

Inflammatory Bowel Disease: Diagnosis & Treatment

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Learning Objectives

- Distinguish between the types of Inflammatory Bowel Disease
- Assess the significance of diagnostic tests in Inflammatory Bowel Disease
- Discuss the principles and evolving treatments in Inflammatory Bowel Disease
- Optimize preventive measures and management in Inflammatory Bowel Disease

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Overview

- Background
- Ulcerative Colitis (UC) v. Crohn's Disease (CD)
- Diagnostic strategies
- Therapeutics & changes in medical management
- Vaccination & preventive measures
- Case Study
- Summary and Conclusions



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BACKGROUND

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Definitions

- **Inflammatory Bowels Disease**
 - Idiopathic inflammation of the GI tract
 - **Ulcerative Colitis**
 - Limited to mucosal layer of colon and rectum
 - **Crohn's Disease**
 - Full thickness inflammation involving any part of the GI tract (mouth to anus)

www.crohnscolitisfoundation.org/press/jp81/update@factbook.pdf

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Epidemiology: United States

- Incidence: 70K new cases IBD diagnosed in U.S. each year
 - Peak onset
 - UC: 30-40 years
 - CD: 20-30 years
 - Pediatric cases: 7-20% (~80K cases in the U.S.)
 - Incidence INCREASING
- Prevalence: ~ 200 cases per 100,000
 - > 1.6 million Americans currently have IBD

www.crohnscolitisfoundation.org/assets/pdf/update-ibd-factbook.pdf

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Epidemiology: United States

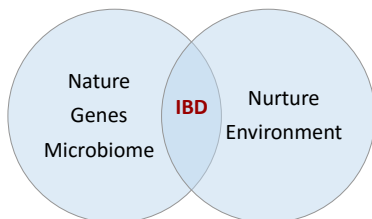
- Gender
 - UC: M > F
 - CD: F > M
- Highest incidence
 - Whites of North America
 - Ashkenazi Jews
- Incidence increasing around the world



www.crohnscolitisfoundation.org/assets/pdf/update-ibd-factbook.pdf

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Etiologic Interplay



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ULCERATIVE COLITIS V. CROHN'S DISEASE

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Ulcerative Colitis

- Begins at rectum and spreads continuously
- Superficial mucosal inflammation of rectum & colon only
- 30% proctitis, 40% left-sided colitis, 30% pancolitis

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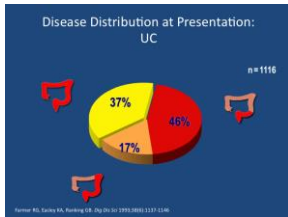
Ulcerative Colitis Presentation

- Symptoms depend on extent and severity of inflammation
 - Bloody diarrhea
 - Abdominal cramping
 - Tenesmus/fecal urgency
- Systemic symptoms, fever, decreased stamina, weight loss
- Extra-intestinal manifestations (1/3 patients)

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Ulcerative Colitis

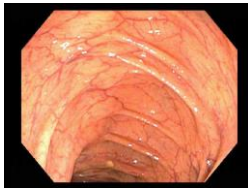
Distribution at Presentation



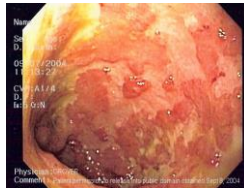
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Ulcerative Colitis

Endoscopic Appearance



NORMAL MUCOSA



ULCERATIVE COLITIS

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Crohn's Disease

- Transmural inflammation of any part of GI tract
 - "Skip" lesions
 - Noncaseating granulomas
 - Inflammation extending from the mucosa to at least the muscularis
- Involves any part of the GI tract (Rectum often spared)
- 30% small bowel (usually terminal ileum), 40% ileum/colon, 25% colon, 5% stomach/duodenum/esophagus
- Fistulas: perirectal/perineum, enterocutaneous, enterocolic, to other internal organs

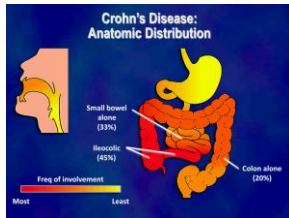
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Crohn's Disease Presentation

- Symptoms:
 - Non-bloody diarrhea
 - Weight loss
 - Fever
 - RLQ pain and/or mass
 - Perianal/perirectal disease with abscess, fistulas, structuring
 - Extraintestinal manifestations

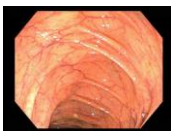
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Crohn's Disease Distribution at Presentation

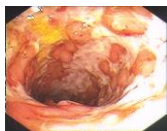


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Crohn's Disease Endoscopic Appearance



NORMAL MUCOSA



CROHN'S COLITIS



CROHN'S COLITIS

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Ulcerative Colitis v. Crohn's Disease

Ulcerative Colitis

- Continuous/superficial
- Rectum to colon only
- ++ Rectal bleeding
- Rare strictures
- Surgery curative
- Extra-intestinal
- Bloody diarrhea/urgency

Crohn's Disease

- "Skip lesions"/deep (transmural)
- Mouth to anus +/- rectum
- +/- Rectal bleeding
- ++ Fistulas/strictures
- Surgery palliative (high rate of recurrence: >50%)
- Extra-intestinal
- Abdominal pain/weight loss

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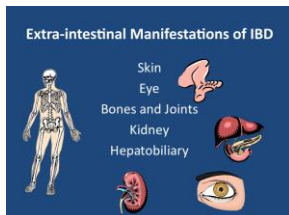
Ulcerative Colitis v. Crohn's Disease

Difficult to distinguish UC from CD in 10-20% of IBD patients



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Inflammatory Bowel Disease Extra-intestinal Manifestations



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Inflammatory Bowel Disease Extra-intestinal Manifestations

Dermatologic



pyoderma gangrenosum



erythema nodosum

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Inflammatory Bowel Disease Extra-intestinal Manifestations

- Ocular: episcleritis, anterior uveitis



- Musculoskeletal: arthritis, ankylosing spondylitis, sacroiliitis
- Hepatobiliary: steatosis, cholelithiasis, primary sclerosing cholangitis (PSC)

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Inflammatory Bowel Disease Toxic Megacolon

- Occurs in 1-3% patients with IBD
- Colonic dilatation > 6 cm & signs of toxicity
 - Fever, hypotension, tachycardia, leukocytosis
- High risk of perforation



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DIAGNOSTIC STUDIES

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Laboratory Studies

- CBC
 - Anemia (iron deficiency, B 12)
- CRP (C reactive protein), ESR
 - Elevated
- CMP (Comprehensive Metabolic Profile)
 - Low albumin from protein loss, inflammation, malabsorption
- Stool studies
 - WBC, culture, C. Diff, O&P

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Laboratory Studies

- IBD Antibody Panels
 - pANCA & ASCA
 - perinuclear Antineutrophil cytoplasmic antibodies (pANCA)
 - 65% UC cases
 - 10% CD cases
 - Antibodies to *Saccharomyces cerevisiae* (ASCA)
 - 60-70% CD
 - 10-15% UC
 - - pANCA/+ASCA ➡ 50% sensitivity & 97% specificity for CD
 - +pANCA/-ASCA ➡ 57% sensitivity & 97% specificity for UC
- Fecal calprotectin ➡ colonic inflammation

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Endoscopy & Radiologic Studies

- Colonoscopy
- Esophagogastroduodenoscopy (EGD/upper endoscopy)
- Video Capsule Endoscopy (VCE Study)
- CT A&P
- CT Enterography
- MR Enterography
- Other modalities
 - Double Balloon Endoscopy
 - Spiral Endoscopy

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THERAPEUTIC APPROACH & MANAGEMENT

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Inflammatory Bowel Disease Goals of Therapy

- Induce remission of active disease
- Maintenance of remission
- Maintain/Restore nutrition
- Avoid surgery
- Avoid complications
 - Disease related
 - Therapy related
- Quality of life

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Inflammatory Bowel Disease Evolving Principles of Therapy

- Incorporate elements of prognosis into diagnosis & medical decision making
- Move to “one size fits all” to “smart therapy for the right patient”
- Precision medicine-optimization of treatments instead of “guesswork”
- Monitoring disease activity to achieve deeper remission & to anticipate flares → proactive approach

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Inflammatory Bowel Disease Drug Classes 2017

- **Aminosalicylates**
 - Oral
 - Rectal
- **Corticosteroids**
 - Systemic
 - Non-systemic
 - Rectal
 - Oral
- **Immunomodulators**
 - Thiopurines
 - Azathioprine & 6-Mercaptopurine
 - Methotrexate
- **Antibiotics**
- **Biologics**
 - Anti-cytokines
 - Anti-TNF
 - Anti-IL12/23/6
 - Anti-integrin (adhesion molecule inhibitors)
- **Investigational molecules**
 - Janus kinase inhibitors
 - Tofacitinib
 - Filgotinib
 - Uspadactinib (ABT-494)
 - Anti-SMAD7 antisense oligonucleotide
 - Mongersen
 - Sphingosine-1-phosphate receptor modulator
 - Ozanimod

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Inflammatory Bowel Disease Aminosalicylates

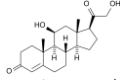
- 5-ASA reduces inflammation
- Sulfasalazine (Azulfidine) → oldest & cheapest
- Newer agents comprised of Mesalamine bound to carrier molecules to prevent degradation in proximal small bowel
 - Asacol, Pentasa, Lialda, Apriso, Colazal, Delzicol, Dipentum, Glazo, Canasa (suppository), Rowasa (enema)
- Oral, enema, and suppository routes



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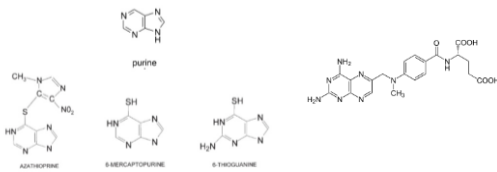
Inflammatory Bowel Disease Corticosteroids

- Topical
- Systemic
- Used for acute flares NOT remission
- Significant side effects: osteoporosis, hypertension, growth retardation, hyperglycemia, cataracts
 - Hydrocortisone (IV, foam, enemas)
 - Prednisone or Methylprednisolone (IV, oral)
 - Budesonide
 - Fewer systemic side effects & less adrenal suppression



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Inflammatory Bowel Disease Immunomodulators



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Inflammatory Bowel Disease Immunomodulators

- 6-Mercaptopurine (6-MP), Azathioprine, Methotrexate (MTX)
- 3-6 month full onset of action
- Side effects: bone marrow suppression, hepatic toxicity, pancreatitis, lymphoma, skin cancers (basal & squamous cell)
- Thiopurine Methyltransferase (TPMT) enzyme activity
- Measure thiopurine methyltransferase (TPMT) enzyme activity prior to starting immunomodulatory agents
 - Genetically determined metabolism
- Lab tests available to monitor metabolite levels

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Inflammatory Bowel Disease

Antibiotics

- Mostly used for treating Crohn's disease
- Issues:
 - Small intestinal bacterial overgrowth 2^o enteral fistulas
 - Modulate an abnormal microbiome in theory
- Broad spectrum bactericidal activity + some immunosuppressive properties
- Commonly used antibiotics
 - Metronidazole (Flagyl)
 - Ciprofloxacin (Cipro)
 - Rifaximin (Xifaxan)

Bernstein CN, Am J Gastroenterol 2015;110:114-126.

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Inflammatory Bowel Disease

Microbiome Modulators

- Antibiotics → supra
- Fecal Microbiota Transplant (FMT)
 - Intestinal dysbiosis important in underlying pathobiology of IBD
 - Administration: oral v. enema v. colonoscopic
- Enteral nutrition
 - Elemental, semi-elemental, & polymeric diets
- Probiotics & Prebiotics
 - Possibly reduce relapses in patients with UC
 - VSL #3
 - Bifidobacterium, Lactobacillus, E. coli
- Omega-3 Fatty Acids
 - May reduce relapses in patients in remission with Crohn's disease

Bernstein CN, Am J Gastroenterol 2015;110:114-126.

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Inflammatory Bowel Disease

Calcineurin Inhibitors (Cyclosporine)

- Severe ulcerative colitis refractory to steroids
- Often used as bridge to surgery or onset of action of immunomodulatory drugs
 - Associated with high 1 year colectomy rate among initial responders
- Significant side effects: nephrotoxicity, hepatotoxicity, hypertension, paresthesias, seizures, anaphylaxis
- Biologics have largely supplanted use due to ease of use & lower toxicity profile

Luharie D et al. Lancet. 2012;380:1909-1915.

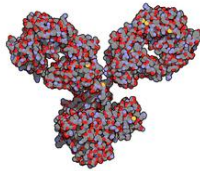
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Inflammatory Bowel Disease Traditional Therapy Summary

Class	Medication	Route	Side Effects
5-ASA (mesalamine)	Azulfidine, Asacol, Apriso, Colazal, Delzicol, Dipentum, Glazo, Lialda, Pentasa, Canasa (suppository), Rowasa (enema)	PO, rectal	Nausea, diarrhea, nephritis, rash
Antibiotics	Flagyl, Cipro, Rifaximin	PO	Nausea, PMC, neuropathy
Steroids	Prednisone, Budesonide, Solumedrol, Hydrocortisone	PO, IV	DM, cataracts, psychosis, weight gain, skin changes, osteoporosis/necrosis, hypertension
Immunomodulators	Azathioprine, 6-MP, Methotrexate	PO	Leukopenia, hepatitis, pancreatitis, lymphoma, infection, skin cancers

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Inflammatory Bowel Disease Biologics: The New Era



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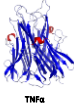
Inflammatory Bowel Disease When to Introduce Biologic Therapy?

- Steroid-refractory UC/CD
- Steroid-dependent UC/CD
- Immunomodulator-refractory UC/CD
- Immunomodulator-intolerant UC/CD
- Clinical predictors of a poor outcome at diagnosis
- Fistulizing CD
- Prevention of Postoperative CD
- Maybe sooner than later

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Inflammatory Bowel Disease Biologics

- Biologics dramatically changed treatment of IBD
 - Initial studies showed closure of fistulas
- Mode of action
 - Specifically target mediators of inflammation
 - Tumor Necrosis Factor Alpha = Cachexin = Cachectin
 - Anti-Tumor Necrosis Factor → Antibodies
- Changed natural history of disease → avoid surgery & complications
- Mucosal healing → Better outcomes
- Faster healing

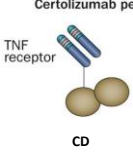


TNFα

Peyrin-Biroult L, et al. Clin Gastroenterol Hepatol 2008;6:644-653.
 Danese S, et al. Ann Intern Med 2014;160:704-711.


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Inflammatory Bowel Disease Anti-TNF Agents




Certolizumab pegol

CD



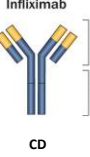
Adalimumab

CD
UC



Golimumab

UC



Infliximab

CD
UC

(Fab')₂

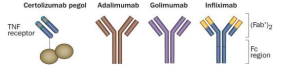
Fc region

van Schoonenburg PA, et al. Nat Rev Rheumatol. 2013;9(3):164-72.

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Inflammatory Bowel Disease Anti-TNF Agents

- Anti-TNF agents were initial biologics to block inflammatory cascade
- 4 Anti-TNF agents currently available
 - **Infliximab**
 - IV infusion
 - **Adalimumab**
 - Subcutaneous
 - **Certolizumab pegol**
 - Subcutaneous
 - **Golimumab**
 - Subcutaneous



Fagan BG, et al. N Engl J Med. 2013;369:699-710.

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Inflammatory Bowel Disease

Anti-TNF Agents

- Need to check for TB, HBV, & HCV prior to treatment
- Loading and maintenance dosing required
- Important to monitor therapeutic drug levels
- Assess stability between doses
- Combination therapy mostly accepted as superior
- Higher response rates in patients with shorter disease duration

Colombel F, et al. *N Engl J Med*. 2010;362:1383-1395.
Panaccione R, et al. *Gastroenterology*. 2014;146:592-600.

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Inflammatory Bowel Disease

Biosimilars

- Copy versions of original biologic agents
 - Similar but not identical
 - Safety data and efficacy data are extrapolated
 - Evidence suggests that unidirectional switches are safe
- Inflectra → biosimilar to infliximab
 - Approved by FDA in April 2016 (approved September 2013 by European Medicines Agency)
- Amjectiva → biosimilar to adalimumab
 - Approved by FDA September 2016
- Greater than 20 other biosimilars in pipeline to infliximab & adalimumab

Daneis S, et al. *Nat Rev Gastroenterol Hepatol*. 2017;14:22-31.
Siczekowska L, et al. *J Crohn's Colitis*. 2016;10:127-132.

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Inflammatory Bowel Disease

Anti-Integrin Antibodies

- $\alpha 4$ Integrins
 - Mediate leukocyte recruitment and adhesion
- Monoclonal Abs with different mechanism of action than anti-TNF agents in intestinal immune response
 - Blocks an integrin ($\alpha 4\beta 7$) on lymphocyte surfaces that facilitates trafficking of lymphocytes to gut & binding of those lymphocytes to specific ligands
- Gut specificity is important
 - β -subunit ($\beta 7$) of $\alpha 4\beta 7$ makes this integrin specific to the gut
 - Limiting lymphocyte trafficking to gut limits systemic & CNS toxicity

Bemstein CN. *Am J Gastroenterol* 2015;110:110-114.

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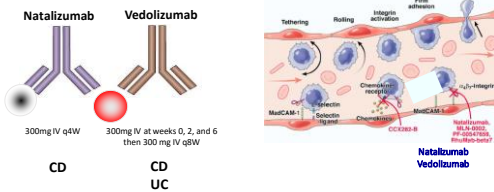
Inflammatory Bowel Disease Anti-Integrin Antibodies

- 2 Agents
 - **Natalizumab**
 - Humanized monoclonal Ab directed against α -4 integrin
 - Blocks leukocyte migration to sites of inflammation → **NOT GUT SPECIFIC**
 - Blocks both α 4β1 & α 4β7
 - Limited use → PML (Progressive Multifocal Leukoencephalopathy)
 - **Vedolizumab**
 - Humanized monoclonal Ab directed against α 4β7
 - Blocks lymphocytes selectively trafficking to the gut → **GUT SPECIFIC**
- Still need to check for TB, HBV, & HCV prior to starting treatment
 - Insurance company requirement

Higgins PD. Am J Gastroenterol 2014;109:1052-1054.

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Inflammatory Bowel Disease Anti-Integrin Antibodies



Modified from van Schootenburg RA, et al. Nat Rev Rheumatol. 2013;9(3):164-72.
Ruggeri P, et al. Gastroenterology. 2009;136(4):1182-97.

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Inflammatory Bowel Disease Anti-Integrin Antibodies

- **Etolizumab (rhuMAb Beta7)**
 - Monoclonal Ab developed with specificity for just β 7 subunit
 - Exclusively binds to lymphocytes with their gut specific receptor mucosal addressin cell adhesion molecule
 - Administered SC
 - As of 2016 in Phase III trials for induction & maintenance therapy for Ulcerative Colitis & Crohn's Disease

Mallikar 1, et al. Expert Opin Biol Ther. 2016 Apr;16:567-72.

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Inflammatory Bowel Disease Anti-IL 12/23

- Interleukin (IL)-12/23 activate certain T cells
- **Ustekinumab**
 - Human IgG₁ monoclonal Ab → interferes with triggering the body's inflammatory response through suppression of certain cytokines
 - Blocks biologic activity of IL-12 & IL 23 by inhibiting receptors for these cytokines on T cells, natural killer cells, & Ag presenting cells
 - Approved by FDA September 26, 2016
 - **Moderate to severe Crohn's Disease**



Bernstein CN, Am J Gastroenterol 2014;110:114-126.
www.medicape.com/viewarticle/869259.

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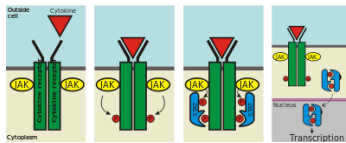
Inflammatory Bowel Disease JAK Inhibitors

- Janus kinase (JAK) family
 - Comprises 4 intracellular tyrosine kinases
 - JAK1, JAK2, JAK3, & nonreceptor tyrosine-protein kinase 2 (TYK2)
 - Activate signal transducers & activators of transcription (STATs) through auto phosphorylation
 - JAK-STAT pathways regulate signaling for multiple immune-relevant mediators: Type I interferon, interferon- γ , & interleukins 2, 4, 6, 7, 9, 12, 15, 21, 23, 27

Sandborn WJ, et al. Gastroenterol Clin North Am 2014;43:603-617.

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Inflammatory Bowel Disease JAK-STAT Pathway



Aaronson DS, et al. Science. 2002;296:1653-6.

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Inflammatory Bowel Disease

JAK Inhibitors

- **Tofacitinib**
 - Inhibits JAK 1 & JAK 3 → interferes with several cytokine receptors
 - Oral agent
 - Effective after renal transplant & approved for RA
 - Phase 3 trial recently shown to be more effective in patients with moderately to severely active ulcerative colitis as induction and maintenance therapy than placebo
 - Associated with increases in certain lipid levels
 - Few nonmelanoma skin cancers & cardiovascular events noted in trial

Sandborn WJ, et al. *N Engl J Med* 2017;376:1723-1736.

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Inflammatory Bowel Disease

Novel Treatments

- **JAK-1 Inhibitors**
 - Tofacitinib
 - Filgotinib
 - Crohn's Disease
 - Upadacitinib (ABT.494)
- **Mesenchymal Stem Cell (Cx601)**
 - Injected around fistulas in perianal Crohn's
- **Oligonucleotide (STNM01)**
 - Left sided UC
 - Double stranded RNA
- **Hyperbaric Oxygen (HBOT)**
 - Ulcerative Colitis
- **Anti-SMAD7 antisense oligonucleotide**
 - Mongersen
- **Sphingosine-1-phosphate receptor modulator**
 - Ozanimod

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Inflammatory Bowel Disease

Summary of Drug Therapy 2017

- Goals of management are evolving: prognosis, target deep remission
- For 5-ASAs understand delivery and possible dose-reduction in maintenance
- You do not need to use steroids as much as you think
- Lymphoma is from thiopurines → risk goes away when drugs stopped
- Nonmelanoma CA skin is from thiopurines → risk does not go away when drugs stopped

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Inflammatory Bowel Disease

Summary of Drug Therapy 2017

- Pro-active anti-TNF drug monitoring is coming here
- Biosimilars are coming → interchangeability is uncertain
- Anti-integrin therapies are safe and probably should be used earlier (at least in UC)
- Anti-IL12/23 is shown to be effective in induction and maintenance of moderate-to-severe CD as maintenance therapy
- JAK inhibitor data is evolving

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Inflammatory Bowel Disease

Surgery: Ulcerative Colitis

- **Surgery ☞ Ulcerative Colitis**
 - Total proctocolectomy curative
 - Eliminates risk of CA colon
 - Necessary in ~ 25% patients
 - Indications:
 - Severe hemorrhage
 - Perforation
 - Fulminant colitis
 - Toxic megacolon
 - Medical failure

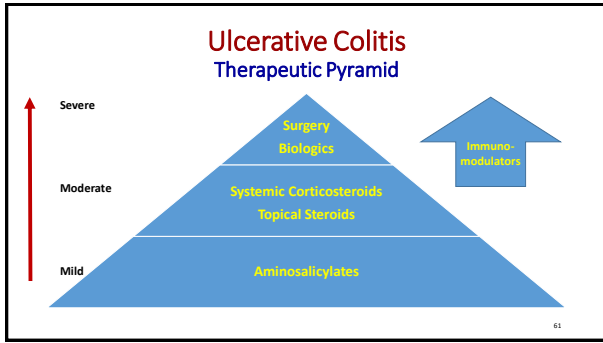
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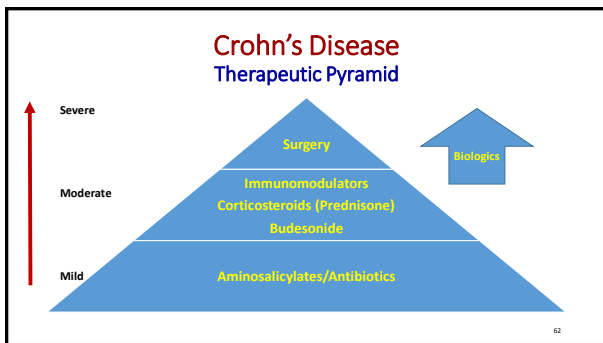
Inflammatory Bowel Disease

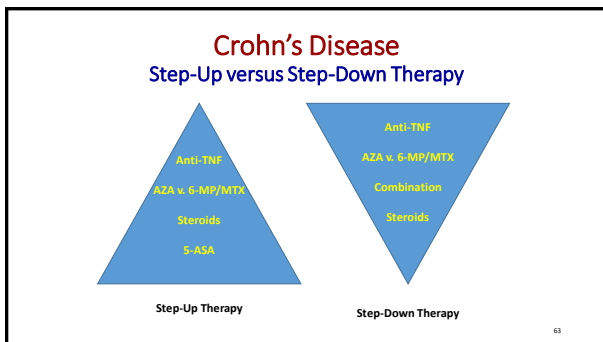
Surgery: Crohn's Disease

- **Surgery ☞ Crohn's Disease**
 - > 50% patients will need @ least one surgery
 - Palliative
 - > 50% recurrence @ surgical site within one year
 - Post-op immunomodulators or biologics may reduce recurrence
 - Indications
 - Strictures causing obstructive symptoms
 - Fistulas or perianal disease refractory to medical therapy
 - Intra-abdominal abscess
 - CA colon

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VACCINATIONS & PREVENTIVE MEASURES

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Biologic Agent Pre-Treatment Assessment

- TB
- HAV
- HBV
- HCV
- HIV (?)
- Other viruses (?)
 - Varicella, Zoster, MMR, Diphtheria & pertussis
 - Influenza

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Checklist for IBD Patients Vaccinations

• **NO LIVE VACCINES IN PATIENTS ON BIOLOGICS**

- Varicella (chicken pox) → live vaccine
 - Zoster (shingles) → live vaccine
 - MMR → live vaccine
 - Diphtheria & Pertussis
 - Influenza
 - HPV
 - Hepatitis B vaccine
 - Hepatitis A vaccine
 - Meningococcal Meningitis
 - Pneumococcal Pneumonia
- } Non-live vaccine

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Checklist for IBD Patients Bone Health

- Check Vitamin D 25-OH level
 - Baseline
 - Follow as necessary
- Bone density assessment → DEXA Scan
- Prescription for Calcium + Vitamin D3
 - All patients with each course of oral steroids
 - Vitamin deficient patients

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Checklist for IBD Patients Therapy Related Testing

- Mesalamines
 - Annual renal function monitoring
- Corticosteroids
 - Bone Health as outlined supra, document plan & use of steroid sparing therapy, Ophthalmology exam
- Thiopurines
 - TPMT level, CBC, LFTs prior to therapy, then routine CBC & LFT monitoring
- Anti-TNFα
 - TB screening prior to therapy (Quantiferon-TB Gold assay +/- CXR, then yearly, Hepatitis B vaccination, CBC, LFTs, & renal function monitoring)


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Checklist for IBD Patients Therapy Related Testing

- Natalizumab
 - Enroll in TOUCH Program
 - Check JCV Ab prior to initiating therapy → treat if negative
 - Retest JCV Ab every 4-6 months
 - CBC & LFTs at baseline & then monitor
- Vedolizumab
 - CBC, LFTs, & renal function at baseline & then monitor
- Proactive Monitoring
 - Check blood levels of biologics, monitor CRP & stool calprotectin

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CASE STUDY



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CASE STUDY
History

- 28 yo female dancer c/o change in bowel habit, stool urgency, bloody stool
 - Symptoms present for ~ 3 months & getting more frequent
 - Admits to LLQ crampy pain → relieved with BM
 - 3-5 stools per day → may wake up at night with "diarrhea"
 - No risk factors for complaints:
 - travel/antibiotics/medical exposure/food/pets/medications/herbals/et cetera
 - Negative ROS (no constitutional or systemic symptoms)
 - PMH, PSH, Family history, social history → negative/non-contributory

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CASE STUDY
Exam

- AA & O x 3, NAD, WN/WD
- Afebrile, normotensive
- Mild LLQ tenderness → no peritoneal signs
- Normal perineum & peri-anal area
- Rectal exam → brown stool flash stool guaiac +
- Exam otherwise WNL

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CASE STUDY

Lab Data

- Hgb 10.2 gm%
- CRP 11.3
- Albumin 3.2 g/dl
- WBC, Platelets, CMP, TSH → WNL
- Stool WBC: many
- Stool culture, C. diff, O&P → negative

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CASE STUDY

Colonoscopy

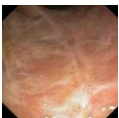
- Colonoscopy to Cecum + Biopsies
 - Inflammation starting at the pectinate (aka: dentate) line extending to the proximal sigmoid colon
 - Inflammation is confluent and continuous
 - Remaining colon looks normal



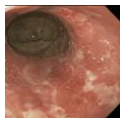
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CASE STUDY

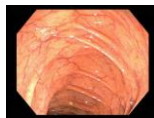
Colonoscopy + Biopsies



RECTUM



SIGMOID COLON



DESCENDING COLON

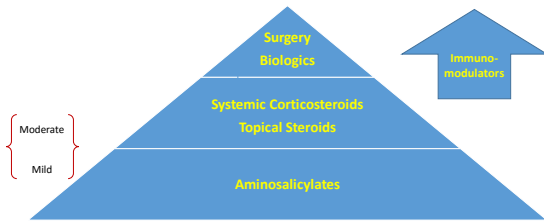
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CASE STUDY Pathology

- Microscopic Appearance
 - PMNs infiltrating crypts of Lieberkuhn at mucosal base forming crypt abscesses
 - Superficial desquamation of overlying epithelium leading to ulcer formation
 - Cryptitis undermining adjacent mucosa with edematous change
 - Findings suggestive of **ulcerative colitis**

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Ulcerative Colitis Therapeutic Pyramid



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CASE STUDY Outcome



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SUMMARY & CONCLUSIONS



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NO GOOD DEED GOES UNPUNISHED!!!



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Thank You

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