ABSITE Killer Plus

Basic Science

General

Null hypothesis = "no difference exists"; Type I Error - reject null hypothesis incorrectly; Type II Error = accept null hypothesis error; Type III Error = conclusions not supported by data

Prospective cohort study = *non-random* assignment to treatment group

Meta-analysis is review and statistical combining of data from different studies

ANOVA is a t-test for >2 samples of quantitative data (continuous variables)

Non-parametric statistics: for *qualitative* data analysis.

Qualtitative variables: a) nominal = named (e.g. color) b) ordinal = on a scale (e.g. pain rated 1-10)

Prevalence = # of patients having the disease in the population (is higher in diseases that last a long time)

Incidence = # of *newly diagnosed* cases in a population in a given time period

Sensitivity = ability to detect disease = # with disease and positive test result / # that have disease (true positive)

Specificity = ability to state no disease is present = # with no disease and negative test result /# without disease (true negative)

		DISEASE +	DISEASE -		
TEST	+	a	b	(a+b)	*test positives*
	-	c	d	(c + d)	*test negatives*
		(a+c) *true positive*	(b+d) *true negative*	a+b+c+d	

Sensitivity = a / (a+b)

Specificity = d / (b+d)

Alveolar macrophages = source of fever in atelectasis

Mitochondria = 2 membranes, TCA cycle in inner matrix

Nucleus has an outer membrane that is continuous with rough ER; ribosomes are made in the nucleolus, which has no membrane

Rough ER makes protein for export, smooth ER for cytoplasmic proteins

Plasma membrane is 60% protein, 40% lipids. Incr cholesterol = incr mobility of proteins

Malignant hyperthermia is due to Ca release from sarcoplasmic reticulum. Fever, tachy, rigid, acidosis. 1st sign is incr in end tidal CO2. Rx = dantrolene, stop operation/anesthetic, supportive care, often is not patient's 1st exposure to anesthetic agent

Diaphragm is 1st muscle to recover from paralytics (neck and face are last)

Lymphatics: no basement membrane. Loose cell to cell jxn. Not present in muscle, bone, tendon, brain.

Rate limiting step in cholesterol formation (in liver, steroid precursor): HMG coA Reductase

Steroid hormones go to nucleus after *binding in cytoplasm* of target cell

Kreb's cycle -> 38 ATP from 1 glucose (anaerobic glycolysis = 2 ATP and lactate)

Macula densa senses low Na/Cl, produces renin which converts *angiotensinogen* to angiotensin I, which is converted to angiotensin II in the *lung* by A.C.E. ATII is a vasoconstrictor and increases aldosterone which keeps Na, loses K/H in urine **(Every Year)**

Renal osteodystrophy: kidney loses Ca, keeps PO4; decr vit D 1-hydroxylation; all leads to secondary hyper PTH

[back to top]

Gut Physiology

L vagus n (anterior) gives hepatic branch, R (posterior) gives celiac brance and the 'criminal nerve of Grassi' which if undivided can keep elevated acid levels post vagotomy

Chief cells produce *pepsinogen* (converted to pepsin) which initiates proteolysis

Parietal cells produce H+ and *intrinsic factor* which binds B12, and is absorbed in terminal ileum

Acetylcholine (ACh), gastrin and histamine are main stimuli for H+ production

ACh (vagus) and gastrin activate PIP, DAG to incr Ca, activate protein kinase C which incr HCl production

Histamine acts on parietal cells via cAMP (H for Happy cAMPer) to incr HCl production

Gastrin produced by antral G cells (why antrectomy helpful); inhibited by H+ in duodenum. Stimulated by amino acids, Ach

Omeprazole blocks H/K ATPase of parietal cell **(Every Year)**

Somatostatin inhibits gastrin, insulin, secretin, ACh; decreases pancreatic and biliary output. Stimulated by acid in duodenum

Proximal vagotomy abolishes *receptive relaxation* which incr liquid emptying; no change for solids

Truncal vagotomy also incr emptying of solids when pyloroplasty done. Decreases basal acid by 80%

Most common symptom post-vagotomy is diarrhea (35%). Dumping syndrom in 10%; early due to hyperosmotic load, fluid shift; late due to increased insulin with decr glucose. Very rare (1%) that dumping is unresponsive to dietary measures **(Every Year)**

Enterokinase activates trypsinogen to trypsin which then activates other enzymes of digestion

CCK: from intestinal mucosa 1) contract gallbladder 2) relax Sphincter of Oddi 3) incr pancreatic *enzyme* secretion **(Every Year)**

Secretin: primary stimulus of pancreatic *bicarb* secretion. High flow rate = high bicarb, low Cl. Slow flow allows HCO3/Cl exchange so low HCO3, high Cl concentration

Enterglucagon: increased in small bowel mucosal hypertrophy, adaptation after small bowel resection

Peptide YY: released from terminal ileum with mixed meal, inhibits acid secretion "ileal brake"

Bile: 80% bile salts, 15% lecithin, 5% cholesterol. Stones form if incr chol or decr salts or decr lecithin. Gallbladder concentrates bile by active resorptiono of NaCl, H2O then follows. Bile pool 5g, recirculated q4h, lose 0.5g daily (10%) **(Every Year)**

Primary bile acids: cholic acid, chenodeoxycholic acid
Secondary (formed by intestinal bacteria): deoxycholic acid and lithocholic acid

MMC: *interdigestive* motility; 90 minute cycles, starts in stomach, goes to TI;
Phase I quiescence
Phase II gallbladder contraction
Phase III peristalsis
Phase IV subsiding electric activity
Motilin is key stimulatory hormone (erythromycin is prokinetic by stimulating motilin receptor)

Jejunum absorbs most Na and H2O (paracellular), more permeable than ileum

[back to top]

Hemostasis

Intrinsic path (PTT): exposed collagen + XII -> XI, IX -> X which activates thrombin to produce fibrin
Extrinsic path (PT): tissue factor + VII -> activated X -> fibrin
X is common to both pathways
XIII crosslinks fibrin to form 'plug'. PT is best single test to evaluate synthetic function of the liver.

Banked blood is low in 2,3-DPG which increases Hgb affinity for O2 (left shift)
Cryo contains fibrinogen and vWF-VIII; used in vWD, hemophilia A, and DIC if fibrinogen low
Vit K inhibits II, VII, IX, X, protein C and protein S

Protein C degrades active V and VIII. Protein S helps protein C
V and VIII are labile factors, low levels stored in blood
Factor VIII only factor not made in liver (made by reticuloendothelial system)

Von Willebrand's Disease: long PTT, *long bleeding time*, +ristocetin test. Type I and III have low amounts of vWF, respond to ddAVP; type II is qualitatively poor vWF
Autosomal dominant (only one beside Rosenthal's XI deficiency). Only inherited coagulopathy with long bleeding time.
Rx with VIII, vWF or cryoprecipitate

ddAVP causes release of vWF, useful also in pts on ASA or w/uremic plt

Glanzman's thrombasthenia: plts have IIb/IIIa receptor deficiency. Decr plt aggregation

Bernard Soulier: Ib deficiency, decr adherence to exposed collagen

VII deficiency causes long PT, normal PTT

Hemophilia A = VIII deficiency, sex-linked recessive, replace to 100% levels pre-op
Have long PTT, normal PT. Newborn has VIII from mom, may not bleed at circumcision

Hemophilia B = IX deficiency = Christmas disease, also sex-linked. achieve 50% levels pre-op

Hemophiliac joint = do not aspirate; ice, ROM therapy, give factor VIII

Lupus anticoagulant: antiphospholipid antibodies, not necessarily with Luppus and generally *pro-coagulant*;
Dx: long *Russel viper venom time*, long PTT which does not correct by adding normal plasma

Factor XII = Hagemann factor; activated by cardiopulmonary bypass -> need for heparin

Factor V Leyden = resistance to activated protein C = common cause of DVT

Plasmin degrades fibrinogen, is inhibited by alpha-2-plasmin inhibitor

Heparin binds/activates ATIII and inactivates factors 9-12; prolongs PTT; counteract with protamine

epsilon-ACA (epsilon amino caproic acid) inhibits fibrinolysis, is the Rx for overdose of thrombolytics; thrombin is best test to monitor thrombolysis

DIC: low platelets, prolonged PT/PTT, low fibrinogen, high fibrin split products

HIT: 'white clot syndrom', thrombocytopenia due to anti-platelet antibody causing plt aggregation. Use dextran to anticoagulate. Generally see after 5 days of heparin, less frequent with LMWH

Prostacyclin = PGI2: from endothelium, decr plt aggregation, vasodilatation, bronchial relaxation

Thromboxane: from platelets, opposite effects of above

Best preop test fro pt on NSAIDS/ASA is bleeding time

[back to top]

Immunology/Infection

IL4 stims B cell to become plasma cell (antibody secreting)
IgG, IgM are opsonins, are able to fix compelment (2 IgGs or IgM needed)
IgM made first, decreased levels after splenectomy
IgA in secretions
IgD a helper, largely unknown
IgG #1 in serum, crosses placenta
IgE allergic reactions, type I hypersensitivity reactions, histamine release (mast cell, basophil), parasites

Variable region of antibody is responsible for antigen recognition

Complement cascade: C3a, C5a are *anaphylatoxins*; C5-9 = membrane attack complex
Classic path initiated w/antibodies; alternate path by bacteria
Classic and alternate paths converge on C3

MHC I: CD8 activation; on all nucleated cells, single chain
MHC II: CD4 activation; on B cells, dendrites, monocytes, 2 chains

Natural Killer cells: neither T nor B cell. No antigen presentation needed. Recognise cells w/o self-MHC.
Natural Killer is responsible for immunosurveillance against CA
IL-2 converts Natural Killer cell to Lymphokine Activated Killer

Intradermal skin test - best test to evaluate cell-mediated immunity

Basophils - source of histamine in blood

Mast cells - source of histamine in tissue

Endotoxin is lipopolysaccharide A from gram negative bacteria

Hyperglycemia comes 24 hours before overt sepsis
Late sepsis noted by decr O2 extraction so incr in SVO2 and decr A-V O2 difference
SVO2 normal 66-77%, so > 77% = sepsis or cyanide poisoning, <66% = decr CO or decr SA O2

4 intraabdominal abscess locations: sub-diaphragmatic, sub-hepatic, inter-loop, and pelvic

C diff colitis: Rx is *oral* vancomycin or flagyl

ß-Strep and clostridial infections can present w/in hours postop **(Every Year)**

Staph aureus is coagulase negative; may produce clear 'slime' with chronic infection (vascular)

Aminoglycosides: bacteri*cidal*, irreversible binding to ribosome, resistance due to decr active transport
Clindamycin, tetracycline, erythromycin: bacterio*static*, reversible binding to ribosome

Vancomycin: binds plasma membrane; resistance is due to altered cell wall

MRSA resistance due to change in bacteria binding protein, not due to a ß-lactamase

Sulbactam and clavulanate inhibit ß-lactamase
Amphotericin: binds sterols to alter fungal cell wall. 80% get renal impairment; see anemia, fever
Quinolones (cipro): mechanism is DNA gyrase inhibition. PO and IV routes equivalent

[back to top]

Medicines

Ketamine: incr cardiac work, O2 use, secretions, BP. No respiratory depressions. Hallucinations.

Methoxyfluorane has renal toxicity.

Halothane is hepatotoxic

Succinylcholine is the only depolarizing agent used; generalized contractions, hyperkalemia in burn patients, fast on/off; risk of aspiration, glaucoma

Clindamycin prolongs neuromuscular blockade

Demerol should be avoided in patients on MAOIs

Octreotide: long-acting somatostatin analog

Reglan = metoclopramide: DA blocker, incr LES tone, incr gastric motility

Omeprazole: mech is blocking Na/H ATPase; assoc w/enterochromaffin hyperplasia in rats. No e/o carcinogenesis in humans

Digoxin: glycoside, inhibits Na-K ATPase to incr Ca in heart. Slows AV conduction. Inotrope but does not incr O2 consumption. Associated with ischemic gut, decr splanchnic flow. Avoid hypokalemia

Amrinone: phosphodiesterase inhibitor, inotrope, incr CO, decr SVR

Metyrapone and Aminoglutethimide: 'medical adrenalectomy'

Leuprolide: 'medical orchiectomy'

Vasopressin: reduces splanchnic blood blow, portal flow ~40%. Useful in GIB, give with ß-blocker to avoid angina.

Sodium nitroprusside relaxes arteries and veins; has cyanide toxicity

Nitroglycerin primarily relaxes veins

Aspirin irreversibly binds *cyclooxygenase*, effective for life of platelets (~7 days)

Indomethacin blocks PG production, used to close PDA (effective in ~70%), decr renal blood flow

Misoprostil replaces PGE2 (cytoprotective) for pt on NSAIDS, to reduce PUD

[back to top]

Fluids, Electrolytes, Nutrition

FeNa < 1, Urine Na < 20, BUN/CR > 30, all indicative of low volume, 'pre-renal'

Saliva has highest K conc (20 meq), then gastric (10 meq), pancreatic/duodenal (5 meq)

Branched chain amino acids are metabolized in *muscle* (leucine, isoleucine, valine); all essential

Vit D is made in skin, to liver for (25-OH) then to kidney (1-OH) then active
Vit D incr calcium binding protein to incr intestinal absorption of Ca

Vit A systemic or topical reverses adverse effects of steroids on wound healing

TBW: infant highest (80%), then men (60%), then women (50%). 10% *less* if obese (less H2O in fat)
Water distribution: if TBW is 60%, then 40% is cellular, 15% is intestinal, and 5% in plasma

Carbs have 3.4 kcal/g **(Every Year)**
Protein has 4 kcal/g **(Every Year)**
Fat has 9 kcal/g **(Every Year)**

Basal calorie expenditure = 25 kcal/kg/day (~1g protein/kg/day needed)

Respiratory quotient = ratio of CO2 produced to O2 consumed, 0.7 = fat used, 1.0 = carb used

6.25 g of protein contains 1 g of Nitrogen. N balance = N in - N out = (Protein/6.25) - (24 hr urine N + 4 g)

Short chain fatty acids: preferred fuel of the colon

Glutamine: preferred fuel of the small bowel. #1 amino acid in bloodstream, see decr levels with stress as glutamine goes to kidney to form ammonium to help acidosis. Shown to decr translocation, incr mucosal health with chemo or RT to bowel

Fat digestion: micelles to enterocytes to chylomicrons to *lymphatics* (to jxn LIJ/SCV) **(Every Year)**

Only Medium and Short Chain Triglycerides go to portal system with aa's and carbs.

Deficiencies:

Chromium deficiency: hyperglycemia (relative diabetes), neuropathy
Zinc: perioral rash, hair loss, poor healing, change in taste
Phosphate: weakness (respiratory), encephalopathy (needed for ATP)
Copper: anemia, neutropenia
Linoleic acid (essential fatty acids) = dermatitis, hair loss, change in vision
Vit A: can decr vit C stores

Cori cycle: glucose to lactate, to the liver, to glucose

Starvation: brain begins using ketones from fatty acids (normally brain and RBCs are dependent on glutamine)

Late starvation: gluconeogenesis shifts to kidney as liver is depleted of alanine

IVF: normal saline is 154 meq Na and Cl; LR is Na 130, K 4, Ca 2.7, Cl 109, bicarb 28

Alkalosis causes hypokalemia by driving K into cells and into urine (exchange for H+)
Hyperkalemia (peaKed t wave, wide QRS): give Ca to protect hear, Bicarb/insulin/glucose, kayexalate, dialysis if severe: 'C Big K die'

Na deficit = .6(wt in kg)(140-Na); replace no more than 1 meq/hr to avoid CPM

Hyperglycemia lowers Na; for every 100 glucose over 100, add 2 to Na

Hypocalcemia and hypomagnesemia both have hyperexcitability, incr reflexes (Chvostek's), tetany

Anion gap acidosis (MUDPiLES) = methanol, *uremia*, *DKA*, paraldehyde, *lactic acidosis*, ethylene glycol, salicylates. Anion gap = Na - (HCO3 + Cl) Normal < 12.

Low Mg inhibits PTH so replace Mg if difficulty correcting a patient's Ca.

[back to top]

Oncology

G1: most variable period of cell cycle. Growth factors act here.

Radiation therapy: M phase most sensitive; most effective w/high O2 levels, higher energy = less skin damage; path: *obliterative enarteritis*; decr healing due to impaired fibroblasts

Extremity Sarcoma biopsy: excisional if < 4cm, otherwise *longitudinal* incision, incisional bioposy (less lymphatic disruption, easier to excise scar if biopsy positive). **(Every Year)**
Postop RT if high grade sarcoma, close margins or tumor > 5 cm

Li Fraumeni syndrome: p53 mutation. Sarcomas, breast CA, brain tumors, leukemia

Sarcomas generally spread *hematogenously*, not to lymphatics. Staging based on *grade*, not size/nodes

Colon CA associated w/loss of APC gene, p53, DCC (deleted in colon CA), k-ras activation

Breast CA associated w/p53, bcl-2, c-myc, c-myb, her 2 neu

c-myc associated w/small cell lung CA, neuroblastoma, Burkitt's lymphoma

Bcl-2 gene regulates *Apoptosis*; p53 and c-myc also associated with apoptosis

sis oncogene is homologous to PDGF

erb B codes for epidermal growth factor receptor. Assocaited with decr survival in breast CA

K ras proto oncogene encodes for GTP protein; 90% of pancreatic CA, 50%of colon CA, also in lung CA

Ret proto-oncogene *diagnostic* for Medullary Thyroid Cancer. Patient with family history of MEN who has Ret proto-oncogene should have total thyroidectomy

Tamoxifen (binds Estrogen Receptor) shown to decr breast CA in high risk; risk DVT endometrial CA

Bleomycin and Busulfan both have *pulmonary fibrosis* as complication

Vincristine, cisplatin both cause neurotoxicity

Levamisole mechanism: immunostimulant; is an antihelminthic agent

Wound Healing, Cytokines

Myofibroblasts (smooth muscle/fibroblast) provide wound contraction. Contract from center of wound. Responsible for healing *by secondary intention*.

Collagen Type I: most abundant throughout. Principal collagen in scar (late); III: in healing wound. Low in Ehler-Danlos; IV: in basement membranes; XI (and II): in cartilage

Collagen is glycine x3. alpha-ketoglutarate, vit C, O2, and iron needed for prolyl hydroxylase, crosslinking

Collagen production begins day 3, max at day 21 then constant *amount* but more crosslinking, strength

Type III becomes type I with maturation ~ week 3

Tensile strength *never* equal to pre-wound

Opening a 5 day or older wound results in quicker healing the 2nd time (cells, products already in place)

Giving *Vitamin A* reduces deleterious effects of steroids on wound healing

Cells to wound (in order): platelets, PMN's, macrophages, fibroblasts (dominant by day 5). Macrophages essential

TGF-ß stimulates fibroblasts; too much/too long -> fibrosis (e.g. cirrhosis, pulmonary fibrosis); also chemotactic for neutrophils. Speeds healing

PDGF attracts fibroblasts and incr smooth muscle (active agent in Regranex) to speed matrix deposition and collagen formation

GmCSF is used in chemotherapy patients to incr neutrophil and macrophage activity

TxA2 from platelets; plt aggregation, vasoconstriction

PGI2 (prostacyclin): plt inhibition, vasodilation and bronchodilation

Initial cytokine response to injury/infection dependent on TNF/IL1 (synergistic), CXC, IL6

TNF: main source is Macrophage/Monocyte. *Endotoxin (LPS a)* is most potent sstimulus for production
Overall has pro-coagulant effect
Responsible for wasting, cachexia in cancer patients, by lipolysis, glycolysis, anorexia
Recruits, activates neutrophils -> more cytokines, free radicals. Exaggerated response -> MOSF

IL-1 also from macs/monos; potentiates TNF; responsible for *fever*; Acts to incr IL-6 (acute phase response), incr endothelium adherence via selectins, ICAM, VCAM

Acute phase response: incr fever, catabolism
Incr C-reactive protein (CRP, an opsonin), amyloid, fibrinogen, haptoglobin, cerulopasmin, and alpha-1 antitrypsin; Decr levels of albumin, transferrin, and fibronectin

CXC chemokines: chemotactic, important in angiogenesis, wound helaing. C stands for Cysteine

[back to top]

Clinical Subjects

Breast

Intercostobrachial nerve (off 2nd intercostal n) sensation to medial arm; can sacrifice
Long thoracic n to serratus anterior, injury = winged scapula
Thoracodorsal n to latissimus dorsi, injury = weak arm adduction/pull ups
Medial pectoral n to pec major and minor; Lateral pec n to pec minor only

Batson's Plexus: valveless verterbral veins, allow direct mets to spine
Poland syndrome: amastia, hypoplastic shoulder, no pectoralis
Mastodynia: Rx with danazol, OCP, evening primrose oil, tamoxifen (?); vit E not useful
Mondor's disease: thrombophlebitis of superficial vein of breast. Cord like mass laterally; Rx: NSAIDS

T1 < 2cm; T2 2-5cm; T3 > 5cm; T4 skin or chest wall involvement, 'grave signs' = peau d'orange, inflammation

N1 + ax nodes; N2 matted or fixed nodes; N3 internal mammary nodes

Stage I T1; II up to T2N1 or T3N0; III T4 or N2; IV Mets (includes supraclav node, unlike lung CA)

Breast mets: to bone, lung, brain

Her 2 neu: a marker for breast CA, implies worse prognosis. *Herceptin* now available for Rx.

Erb B 2, p53, cathepsin all indicate worse prognosis

1cm tumor is ~5 yrs old

Tamoxifen reduces risk 50% in high risk but incr endometrial CA, DVT

Atypical hyperplasia raises risk x 4 (only finding in fibrocystic that incr risk)

ER+PR+ is better than ER-PR+ which is better than ER+PR- which is better than ER-PR-

DCIS 50% develop invasive carcinoma, is a *precursor*. Usually lumpectomy + RT, but mastetomy for high grade/large tumor/poor margins. 50% of DCIS recurrence is invasive

LCIS 30-40% develop invasive carcinoma (either breast), is a *marker of risk*, TReatment options: nothing, tamoxifen, or bilateral mastectomy

Comedo Breast CA: likely multicentric, do mastectomy. Poor Px

Paget's disease of the breast: eczematous lesions on nipple, there is underlying DCIS or Ductal CA

Cystosarcoma Phyllodes or 'Phyllodes tumor' since only 10% malignant; Large; Rare nodal mets; As with other sarcomas, spread is *hematogenous*, not lumphatic. Rx is wide local excision, rarely mastectomy, *no* axillary node dissection **(Every Year)**

BRCA 85% have CA by age 70.
BRCA1 a/w ovarian CA (50%)
BRCA2 a/w male breast CA

Indications for RT after mastectomy: > 4 nodes, skin or chest wall involvement, +margins

Stewart Treves: lympangiosarcoma in lympedematous limb, presents with purplish mass on arm ~ 1o yrs s/p MRM

Intraductal Papilloma: no risk of CA. #1 cause of bloody nipple discharge (although 1/2 are serous)

[back to top]

Cardiothoracic

Diaphragm: T8 Vena Cava, T10 Esophagus (and vagi), T12 Thoracic duct and aorta

Type I alveoli: functional gas exhange; Type II: produce *surfactant* (decr surgace tension), 1% of avleoli

Pre-thoracotomy PFTs: need FEV1 > 2L / 1L / 0.6L for pneumonectomy/lobectomy/wedge resection
Need predicted postop FEV1 > 0.8

Adenocarcinoma now #1 lung CA; squamous a/w PTH-like substance; Small cell w/ACTH, ADH

T1: < 3cm, T2 > 3cm, T3 invasion of chest wall, periardium, diaphragm, < 2 cm from carina; T4 = unresectatble = into mediastinum, heart, great vessel, esophagus, trachea, vertebrae, effusion

N1: ipsi hilar nodes; N2: ipsi mediastinal; N3 = unresectable = contralateral or scalene or subclavian nodes

Stage 1: T1-2N0; II: T2N1; IIIa up to T3 or N2; IIIb unresectable T4 or N3; IV: M1

Pancoast tumor involves sympathetic chain (Horner's syndrome) and/or *ulnar* nerve

Left lung can drain to right mediastinum (left to right, like reading)

Thymoma: indication for resection
Resecting thymus (even if no thymoma) in myasthenia gravis improves 90% (10% of m.g. have thymomas)

Popcorn lesion on CXR is classically a *hamartoma*

Thoracic oulet syndrome rarely involves artery or vein (1-3%), generally *ulnar* n paresthesias

Spontaneous PTX 10:1 male predilection; 50% recur then 75% of those again. Thoracoscopy for 2nd or cont air leak

Post MI VSD presents day 2-7; 2% of MI's; pan-systolic murmur

SVC syndrome: 90% due to lung CA; Rx with XRT

Takayasu arteritis: young femaile, involves thoracic and abd aorta and PA. Dx by angio

Tissue valves (shorter lasting, but no anti coag needed) use in patient who may become pregnant, has contraindication to coumadin; also used for all *tricuspid* replacements
Rheumatic fever leads to *mitral stenosis*; see regurg with MI or valve degeneration

Chylothorax (non-iatrogenic) usually due to posterior mediastinal tumor (75% lymphoma). XRT may help.
Thoracic duct injury: Rx with drainage/NPO x 2 wks; if not reesolved then R thoracotomy, ligate duct
Thoracic duct enters chest on R with Aorta at T12, crosses to left at T4, joins IJ/Subclavian junction

Thoracic aorta aneuryms, operate for > 6 cm, symptomatic

Aortic Dissection: type A -> involves ascending aorta, must operate; type B does not involve ascending aorta. Medical management.

CAD: leading killer in U.S. (2x Cancer)

CABG indications: intractable symptoms, > 50% left main, triple vessel dis, or 70% LAD + 1 other vessel

Angioplasty: 20% restenosis by 1 yr; vein graft 5 yr patency 80%; IMA graft 95% patency at 20 yrs

VSD: #1 cardiac congenital defect, 50% close on their own, OR if symptomatic or failure to thrive

PDA: close all those that *indomethacin* does not at 6 mths of age

IABP: aguments diastolic coronary blood flow and reduces afterload by inflating during *diastole*. Inflates 40 msec before T wave, deflates with p wave. **(Every Year)**

[back to top]

ColoRectal

Colon actively secretes K and HCO3

Superior rectal artery off IMA; Middle off internal iliac; Inferior off internal pudendal (off int iliac)
External sphincter innervated by inferior rectal branch of internal pudendal n andperineal branch S4

Squamous cell CA of anal canal: Rx with *Nigro protocol* (chemo and XRT), not surgery. **(Every Year)**
APR for recurrent disease

Transformation of polyp to CA takes ~ 8 yrs
T1 (limited to submucosa) rectal adenoCA can be excised transanally; T2: 20% are node +, rec APR; do not do transanal if poor differentiation, neuro/vasc invasion.
Stage III colon CA (node +) gets chemo, no XRT
Stage II, III rectal CA gets chemo and XRT
1/2 of colon CA has ras mutation, p53 absent in 85%, DCC (deleted in colon CA) in 70%

Familial adenomatous polyposis: automsomal dominant, CA by age 40, APC gene
Need total colectomy prophylactically
Have UGI polyps as well, need to survey duodenum for CA
Also develop desmoids - benign, but very difficult to manage
Sulindac makes polyps recede

Hereditary Non-polyposis Colon CA: Lynch I R sided, multiple CA's, young; Lynch II a/w CA of ovary, bladder, stomach
Both a/w *DNA mismatch repair gene* mutations
Amsterdam criteria: 3 1st degree relatives, over 2 generations **(Every Year)**

Gardner's syndrome: colon CA and desmoid tumors
Turcot's syndrome: colon CA and brain tumors
Peutz Jeghers: polyposis (not colon CA) and mucocutaneous pigmentation

Sigmoid volvulus: decompress with scope, prep bowel, do sigmoid colectomy that admission
Cecal volvulus: likely will not decompress, take to OR, most recommend R hemicolectomy with ileo-transverse anastomosis, cecopexy is alternative

Carcinoid of appendix: &Mac179; 2 cm or involving base = do R hemicolectomy, otherwise appendectomy only

If operating for appy and find normal appy and Crohn's disease: take appendix (unless cecum involved in inflammation). Does not incr fistula rate. **(Every Year)**

Perianal abscess in Crohn's: incision and drainage as with any abscess

In Ulcerative Colitis, proctocolectomy does *not* help sclerosing cholangitis, may help skin, anermia; rarely helps arthritis
HLA B27 a/w sacroiliitis

Pouchitis: Rx with flagyl or short chain fatty acid enemas

Pyoderma gangrenosum: Rx with Dapson and/or steroids (topical or systemic)

Fissue in Ano: 10% anterior in women, nearly all others *posterio midline*
Rx with Sitz baths, regular loose BM (water/fiber); persists then lateral internal sphincterotomy
Some try nitroglycerine creams (incr O2 for ischemia) or botox (relax sphincter)
Fissure not in midline - think IBD, TB, syphillis

Bowen's disease - intraepidermal squamous cell carcinoma, only 5% invasive -> wide local excision

Perianal Paget's - rare intraepidermal neoplasm of apocrine glands, long pre-invasive phase. +PAS stain

1/4 of patients with colonic AVM have aortic stenosis (1/2 have CAD)

Campylobacter infectious colitis: may see *aphthous ulcers* on colonoscopy

[back to top]

Esophagus

No serosa; mucosa is strongest layer (in small bowel, submucosa is strongest)

Central input initiates swallow which elicits primary peristalsis, distention then elicits secondary peristalsis. Sphincters are contracted at rest. Normal LES tone = 15-25 mmHg (length 4cm)

Swallowing order of events: soft palate closes nasopharynx, larynx up, larynx closes, UES relaxes, pharyngeal contraction

Zencker's diverticulum: occurs in Killian's triangle, due to incr pressure (pulsion tic), need *myotomy* and diverticulectomy/pexy. Approach via left cervical incision

Paraesophageal hernia: always operate since risk of incarceration, strangulation **(Every Year)**

Diffuse esophageal spasm: *medical* treatment (Ca channel blockers)

Esophageal rupture (Boerhaave's) key to survival is early Dx (85% dead if > 36 hours)

Achalasia: decr ganglion cells in Auerbach's plexus, absence of peristalsis and esophageal dilation. Bird's beak on Ba swallow; manometry shows no peristalsis, high LES pressures/failure to relax. Rx: laparoscopic or thoracoscopic Heller myotomy

Barrett's esophagus: metaplasia from squamous to *columnar* cells. 1-2% get adenocarcinoma (30-100 x risk) P53 associated (tumor suppresor gene)

Achalasia and chemical ingestion also incr risk of esophageal CA

AdenoCA now #1 esophageal cancer over squamous (also true for lung CA)

R gastroepiploic artery is main supply to stomach when used to replace esophagus

Leiomyoma: if symptomatic or > 5cm excise by *enucleation* via thoracotomy (R if middle, L if lower esophagus). *Do not biopsy* on EGD.

[back to top]

Head and Neck

Anterior to posterior: subclavian vein, phrenic nerve, anterior scalene, subclavian artery

Parotitis: staph. Seen in elderly, dehydrated, Rx abx; drainage if abscess/not improving

Painless mass on roof of mouth: Torus (bony exostosis, midline of palate)

Erythroplakia is worse (pre-malignant) than leukoplakia. Retinoids can reverse leukoplakia and reduce chance of 2nd head and neck malignancy

Head and Neck SCCa: Stage I, II (up to 4cm, no nodes) Rx with single modality (surgery or RT); III, IV get combined modality

Nasopharyngeal SCCa present late (50% as neck mass), drain to posterior neck nodes, a/w EBV

Glottic CA: if cords not fixed, then RT; if fixed, need surgery and RT

Lip CA (99% epidermoid carcinoma): lower > upper due to sun exposure; resect, primary closure if < 1/2 of lip, otherwise flaps. Radical neck dissection if node +

Tongue CA: usually need surgery and XRT. Incr in plummer vinson (dysphagia, spoon fingers, anemia)

Larger salivary glands (parotid) = more likely for tumor to be benign

Mucoepidermoid Carcinoma: #1 malignant salivary tumor overall

Adenoid Cystic Carcinmoa: #1 malignant salivery tymor of the submandibular/mino glands

Pleomorphic adenoma = mixed parotid tumor = #1 benign tumor, do not enucleate, needs superficial parotidectomy (spare CN7); if malignant, take whole parotid w/CN7; If high grade (anaplastic), need radical neck dissection

Warthin's tumor (adenolymphoma) #2 benign salivary tumor. 10% bilateral. 70% of bilateral parotid tumors are Warthin's tumor. Rx: superfiical parotidectomy.

Radical neck dissection takes CNXII, SCM, IJ, submandibular gland. Most morbid = CN XII

Juvenile Nasopharyngeal Angifirboma: benign, in teen males, present w/obstruction, epistaxis. Rx embolize (internal maxillary a), then extirpate

Frey's syndrome: injury of *auriculotemporal nerve*; gustatory sweating (crossed sweat/salivary fibers)

Massive bleeding from trach is from *innominate artery (tracheo-innominate fistula)* Present w/small heraldic bleed. Avoid by making tracheostomy no lower than 3rd tracheal ring.

[back to top]

Hepatobiliary

R hepatic artery off of SMA in 17% **(Every Year)**
L hepatic artery off of L gastric artery in 10%

Kupffer cells: clear portal blood immunosurveillance

Portal triad: portal vein posterior to CBD (on R) and hepatic artery (on L)

Hepatorenal syndrome: see low urinary Na

Cholangitis: jaundice, RUQ tenderness, fever, hypotension, change in mental status
Needs immediate IV abx, fluid resuscitation and emergent drainage of CBD **(Every Year)**

Retained CBD stone identified on T-tube cholangiogram 6 wks postop best managed by radiology stone retrieval

Benign biliary stricture: #1 cause is iatrogenic (lap chole)

Gallbladder adenocarcinoma: 90% have stones. Cholecystectomy adquate if confined to mucosa. If grossly visible tumor, do regional lymphadenectomy, wedge segment V, skeletonize portal triad.

Porcelain gallbladder = 30-65% risk of cancer. Cholecystectomy indicated.

Hematobilia triad = GI bleed, jaundice, RUQ pain. workup (and rx) with arteriogram

Gallbladder concentrates bile by active absorption of Na, Cl (H2O then follows)

Hepatic adenoma: 10% rupture/bleed; have malignant potential; 'cold' on liver scan. Hepatic adenoma *is an indication for resection*. **(Every Year)**

Hepatic hemangioma: do nothing unless giant or symptomatic/consumptive. Kasaback Merritt syndrome: consuptive coagulopathy or CHF due to hemangioma.

Amebic abscess (anchovy paste) Rx metronidazole, not surgical

Hydatid = Echinococcal cyst: +Casoni skin test, +indirect hemagglutination; resect (pericystectomy)

Hepatocellular CA is #1 CA worldwide. May have high alpha-FP.
Chronic Hep B and C is #1 cause; also assoc w/any cirrhosis (EtOH, hemochromatosis, primary biliary cirrhosis, alpha-1 antitrypsin deficiency), clonorchis sinensis (flukes), aflatoxin, Fibrolamellar variant has better Px.

[back to top]

Neurosurgery

Peripheral nerve injuries:
Neuropraxis = focal demyelination, improves
Axonotmesis = loss of *axon* continuity (nerve and sheath intact). Regenration 1 mm/day.
Neurotmesis = loss of *nerve* continuity, surgery required for nerve recovery

ADH produced when high *osmolarity* is sensed at *supraoptic nucleus* of hypothalamus
Causes incr free H2O absorption at the distal tubules and collecting ducts
Alcohol and head injury inhibit ADH release = Diabetes Insipidus
DI = high urine output, low urine SG, high serum osmolarity/Na
May also see SIADH with CHI = oliguric, high urine osmolarity, low serum osmo/Na **(Every Year)**

AVM's: congenital, bleed age 40-60; aneurysms younger (age 20-59), are a/w HTN

Most adult brain tumors are malignant, spinal cord tumors are 60% benign (extradural likely malignant/met)

Acoustic neuroma: CN8 at the cerebello-pontine angle (cps)

13% of patients with head injury have a spinal injury

Subdural hematoma: crescent shape, conforms to brain; 50% mortality

Epidural hematoma: lens shape, goes into brain, 10% mortality, *middle meningeal artery*, 'lucid interval'

Cerebral perfusion pressure = CPP = MAP - ICP, want to keep ~70 **(Every Year)**

Cushing's triad with incr ICP: HTN, bradycardia, Kussmaul respirations (slow, irregular)

GCS Motor: 6 commands, 5 localizes, 4 withdraw pain, 3 flexion pain (decorticate), 2 extension pain, 1 none
GCS Verbal: 5 oriented, 4 confused, 3 inappropriate, 2 incomprehensible, 1 none
GCS Eyes: 4 spontaneous, 3 to command, 2 to pain, 1 none **(Every Year)**

GCS 8 or less: ICP monitor indicated; 10 or less intubation indicated; GCS 5 ~ 50% mortality

Cord injury above T5 can cause spinal shock; Rx with fluids, may need alpha-agonist. Recognize by hypotension with *bradycardia, warm perfused extremities* (vasodilated).

Anterior spinal artery syndrome: lose bilateral motor, pain and temp; keep position sense, light touch

Brown Sequard: spinal cord transected 1/2 way; lost ipsilateral motor, contralateral pain and temp

Central Cord Syndrome: bilateral loss of upper extremity motor, pain, temp; legs relatively spared. usually due to hyperextended c-spine injury

Skull fx: to OR if open fx or if depressed (to ~ thickness of skull or more)

[back to top]

Orthopedics

Osteo*b*lasts *b*uild bone, osteoclasts destroy it

L3L4 disc = L4 root compression (L4 think 4 quadriceps, weak knee jerk)
L4L5 disc = L5 root compression (lift 5 toes, dorsiflexion; mae see big toe hyperesthesia)
L5S1 disc = S1 root compression (*S*tand on tiptoes, plantar flexion, weak ankle jerk, change in sensation to lateral foot/calf)

Biceps reflex C5/6; triceps is C7; anal wink = S2-S4

Ulnar n. intrinsic musculature of hand, finger abduction (for 'U' shape); wrist flexion; sensation to pinkie, ring fingers, back of hand

Median n. thumb apposition, sensation to most of palm, 1st 2 1/2 fingers (carpal tunnel)

Radial n. no motor in hand; wrist extension, finger extension; sensation to back of lateral hand

Femur fx: early ORIF allows early mobilization, decr fat embolization, decr complications.
Pediatric femur fx: closed reduction, not ORIF (avoid interference with epiphyseal growth plate)

Salter-Harris fx III, IV, V are intra-articular and generally need open procedure

Hip dislocation: 90% posterior which present w/internal rotation, flexed, adducted thigh
Risk of *sciatic n.* injury, AVN of femoral head
Anterior hip dislocation: frog leg (external rotation, abduction)

Femoral neck fx: shorted limb, ext rotation, risk of non-union, AVN

Terrible Triad of O'Donaghue: lateral blow to knee -> injury to ACL, MCL, medial meniscus

Posterior knee dislocation: popliteal injury common, texts say arteriogram all

Calcaneous fx: prone to compartment syndrome (as are tibia fx, supracondylar humerus fx)

Shoulder dislocation: 90% anterior (risk *axillary nerve injury*); posterior seen with seizures, electrocution

Humerus fx: may see radial nerve injury (weak wrist extension, sensation lateral-dorsal hand). Improves

Volkmann's contracture: supracondylar humerus fx -> compromised *anterior interosseous artery*. Deep forearm flexor compartment syndrome, need fasciotomy. Pain in forearm w/extension. *Median nerve*.

Dupuytren's contracture of palmar fascia: Rx with steroids, physical therapy; may need fasciotomy

Navicular fx: tender snuffbox; even with negative XR, requires cast up to elbow

Monteggia fx: proximal ulnar fx w/radial head dislocation. ORIF.

Bone mets: can fixate, XRT for pain relief. Only 65% symptomatic

Ewing's sarcoma: 'onion layering', pseudorosettes on path. Rx is XRT; Avg survival = 2 yrs

Osteogenic sarcoma: *sunburst* pattern on XRay

[back to top]

Pancreas

Santorini is Small duct, Wirsung is major duct. Pancreas divisum = failure of fusion (5% of population, prone to pancreatitis), Santorini is then major duct

Annular pancreas: double bubble on XRay. Rx obstruction w/duodenojejunostomy. Do not resect pancreas.

Pancreatic CA: overall 90% dead in one year

CA 19-9 (serum marker) is generally high in pancreatic CA. 90% have mutated K-Ras.

Celiac plexus block is effective pain relief for non-resectable CA (50% EtOH on both sides of aorta near celiac)

Pancreatic pseudocysts: expectant management if asymptomatic and not enlarging up until ~12 wks after episode of acute pancreatitis. 85% of pseudocysts resolve on their own.
Internal drainage by cyst-gastrostomy, -duodenostomy, or -jejunostomy: complications of untreated pseudocyst: bleed, infection, rupture, obstruction of CBD or duodenum. Recurrence 10%: much higher with *external drainage.*

Insulinoma: #1 islet cell tumor overall. Insulin to glucose ratio > 0.4. Incr C peptide (as with parathyroid hormone, C terminal of hormone is inactive).
90% benign
Rx = enucleation

Gastrinoma: #1 islet cell tumor in MEN (MEN I). 60% malignant, 50% are multiple.
90% are in gastrinoma triangle: 1. cystic/CBD junction 2. pancreas neck 3. 3rd part of duodenum
Gastrin level > 1000, do secretin stimluation test (normal pts will decr gastrin)
Severe ulcer disease, diarrhea (due to lipase destruction by acid, malabsorption, and incr secretion)
NGT and H2 blockers help diarrhea

Somatostatinoma: gallstones, steatorrhea, pancreatitis, diabetes

Glucogonoma: diabetes, glossitis, stomatitis, *migratory necrolytic erythema,* streptozocin and octreotide help

VIP-oma: WDHA syndrome = Watery Diarrhea Hypokalemia Achlohydria.
Diarrhea does not improve with NGT or H2 blockers

[back to top]

Pediatrics

Choledochal cysts: must excise. Leaving cyst = 25% cancer, 30% pancreatitis **(Every Year)**
Type I: (>90%) whole CBD involved. Excise, do hepatico-jejunostomy
Type II: diverticulum. Do diverticulectomy
Type III: Choledochocele involving sphincter. Excise, sphincteroplasty
Type IV: Intra- and Extrahepatic cysts (Caroli's disease). Tranplant
Type V: Intrahepatic cysts. Transplant

Pulmonary sequestration: extralobar has systemic artery and vein; intraloabar has aorta in and pulmonary vein out. Resection is treatment for both. #1 presentation = infection (not as respiratory distress in newborn)

Congenital lobar emphysema: massive hyperinflation of a single lobe, usually upper/middle.
1/3 have resp distress at birth, only 5% present after age 6 months
M:F ratio is 2:1
CXR: radiolucency of affected lobe, commpression of other lobe
Severely symptomatic: lobectomy, excellent Px

Cystic hygroma = lymphangioma -> resect. Infection is #1 complication
Sistrunk procedure: excision of thyroglossal duct cyst (*midline*) with hyoid bone

1st sign of CHF in children is *hepatomegaly*

Strawberry hemagioma: appear in 1st few weeks of life; leave alone since most involute by age 7.

Neuroblastoma: #1 solid peds malignancy, 90% have incr VMA; high HVA (homovanillic acid) = worse Px. From neural crest, only 30% cure. Associated with N-myc

#1 peds malignancy overall is leukemia

Wilm's tumor = *nephro*blastoma. 80% cure with nephrectomy

Biliary atresia: need Kasi procedure (before age 3 months) = hepatoportoenterostomy

Meckel's diverticulum: on anti-mesenteric border. 2 ft from ileocecal valve, 2% population, 2% symptomatic, 2 types of tissue (pancreatic, gastric), 2 common presentations (diverticulitis, GIB). #1 GIB in children.
Embryology = persistent omphalomesenteric duct

Intussusception: reduce with air/contrast enema. IV glucagon can help (relaxes smooth muscle). Usually < 3 yo. To OR if peritonitis, free air. Adult w/intussception goes to OR since high likelihood of malignancy at lead point

Intestinal atreasias are secondary to *intra-uterine vascular events*. Mother may have polyhydramnios. 10% of atresias are multiple.
Duodenal atresia presents w/bilious vomiting, "double-bubble"; #1 neonatal duodenal obstruction. Assoc with trisomy 21 (Down's); 1/3 have cardiac defects

TE fistulas: 90% are are type C as in "*C*ommon" = blind esophagus, distal TEF. Spit up feeds. NGT won't pass.
5% are type A = blind esophagus, no fistula = no air in entire GI tract
VATER - vertebral, anorectal (imperforate anus in 10%). TEF, radial, renal anomalies

Ladd's procedure for malrotation: appendectomy, take down bands, counterclockwise rotation

Meconium ileus (cystic fibrosis): try gastrograffin enema (dx and rx)

#1 cause of colon obstruction = Hirschsprung's (no BM in 1st 24 hrs, dx with rectal bx)

NEC: presents *after* initiating feeds in neonate (premie) with blood in stool.
OR for free air, peritonitis, acidosis/thrombocytopenia/clinical deterioration (resect, ostomies)
Must do contrast eval before reconnecting bowel weeks later (20% will have stenoses)

Imperforate anus: if high, have meconium in urine (fistula to bladder, vagina or urethra) need colostomy

Gastroschisis: *intrauterine rupture of umbilical cord*, no associated defects, lateral (right) defect, no sac

Omphalocele: midline defect, may contain liver or other non-bowel contents, frequent anomalies (cardiac, pericardium, sternum, diaphragm = Cantell pentology). Has peritoneal sac.

[back to top]

Pituitary/Adrenal Glands

PNMT converts norepinephrine to epinephrine. Found only in the adrenal medulla

Pheochromocytoma: 10% are: malignant, bilateral, in children, part of MEN, extra-adrenal (organ of Zuckerkandl at Ao bifurcation = most common)
Preop: alpha block first, then beta block if tachycardic
Screen with urine metanephrines, VMA
MIBG can localizes

Nelson syndrome: post adrenalectomy (10%), incr ACTH, pigmentation, vision changes from incr pituitary response

Waterhouse Friedrickson: adrenal hemorrhage a/w meningococcal sepsis

Conn's syndrome = hyperaldosteronism = 80% adenoma, 20% bilateral hyperplasia (see with postural stimulation test). HTN, low K, high Na

Addison's disease = low aldosterone and glucocorticoids = low Na, high K, hypoglycemia. Crisis presents similar to sepsis with hypoTN, fever; steroids are diagnostic and therapeutic

Congenital Adrenal Hyperplasia: 21-hydroxylase deficiency = most common

Cushing's syndrome = excess steroids; most commonly iatrogenic.

Pituitary (Cushing's *Disease*): 70% of non-iatrogenic; high ACTH, suppresses w/high dose steroid test

Adrenal Cushing's Syndrome: (15%) low ACTH, independent steroid production, does not suppress

Ectopic Cushing's Syndrome: ACTH produced elsewhere, usually small cell CA, does not suppress

Posterior pituitary = neurohypophysis -> ADH, Oxytocin

Anterior pituitary = adenohypphysis -> GH, ACTH, TSH, LH, FSH, Prolactin

Bitemporal hemianopsia is classica vision change with pituitary mass effect

Chromophobe pituitary adenoma: non-functional, see decr GH, FSH, L"H, TSH, ACTH

Prolactinoma #1 = pituitary adenoma: galactorrhea, irregular menses . Bromocriptineor trans-sphenoidal resection

Sheehan syndrome: postpartum lack of lactation., persistent amenorrhea

[back to top]

Plastics, Skin

Langerhans cells: antigen regonition, involved in contact hypersenstivity

Merkel cells: sensory mechanoreceptors. Merkel cell carcinoma presents as red/purple papulo-nodule. A neuroendocrine tumor with staining for neuron specific enolase and neurofilament protein.

Glomus cell tumor: painful, subungal tumor, benign, from glomic end organ. Rx: shell out

Hidadrenitis: involves apocrine glands, therefore see after puberty in axilla, groin

Basal cell CA 4:1 mor common than SCC. BCCs has peripheral palisading of nuclei on pathology

FTSG contracts less than STSG. STSG donor site regenerates from hari follicles, skin appendages.

STSG blood supply by *imbibition* 1st few days, then neovascularization days 2-7 (capillary ingrowth)

Flap necrosis: most commonly due to *venous thrombosis*

Risks for melanoma: Dysplastic nevi, congenital nevi, BK, Mole syndrome (100% risk)
Depth <1mm; 1-4mm;>4mm = 1;2;3 cm margins respectively
Melanoma sites: skin > eyes > rectum; #1 skin site for men is back, in women is legs
Worse Px if on BANS: back, arms, neck, scalp
Breslow: <0.75mm (90%cure); 0.75 to 1.65mm; 1.65-4mm;>4mm (80% distant mets)
4 types: nodular (worst, early mets), superficial spreading, lentigo maligna, acral lentiginous

Keloid : extends beyond wound margins; failure of collage breakdown and incr collagen production

Hypertrophic scar does *not* extend beyond margins

[back to top]

Stomach, Small Bowel

MALT is a precursor to gastric lymphoma, it regresses with H. pylori rx

Clo test detects *urease* from H. pylori

Type I gastric ulcer assoc w/type A blood, other ulcer types with type O

Type I on lesser curve; II = 2 ulcers (lesser curve and duodenal); III = prepyloric; IV = high lesser curve; V = anywhere a/w NSAID use

Gastric adeno CA: incr risk w/adenoma > 2 cm, type A blood, nitrosamines, chronic atrophic gastritis/pernicious anemia
Has intramural spread so 6 cm margin necessary

Gastric lymphoma: chemo and RT rx of choice, surgery for complications

Bowel rest, NGT cures 65% of partial SBO, 20% of complete SBO

Terminal ileum resection: decr bile salt absorption -> less colonic H2O absorption -> diarrhea; decr B12/intrinsic factor absorption; decr binding of oxalate -> more oxalate absorbed in colon -> more oxalate stones

Pts w/Crohn's dz with numerous strictures: avoid resection (and short gut), perform stricturoplasties

Carcinoid: tryptophan -> serotonin -> 5-HIAA (measure in urine)
Tryptophan diversion can cause *pellagra* (3 D's: dermatitis, dementia, diarrhea)
Serotonin is secreted by argentafin staining cells (enterochromaffin cells) only
9% of patients *with* mets get Carcinoid syndrome (flushing, asthma, diarrhea, R sided heart valve dz); octreotide helps
1/3 of pts w/SB carcinoid have multiple primary sites, 1/4 have metachronous adenocarcinoma
chemo for carcinoid: streptozocin, doxorubicin, 5 FU palliate

Fistula: less likely to heal with FRIENDS: *F*oreign body, *R*adiation, *I*BD, *E*pitheliazation, *N*eoplasm, *D*istal obstruction, *S*epsis/infection

TPN proven to incr closure rate of fistulas, but not shown to incr survival

SBO due to gallstones (from cholecysto-enteric fistula): SBO with air in biliary tree. "Gallstone ileus"; Remove stone to relieve SBO but leave gallbladder and fistula to decr mortality

[back to top]

Thyroid and Parathyroid

Parafollicular C cells derived from neural creast, produce *calcitonin* (decr derum calcium)

T3 is 3 times as active as T4, half-life = 3 days

PTU: prevents DIT, MIT coupling; crosses placenta -> cretinism; rare but dreadul *aplastic anemia*

*P*TU, *P*ropranolol, *P*rednisone (& other steroids) all block *P*eripheral conversion of T4 to T3

Wolk Chaikoff effect: high I-doses (lugol's, KI) inhibit TSH, useful in thyroid storm

FNA cannot distinguish malignant/benign with follicular and Hurthle cell -> need *tissue*

Papillary Thyroid CA: most common (85%, *P* for *P*opular), Lymphatic spread but nodes don't predict survival. 20% of adults, 80% of children present node positive, 80% are multicentric.
*P*sammoma bodies on path (*P* again), represents deposited calcium
History of exposure to radiation incr. risk
F:M ratio is 3:1; 1/2 are before age 40
MACIS criteria: *M*ets, *A*ge (M>50, F>40 is worse), *C*ompleteness of resection, *I*nvasiveness and *S*ize (>1.5cm generally means *total* thyroidectomy needed)

Follicular Thyroid CA: spreads hematogenously, 60% present with mets. Present a little older (50s), also F:M 3:1. Needle dx not adequate. Generally do total thyroidectomy with ablative RI post-op

Medullary Thyroid CA (MTC): 20% have MEN2 (tend to be bilateral, younger, worse prognosis)
See *amyloid* on path (pathognomonic)
Gastrin is used as provocative test for Medullary thyroid CA (incr calcitonin)
Originates from parafollicular C cells.
Ret proto-oncogene is diagnostic.
Rx = total thyroidectomy, neck dissection if node (+)

Cold nodule more likely CA than hot.

1st step in work-up of thyroid nodule after H&P is FNA **(Every Year)**

No radioactive iodine during pregnancy. Operate in 2nd trimester if possible.

Radioactive iodine only useful for well-differentiated tumors (papillary and follicular)

Superior laryngeal n, external branch: motor to cricothyroid muscle, injury = loss of projection, high pitch. Provides sensory to supraglottis
Recurrent laryngeal n innervates all of larynx except cricothyroid. Bilateral inj = occluded airway

Superior parathyroids from 4th puch, inferior (and thymus) from 3rd; inferior more variable position
All parathyroids generally receive blood supply from inferior thyroid artery
N terminal is active, C terminal is inactive portion of hormone (as with insulin)
PTH incr calcium bind protein to incr gut absorption of CA; incr kidney Ca absorption, incr PO4 loss

Hyperparathyroidism: a/w *prad oncogene* and h/o radiation exposure
Incr Ca, Decr Ph; Cl-:Ph ratio > 33:1
Osteitis fibrosa cystica is pathognomonic for hyperPTH
Check urine Ca, should be high (r/o FHH = familal hypocalciuric hypercalcemia)
Most patients are asymptomatic, found incidentally with high Ca
85% have single gland adenoma (except in MEN where incr PTHis due to 4 gland hyperplasia)
Rare parathyroid adenocarcinoma: palpable mass, very high Ca; resect widely

MEN I: 'PPP' *P*ancreatic islet cell tumor, *P*ituitary tumor, hyper*P*arathyroidism
MEN IIa: '2 MPH' *M*edullary thyroid CA (nearly all pts), *P*heochromocytoma, *H*yperparathyroidism
MEN IIb: *M*edullary thyroid CA (nearly all pts), *P*heochromocytoma, mucosal neuromas/Marfans' syndrome

[back to top]

Transplant

Graft vs host disease is mediated by T cells. **(Every Year)**

Hyperacute rejection due to *pre-formed antibodies* (avoid by not transplanting when *crossmatch is positive*)

Acute rejection due to foreign MHC antigens of graft cells. Bx shows lymphocytic infiltrate, Rx w/OKT3

Chronic rejection: gradual loss of blood supply. No treatment

Immunosuppression is largely cellular and not humoral system, therefore viral risk > bacterial
See incr CA (skin, leukemia, lymphoma, cervical)
CMV is #1 virus post-transplant

Azathioprine: 6MP derivative, purine analog that acts as an antimetabolite, decr DNA synthesis

Mycophenolate (cellcept): blocks purine synthesis to decr T and B cell proliferation

Cyclosporine: inhibits mRNA encoding IL-2. *Rotamase* inhibitor. Nephrotoxic

FK506: more potent than Cyclosporine, blocks IL-2 expression/production from T cells.

Prendisone blocks IL-1 from macrophages

OKT3 monoclonal antibody, used to treat rejection

Biliary stricture post liver transplant? Check hepatic artery flow, may be due to ischemia

#1 cause of oliguria s/p renal transplant is ATN

Cardiac transplant: 84% 1 yr survival

Liver transplant: 70% 1 yr graft survival

[back to top]

Trauma & Critical Care

Catecholamine response to injury is maximal at 24-48 hours
Also see incr ADH, incr ACTH (which incr corisol and aldosterone)

Neck zones: I below cricoid, II cricoid to angle of jaw (most amenable to OR exploration); III jaw to skull
Remember 1 to 3 = *low to high* (as with LeForte fx and embryology of POTH glands [inferior glands and thymus from 3rd puch, superior from 4th pouch])

#1 cause of preventable blunt trauma death is missed intra-abdominal injury

DPL: perform supra-umbilical if (+)pelvic fx; 10cc/kg infusion for peds. Positive if 1.10cc frank blood, 2. food particles, 3. bile, 4. bacteria, 5. >100,000 RBC/mm, 6. 500 WBC/mm. Positive = explore

Indications for thoracotomy for hemothorax: 1. Instability, 2. >1500 cc out initially, 3. >200 cc/hr x 4 hrs, 4. incompletely drained hemothorax despite 2 good tubes

Cardiac tamponade: hypotension is due to decr diastolic filling. Tapped blood does not clot.

Fat emboli: petechiae, hypoxia, confusion/agitation; sudan urine stain for fat

Diaphragm rupture from blunt trauma: 8:1 on Left; dx by NGT in chest on CXR. Rx = laparotomy. Delayed presentation -- consider approaching via chest since there will be adhesions

Splenectomy: lose *tuftsin*, *properidin*, *fibronectin* (non-specific opsonins); decr IgM production
Splenectomy helps *all* patients with hereditary spherocytosis (anemia and jaundice remit); helps 80% of patients w/ITP
Do not do splenectomy for patients with TTP (low plts, hemolytic anemia, neuro changes). Rx = plasmapheresis

Pulmonary compliance = change in Volume for a given change in Pressure (want high compliance)
Compliance decr in ARDS, pulmonary edema (takes greater pressure to get same volume)

Aging reduces FEV1 and FVC

O2 delivery = C.O. x O2 content = C.O. x Hgb x 13 x O2Sat
O2 use = C.O x (CaO2 - CvO2)

Initial Rx for air embolus is place pt in Tendelenburg with L side down. Can then attempt air aspiration via central line in RA

PEEP: incr FRC, incr compliance, keeps alveoli open; rare PTX unless very high **(Every Year)**
FRC = air in lungs after normal exhalation
Inspiratory capacity: air breathed in from FRC
Vital capacity: greatest vol. that can be exhaled

Hgb: O2 dissociation with incr temp, CO2, H+, 2,3DPG (high altitude, babies) = "right shift" to provide O2

EDRF = nitric oxide, made from *arginine* in endothelial cells. Vasodilatation via cGMP, incr in sepsis

Hydroflouric acid burns: Rx with topical Calcium

Carbon monoxide falsely elevates the O2Sat reading: it reduces available Hgb. Giving 100% O2 reduces T1/2 of CO from 5 hrs to 1 hr

Silvadene: risk of neutropenia. Good activity against Candida. Poor eschar penetration
Sulfamylon: painful; acidosis due to carbonic anhydrase inhibition (less H2CO3 -> H2O + CO2)
Silver Nitrate: hypnatremia nd hypochloremia due to leeching of NaCl
#1 infection in burn patients is *pneumonia*
Burn patients have initial drop in cardiac output, then are hyperdynamic
SCCA that develops in chronic wound = *Marfolin's ulcer*

[back to top]

Urology

Alpha Feto Protein and beta-HCG are markers for non-seminomatous testicular CA

Testicular mass: biopsy is orchiectomy via *inguinal incision*. Never trans-scrotal **(Every Year)**

Seminoma very radiosensitive = even stage I gets RT (25% have occult mets)
Node (+) gets platinum chemo.
Usually age 20-35; most tumors are malignant; rare in African-Americans

Cryptorchidism: incr testicular CA x 3-14. Orchiopexy incr fertility but does not decr CA risk. Do age ~ 2 yrs

Testicular torsion: Rx with *bilateral* orchiopexy

Varicocele: remember L gonadal vein drains to L renal vein (may be obstructed by renal cell CA)

Ureteral injury (iatrogenic or otherwise): avoid ureteral dissection (compromise blood supply), use absorbable suture (otherwise nidus for stones as with bile duct), stent and *drain*

Urethral injury: suspect with blood at meatus, scrotal/penile injury, high-riding prostate. Dx with retrograde urethrogram (RUG), 1st Rx is do not place foley -> needs suprapubic cath

Bladder injury: when with pelvic fx, is usually *extraperitoneal*, generally need foley drainage only. If no pelvic fx, is usually dome rupture (full bladder in MVA); needs OR, 3 layer closure, keep foley

Prostate CA mets to bone are osteoblastic, radio-dense

Oxalate stones most common (especially after small bowel resection); Mg Am Ph 15%, urate 8%

Proteus infection (urease producing) -> struvite stones, "staghorn"

Renal Cell CA: triad of abd pain (capsule stretching), mass, hematuria
Can see erythrocytosis due to incr erythropoetin; fever; HTN; Stouffer syndrome (decr hepatic flow)

Erythropoetin: 95% made by kidney, stimulated by hypoxia, decr production in ESRD

[back to top]

Vascular

Popliteal aneurysm: #1 peripheral aneurysm; 50% bilateral; 1/3rd have AAA. Risk of emboli and thrombosis, so operate (exclude and bypass)

Visceral aneurysms: splenic #1 (60%). Rx if > 2 cm, child bearing age or planning pregnancy, or symptomatic

AAA rupture risk: < 5cm = 20% in 5 yrs; 5-7 cm = 33%, > 7cm = 95%. Incr risk w/HTN & COPD

Bloody diarrhea first few days s/p AAA repair demands sigmoidoscopy to eval for ischemic colon (due to loss of IMA). Take to OR if necrosis

Claudication: initial Rx is smoking cessation, exercise, trental -> NOT surgery **(Every Year)**

ACAS (asymptomatic, >60% stenosis) CEA reduces 5 year stroke rate from 11 to 5%

NASCET (symptomatic, >70% stenosis) CEA reduces 5 year stroke rate from 26 to 9%

#1 CN injury with CEA = vagus n. (clamp application) -> hoarseness

Fibromuscular dysplasia: young women, R renal artery most likely involved; amenable to angioplasty. See young woman with HTN think FMD

Atherosclerosis pathology: type I foam cells (lipids in macrophages; II fibrointimal lesion = smooth muscle proliferation due to mac's growth factors; III: disruption exposes collagen -> thrombosis

[back to top]

Gynecology

PID: each episode incr infertility approx 10%, also incr risk of ectopic pregnancy

Krukenberg tumor: colon or stomach CA met to ovary. See *signet cells* on path

Meig's syndrome: pelvic tumor -> ascites, hydrothorax

Appendicitis in pregnancy: 50% premature delivery, fetal mortality 2-8%, maternal 1%

Endometriosis can involve rectum; presents with rectal bleed, irregular menses, pelvic pain, bluish mass on proctoscopy; Rx = hormonal therapy.

Ovarian CA: stage I limited to ovary (5 yr survival only 66%); II in pelvis; III throughout abdomen; IV distant mets

[back to top]

Hernia

Howship Romberg sign = inner thigh pain w/internal rotation = obturator hernia (women 5:1)

Ileoinguinal nerve traverses inguinal canal; sensation to superomedial thigh *and* scrotum

Genitofemoral nerve: genital branch runs on spermatic cord to cremaster (motor) and scrotum (no leg)

Femoral hernia is medial to vein, artery and then nerve; "NAVEL" E = empty space for hernia

Spigelian hernia: inferior to linea semicircularis, through linea seminlunaris; *deep to ext oblique* and therefore hard to diagnose Often incarcerates bowel, repair all.

Petit's hernia: inferior lumbar triangle (iliac crest, ext oblique, lat dorsi)

Grynfelt's: superior lumbar triangle (12th rib, internal oblique, lumbosacral aponeurosis)