrotic bowel
  - Planned second look operation
  - Often need an ostomy if perfusion not clearly adequate

UPMC LIFE CHANGING MEDICINE

12

Vascular Insufficiency of the Intestine - Postop

- Generally require ICU care postop
- May develop multiple organ failure
- Acute kidney injury is common
  - Often have underlying chronic renal insufficiency preop
- Acute respiratory failure and pneumonia are common
- Require ongoing resuscitation and monitoring for bleeding (heparin, thrombolysis)
- Complications are frequent and ICU/hospital stay may be prolonged

13

UPMC LIFE CHANGING MEDICINE

Intestinal Obstruction - Causes

- Adhesions
- Malignancy
- Hernias
- Strictures
- Early postoperative obstruction
- Intussusception
- Gallstone Ileus
- SMA syndrome

14

UPMC LIFE CHANGING MEDICINE

Intestinal Obstruction - Treatment

- Nasogastric tube decompression
- Long decompression tubes (Baker tube)
  - Rarely used at this point
- Water soluble contrast

15

UPMC LIFE CHANGING MEDICINE

Intestinal Obstruction – Surgical Treatment

- Approximately 25% of patients “fail” nonoperative management
- Triggers for surgery
  - Worsening abdominal exam
  - Suspicion of closed loop obstruction
  - Fever
  - Tachycardia
  - Acidosis

UPMC LIFE CHANGING MEDICINE

16

Intestinal Obstruction – Surgical Treatment

- Exploratory laparotomy
  - Goal is no find and fix the source of obstruction
    - Adhesiolysis may be sufficient
    - Identify hernias (internal or abdominal wall)
  - Assess bowel viability
    - Doppler
    - Fluorescein/Wood’s Lamp
    - Spy Elite system
  - Resect any nonviable bowel
  - Avoid enterotomy

UPMC LIFE CHANGING MEDICINE

17

Intestinal Obstruction – Surgical Treatment

- Exploratory Laparoscopy
  - Depends on surgeon experience with laparoscopy
  - Best candidates have mild abdominal distention, more proximal obstruction, partial obstruction or suspicion of a single band
- Postoperatively
  - Bowel function may be significantly delayed
  - Nutritional considerations
  - Early mobilization
  - Limit opiates

UPMC LIFE CHANGING MEDICINE

18

Hernia - Types

- Incisional hernia
- Umbilical hernia
- Parastomal hernia
- Inguinal hernia
- Femoral hernia
- Obturator hernia
- Richter's hernia
- Epigastric hernia
- Spigelian hernia
- Lumbar hernia

UPMC LIFE CHANGING MEDICINE

19

Hernia – Treatment

- Treatment of hernias is surgical
- Depending on the type of hernia the surgical treatment varies
  - Small hernias may be amenable to direct suture repair
  - Larger hernias require tension-free repairs
    - Mesh – synthetic, biologic
    - Tissue advancement flaps
  - Open versus laparoscopic repairs

UPMC LIFE CHANGING MEDICINE

20

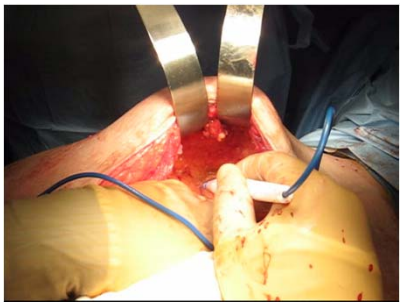
Hernia – Postoperative

- Pulmonary toilet, mobilization
- Bowel function may be delayed – depending on the adhesiolysis and closure
- Abdominal compartment syndrome in component separation with loss of domain
- Binder
- No Lifting!

UPMC LIFE CHANGING MEDICINE

21

Separation of Parts (Component Separation)



UPMC LIFE CHANGING MEDICINE

22

Diverticulitis

- Hinchey Classification
  - I: Localized (paracolonic) abscess
  - II: Pelvic abscess
  - III: Purulent Peritonitis
  - IV: Fecal Peritonitis
- Up to a Hinchey III, laparoscopic washout and drainage (plus antibiotics) is acceptable
- Hinchey IV requires a Hartmann's Procedure

UPMC LIFE CHANGING MEDICINE

23

Hartmann's Procedure

- **Sigmoid colectomy with end descending colostomy**
- Postop risks: wound infection, intraabdominal abscess, rectal stump blowout
- Most have the colostomy reversed in 3-6 months

UPMC LIFE CHANGING MEDICINE

24

Peptic Ulcer Disease

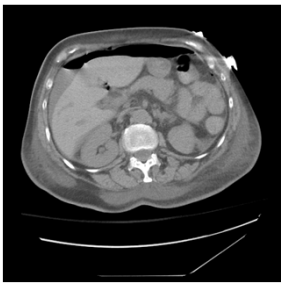
- **Perforation**
- Acute onset of pain
- Free intraperitoneal air
- Proton pump inhibitors
- Antibiotics, NGT
- Surgery
- Treatment for *H. pylori*

- **Bleeding**
- Proton pump inhibitors
- EGD with possible cautery, injection of epinephrine, clipping
- Angiography
- Surgery for failure or ongoing transfusion requirment

25

UPMC LIFE CHANGING MEDICINE

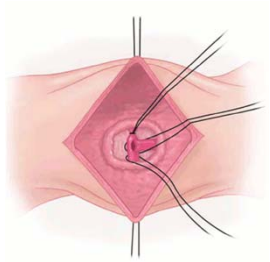
Omental (Graham) Patch



26

UPMC LIFE CHANGING MEDICINE

Peptic Ulcer Disease - Bleeding



- Doudenotomy with oversewing of the GDA
- Often combined with an acid reducing procedure (vagotomy)

27

UPMC LIFE CHANGING MEDICINE

Peptic Ulcer Surgery - Postop

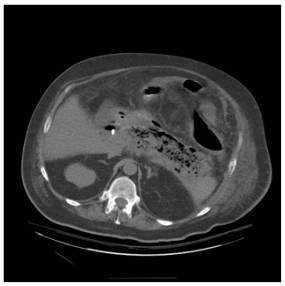
- Treatment for *H pylori*
- Nasogastric tube drainage
- Antibiotics
- Gastrograffin contrast study to assess for leak between postop day 5-7
- Ascites drain management in cirrhotic patients

UPMC LIFE CHANGING MEDICINE

28

Pancreatitis

- Most common causes are alcohol induced and gallstone pancreatitis
- Gallstone pancreatitis should have CCY prior to leaving the hospital
- Acute pancreatitis may require surgical treatment
  - Infected necrotizing pancreatitis
  - Abdominal compartment syndrome
  - Pseudocysts



UPMC LIFE CHANGING MEDICINE

29

Pancreatic necrosectomy

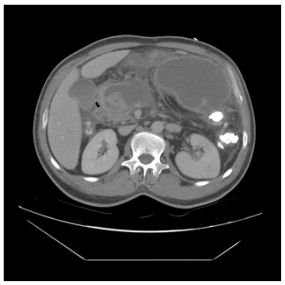
- Debride infected necrotic pancreas
- Wide drainage – often with large sump drains that allow for irrigation
- Nutritional support
- Postoperatively at risk for multiple organ failure
- Large drains in the lesser sac may erode into splenic vessels
- Pseudoaneurysms

UPMC LIFE CHANGING MEDICINE

30

Pseudocysts

- Generally observed for 6-8 weeks
- Endoscopic drainage
- Surgical drainage
- External (percutaneous) drainage
- Cystgastrostomy, cystduodenostomy, cystjejunostomy



UPMC LIFE CHANGING MEDICINE

31

Pancreatitis – additional concerns

- Pancreatic insufficiency
  - Diabetes
  - Malabsorption
- Splenic vein thrombosis

UPMC LIFE CHANGING MEDICINE

32

Enteric fistula

- Enetrocutaneous fistula
- Enteroatmospheric fistula
- Low output vs high output
- **Initial management**: correct fluid and electrolytes, treatment of infection, nutritional support, fistula control and skin care
- Those who fail conservative management (2/3) will require surgery

UPMC LIFE CHANGING MEDICINE

33

Enteric fistula

- Surgery generally delayed for 3-6 months to minimize the risk of bowel injury
- Pt must be well nourished, free of infection
- Attempt to enter the abdomen in a “virgin” area
- Meticulous dissection to avoid bowel injury
- Extensive adhesiolysis usually required
- Tension free repair of well-vascularized bowel
- Must address any distal obstruction

Post op nutritional support

UPMC LIFE CHANGING MEDICINE

34

Necrotizing fasciitis

- Type I
  - Mixed infection caused by aerobic and anaerobic bacteria
  - Risk factors: Diabetes, PVD, immunosupression
  - Mortality 21%
- Type II
  - Group A strep or other beta hemolytic strep
  - Mortality 14-34%

UPMC LIFE CHANGING MEDICINE

35

Infections and Abscesses – Skin, perirectal, perianal

- Includes necrotizing soft tissue infections
- May be unimpressive on inspection of the skin with significant extension in the deeper tissues
- Treatment is surgical incision and debridement
- Must debride all devitalized tissue

UPMC LIFE CHANGING MEDICINE

36

Infections and Abscesses – Skin, perirectal, perianal

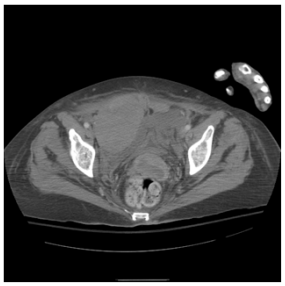
- Must debride without concern for the reconstruction
- If the infection is perineal, may require diverting ostomy for wound care of fecal contamination cannot be prevented

UPMC LIFE CHANGING MEDICINE

37

Hematoma

- Soft tissue hematomas
- Retroperitoneal area and rectus sheath most common
- Generally related to anticoagulation
- Primary treatment is reversal of anticoagulation and transfusion as needed
- May require surgery for:
  - **Abdominal compartment syndrome**
  - **Tense hematoma with skin ischemia/necrosis**



UPMC LIFE CHANGING MEDICINE

38

Feeding tubes

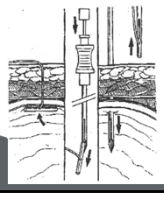
- Nutritional support
- Dysphagia – stroke, head and neck cancer, dementia
- Frequent consults
- Not entirely benign procedures…

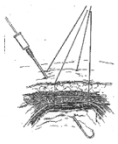
UPMC LIFE CHANGING MEDICINE

39

Gastrostomy

- **Open Gastrostomy**
- Surgical gastropexy performed
- **Laparoscopic Gastrostomy**
- Surgical gastropexy or T-fasteners



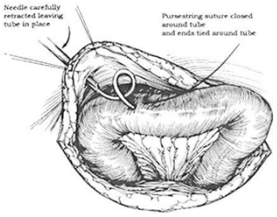


- **Percutaneous Endoscopic Gastrostomy**
- Endoscopy
- Transillumination
- Needle, guidewire
- May use T-fasteners
- Relative contraindications
  - Prior abdominal surgery
  - Malnutrition
  - Ascites
  - "Pullers"

UPMC LIFE CHANGING MEDICINE

Jejunostomy

- Tube placed into the proximal jejunum
- May be done open, laparoscopic or endoscopically (PEJ)
- The fixed point of the bowel at the abdominal wall may cause bowel obstruction (volvulus, internal hernia)

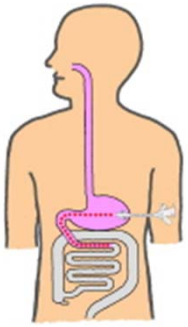


UPMC LIFE CHANGING MEDICINE

41

Transgastric Jejunostomy (GJ)

- Placed through the stomach for postpyloric feeding
- Benefits of jejunal feeds
- Less risk of bowel obstruction/torsion at the tube site than a jejunostomy
- Can convert a Gastrostomy to a GJ under fluoroscopy



UPMC LIFE CHANGING MEDICINE

42

Tracheostomy

- Frequent consult for many EGS/ACS services
- Acute respiratory failure
  - Failure to wean
- Inability to maintain airway and manage secretions
  - Stroke

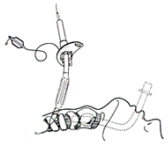
UPMC LIFE CHANGING MEDICINE

43

Tracheostomy – two common procedures

- **Open Tracheostomy**
- Can be done at the bedside (ICU) or in the OR
- Dissect down to the trachea
- Place stay sutures in the trachea
- Open the trachea, pull back tube and under direct vision place tube in the trachea

- Percutaneous Tracheostomy
- Generally done in the ICU
- Bronchoscopic guidance
- Modified Seldinger technique
- Small incision
- Dilate trachea



UPMC LIFE CHANGING MEDICINE

44

Tracheostomy - Complications

- **Bleeding**
- Concern for a sentinel bleed – indicating a possible tracheoimoninate fistula
- Trach balloon erodes through trachea into inominate artery
- Often fatal
- **Tracheal Stenosis**

UPMC LIFE CHANGING MEDICINE

45

Ileostomy

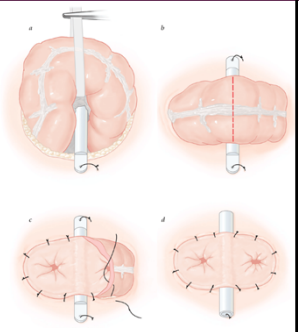
- Ileum brought out to the skin
- Generally liquid output
- May require agents to slow output to avoid dehydration
- Fluid and electrolyte management critical post op
- Usually performed as a Brooke – everted to make a "nipple" to ease pouching, minimize skin complications
- Ileostomies that are flush are often difficult to pouch
- May be loop versus end

UPMC LIFE CHANGING MEDICINE

46

Colostomy

- Depending on site, may have liquid (right side) or solid (left side) output
- May be loop versus end
- Reversal of loop stomas are easier than end stomas



UPMC LIFE CHANGING MEDICINE

47

Stomas - Postop

- Must be observed for function, ischemia and retraction
- Take down the bag, look at it
- Stomas may separate from the skin edges and develop an abscess
- Patients may develop a parastomal hernia
  - Surgical repair

UPMC LIFE CHANGING MEDICINE

48

Fulminant *Clostridium dificile* colitis

- Acute *C. difficile* infection can become fulminant with signs of systemic toxicity
- May or may not have diarrhea
- Evidence of end-organ damage
- High clinical suspicion
- Oral or IV metronidizole
- Oral or rectal vancomycin
- Surgery
  - Standard therapy → Subtotal Colectomy

49

UPMC LIFE CHANGING MEDICINE

Subtotal Colectomy

50

UPMC LIFE CHANGING MEDICINE

Fulminant *Clostridium dificile* colitis

- Alternative surgical therapy
- Laparoscopic loop ileostomy with colonic lavage
  - "Zuckerbraun Procedure"
  - Lavage with 8 liters of PEG and vancomycin intraoperatively
  - Colonic irrigation with Vancomycin BID for 10 days
  - Able to maintain the colon in 93% of patients
  - Reversbile, pts are not committed to a lifetime ileostomy or ileorectal anastomosis

51

UPMC LIFE CHANGING MEDICINE

Approach to the Polytraumatized Patient with Musculoskeletal Injuries

David R. Renner PA-C
Department of Orthopaedic Surgery
St. Lukes University Hospital

Why?

- In most Level 1 centers, the trauma-trained general surgeon is the leader of the multidisciplinary care team, and the orthopaedist functions as a team member
- In many community centers, a general surgeon is often in charge of the overall management of the trauma patient, but the orthopaedist may, at times, serve as leader

Why?

- Since the orthopaedist may be called upon to assume the leadership role, it is incumbent on him to be thoroughly familiar with the evaluation and management of the trauma patient, from assessment in the trauma bay through discharge and rehabilitation

How?

- Advanced level practitioner's are very effective in the management of these patients from admission to discharge.
- They also maximize their physician's "time and tasks". They can serve as a liaison to the multi-disciplinary specialists.

Associated Injuries

- Injuries due to blunt trauma, industrial accidents and falls frequently affect more than one system
- Polytraumatized patients must be evaluated with an awareness of the possibility of associated injuries and must be managed in time-relevant phases

Phases of Trauma Care

- Prehospital phase
- Hospital phase
  - acute
  - primary
  - secondary
  - tertiary
- Rehabilitation phase

Phases of Trauma Care

- Each period has its own priorities in resuscitation and injury management, as well as predictable patterns of morbidity and mortality

Mortality Patterns

- Acute and primary periods
  - hemodynamic complications and lethal head injury
- Secondary period
  - early organ failure, particularly pulmonary
- Tertiary period
  - Sepsis, pulmonary failure, and delayed organ failure

Today's Goals

- Focus on the basic tenets of trauma care
- Focus on the evaluation of the multiply injured patient
- Focus on the benefits of early orthopaedic intervention in this setting

Prehospital Phase

Necessary Components

- One of the goals of trauma care is to provide earlier evaluation and increasingly sophisticated prehospital care
- Optimal transport, resuscitation, stabilization, and definitive care of the multiply injured patient depend on 3 key elements
  - paramedics familiar with life support protocols
  - communication between paramedics and receiving hospital
  - dedicated space and equipment for management of the patient

Prehospital Care

- When indicated, the patient should arrive with spinal immobilization
- Open wounds should be covered with sterile bandages
- Hemorrhage should be controlled with direct pressure
- Prefabricated splints should be used to immobilize long-bone injuries

Acute Hospital Period

Initial 1 to 2 Hours

- A logical, systematic approach for evaluation and management must be followed
- Primary survey -->
- Acute resuscitation -->
- Secondary survey
- Some elements may be performed concurrently

Primary Survey Alphabet

- *A*-Airway maintenance with c-spine control
- *B*-Breathing and ventilation
- *C*-Circulation and hemorrhage control
- *D*-Disability evaluation(neurologic status)
- *E*-Exposure and environmental control(completely undress & examine, but prevent hypothermia)

Airway

- Establishing airway is top priority
- Always must consider possibility of C-spine injury
- Need lateral of C-spine including the C7-T1 interspace
- If patient not awake and alert, negative lateral exam does not necessarily clear C-spine

Breathing and Ventilation

- Placement of an orotracheal, nasotracheal, or surgical airway is mandatory if there are mechanical factors preventing normal breathing
- If ventilation difficult, consider PTx vs.. HTx, etc.. and treat accordingly

Circulation and Hemorrhage

- Hypotension in the multiply injured patient may be due to diverse causes, including:
  - hemorrhage--accounts for 95% of cases
  - brain injury
  - quadriplegia
  - hypothermia
  - MI
  - mediastinal shock

Blunt Trauma and Blood Loss

- External hemorrhage-easiest to diagnose and can be treated with pressure
- Intrathoracic-usually diagnosed by PE or on CXR
- Intraperitoneal-can be evaluated by ultrasound, CT and PE
- Extraperitoneal-inferred by presence of pelvic fractures, may be life-threatening
- Long-bone fractures-identified by PE and X-rays

Disability/Neurologic Exam

- Glasgow Coma Scale is useful for quick neuro assessment
  - Eye opening
  - Motor response
  - Verbal response
  - Get 3 points for showing up, 15 point max
- A more thorough exam can be made with secondary survey

Environment and Exposure

- Undress and examine
- Logroll to examine spine, posterior chest wall and flank
- Must avoid hypothermia with these maneuvers

Resuscitation

- Concurrent with the primary assessment, the resuscitation must begin
- Large-bore IV's with warm LR
- If no response to 2L LR, then blood is transfused
- BP, HR and urine output are decent indicators as the the adequacy of resuscitation

Mandatory Images in the Trauma Bay

- Lateral C-spine
- AP CXR
- AP Pelvis
- As indicated by PE or protocol, additional anatomy-specific radiographic studies can be obtained as part of secondary survey

Pelvis

- A major concern for trauma team is the presence of a pelvic fracture in a patient with continued hemodynamic deterioration
- If hemorrhage from the chest, belly, or external sites has been either excluded as the cause of hypotension or controlled, evaluation of the AP pelvis may reveal that a pelvic fracture is the site of hemorrhage

Tile's "ABC"

- Pioneering classification of pelvis fractures which offers a fairly simple description
- Type A-stable
- Type B-partially stable
- Type C-completely unstable

Tile A

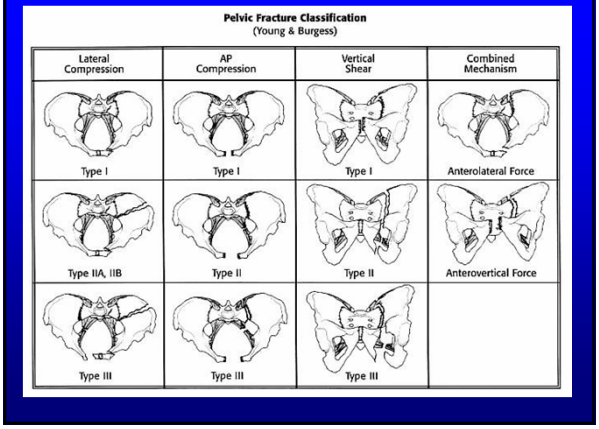
- The good
- "Stable"

Tile B

- The bad
- Vertically stable
- Rotationally unstable

Young and Burgess' Scheme

- Pelvic fractures are divided into 4 types
  - Lateral compression(LC)
  - AP compression(APC)
  - Vertical shear(VS)
  - Combined mechanical injury
- Plane of the anterior ring disruption indicated the direction of the applied force, suggesting the nature of the posterior ring injury, and *can be used to establish the risk of hemorrhage*



Tile C

- The ugly
- Vertically unstable
- Rotationally unstable

Lateral Compression Injuries

- Oblique anterior ring fracture
- Associated with:
  - decreasing pelvic volume
  - intraperitoneal or intrathoracic hemorrhage
  - high incidence of CHI
- High mortality of LC-III are usually secondary to associated injuries

Anteroposterior Compression Injuries

- Characterized by vertical pubic rami fractures
- Are associated with greatest incidence of hemorrhage
- Posterior ring injury is as follows:
  - APC-I:sacrospinous & sacrotuberous ligaments
  - APC-II: anterior SI ligament
  - APC-III: posterior SI ligament
- Neurovascular structures adjacent to these ligaments also are disrupted
- APC-III has been associated with >20 U PRBC requirement

APC-III

Vertical Shear Injuries

- Often associated with massive blood loss
- Typically present with initial cephalad displacement

Orthopaedic Math

- Pelvic volume = 2/3 pi r3
- Even a small increase in pelvic diameter exponentially increases volume
- As important posterior structures are sequentially torn, associated vessels may also be disrupted, resulting in hemorrhage

Unstable Pelvic Fracture and Fatal Exsanguination

- These patients are at risk due to:
  - the administration of IVF impairs the body's natural compensatory mechanism of decreasing blood flow to increase clotting
  - the administration of nonclotting, often cold IVF which limits clotting ability
  - movement for diagnostic and examination purposes

Blood Loss with Pelvic Fracture

- Death due to torrential hemorrhage
- Truck rollover injury

Management of Hemorrhage

- Hemorrhage following pelvic fractures can be managed by:
  - angiography and embolization
  - exploration and vascular ligation
  - ORIF
  - CREF
  - pneumatic antishock garments
- Treatment choice depends on resources of hospital and experience of personnel

Angiography and Embolization

- This technique can be used to diagnose and treat arterial hemorrhage
- It is a less than optimal treatment for the patient in extremis because the bleeding is most frequently venous
- Requires immediate availability of specialized personnel

Angiography and Embolization

ORIF

- Mechanically the most stable form of fixation and may be done concurrently with other emergent surgery
- Must not violate retroperitoneal space, which would decompress tamponade
- Hollow viscus perforation with wound contamination is relative contraindication

ORIF

- Technically most demanding
- Usually not done acutely
- Biomechanically most stable

External Fixation

- In many instances, CREF is method of choice for hemorrhage control
- Benefits include:
  - stabilization of pelvic ring
  - controls pelvic volume
  - minimizes dislodgement of clots
  - aids in controlling cancellous bone bleeding
  - facilitates early patient mobilization

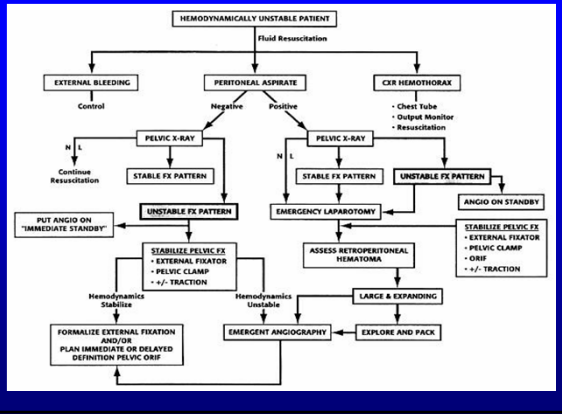
External Fixation-Technique

- Pins are inserted between cortices of ilium
- Clamps attach pins into groups
- Connecting rods are loosely attached to the clamps to form a frame
- Pelvis is reduced by posterior manual compression and longitudinal traction
- Frame is locked
- Frame construct should allow further abdominal or chest diagnostic studies without releasing the reduction

External Fixation

Pneumatic Antishock Garments

- Effective as temporary splints for the pelvis and lower extremity
- Prolonged use limits evaluation of, and access to, lower extremity trauma
- Use is contraindicated in the treatment of open fractures, and may potentiate a compartment syndrome



Acute Hospital Period--Other Orthopaedic Goals

- Reduction of major joint dislocations and fracture/dislocations should be addressed
- Orthopaedic surgeon must be aggressive in managing these injuries, particularly hip and knee dislocations
- If there is neurovascular compromise, early realignment of joint may help restore blood flow to the distal extremity, avoiding ischemia and compartment syndrome

Acute Hospital Period: Hours 3 to 12

Re-evaluation

- Secondary survey is completed
- Because the patient is often unconscious, and unable to localize injuries, great care must be taken during this evaluation
- A patient's overt, overwhelming injuries frequently mask other serious injuries that, if unrecognized and untreated, may cause future disability

Limb Salvage

- Decisions related to limb salvage must be considered during this time frame
- Extremities with massive injuries must be carefully evaluated for:
  - the degree of soft-tissue damage
  - perfusion of the limb distal to the injury
  - neurologic function in the distal limb
  - number of levels of injury within the limb

Limb Salvage

- Attempts to quantify the injury and outcome have not proven uniformly successful
- Indices such as MESS direct attention to the important factors such as ischemic time, hypotension and neurologic function that must be evaluated when evaluating the feasibility of salvage
- Physician experience may be the most reliable determinant of whether to salvage or amputate

Limb Salvage?

- Degloving foot injury in a 25 y/o fashion model
- This was appropriately treated with early amputation

Limb Salvage?

- Are you kidding me?
- …but notice normal foot which is sensate

Orthopaedic Priority #1--Open Fractures

- Requires Ancef +/- Gentamicin, and tetanus booster in ER
- Wound dressed sterilely, limb splinted
- When patient stable, to OR for I + D and skeletal stabilization
- Primary closure vs. delayed primary closure?
- Early soft tissue coverage is necessary for optimal functional outcome

Open Fractures

- Injuries like this require emergent debridement and skeletal stabilization

Benefits of Early Fracture Stabilization

- Orthopaedic injuries are frequently overlooked initially in the interest of acute resuscitation of the multiply injured patient
- Many studies have shown that aggressive early management of these injuries increases long-term survival and decreases morbidity

Benefits of Early Fracture Stabilization

- Fixation of unstable fractures of the pelvis, femur, and tibia should be done within the first 24 hours after injury if medically feasible
- The goal is stable skeletal fixation that will allow early mobilization of the patient
- Early fracture stabilization has been found to have many beneficial effects

Benefits of Early Fracture Stabilization

- Decreased musculoskeletal morbidity
  - early PT decreases rehab time and reduces long-term disability
- Decreased hospital stay
  - decreased ICU and hospital stays
  - translates into net total hospital cost
- Other benefits
  - improved nursing care
  - improved patient comfort, reducing narcotic requirement

Pulmonary Complications after Trauma

- Fat Embolism Syndrome
- Adult Respiratory Distress Syndrome
- Thromboembolic Complications

Fat Embolism Syndrome

- Following fracture, marrow fat embolizes and travels to lungs
- Cascade occurs in lungs, releasing vasoactive substances
- Clinically, FES is identified by acute hypoxemia, MS change, and interstitial infiltrate on CXR
- Incidence in isolated LBF is 0.5% to 2.0%
- In setting of multiply injured patient it approaches 10% to 15%

Fat Embolism Syndrome

- Be wary of the patient with the "isolated femur fracture"

Fat Embolism Syndrome

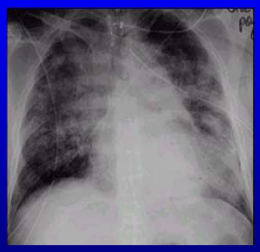
- Studies have demonstrated that early fracture stabilization results in a decreased incidence of FES
- In a prospective, randomized study of early versus delayed femoral nailings, Bone found no cases of FES in the early-stabilization group

ARDS

- A devastating complication of trauma
- Characterized by refractory hypoxemia and diffuse interstitial changes on CXR
- Known to have high mortality rates
- Growing body of evidence has shown that early fracture stabilization can substantially decrease the incidence of ARDS

ARDS

- Early ARDS
- Interstitial changes and patchy infiltrates
- Early ORIF and rapid mobilization may help prevent this



Thromboembolic Complications

- DVT and PE can adversely affect patient outcome and have been reported to occur more frequently in multiply injured patient than in patients with isolated injuries
- Early fracture stabilization facilitates early patient mobilization and may decrease the incidence of thromboembolic complications

Pulmonary Embolism

- A potentially fatal complication of DVT
- Treated by prompt diagnosis and anticoagulants
- Filters can prevent PE, not DVT

Secondary Period: Hours 13 to 72

Secondary Period

- Formulate a plan for fixation of the remaining fractures
- Must take into consideration the patient's overall status, since changes in overall status can and will impact orthopaedic treatment plan
- Plan must be communicated with other members of the treatment team

Secondary Period

- Continual patient reevaluation
- Possibility of compartment syndrome during this period exists as severely injured limbs are at risk whether or not fracture is present
- In the unconscious patient, the surgeons level of suspicion must be higher due to lack of symptoms
- Liberal utilization of pressure recording devices
- If present--fasciotomy is required

Secondary Period

- Traumatic wounds not closeable should undergo repeated excisional debridement
- Definitive treatment of
  - spinal fractures
  - pelvis & acetabulum fractures
  - upper extremity fractures
  - periarticular fractures
- Goal is stable fixation of fractures to allow patient mobilization

Secondary Period

- A comminuted tib/fib fracture with a contused soft-tissue envelope like this is best treated with provisional external fixation

Secondary Period

- Poorly timed surgery can result in this, no matter how technically well-done

Tertiary Period: Beyond 3 Days

Tertiary Period

- **Definitive wound management is undertaken**
  - **STSG for healthy granulating wounds**
  - **rotational vs. free flaps in presence of exposed bone**
- **Guiding principle is to obtain a closed envelope around bone as early as possible**
- **Consider bone grafting at time of closure for those with defects**

Tertiary Period

- **Time to close, graft or flap open wounds**
- **Often done by trauma or plastics**

Tertiary Period

- Open wounds like this need flap closure
- An intact soft tissue envelope is a prerequisite for bone healing

Tertiary Period

- **7 to 10 days post-injury is ideal time to convert provisional externally fixed limbs to ORIF**
- **Soft tissues should be better**
- **Less chance of catastrophic wound breakdown**

Rehabilitation Phase

Rehabilitation Phase

- Rehabilitation should begin early, with joint range of motion under PT/OT supervision
- Duration of rehabilitation phase is longer for polytraumatized patient than for one with isolated injuries because the cumulative effect of multiple injuries is greater than the sum of individual ones

Rehabilitation Phase

- Delayed bone reconstruction in massively injured extremity can take many forms
- In injuries at risk for nonunion, bone grafting should be undertaken early
- A healed soft-tissue envelope is desirable prior to grafting

Rehabilitation Phase

- Deformity correction and bone transport have become more common in US since adoption of Ilizarov methods
- Although application of frames may speed recovery of the patient, techniques are demanding and require a great deal of time, not only from the surgeon but also by the patient, who must participate actively

Rehabilitation Phase

- Multitrauma patients are at increased risk of infection because of the inherent physiologic changes associated with trauma
- Nonorthopaedic infections must be managed by the trauma and critical care teams
- Orthopaedic infections must be treated by the orthopaedist in addition to other specialists

Orthopaedic Infections

- Wounds must be treated aggressively, with excisional debridement of all necrotic bone and soft tissue
- Wounds which were previously closed may now require flap coverage
- Initial plans may need to be revised
- Failure to address the issue of infection may change what may have been an excellent outcome of a difficult problem to a poor outcome and a lifetime of disability

Orthopaedic Infections

- Antibiotics should be specific for organisms identified at the time of debridement
- Broad-spectrum antibiotics are appropriate upon presentation, but should be tailored once the specific organism and sensitivities have been identified

Orthopaedic Infections

- Nonunion may the only symptom of osteomyelitis
- Orthopaedic infections are easy to achieve, difficult to eradicate

Summary

- The orthopaedic surgeon should be involved in the care of the multiply injured patient from admission through rehabilitation
- Early orthopaedic intervention affords the benefits of decreased mortality, increased hemodynamic stability, decreased pulmonary complication rate, early mobilization, decreased complications of recumbency, decreased narcotic requirements, and a greater likelihood of an excellent outcome


Thank You

A New AP in a New Trauma Center

Babak Sarani, MD, FACS, FCCM
Associate Professor of Surgery
Chief, Trauma and Acute Care Surgery
George Washington University

Disclosures

- None

Objectives

- The Role of the AP in a new trauma program
- Recruiting a AP to a new trauma center
- Retaining and Mentoring the AP

House-Officer Goals

- Learn fundamental principles of trauma care
  - Junior residents: ATLS, floor-based care
  - Senior residents: Decisions regarding operative v non-operative management, ICU-based care, operative maneuvers
  - Fellows: Same as senior resident + understand administrative aspects of trauma center and system

The Role of the AP

- **CONTINUITY**
  - "Trauma Provost"
- Fill the void
  - "Weak Resident"
  - 80-hour resident and 16-hour intern
- Liaison with nurses
  - Identify problems early
  - Feedback on new initiatives

The Role of the AP in a New Trauma Center

- New trauma system started July 1, 2012
  - Dedicated trauma team
    - Attending of the week
    - PGY-3 Resident
    - 2 Interns
    - 1 NP
  - Few established protocols or guidelines
    - None enforced or monitored

The Role of the AP in a New Trauma Center

- Mentor to junior residents
  - Trauma Resuscitation/initial survey
  - Monitor guidelines – DVT, DT, C-spine clearance
- Mentor to nurses – especially floor RN
  - Explain "why"
  - Resource

The Role of the AP in a New Trauma Center

- Hierarchy/delineation of goals
  - Mentor and TPD as "Solomon"
    - Logical reasoning for decisions
    - No-favorites/mutual respect
  - Goal is to have the AP function at a chief/fellow level
    - However, upper level residents must retain authority with the attending as the final arbiter in extreme cases
  - The "turtle" wins the race

Recruiting an AP to a New Trauma Center

- The Trauma Center and the AP both win when the AP moves on and assumes a leadership position
  - Clinical Excellence
  - Teaching Excellence
  - Research Excellence

Recruiting an AP to a New Trauma Center

- Expectations
  - Level I: Teaching and scholarship
    - ATCN or other such courses
    - Publications – help with clinical research
  - All levels: Clinical Excellence
    - With NP, teach MDs "how nurses think" and teach nurses "how doctors think"
  - Even-toned/tempered
    - Critical in a new program (with old personnel)

Recruiting an AP to a New Trauma Center

- Realistic
  - Rapid accumulation of knowledge with room for errors
  - Potential for downtime/homework
- Direct report to Trauma Director
  - 24-hour access
  - TPD establishes the tone of the whole program

Recruiting an AP to a New Trauma Center

- New v Experienced AP
  - Patient acuity and volume
  - Mentoring ability and desire

Retaining the AP

- Goal: position the AP to leave for a bigger/better job in 5-7 years
- The Trauma Center and the AP both win when the AP moves on and assumes a leadership position
  - Clinical Excellence
  - Teaching Excellence
  - Research Excellence

Retaining the AP

- Clinical Excellence
  - Exposure to TB, OR, ICU, Floor
    - First assist skills
    - Suturing skills
    - Autonomy in the TB and Floor. Cooperative with ICU team
  - Med Literature knowledge base
    - On-line library of key articles
  - Give AP public credit for good decisions
    - Patients, nurses, other members of the team

Retaining the AP

- Teaching Excellence
  - Trauma courses – local/regional
  - In-service to other departments, esp nursing
  - Develop a local/regional/national reputation

Retaining the AP

- Research/Scholarship Excellence
  - Case reports initially then bigger projects
  - Screen/enroll pts for projects
  - Liaison for joint projects with other depts (NIH)
  - Build reputation via medical literature
  - Develop reputation via medical societies

Conclusion

- An AP is vital to new trauma program
- Need to ensure new program needs/expectations are in-line with recruit
- Need to mentor/grow the recruit for longevity of person and overall program