The 17th Rocky Mountain Interventional Endoscopy Course would like to

WELCOME

you to the

MAIN COURSE- SATURDAY

COURSE EXHIBITORS/CONTRIBUTORS

AbbVie

Boston Scientific Corporation

Castle Biosciences

Cook Medical

Olympus Corporation

Erbe USA

Medtronic

Steris Endoscopy

Merit Medical Endotek

Pentax Medical

Apollo Endosurgery

CDx Diagnostics

ChiRhoClin, Inc.

Interpace Diagnostics

Ovesco Endoscopy USA

Omega Medical Imaging

Takeda Pharmaceuticals

AM LECTURES AND CASE REVIEW SCHEDULE

SATURDAY, SEPTEMBER 10, 2022
Location: Anschutz Medical Campus,
Ed 2 South Building, Main Auditorium

Main Course: Endoscopic Techniques and Devices to Optimize Organ Preservation
Saturday, September 10, 2022

6:45-7:45 a.m.	Breakfast
7:45-8:00 a.m.	Introduction

Session I – Chronic Pancreatitis
Moderators: Urban Arnelo, MD and Jeff Easler, MD

8:00-8:15 a.m.	*Workup for Etiology of the Patient with Chronic Pancreatitis*	**Samuel Han, MD**
8:15-8:30 a.m.	*Pancreatic Endotherapy for Pancreatic Duct Strictures and Leaks*	**Shivangi Kothari, MD**
8:30-8:45 a.m.	*Managing Stones in Chronic Pancreatitis*	**Jeff Easler, MD**
8:45-9:00 a.m.	*Evolving Pancreatoscopy Techniques for Organ Preservation*	**Raj Shah, MD**
9:00-10:00 a.m.	*Q and A, Video Case Review from Friday Live Cases; Panel Discussion*	
10:00-10:30 a.m.	Break	

Session II – Biliary Disorders
Moderators: Anna Duloy, MD and Todd Baron, MD

10:30-10:45 a.m.	*Optimizing Success to Remove Large Biliary Stones*	**Paul Leonor, MD**
10:45-11:00 a.m.	*Biliary Cannulation Techniques: Advanced is now Conventional*	**Natalie Cosgrove, MD**
11:00-11:15 a.m.	*Endoscopic Drainage of Cholecystitis: Shifting Paradigm?*	**Todd Baron, MD**
11:15-11:30 a.m.	*Cholangiopancreatoscopy can Facilitate Organ Preservation*	**Urban Arnelo, MD**
11:30 a.m.-12:15 p.m.	*Q and A, Video Case Review from Friday Live Cases; Panel Discussion*	
12:15-1:15 p.m.	Lunch	

Session III – Colon Preservation
Moderators: Mihir Wagh, MD and Larissa Muething, MD

1:15-1:30 p.m.	*Updates in Colon Cancer Screening*	**Swati Patel, MD**
1:30-1:45 p.m.	*Large Colon Polyps: EMR, ESD, FTRD or Surgery*	**Mohamed Othman, MD**
1:45-2:00 p.m.	*Preserving the Colon in the Setting of Strictures, Fistula and Leaks*	**Hazem Hammad, MD**
2:00-2:15 p.m.	*Advanced Imaging in the Colon – From Virtual Chromoendoscopy to Artificial Intelligence*	**Vani Konda, MD**
2:15-3:15 p.m.	*Q and A, Video Case Review from Friday Live Cases; Panel Discussion*	
3:15 p.m.	Break	

Session IV – Esophagus and Stomach
Moderators: Sachin Wani, MD and Natalie Cosgrove, MD

3:45-4:00 p.m.	*Optimizing Outcomes in Endoscopic Eradication Therapies for Barrett's Esophagus*	**Vani Konda, MD**
4:00-4:15 p.m.	*Advances in the Management of Upper GI Bleeding*	**Larissa Muething, MD**
4:15-4:30 p.m.	*Pragmatic Approach to Management of Esophageal Strictures*	**Mohamed Othman, MD**
4:30-4:45 p.m.	*Bariatric Endoscopy: State of the Art in 2022*	**Rehan Haidry, MD**
4:45-5:30 p.m.	*Q and A, Panel Discussion*	
5:30-6:30 p.m.	*Faculty and Attendee Recognition Reception*	
6:30 p.m.	Adjourn	

MAIN COURSE DIRECTORS

Raj J. Shah, MD, MASGE, AGAF
Professor of Medicine
Director, Pancreaticobiliary Endoscopy
University of Colorado
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, Colorado

Sachin Wani, MD, FASGE
Professor of Medicine
Medical Director Esophageal and Gastric Center
University of Colorado
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, Colorado

Anna Duloy, MD
Assistant Professor of Medicine
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, Colorado

MAIN COURSE FACULTY

Urban Arnelo, MD, PhD
Professor of Endoscopic Surgery
Chief Department of Surgery
Umeå University Hospital
Umeå, Sweden

Todd H. Baron, MD
Division of Gastroenterology and Hepatology
Professor of Medicine
Director of Advanced Therapeutic

Natalie Cosgrove, MD
Interventional Endoscopist
Digestive Health and Surgery Institute
AdventHealth Orlando Center for Interventional Endoscopy
Medical Director of Clinical Quality Safety in Gastroenterology
Orlando, FL

Jeff Easler, MD
Assistant Professor of Medicine
Indiana University School of Medicine
Director, Advanced Endoscopy Fellowship
Indianapolis, IN

Dr. Rehan Haidry BSc(Hons), MD, FRCP
Honorary Associate Professor
Consultant Gastroenterologist, Interventional EndoscopistUniversity College Hospital
London, England

Hazem Hammad, MD
Assistant Professor of Medicine
Director of Advanced Endoscopy, Rocky Mountain Regional VA Medical Center
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

Samuel Han, MD, MS
Assistant Professor
Division of Gastroenterology, Hepatology, and Nutrition
The Ohio State University Wexner Medical Center
Columbus, OH

Vani J.A. Konda, MD
Medical Director, Baylor, Scott and White Center for Esophageal Diseases
Medical Director, GI Physiology Lab at Baylor University Medical Center
Adj. Associate Professor, Texas A&M College of Medicine
Dallas, TX

Shivangi Kothari, MD, FACG, FASGE
Associate Professor, Medicine, Division of Gastroenterology/Hepatology
Associate Director of Endoscopy
University of Rochester Medical Center & Strong Memorial Hospital
Rochester, NY

Paul Leonor, MD
Assistant Professor of Medicine
Interventional Gastroenterology
Division of Gastroenterology and Hepatology
Loma Linda University
Loma Linda, CA

Larissa Muething, MD
Assistant Professor of Medicine
Division of Gastroenterology and Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

Mohamed O Othman, MD
William T. Butler Endowed Chair for Distinguished Faculty
Professor of Medicine, Gastroenterology and Hepatology Section
Baylor College of Medicine
Chief, Gastroenterology Section at Baylor St Luke's Medical Center
Houston, Texas

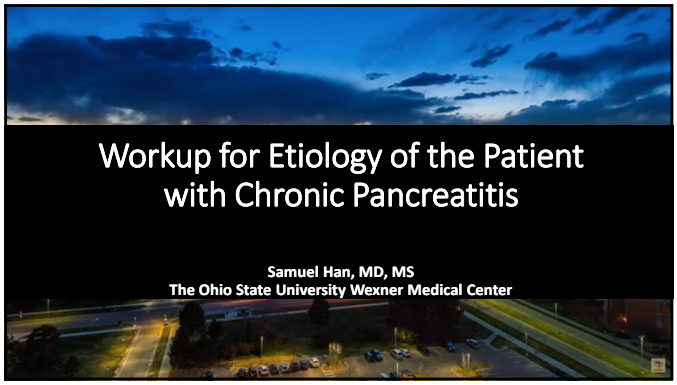
Swati G. Patel, MD, MS
Associate Professor of Medicine
Director, Hereditary GI Cancer Center
Division of Gastroenterology and Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

R. Matthew Reveille, MD
Associate Professor of Medicine
University of Colorado
GI Section Chief, Rocky Mountain Regional VAMC
Aurora, CO

Shelby Sullivan, MD, FASGE, FACG, DABOM
Associate Professor of Medicine
Director, Gastroenterology Metabolic and Bariatric Program
Division of Gastroenterology and Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

Workup for Etiology of the Patient with Chronic Pancreatitis

Samuel Han, MD
Assistant Professor
Division of Gastroenterology, Hepatology, and Nutrition
The Ohio State University Wexner Medical Center
Columbus, OH



Workup for Etiology of the Patient with Chronic Pancreatitis

Samuel Han, MD, MS
The Ohio State University Wexner Medical Center

Disclosures

- No conflicts of interest
- Grant Support:
  ASGE Endoscopic Research Award
  CCTS Path to K Program
  NIH R21DK117212
  NIH R01DK132709
  NIH L30DK126090

Objectives

- **Provide an overview of the different etiologies of chronic pancreatitis**
- **Provide practical guidance on working up the etiology of chronic pancreatitis**

Chronic Pancreatitis Mechanistic Definition

- **"Pathologic fibro-inflammatory syndrome of the pancreas in individuals with genetic, environmental and/or other risk factors who develop persistent pathologic responses to parenchymal injury or stress"**

4 | Whitcomb DC, et al. Pancreatology 2016

The Ohio State University Wexner Medical Center

Chronic Pancreatitis Classifications

TIGAR-O

Toxic-metabolic
Idiopathic
Genetic
Autoimmune
Recurrent and severe acute pancreatitis
Obstructive

5 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

The Ohio State University Wexner Medical Center

Chronic Pancreatitis Classifications

M-ANNHEIM

M Pancreatitis with **M**ultiple Risk Factors

Alcohol consumption
Nicotine consumption
Nutritional factors
Hereditary factors
Efferent duct factors
Immunological Factors
Miscellaneous and rare metabolic factors

6 | Schneider A, et al. J Gastroenterol 2007

The Ohio State University Wexner Medical Center

Etiology Approach

- Comprehensive Medical History
- Laboratory studies
- Cross-sectional imaging

7 | Löhr JM et al. UEGJ 2017

The Ohio State University Wexner Medical Center

Medical History – Toxic-metabolic

- **Alcohol** most common risk factor (80g/day for 6 years)
- **Smoking** is an independent risk factor
- **Hypercalcemia**, hyperparathyroidism
- **Hypertriglyceridemia**

8 | Löhr JM et al. UEGJ 2017

The Ohio State University Wexner Medical Center

Medical History – Toxic-metabolic

- **Medications** (azathioprine, methylprednisolone, ACE inhibitors, statins, estrogens, valproic acid, phenacetin prior to withdrawal from market)
- **Toxins** (CKD-related, DBTC, scorpion venom, anticholinesterase insecticides, metals)

9 | Löhr JM et al. UEGJ 2017

The Ohio State University Wexner Medical Center

Idiopathic

- **Early-onset vs Late-onset** (age of 35 as cut-off)
- Approximately 15-25% of patients after extensive work-up has been performed (but most likely have complex genetic risk profiles)

Löhr JM et al. UEGJ 2017
10 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

Genetic

- **Suspect** with early-onset pancreatitis (age < 35 years) and no other obvious causes or when there is a positive family history of pancreatitis, diabetes, dyslipidemia and pancreatic cancer.

Löhr JM et al. UEGJ 2017
11 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

Genetic

- **Autosomal Dominant** – **PRSS1** or **MODY8** variation in CEL

Löhr JM et al. UEGJ 2017
12 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

Genetic

- **Autosomal Recessive – Cystic fibrosis** (classic), cystic-fibrosis related disorders (**CFTR-RD**), and pathogenic **SPINK1** mutations
- **Tropical pancreatitis** – *Tropical calcific pancreatitis* and *Fibrocalculous pancreatic diabetes* – represents a complex genetic disorder

Löhr JM et al. UEGJ 2017
13 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

Autoimmune Pancreatitis

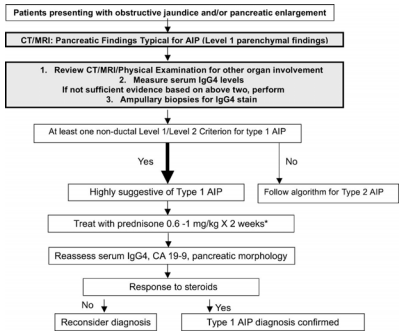
- Distinct form of pancreatitis characterized by frequent presentation with obstructive jaundice with or without a pancreatic mass.
- **Acute Presentation**: jaundice and/or mass with pancreatic swelling (diffuse or local)
- **Late Presentation**: Atrophy, calcification, ductal dilatation – typically do not have pain or recurrent pancreatitis

Löhr JM et al. UEGJ 2017
Whitcomb DC, et al. Clin Transl Gastroenterol 2019
14 | Shimosegawa T, et al. Pancreas 2011

AIP – Distinguishing between Type 1 and 2

- Imaging and steroid response cannot distinguish the 2 types
- Serologic abnormalities (IgG4, IgG, ANA) only seen in Type 1
- IBD associated with both forms – but more so with Type 2

Löhr JM et al. UEGJ 2017
Whitcomb DC, et al. Clin Transl Gastroenterol 2019
15 | Shimosegawa T, et al. Pancreas 2011



16 | Shimosegawa T, et al. Pancreas 2011

Recurrent Acute and Severe Acute Pancreatitis

- **Severe AP** – persistent SIRS with multiorgan failure
- **Trauma**
- **Ischemia**
- Severe Biliary AP – **post-ERCP pancreatitis**

- **Infectious** –
  a) Mumps, Coxsackie, CMV, VZV, CMV, HIV
  b) Myoplasma, Legionella, Salmonella, Leptospira
  c) Aspergillus
  d) Toxoplasma, Cryptosporidium, Ascaris

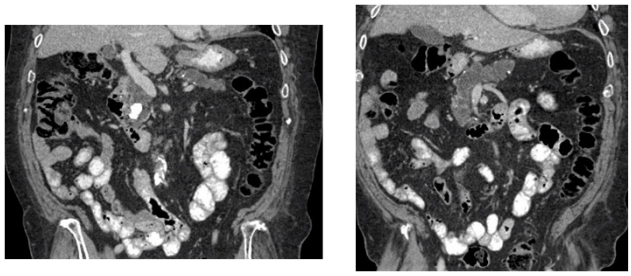
Löhr JM et al. UEGJ 2017
17 | Whitcomb DC, et al. Clin Transl Gastroenterol 2019

Obstructive

- **Ampullary stenosis**
- **Pancreas Divisum**
- **Localized mass** – MD-IPMN
- **Anatomic variants** – Choledochal cysts, anomalous pancreaticobiliary union, annual pancreas

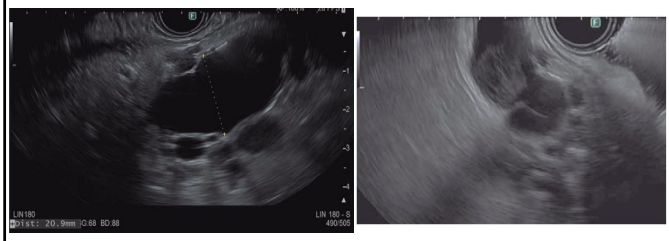
18 |

MD-IPMN with Pancreatic Duct Stones



Han S, et al. Pancreas 2019

MD-IPMN with Pancreatic Duct Stones



Han S, et al. Pancreas 2019

Thank you!!

Medical Pancreatology

Interventional Pancreatology

Translational Pancreatology

Pancreatic Endotherapy for Pancreatic Duct Strictures and Leaks

Shivangi Kothari, MD
Associate Professor, Medicine, Division of Gastroenterology/Hepatology
Associate Director of Endoscopy
University of Rochester Medical Center & Strong Memorial Hospital
Rochester, NY

Managing Stones in Chronic Pancreatitis

Jeff Easler, MD
Assistant Professor of Medicine
Indiana University School of Medicine
Director, Advanced Endoscopy Fellowship
Indianapolis, IN

Endoscopic Techniques and Devices to Optimize Organ Preservation:

Managing Stones in Chronic Pancreatitis

Jeffrey J. Easler, MD
Associate Professor of Medicine

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Disclosures

- Consultant, Boston Scientific Co.

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Learning Objectives

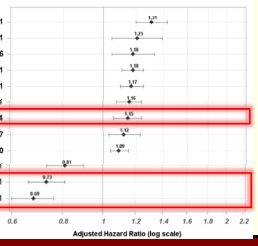
- Understand the role of endoscopic therapy in the multi-discipline management of symptomatic chronic pancreatitis
- Recognize the therapeutic options for symptomatic, obstructing pancreatic duct stones
- Recognize the risks, benefits and limitations of existing therapies for symptomatic pancreatic duct stones

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Readmission burden

- 26.7% 30-day readmission

Predictor		HR	95% CI	P
Clinical	Renal failure	1.31	(1.20-1.43)	<.0001
	Rheumatic disease	1.21	(1.05-1.39)	0.01
	Congestive heart failure	1.18	(1.05-1.33)	0.006
	Chronic anemia	1.18	(1.11-1.25)	<.0001
	Depression	1.17	(1.10-1.25)	<.0001
	Drug abuse	1.16	(1.06-1.24)	<.0001
	Abdominal pain	1.15	(1.06-1.24)	0.0004
	Psychosis	1.12	(1.03-1.23)	0.007
	Diabetes	1.09	(1.04-1.15)	0.0010
	Obesity	0.81	(0.73-0.90)	<.0001
	ERCP	0.73	(0.66-0.81)	<.0001
	Pancreatic Surgery	0.68	(0.60-0.76)	<.0001

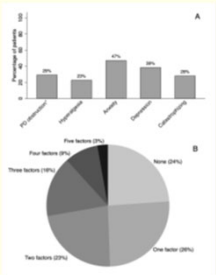


SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Shah R, et al. Pancreatology. 2018

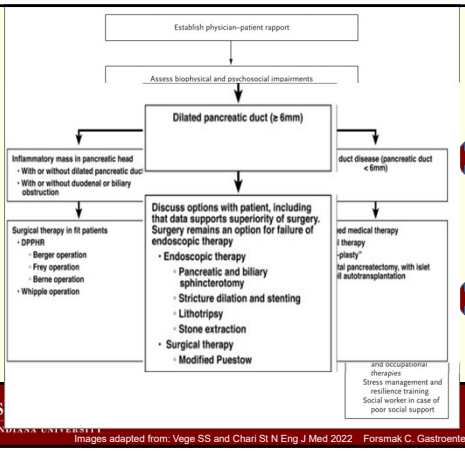
Managing Painful Chronic Pancreatitis

- Poor correlation between imaging findings and symptoms
- Pain processing/pattern, coping behaviors, anxiety, depression disproportionately impact patient reported outcomes (PROs)
- Data for endoscopic management of chronic pancreatitis is:
  - Low quality (*mostly* retrospective)
  - Heterogeneous: study design(s), metrics and PRO assessments
  - High placebo response (>25-30%)



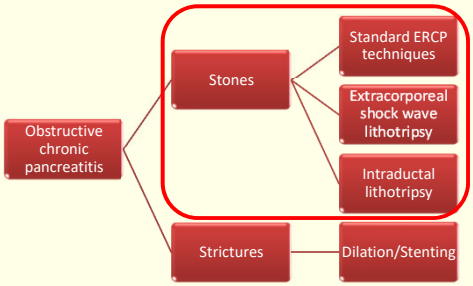
SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Oleson et al Gut 2021



Images adapted from: Vege SS and Chari St N Eng J Med 2022 Forsmak C. Gastroenterol 2013

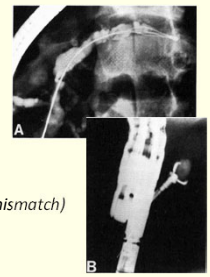
Non-Operative Management Options



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

"Standard" ERCP techniques

- Pancreatic sphincterotomy
- Serial stenting
- Stone fragmentation/extraction
  - Rat tooth forceps
  - Stone retrieval basket
  - Stone retrieval balloon
- Saline irrigation
- >6-7mm mechanical lithotripsy
  - *Technically difficult (… duct to equipment mismatch)*
  - *Adverse event profile (10% rate of basket entrapment)*



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Sherman S, Lehman GA, et al. GIE, 1991
Thomas M… Watkins JL, et al. Am J Gastro, 2007.

Complex* PD Stones Require Advanced Lithotripsy Technique(s)

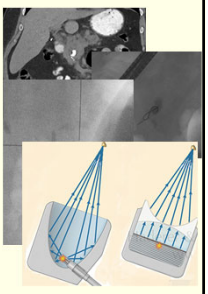
- *Complex PD Stones:
  - Size >5-6mm
  - Upstream from PD stricture
  - Inconvenient location (Peri-ampullary, Genu <<< Body of Pancreas)
- Non-mechanical lithotripsy techniques:
  - Extracorporeal shock wave lithotripsy (ESWL)
  - Single operator pancreatoscopy with intraductal lithotripsy (SOPIL)

Thomas M… Watkins JL, et al. Am J Gastro, 2007.

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Extracorporeal shock wave lithotripsy

- Preparation:
  - Pre-procedure KUB to confirm target **radiopaque**
  - If radiolucent on KUB, pre-procedure ERCP with stent placement
  - Usually need GA or epidural anesthesia… HOLD STILL!!
- Components
  - Generator spark plug-gap, piezoelectric or electromagnetic generator produces shock waves
  - Focusing System converging energy on stone
  - Aqueous, coupling medium to transmit energy
  - Imaging System, ideally fluoroscopy
- Shocks- 90 waves/min, mean 2-3 sessions



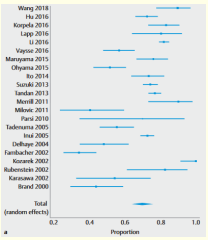
SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Haderer & Muller Biomedical Art, 2018.
Riditlid W, Fogel EL, Sherman S. Chronic pancreatitis, in ERCP The Fundamentals. 2015

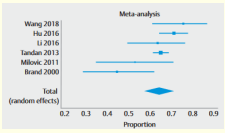
Efficacy of ESWL

(Meta-analysis: 22 studies, 3868 patients)

Ductal clearance, 69.8%



Absence of pain, 64.2%



Unclear Effectiveness:

- Exocrine and endocrine deficiency (10 studies, heterogenous metrics/definitions)
- Quality of life metrics (5 studies, heterogenous metrics/definitions

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

van Huijgevoort N, et al. Endoscopy International Open 2020.

Predictors for Technical Success of ESWL

- Stone morphology: smaller, lower density (<820.5 HU), solitary stones
- Location, Head
- Absence of PD stricture
- Rx at higher volume ESWL programs *(expertise)*
- ESWL performed by a gastroenterologist (over a urologist)
- Pancreatic stent placement
- *IV Secretin pre-peri-ESWL

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

van Huijgevoort et al Endosc Int Open 2020
*Choi et al. Pancreatology 2012.
Guesens D and Van Melnstein H. Acta Gastro-Enterologica Belgica 2021
Jaben et al Clin Gastronetrol Hepatol 2020

Safety and Complications of ESWL

Table 3. — Complication frequencies

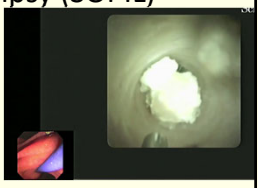
Complication	Frequency (43, 46)
Pancreatitis	4%
Infection	1.4%
Bleeding	0.3%
Steinstrasse	0.4%
Perforation	0.3%
Pancreatico-biliary fistula	0.1%
Other: splenic rupture, pancreatic fluid collection, perirenal hematoma, biliary obstruction, bowel perforation, liver trauma	Case reports

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Guesens D and Van Melnstein H. Acta Gastro-Enterologica Belgica 2021

Single operator pancreatoscopy with intraductal lithotripsy (SOPIL)

- ERCP pancreatic duct access with a…
- Digital single-use cholangiopancreatoscope
- Therapy targeted at stone under direct visualization within the main pancreatic duct
- Intraductal stone fragmentation with
  - Laser light energy (Holmium laser)-> absorbed by the stone target for the purposes of lithotripsy
  - Spark within an aqueous media generates electrohydraulic shockwaves -> impact against the stone surface for lithotripsy



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Efficacy of SOPIL

(Meta-analysis: 10 retrospective studies, 302 patients)

Table 3 Efficacy and safety of per-oral pancreatoscopy: electrohydraulic lithotripsy versus laser lithotripsy.

	Electrohydraulic Lithotripsy (EHL)		Laser Lithotripsy (LL)		*P* value
	Pooled Rate (95% CI)	Heterogeneity (I^2)	Pooled Rate (95% CI)	Heterogeneity (I^2)	
Technical Success (%) * 91.1%	85.92% (95% CI 66.35 to 94.97) [6 studies, n = 124]	61.30	97.74% (95% CI 92.42 to 99.35) [4 studies, n = 161]	0.00	0.0509
Clinical Success (%)	76.16% (95% CI 55.61 to 89.07) [5 studies, n = 44]	61.19	96.32% (95% CI 82.88 to 99.30) [3 studies, n = 111]	48.68	0.1430
Single Lithotripsy Success (%) * 62.1%	46.18% (95% CI 20.96 to 73.52) [3 studies, n = 36]	69.67	60.49% (95% CI 25.28 to 87.39) [3 studies, n = 111]	90.64	0.5573
Adverse Events (%) * 8% PEP	10.24% (95% CI 4.60 to 21.26) [6 studies, n = 71]	0.00	7.09% (95% CI 3.59 to 13.54) [3 studies, n = 111]	0.00	0.4542

* Entire Cohort

Trend, but no significant difference in EHL vs ILL technique

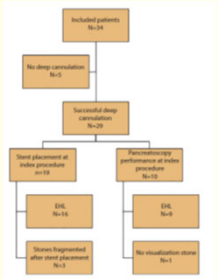
McCarthy

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

PELSTONE Study

- Prospective Study of SOPIL for PD stones
- Consecutive patients, no prior ERCP/ESWL
- Median 2 (IQR 2) ERCP procedures
- Clinical success 72%
  - Mean Izbick pain score decline from 59.8-> 27.2 (p=0.002)
  - 14/22 >50% decrease Izbicki pain score
- AE 40% (26% PEP rate)
  - All received rectal NSAID PPx

Technical success 71% (n=25/34), 92% when PD access secured



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Van der Wiel et al. Gastrointest Endosc 2022

Lessons Learned from PELSTONE: Dr. Marco J. Bruno, IECP SIG DDW 2022

- Index procedure: cannulation, stent insertion
  - Not insignificant proportion (9%, PRESTONE cohort) of complex PD stones can be extracted after period of stenting alone
  - Assists with subsequent delivery of PD stones across strictures
  - Creates ease at second procedure for free-hand PD cannulation/ cholangiopancreatoscope advancement
- Given high rate of PEP, consider:
  - Detailed, careful pre-procedure consent
  - Judicious irrigation
  - Systematic use of PEP prophylaxis (PR NSAIDs, Prophylactic PD Stent)

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

ESGE 2018 guidelines

- ESWL for clearance of MPD stones >5 mm and ERCP for MPD stones <5 mm (strong)
- ERCP after ESWL reserved after no spontaneous clearance of PD stones *(weak)*
- SOPIL when ESWL not available or ineffective *(weak)*

Dumonceau et al. Endoscopy. 2019..

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

ESWL versus SOPIL

- Theoretical advantages of SOPIL over ESWL
  - Direct visualization → improved targeting
  - Radiolucent stones cannot be targeted with ESWL
  - AE's of ESWL include injury to adjacent organs
  - SOPIL seamlessly incorporated into ERCP
  - Access
- Comparative studies ?

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

A comparative study between single-operator pancreatoscopy with intraductal lithotripsy and extracorporeal shock wave lithotripsy for the management of large main pancreatic duct stones.
Bick B, Patel F, Easler J, Tong Y. Watkins JL, McHenry L, Lehman G, Fogel EL, Gromski MA, Sherman S.
Surg Endoscopy 2022

- Retrospective, comparative case series of SOPIL vs ESWL
  - Consecutive patients managed at IU 2013-2019
  - MPD stones ≥5 mm
  - Managed with SOPIL or ESWL-ERCP
- Outcomes:
  - Technical success: stone fragmentation and clearance
    - Cross-over between ESWL to SOPIL based on MD discretion
  - Total # procedures
  - Pain : decrease in VAS or subjective improvement in pain
  - Post procedure EPI resolution; cessation of PERT

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Baseline characteristics

	All patients (N=258)	ESWL (n=240)	SOPIL (n=18)	p value
Stone and pancreas anatomy				
Stone location (%)***				
Head	213 (82.6%)	196 (81.7%)	17 (94.4%)	0.329
Neck	30 (11.6%)	28 (11.7%)	2 (11.1%)	1.000
Body	38 (14.7%)	32 (13.3%)	6 (33.3%)	0.033
Tail	9 (3.5%)	8 (3.3%)	1 (5.6%)	0.484
Number of main duct stones, mean (SD)	1.3 (0.7)	1.3 (0.7)	1.7 (1.0)	0.036
Single stone (%)	198 (76.7%)	185 (77.7%)	11 (61.1%)	0.267
3 or more stones present (%)	15 (5.8%)	11 (4.6%)	4 (22.2%)	0.014
Largest stone size (mm), mean (SD)	10.0 (4.5)	10.0 (4.2)	10.3 (7.4)	0.770
Presence of parenchymal stones (%)	166 (64.3%)	152 (63.3%)	14 (77.8%)	0.217
Downstream pancreatic duct stricture (%)	140 (54.3%)	133 (55.4%)	7 (38.9%)	0.174
Largest pancreatic duct diameter (mm), mean (SD)	7.3 (2.8)	7.2 (2.8)	8.2 (2.6)	0.152

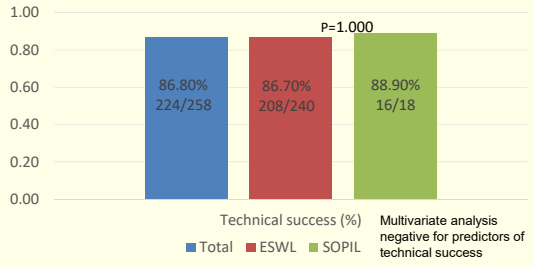
SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Baseline characteristics

	All patients (N=258)	ESWL (n=240)	SOPIL (n=18)	p value
Procedure history				
Prior ERCP (%)	165 (64.0%)	151 (62.9%)	14 (77.8%)	0.120
Prior pancreatic sphincterotomy [%]	121 (46.9%)	107 (44.6%)	14 (77.8%)	0.006
Prior failed stone extraction [%]	25 (9.7%)	18 (7.5%)	7 (38.9%)	<0.001
PD stent prior to lithotripsy [%]	90 (34.9%)	77 (32.1%)	13 (72.2%)	<0.001
Prior failed lithotripsy [%]	14 (5.4%)	7 (2.9%)	7 (38.9%)	<0.001
Prior failed ESWL [%]	10 (3.9%)	3 (1.3%)	7 (38.9%)	<0.001
Prior failed SOPIL [%]	4 (1.6%)	4 (1.7%)	0	0.278

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

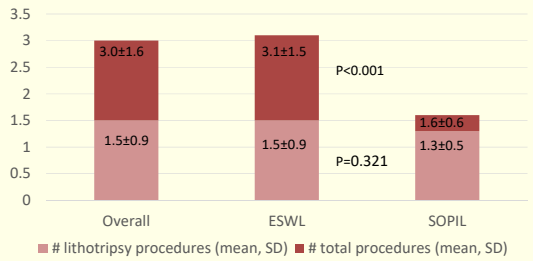
Main outcomes, ESWL vs SOPIL



Multivariate analysis negative for predictors of technical success

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

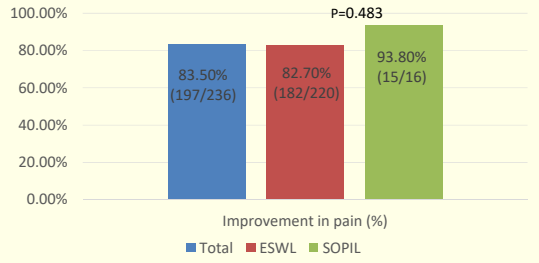
Main outcomes, ESWL vs SOPIL



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

SOPIL over ESWL (OR 5.2, p=0.017), smaller stones (OR 2.04, p=0.025) associated with fewer procedure

Clinical outcomes, pain improvement



SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Successful stone clearance predicted pain improvement OR 93.5, p <0.001)

Adverse events, ESWL vs SOPIL

	All patients (N=258)	ESWL (n=240)	SOPIL (n=18)	p value
Adverse events related to any procedures (%)	16 (6.2%)	15 (6.3%)	1 (5.6%)	1.000
Post-ERCP/Post-ESWL pancreatitis	12 (4.7%)	11 (4.6%)	1 (5.6%)	
Ascending cholangitis	1 (0.4%)	1 (0.4%)	0	
GI bleeding	1 (0.4%)	1 (0.4%)	0	
Symptomatic hematoma	1 (0.4%)	1 (0.4%)	0	
Adverse events at index lithotripsy session (%)	6 (2.3%)	5 (2.1%)	1 (5.6%)	0.355
Post-procedure admission (%)	49 (19.0%)	45 (18.8%)	4 (22.2%)	0.755

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Ongoing Randomized, Prospective Studies

- IU, Single Center, ESWL vs SOPIL-EHL –
  - Status: 19 Enrolled/Undergoing Study Procedures
- U of Colorado lead site, Multicenter, ESWL vs SOPIL-EHL or ILL

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Painful Chronic Pancreatitis with Obstruction: Surgery Versus Endotherapy

- Mendieta PJO et al. Meta-analysis, 3 existing RCTs, 199 patients
  - Surgery superior for complete *long term* pain relief (35.7 vs 16.4%, p=0.02)
  - No difference for short term (28.1 vs 17.5%-p=0.15) or long term (41.1 vs 34% p=0.42) partial pain relief
  - No differences in complications (p=0.50), days of hospitalization (p=0.21)

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Mendieta PJO et al. Surg Endosc 2021

Painful Chronic Pancreatitis with Obstruction: Surgery Versus Endotherapy

- *Based on comparative studies with surgery*:
  - Pancreatic therapy (surgical, endoscopic) should be offered in a setting of multidiscipline expertise
  - An operative approach should be discussed with ***all*** patients
- Offer surgery ***over endotherapy*** ….
  - Good candidate for an operation (age, comorbidities)
  - Desires a single intervention
  - Poor candidate for ESWL/ERCP approach*
  - Recurrent of symptomatic, pancreatic duct obstruction following endotherapy
  - Multi-focal, simultaneous regions of obstruction from chronic pancreatitis (e.g. biliary, duodenal stricture)

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Conclusions

- Select patients with painful chronic pancreatitis carefully for interventions… not appropriate for all
- ESWL and SOPIL are effective options for clearance of large PD stones
- While ESWL alone can be effective, ERCP should be paired with ESWL to ensure complete resolution of PD obstruction
- ERCP same day with ESWL is feasible and effective

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Conclusions

- A SOPIL approach may offer fewer procedures, shorter procedure time in select patients
- SOPIL approach may associate with a high risk for PEP (*PELSTONE study*)
- Surgery is an excellent early choice for many patients with chronic pancreatitis and symptoms from obstruction

SCHOOL OF MEDICINE
INDIANA UNIVERSITY

Evolving Pancreatoscopy Techniques for Organ Preservation

Raj Shah, MD
Professor of Medicine
Director, Pancreaticobiliary Endoscopy
University of Colorado
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, Colorado

Optimizing Success to Remove Large Biliary Stones

Paul Leonor, MD
Assistant Professor of Medicine
Interventional Gastroenterology
Division of Gastroenterology and Hepatology
Loma Linda University
Loma Linda, CA

Optimizing Success in Removing Large Bile Duct Stones

Paul Leonor, MD
Assistant Professor of Medicine
Division of Gastroenterology & Hepatology
Interventional Endoscopy, Loma Linda University

LOMA LINDA UNIVERSITY HEALTH

Many Strengths. One Mission.

Disclosures

» **None**

Introduction

» The majority of bile duct stones can be removed via standard biliary sphincterotomy and balloon extraction
  - However, upwards of 10-15% of patients will have difficult, complicated stones

Yasuda I, Itoi T, Dig Endosc. 2013

Difficult Stones

- Stone Characteristics
  - Multiple Stones
  - Stones > 1 cm
  - Proximal to stricture, intrahepatic stones
- Anatomic Factors
  - Surgically altered anatomy

Difficult Stones

- Stone Characteristics
  - Multiple Stones
  - **Stones > 1 cm**
  - Proximal to stricture, intrahepatic stones
- Anatomic Factors
  - Surgically altered anatomy

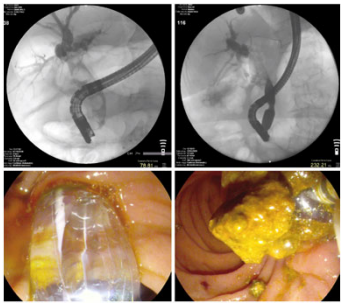
Large Stones

- Endoscopic sphincterotomy (ES) + Large Papillary Balloon Dilation (LPBD)
- Lithotripsy
  - Mechanical Lithotripsy (ML)
  - Cholangioscopy-guided Lithotripsy
    - Electrohydraulic Lithotripsy (EHL) or Laser Lithotripsy (LL)

Large Papillary Balloon Dilation

- Large diameter balloon (12-20 mm)
  - Maximum dilation diameter should not exceed diameter of distal duct
  - Held inflated for about 30-60 seconds after disappearance of waist
- Can be performed with or without sphincterotomy
  - Can possibly increase risk of pancreatitis without sphincterotomy, however in limited data on LPBD alone, risk appears to be similar

Park SJ, Kim JH, Hwang JC, et al. Dig Dis Sci 2012
Jeong S, Ki SH, Lee DH, et al. Gastrointest Endosc 2009



Grande G, Cocca S, Bertani H et al. World J Gastrointest Endosc. 2021

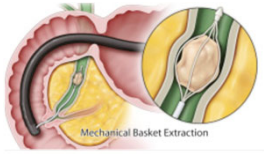
Large Papillary Balloon Dilation

- EST+LPBD vs. EST alone
  - Overall success rate: 96.5% vs 95.3%, P = .141
  - Lower pancreatitis risk when combined (8.3% vs 12.7%, OR 1.60, P < .001)
- LPBD + EST vs. LPBD alone
  - Overall success rate 97.2% vs 96.5%, P = .432
- LPBD+EST may reduce need for ML
  - 3/5 RCTs showed reduced need for ML while 2 showed similar need

Kim JH, Yang MJ, Hwang JC, et al. World J Gastroenterol 2013

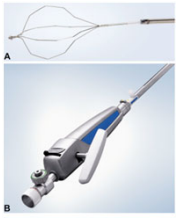
Mechanical Lithotripsy

» Involves use of a wire basket to grasp stone and handle to withdraw basket into sheath, resulting in crushing force to stones within basket

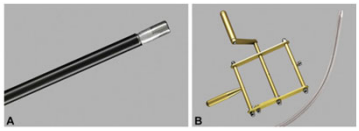


Buxbaum J, Sahakian A et al. Gastrointest Endosc. 2017

Mechanical Lithotripsy



Olympus



Cook Medical

Mechanical Lithotripsy

» Leads to complete bile duct clearance in 80-90% of cases [1]
- 20-30% require more than one session

» Less likely to be successful with impacted or larger stones
- Case series of 209 patients with median stone diameter = 18 mm
  - For stones >25 mm, rate of successful stone clearance fell from 87.6% to 67.6%

Garg PK, Tandon RK et al. Gastroinst Endsoc. 2004
Schneider MU, Matek W. Endoscopy. 1988

Mechanical Lithotripsy

- Similar rates of standard ERCP risks including bleeding, infection, perforation, cholangitis, pancreatitis as other techniques
- Most feared adverse event is entrapment of the basket within bile duct
  - In one retrospective study of 643 cases:
    - 29 lithotripsy-related AE (11 cases of trapped/broken baskets, 8 traction wire fracture, 7 broken handle and 3 perforation or duct injury) in 23 patients (3.6%)
    - Almost all treated endoscopically with salvage or alternative lithotripsy techniques, extension of sphincterotomy or stent placement, while only one case required surgery

Thomas, M, Howell, UA, Am J Gastroenterol. 2007

Cholangioscopy-guided Lithotripsy

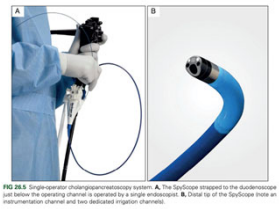


FIG 20.5 Single-operator cholangiopancreatoscopy system. **A**, The SpyScope strapped to the duodenoscope just below the operating channel is operated by a single endoscopist. **B**, Distal tip of the SpyScope (note an instrumentation channel and two dedicated irrigation channels).

SpyGlass Direct Visualization System (Boston Scientific)

Electrohydraulic Lithotripsy

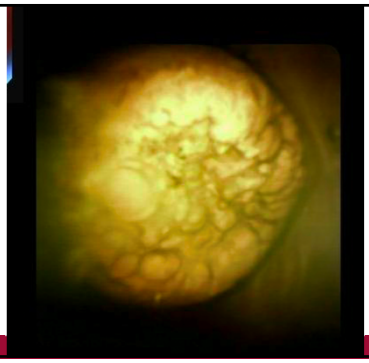
- Uses bipolar probe and a charge generator to transmit charge across electrodes and produce a spark

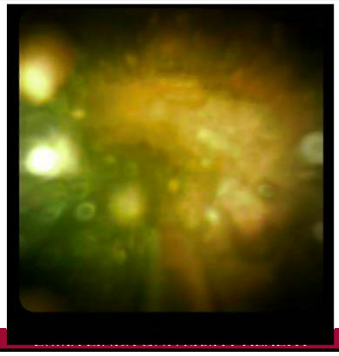
Northgate Technologies

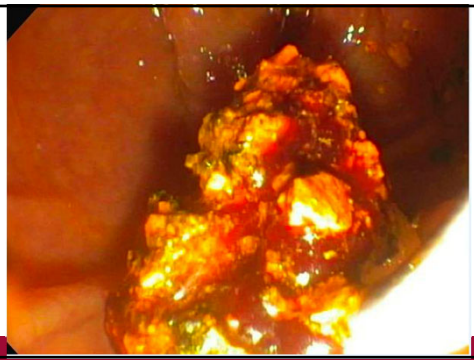
Electrohydraulic Lithotripsy

- Causes expansion of surrounding fluid and oscillating shock wave of pressure leading to stone fragmentation

Northgate Technologies







Laser Lithotripsy

- Focus laser light of a high-power density on the surface of a stone creating a plasma of a gaseous collection of ions and free electrons that oscillates and induces waves fracturing the stone surface
  - Holmium:yttrium aluminum garnet (YAG) lasers commercially available (Lumenis Inc.)
- Relatively precise targeting that may reduce risk of injury to surrounding tissue

Watson RR, Parsi, MA et al. VideoGIE 2018

Cholangioscopy-guided Lithotripsy

- Overall success rate of EHL or LL exceeds 90%
- RCT of 60 patients with stones >10 mm to cholangioscopy-guided laser lithotripsy (42 patients) or conventional therapies (18 patients), the latter including balloon/basket extraction, mechanical lithotripsy and papillary dilation
  - Successful clearance of 93% of patients undergoing cholangioscopy compared to 67% using conventional therapy only (p = 0.009)

Korrapati, P.; Ciolino, J et al. Endosc Int 2016
Buxbaum J, Sahakian A et al. Gastrointest Endosc. 2017

Cholangioscopy-guided Lithotripsy

- No prospective head to head trials of EHL vs LL yet, however retrospective data suggest similar efficacy
  - Choice between two likely depends more on local availability

Questions?

Biliary Cannulation Techniques: Advanced is now Conventional

Natalie Cosgrove, MD
Interventional Endoscopist
Digestive Health and Surgery Institute
AdventHealth Orlando Center for Interventional Endoscopy
Medical Director of Clinical Quality Safety in Gastroenterology
Orlando, FL

BILIARY CANNULATION TECHNIQUES: ADVANCED IS NOW CONVENTIONAL

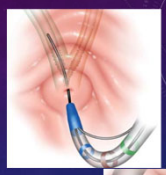
NATALIE COSGROVE, MD
ADVENT HEALTH ORLANDO CIE
ORLANDO, FL

DISCLOSURES

- Consultant Boston Scientific

REMEMBER THE BASICS!

- Remember where you are headed! Good orientation is key!
- In most cases:
  - Approach from below (inferior to) the papilla
  - Aim left upper quadrant of papilla, towards 11-12 O Clock[2]
- May need to use several techniques for success
  - Will depend on your comfort, expertise, case specifics



Edmundowicz, et al. Wire-guided cannulation Technique Guide. Boston Scientific, 2007.
2 den Winkel, et al. Biliary cannulation in endoscopic retrograde cholangiography: how to tackle the difficult papilla. Digestive diseases. 2020.

DOUBLE WIRE TECHNIQUE

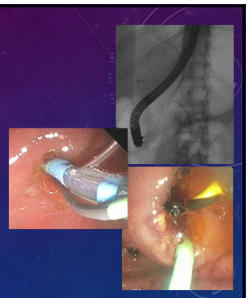
- **Approach-**
  - Wire placed into the pancreatic duct
  - Biliary access achieved with second wire into CBD
    - Cannulate OVER pancreatic duct wire
    - Advance pancreatic duct stent deep in the main duct to decrease risk of dislodgement during cannulation
- **Theoretical benefit:**
  - "Straightens" the pancreatic duct and common channel (->helps straighten S shaped distal CBD), "blocks" the pancreatic orifice, stabilizes the papilla and lifts towards working channel

Video courtesy of Dr Muhammad Hasan

Franzo, et al. Compilation of techniques for successful biliary cannulation. Am J Gastro. 2017.
Herreros de Tejada, et al. Double-guidewire technique for difficult bile duct cannulation: a multicenter randomized controlled trial. GIE 2009.
Laquiere, et al. Early double-guidewire versus repeated single-guidewire technique to facilitate selective bile duct cannulation: a randomized controlled trial. Endoscopy 2022.
Ito, et al. Can pancreatic duct stenting prevent post-ERCP pancreatitis in patients who undergo pancreatic duct guidewire placement for achieving selective biliary cannulation? A prospective randomized controlled trial. J gastroenterol. 2010.

DOUBLE WIRE TECHNIQUE

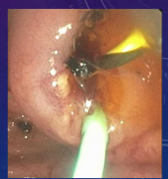
- **Not good to attempt unless you already accessed pancreatic duct!**
  - Increases risk of PEP without improving success of cannulation (in meta-analysis)[1]
    - 25% failure rate of PD cannulation in RCT[2]
    - Repeated attempts at PD cannulation to perform this technique may worsen pancreatitis risk
- "Consider doing this technique if the wire inadvertently enters the pancreatic duct (especially if difficult cannulation or *repeated* PD cannulation)"
- **ALTHOUGH EARLIER USE MAY BE BETTER?**
  - Randomized trial of double wire (*at **FIRST** inadvertent PD cannulation*) versus continued attempts at biliary cannulation[3]
    - Early double guidewire use = faster biliary cannulation (10.4 vs 6 min, p<0.003)
    - No difference in adverse events



1 Tse, et al. Double-guidewire technique n difficult biliary cannulation for the prevention of post-ERCP pancreatitis a systematic review and meta-analysis Endoscopy 2017
2Herreros de Tejada, et al. Double-guidewire technique for difficult bile duct cannulation: a multicenter randomized controlled trial. GIE 2009.
3 Laquiere, et al. Early double-guidewire versus repeated single-guidewire technique to facilitate selective bile duct cannulation: a randomized controlled trial. Endoscopy 2022.

DOUBLE WIRE TECHNIQUE

- Prophylactic pancreatic duct stent should be placed over pancreatic wire prior to wire removal[1,2]
  - **In studies:**
    - PD stenting over wire successful in 86-91% pts[3]
    - Decreases PEP rates by 20-25%[2] to single digits!
  - Consider placing PD stent at procedure conclusion to decrease risk of stent dislodgement[3]



1 Nguyen-Tang, et al. Double-guidewire technique for difficult bile duct cannulation: why not insert a pancreatic duct stent? 2010
2 Ito, et al. Can pancreatic duct stenting prevent post-ERCP pancreatitis in patients who undergo pancreatic duct guidewire placement for achieving selective biliary cannulation? A prospective randomized controlled trial. J gastroenterol. 2010.
3Papillary cannulation and sphincterotomy techniques at ERCP: ESGE Clinical Guideline 2016

CANNULATION OVER PD STENT

- Approach-
  - Plastic pancreatic duct stent placed -> biliary cannulation performed over pancreatic duct stent
    - Similar theoretical benefits as double wire
  - Pancreatic duct stent left in place to decrease PEP
    - Consider choosing longer pancreatic duct stent to decrease risk of dislodgement during cannulation attempts
- May not be as good as double wire
  - In randomized trial of double guidewire vs cannulation over 5Fr pancreatic duct stent (after unintentional PD cannulation)2:
    - Significantly lower selective CBD cannulation in stent group(54% vs 90%, p<0.001)
    - Higher need for needle knife access in stent group (45% vs 10%, p<0.001)

Garcia-Cano, et al. Common bile duct access in ERCP over a new plastic pancreatic duct stent after unintentional pancreatic guidewire cannulation. GIE 2016
2 Eminler, wire-guided cannulation over a pancreatic stent method increases the needle for needle-knife precutting with difficult biliary cannulations. GIE 2019.

PRECUT ACCESS

"Use of needle knife to perform stepwise mucosa incision…in the direction of the bile duct until the biliary sphincter is visualized"

- **Precut papillotomy/sphincterotomy-**
  - Approach:
    - Needle tip extended 3–4 mm from the sheath
    - Needle engaged **at upper margin of papillary orifice**
    - Freehand cut with needle knife from papillary orifice upwards in 11-12 O'clock direction
      - Can perform over a pancreatic duct stent
    - Cannulate bile duct with guide wire then sphincterotome
    - Can extend cut with sphincterotomy

Video courtesy of Dr Raj Shah

Maroulgenis, et al. Needle knife fistulotomy versus needle knife precut papillotomy for the treatment of common bile duct stones. GIE 1999

PRECUT ACCESS

- P

When access to the pancreatic duct is easy to obtain, ESGE suggests placement of a pancreatic stent prior to precutting.

- **Benefits:**
  - **Stent can be guide for precutting**
  - **Decreases risk PEP**
- **In randomized trial of leaving PD stent in place versus removing[1]**
  - **PEP 4.3% LEAVING STENT vs 21.3% REMOVING STENT (p=0.027)**
  - *PD cannulation only successful in 62% pts with failed cannulation*
  - Failed stent placement = 13.8% PEP

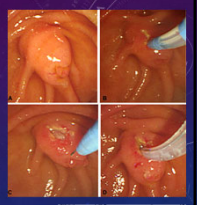
TABLE 2. Frequency of precut sphincterotomy–associated pancreatitis

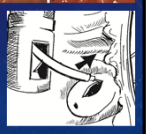
Group	No. of pancreatitis/total no. of patients (%)
Stent	a: 2/46 (4.3)
Stent removed	b: 10/47 (21.3)
No stent	c: 8/58 (13.8)

Che, et al. Does leaving a main pancreatic duct stent in place reduce the incidence of pre cut biliary sphincterotomy-associated pancreatitis? A randomized, prospective study. GIE 2013.

PRECUT ACCESS

- **Precut Fistulotomy-**
  - Approach:
    - Free hand cut starts **ABOVE orifice at roof of papilla (stays separate)**
      - Junction of upper 1/3 and lower 2/3 of papillary roof
      - At bulging portion of intraduodenal segment[3]
    - Repeated shallow incisions until bile or sphincter visible
      - At least 5 mm from orifice), towards 11-12 O clock direction
    - Cannulate via fistulotomy site
      - Extend site (if needed) with sphincterotome/ dilation balloon



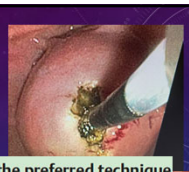


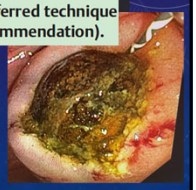
1 Maharshi, et al. Early precut versus primary precut sphincterotomy to reduce post ERCP pancreatitis: randomized controlled trial. GIE 2021.
2 Cennamo, et al. Can early precut implementation reduce endoscopic retrograde cholangiopancreatography-related complication risk? Meta-analysis of randomized controlled trials. Endoscopy 2010.
3 Jang, et al. Primary needle-knife fistulotomy versus conventional cannulation method in a high-risk cohort of post-ERCP Pancreatitis. AJG. 2020.
4 Papilla cannulation and sphincterotomy techniques at ERCP: ESGE Clinical Guideline 2016

PRECUT ACCESS

- **Precut Fistulotomy-**
- *Good for cases where the CBD intraduodenal segm*
- *or im*
- *Theoretically avoids pancreatic orifice injury*
  - Several studies with decreased rates of PEP for precut fistulotomy vs papillotomy[4]

ESGE recommends needle-knife fistulotomy as the preferred technique for precutting (moderate quality evidence, strong recommendation).





1 Maharshi, et al. Early precut versus primary precut sphincterotomy to reduce post ERCP pancreatitis: randomized controlled trial. GIE 2021.
2 Cennamo, et al. Can early precut implementation reduce endoscopic retrograde cholangiopancreatography-related complication risk? Meta-analysis of randomized controlled trials. Endoscopy 2010.
3 Jang, et al. Primary needle-knife fistulotomy versus conventional cannulation method in a high-risk cohort of post-ERCP pancreatitis. AJG. 2020.
4 Papilla cannulation and sphincterotomy techniques at ERCP: ESGE Clinical Guideline 2016

PRECUT ACCESS

- Generally considered last resort after other failed cannulation attempts[1]
  - Risk factor for PEP
- However…Is precut itself the problem, or the prolonged cannulation attempts leading up to it?

1 Maharshi, et al. Early precut versus primary precut sphincterotomy to reduce post ERCP pancreatitis: randomized controlled trial. GIE 2021.
2 Cennamo, et al. Can early precut implementation reduce endoscopic retrograde cholangiopancreatography-related complication risk? Meta-analysis of randomized controlled trials. Endoscopy 2010.
3 Jang, et al. Primary needle-knife fistulotomy versus conventional cannulation method in a high-risk cohort of post-ERCP pancreatitis. AJG. 2020.
Facciorusso, et al. Comparative efficacy of different methods for difficult biliary cannulation in ERCP: a systematic review and network meta-analysis. GIE 2022.

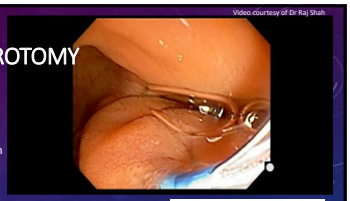
PRECUT ACCESS

- **May be safe (AND BETTER) for EARLY use (*in expert hands*)**
  - In meta-analysis of randomized trials of early pre-cut (in expert hands) vs "standard persistent"[2]: (Included both fistulotomy and papillotomy)[2]
- **May**
  - **ESGE suggests that precutting should be used only by endoscopists who achieve selective biliary cannulation in more than 80% of cases using standard cannulation techniques. Endoscopists who do not reach such a success rate should not be doing precuts independently (low quality evi-**
    - Higher technical success in primary fistulotomy group (97.9 vs 89.7%, =0.005)
  - In randomized study of primary vs early papillotomy (only after 2 failed cannulation attempts)[1]
    - PEP LOWER in PRIMARY precut group (0.67% vs 5.2%, p =0.04), Despite no PD stents/indomethacin used!!
- ***BUT KEEP IN MIND: Studies done in expert hands, excluded certain papilla types***

1 Mahajan, et al. Early precut versus primary precut sphincterotomy to reduce post ERCP pancreatitis: randomized controlled trial. GIE 2021.
2 Cennamo, et al. Can early precut implementation reduce endoscopic retrograde cholangiopancreatography-related complication risk? Meta-analysis of randomized controlled trials. Endoscopy 2010.
3 Jang, et al. Primary needle-knife fistulotomy versus conventional cannulation method in a high-risk cohort of post-ERCP pancreatitis. AJG. 2020.

TRANSPANCREATIC SPHINCTEROTOMY

Video courtesy of Dr Raj Shah



- **Approach-**
  - After unintentional pancreatic access-> a sphincterotome in the PD is used to incise through the septum between the pancreatic duct and the common bile duct (cutting towards 11-12 O'Clock position)
  - Wire guided over PD wire (not freehand)
  - Place PD stent over wire after procedure
- *Effectively cuts the septum in between the pancreatic and CBD to "expose" the bile duct orifice*
- Theo**retical benefit:**
  - Location of incision relative to CBD more controlled than free hand (over wire)

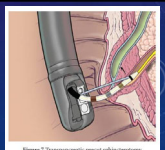


Figure 7 Transpancreatic precut sphincterotomy

1 Kylanpaa, et al. Transpancreatic biliary sphincterotomy versus double guidewire in difficult biliary cannulation: A randomized controlled trial. Endoscopy 2021.
2 Facciorusso, et al. Comparative efficacy of different methods for difficult biliary cannulation in ERCP: a systematic review and network meta-analysis. GIE 2022.

TRANSPANCREATIC SPHINCTEROTOMY

- Randomized multicenter study[1] of double wire vs TS (if unintentional PD cannulation AND difficult cannulation)
  - No difference in PEP (13.5% vs .16.2%, p=0.69)
    - No routine PD stents used in study
  - Higher biliary cannulation success rate for TS(84.6 vs 69.7%, p = 0.01)
- In meta-analysis of comparison RCT of difficult biliary cannulation techniques[2]:
  - TS superior to other methods for biliary cannulation success (low quality evidence)
- *Thought to be "safe and underutilized" technique*
  - *But unclear what learning curve/level of expertise needed is*[3]

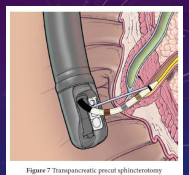
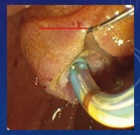


Figure 7 Transpancreatic precut sphincterotomy



1 Kylanpaa, et al. Transpancreatic biliary sphincterotomy versus double guidewire in difficult biliary cannulation: A randomized controlled trial. Endoscopy 2021.
2 Facciorusso, et al. Comparative efficacy of different methods for difficult biliary cannulation in ERCP: a systematic review and network meta-analysis. GIE 2022.
3 Martin. Transpancreatic sphincterotomy: "I don't get no respect" Digestive diseases and sciences, 2021

EUS RENDEZVOUS

- Approach:
  - Puncture CBD under EUS guidance (19G needle)
  - Correct position confirmed by bile aspiration, contrast injection
  - Advance guidewire antegrade through CBD->across ampulla-> into duodenum
  - Biliary cannulation either alongside or over wire with duodenoscope
- In meta-analysis[1]:
  - Technical success 86.1%
  - Pooled adverse events 14%
- Higher success reported with CBD puncture from D2[2]
- *Good for cases of distal obstruction (ampullary mass, distal CBD stricture)*

TABLE 4. Adverse Event Rates

Adverse Events	No. Studies	Rate (95% Confidence Interval) (%)
Adverse events	12	14 (10.5-18.4)
Pancreatitis	11	7.2 (4.5-11.4)
Cholangitis	11	2.3 (1.1-4.9)
Bile leak	11	3.3 (1.7-6.1)
Bleeding	11	2.1 (1-4.7)
Perforation	11	2.7 (1.3-5.4)
Peritonitis	11	2.3 (1.1-5)

1 Klair, et al. Effectiveness and safety of EUS rendezvous after failed biliary cannulation with ERCP: A systematic review and proportion meta-analysis. J clinic Gastroenterol. 2021.
2 Iwashita, et al. EUS-guided rendezvous for difficult biliary cannulation using a standardized algorithm: a multicenter prospective pilot study. DE. 2016.
Tsuchiya, et al. Endoscopic ultrasonography-guided rendezvous technique. Digestive Endoscopy 2016.

Endoscopic Drainage of Cholecystitis: Shifting Paradigm?

Todd Baron, MD
Division of Gastroenterology and Hepatology
Professor of Medicine
Director of Advanced Therapeutic Endoscopy
University of North Carolina Hospital
Chapel Hill, NC

Cholangiopancreatoscopy can Facilitate Organ Preservation

Urban Arnelo, MD
Professor of Endoscopic Surgery
Chief Department of Surgery
Umeå University Hospital
Umeå, Sweden

CHOLANGIOPANCREATOSCOPY CAN FACILITATE ORGAN PRESERVATION

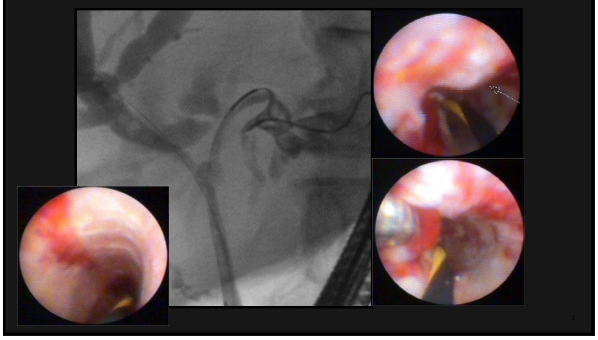
Urban Arnelo
Professor of Endoscopic Surgery
Chief Department of Surgery
Umeå University Hospital, Umeå, Sweden

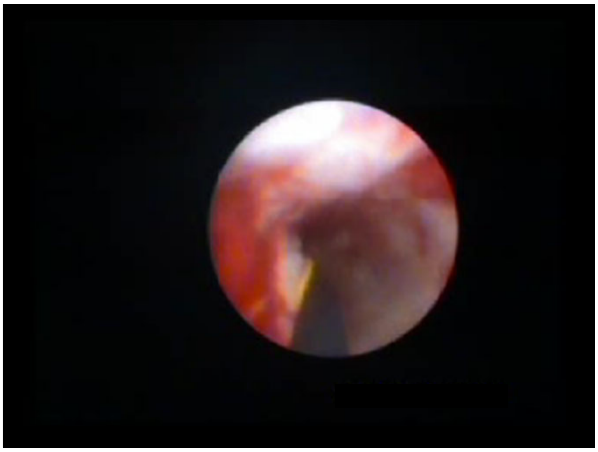
School of Medicine
UNIVERSITY OF COLORADO
ANSCHUTZ MEDICAL CAMPUS

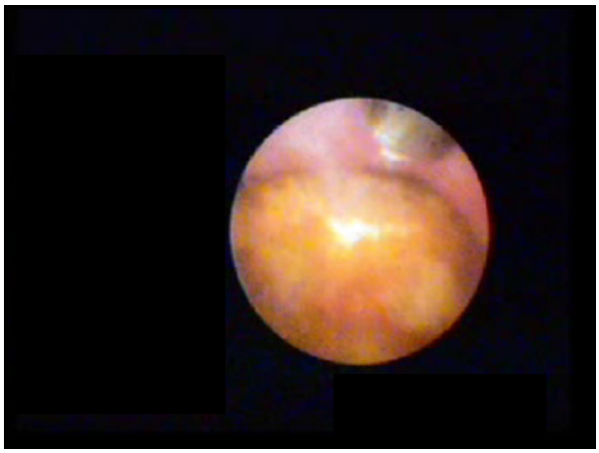
UMEÅ UNIVERSITY

The 17th RMIE Course
Sep 8-10, 2022

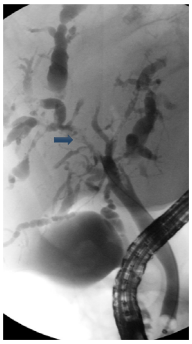
KLATSKIN – EXTENT OF GROWTH



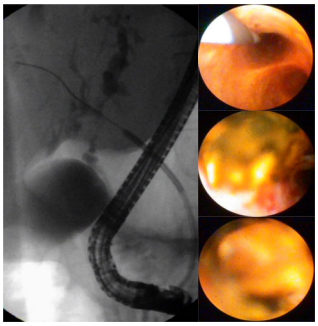




PSC PATIENT WITH DOMINANT STRICTURE



A possibly malignant stricture turned into a stone



5

BACKGROUND: MOTHER-BABY-SCOPY

Peroral cholangioscopy

Rösch & Demling, Endoscopy 1976

of value in

- indeterminate strictures

Bogardus et al, Am J Gastroenterol 1996

Seo et al & Fukuda et al, Gastrointest Endosc 2000 resp 2005

Wakai et al, World J Gastroenterol 2005

- difficult CBD stones (+laser/EHL)

Leung et al, BMJ 1989

Hixson et al & Arya et al, Am J Gastroenterol 1992 resp 2004

Binmoeller et al & Farrell et al, Endoscopy 1993 resp 2005

Okugawa et al, Gastrointest Endosc 2002

6

Slow development due to technological limitations

Mother-Baby system

Routine use, hampered by:
- Complex setup, 2 endoscopists

- Technically demanding procedure
- Partial steerability (2-way)
- Small working channel
  - Difficult irrigation
  - Sampling capasity limited
- Pancreas – limited access
- Scope fragility
- Time consuming and Expensive

Evaluation of early prototype 2003-2005

2004

Feasibility study of present system 2005-2006

Chen and Pleskow *GIE* 2007

Multicenter experience

Chen et al *GIE* 2011

Stockholm starts March 2007

Commercially available since Jan 2008

SpyGlass system

7

Scandinavian Journal of Gastroenterology. 2012; Early Online, 1–7

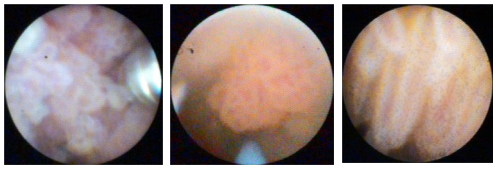
informa
healthcare

ORIGINAL ARTICLE

The clinicopathological spectrum and management of intraductal papillary mucinous neoplasm of the bile duct (IPMN-B)

MELROY A D'SOUZA, BENGT ISAKSSON, MATTHIAS LÖHR, LARS ENOCHSSON, FREDRIK SWAHN, LARS LUNDELL & URBAN ARNELO

Department of Clinical Science, Intervention, and Technology (CLINTEC), Division of Surgery, Karolinska Institutet, Karolinska University Hospital, Huddinge, Stockholm, Sweden

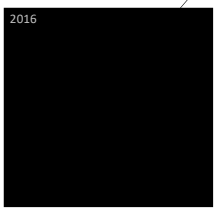


8

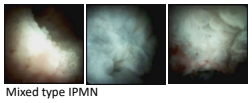
CHOLANGIOPANCREATOSCOPY

- Biliary

Biliary IPMN



- Pancreatic



Mixed type IPMN

Arnelo et al, Scand J Gastroenterol 2007
D'Sousa…Arnelo et al, Scand J Gastroenterol 2013
Urban, Arnelo et al, Gastroenterol Hepatol 2013
Arnelo et al, Pancreatology 2014
Arnelo et al, Endoscopy 2015
Lübbe, Arnelo et al, Endoscopy 2015
Löhr, Arnelo et al, UEGJ 2015
Urban…Arnelo et al, Gastroenterol Hepatol 2016
Sethi…Arnelo et al, Gastrointest Endosc 2016
Del Chiaro…Arnelo et al, Ann Surg Oncol 2017
Majeed…Arnelo et al, Scand J Gastroenterol 2018
Tyberg…Arnelo et al, J Clin Gastroenterol 2018
Reuterwall…Arnelo et al, BMC Gastroenterol 2019
Sethi …Arnelo et al, J Clin Gastroenterol 2020
Kahaleh … Arnelo et al, Dig Dis Sci 2021
Vehviläinen … Arnelo et al, Surg Endosc 2022

9

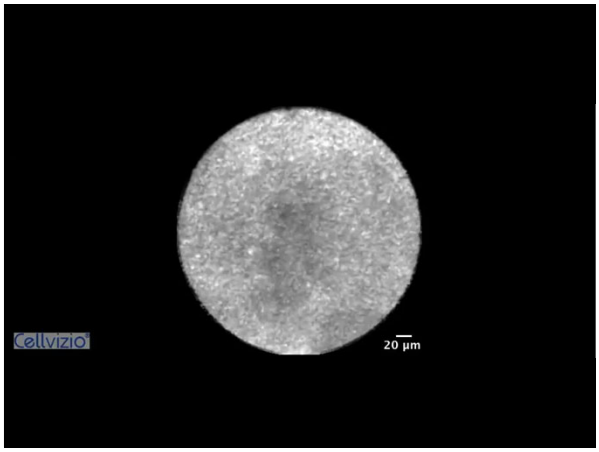
PROBLEMS TO BE SOLVED

- Despite DS and further improvements it is not enough!
- How to spot a cancer?

Pathologic vessels

Picture taken in Vilnius, Lithuania

10



EXAMPLE WHERE SPY INFLUENCED THE DECISION TO PERFORM SURGERY

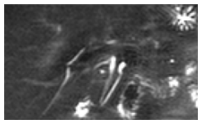
Pre-operative Peroral Pancreatoscopy

- 80 yrs old woman
- 8 mm MPD, mixed type IPMN suspected
- Borderline to tolerate major surgery due to comorbidities

12

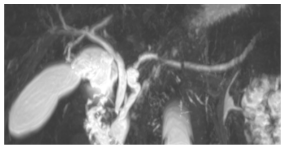
EXAMPLE WHERE SPY AVOIDED UNNECESSARY SURGERY

MRT 2003



- 69 yr old woman
- Irregular MPD with segmental dilatation
- Multidisciplinary treatment conference suggests a Whipple's procedure

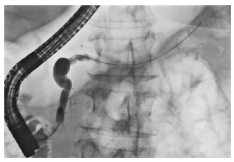
MRCP 2016



13

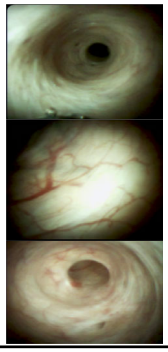
EXAMPLE WHERE SPY AVOIDED UNNECESSARY SURGERY (CONTINUED)

Pancreatogram 2017



Technically very good pancreatoscopy procedure, the entire duct is inspected. No signs of IPMN.

SpyGlass views



Corpus

Close up of vessels

Caput

14

CHOLANGIOPANCREATOSCOPY – INFLUENCES SURGERY?

Digital Pancreaticocholangioscopy for mapping of Pancreatico-Biliary Neoplasia: Can We Alter the Surgical Resection Margin ?

Surgical plan changed in **33%** (39/118)

AuthorBlock: *Amy Tyberg[1], Isaac Raijman[2], Ali Siddiqui[3], Urban Arnelo[4], Douglas G. Adler[5], Ming-ming Xu[1], Divyesh V. Sejpal[6], Prashant Kedia[7], Yun Nah Lee[8], Frank G. Gress[9], Reem Z. Sharaiha[1], Monica Gaidhane[1], Michel Kahaleh[1]*

[1]Weill Cornell Medical Center, New York, New York, United States; [2]Gastroenterology, Houston Medical Center , Houston, Texas, United States; [3]Gastroenterology, Thomas Jefferson University, Philadelphia, Pennsylvania, United States; [4]Gastroenterology, Karolinska Institut, Stockholm, Sweden; [5]Gastroenterology, University of Utah, Salt Lake City, Utah, United States; [6]Gastroenterology, North Shore LIJ, Long Island, New York, United States; [7]Gastroenterology, Methodist , Dallas, Texas, United States; [8]Gastroenterology, SoonChunHyang University School of Medicine, Seoul, Korea (the Republic of); [9]Gastroenterology, CUMC, New York, New York, United States;

J Clin Gastroenterol 2019;53:71–75

15

Accepted Manuscript online: 2022-06-03 Article published online: 2022-07-20

Systematic Review

Thieme

The role of pancreatoscopy in the diagnostic work-up of intraductal papillary mucinous neoplasms: a systematic review and meta-analysis

OPEN ACCESS

INFOGRAPHIC

What is the role of pancreatoscopy for IPMN?

- Limited accuracy of diagnostic imaging (CT, MRI, EUS, ERCP)
- Risk of over- or undertreatment

Methods: Meta-analysis: 25 articles

Results:

Diagnosis	Disease extent
Observation rate: 96% Diagnostic accuracy: 88%–100% Biopsy and cytology: improved accuracy	Altered clinical decision-making: 13%–62%
Invasiveness features	**Complications**
Coarse mucosa Friability Tumor vessels	Adverse event rate: 12% Pancreatitis: 10%

De Jong, et al. Endoscopy 2022
European Cholangioscopy study group

16

PANCREATOSCOPY AND ADVERSE EVENTS

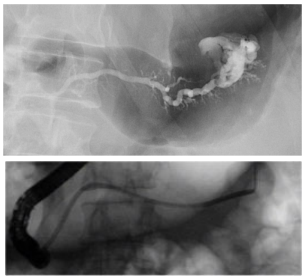
All studies n=210

Nagayoshi et al, J Hepatobil Pancreat Sci 2014
Arnelo et al, Pancreatology 2014
Parbhu et al, J Clin Gastroenterol 2017
El Hajj et al, GIE 2017
Ohtsuka et al, Pancreatology 2018
Trindade Endoscopy 2018

17

PROPOSALS TO OVERCOME THE PROBLEM

- 1) **Better patient selection (dilated MPD)**



A middle aged man with a MPD involvement of IPMN

18

PROPOSALS TO OVERCOME THE PROBLEM

- 3) **Second seanse pancreatoscopy**
  - In case of intact papilla and difficult cannulation
- 4) **Careful irrigation**
  - Minimize volume and use low rate of infusion, to prevent high intraductal preassure

Arnelo et al, Pancreatology 2014

Nagayoshi et al, J Hepatobil Pancreat Sci 2014

Trindade Endoscopy 2018

19

PROPOSALS TO OVERCOME THE PROBLEM

- 4) **Intraoperative pancreatoscopy**
  - 24 patients. Safe, effective, contributes to successful pancreatic surgery Kaneko et al, Arch Surg 1998
  - 1 patient. A good diagnostic tool, helps to decide resection margins Yelamali et al, Surg Endosc 2012
  - 23 patients. A help to enable appropriate resection. In 22% resection was extended Pucci et al, J Gastrointestinal Surg 2014
  - 21 patients. Plays a significant role in the surgical management. Modified the type of surgery in 24%

Navez et al, J Am Coll Surg 2015

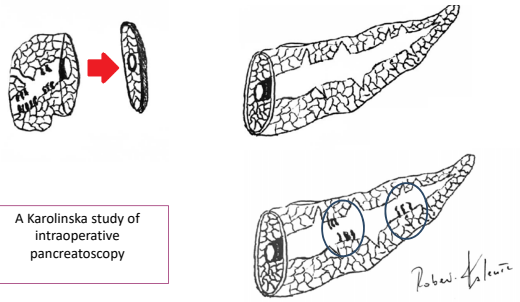
20

INTRAOPERATIVE PANCREATOSCOPY WILL BE MORE COMMON?

Pancreatoscopy helps in tailoring the resection?
- Organ preserving
- Extended (more radical)

21

FROZEN SECTION DURING PANCREATO-DUODENECTOMY FOR IPMN



A Karolinska study of intraoperative pancreatoscopy

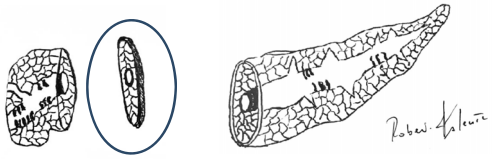
Drawings are not to be used prior to publication, R Valente©

22

Sigmoidoscopy for sigma polyps

23

FROZEN SECTION CORRESPOND TO THE DISEASE STATUS OF PLANNED REMNANT?



Drawings are not to be used prior to publication, R Valente©

24

Frozen section useful?

Author, Year	Study design	N patients	% pancreas remnant recurrence with negative frozen section	% pancreas remnant recurrence with positive frozen section	p
Tamura K(1), 2014	Retrospective Cohort	49	N/A	N/A	NS
Fujii T (2), 2010	Retrospective cohort	103	7.8	10.7	NS
Marchegiani G (3), 2015	Retrospective cohort	360	14	25	0.008
Pea A (4), 2016	Retrospective cohort	260	N/A	N/A	0.032
White R (5), 2007	Retrospective cohort	78	2	17	0.02
Park J (6), 2011	Retrospective cohort	103	N/A	N/A	NS
Nara S (7), 2009	Retrospective cohort	130	N/A	N/A	NS
Landa I (8), 2009	Retrospective cohort	89	12.3	3.3	NS
Long KM (9), 2012	Meta-analysis (non invasive IPMNs)	701	3.7	9.5	0.01
Miller JR (10), 2011	Retrospective cohort	191	N/A	N/A	NS
Moriya T (11), 2012	Longitudinal Level II Cohort study	203	7.8	0.5	NS
Bhardwaj (12) N, 2016	Meta-analysis	1488	N/A	N/A	NS
Yamaguchi J (13), 2016	Retrospective cohort	36 unifocal 19 multifocal	3.4 20	28.6 22.2	0.03 NS
Kang MJ (14), 2014	Retrospective cohort	366	10.4	12.1	NS
Frankel T (15), 2013	Retrospective cohort	192	13	31	0.002
Kourafas D (16), 2015	Retrospective cohort	87	N/A	N/A	0.001
Yogi T (17), 2015	Retrospective cohort	153	N/A	N/A	0.03

25

AIM

- To assess the diagnostic yield and clinical impact of intraoperative pancreatoscopy in operated IPMN patients

26

Methods

- Retrospective Cohort, Non Sponsored Study
- Single Center: Karolinska University Hospital
- Discussion in MDT Conference
- Ethical Approval

Inclusion Criteria:

- Surgical resection for suspect MPD involving IPMN
- Dilation of the MPD at preoperative imaging at least 5 mm

Exclusion Criteria:

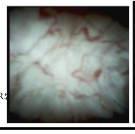
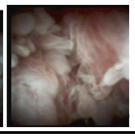
- Non dilated duct
- Age< 18 years old

27

Methods

- All included patients underwent:
  - frozen section analysis of the resected margin
  - Intraoperative Pancreatoscopy ± Biopsies

Pancreatoscopic findings:
  - Normal duct
  - Granular - "Finger-like" structures
  - Aspecific/nodular changes
  - Signs of neovascularization
  - Mucus presence assessment

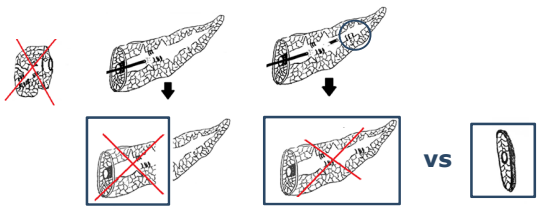
Methods

- Frozen section analysis **vs** histology in the **extended resection**

- Diagnostic yield of pancreatoscopy guided:
  - biopsy
  - visual impression/morphological description

29

Methods



Drawings are not to be used prior to publication, R Valente©

30

RESULTS

Total Patients	46
Male	24 (52.1%)
Mean age	67.3 yrs (45-82)
ASA1 ASA2 ASA3 ASA4	4 (8.6%) 18 (39.1%) 21 (45.6%) 3 (6.5%)
Pancreaticoduodenectomy Total Pancreatectomy Distal Pancreatectomy plus splenectomy	28 (60.8%) 14 (30.4%) 4 (8.6%)
Mean Hospital Stay (days)	18 (14-21)
Complications	15 (32.6%)
Pancreatoscopy related Complications	1 (2.1%)
Peroperative Mortality	0 (0%)
Reoperation	1 (2.1%)
Fistula B or C	0 (%)
Bleeding	3 (6.3%)
Clavien Dindo≥3	4 (8.2%)

RESULTS

Patients	46
Technical Success	43 (93.4%)
Mean lenght of dilated duct	7.5 cm (6.7-8.4)
Pancreatoscopy Findings	Mucus 12 (26%) Pathological Vessels 11 (23.9%) Exophytic Growth 19 (41.3%) Finger Like Projections 12 (26%)
Final Assessment of Possible Remnant IPMNs	17 (36.9%)
Change of planned procedure **Extended resection** **Spared parenchyma**	**30 (65.2%)** **20 (43.4%)** **10 (21.7%)**
Extension of PD margins Completing Total Pancreatectomy Completing Distal Pancreatectomy	7 (15.2%) 12 (26%) 1 (2.1%)
Pancreatoscopic biopsies	19 (41.3%)

32

RESULTS

Patients with extended resection	20
Frozen section	LGD 17 (85%) HGD 2 (10%) Cancer 0 (0%) Benign 1 (5%)
Final Histology on Extended Resection	LGD 11 (55%) HGD 6 (30%) pNET 1 (5%) Cancer 0 (0%) Benign 2 (10%)
Clinically relevant changes	7 (35%)

33

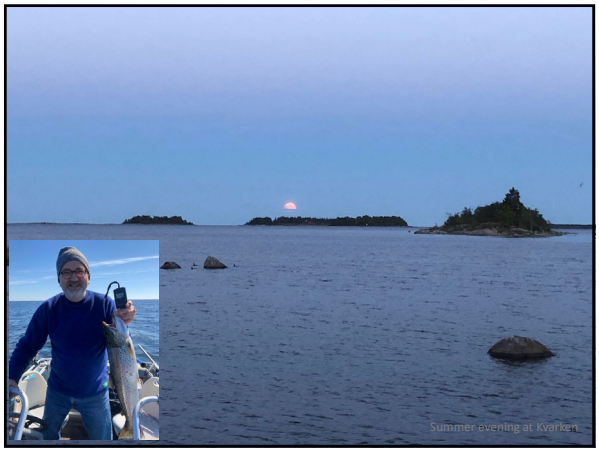
Pancreatoscopic features	Diagnostic Yield
Finger like projections	Sensitivity 42.8% Specificity 46.1% PPV 30.0% NPV 60.0%
Intraductal Exophytic growth	Sensitivity 57.1% Specificity 30.7% PPV 30.7% NPV 57.1%
Pathological vessels	Sensitivity 42.8% Specificity 53.8% PPV 33.3% NPV 63.6%
Mucus	Sensitivity 57.1% Specificity 69.3% PPV 50.0% NPV 75.0%
Operator assessment	Sensitivity 85.7% Specificity 23.0% PPV 35.5% NPV 75.0%
Frozen Section	Sensitivity 28.5% Specificity 92.3% PPV 66.6% NPV 70.5%

34

CONCLUSIONS

- Pancreatoscopy is feasible with high technical success
- Allows for early identification of MPD preneoplastic lesions such as main duct and mixed type IPMNs. Thus, helps in clinical decision-making/planning or even dictate the type of surgery
- Pancreatoscopy can safely be performed:
  - → During surgery i.e. Intraoperative Pancreatoscopy
  - → Peroral Pancreatoscopy, if MPD is dilated

35



Updates in Colon Cancer Screening

Swati Patel, MD
Associate Professor of Medicine
Director, Hereditary GI Cancer Center
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Updates in Colorectal Cancer Screening

Swati G. Patel, MD MS
Associate Professor of Medicine
Division of Gastroenterology & Hepatology Director,
Gastrointestinal Cancer Risk and Prevention Center
University of Colorado Anschutz Medical Center
Rocky Mountain Regional Veterans Affairs Medical Center
Swati.Patel@cuanschutz.edu

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

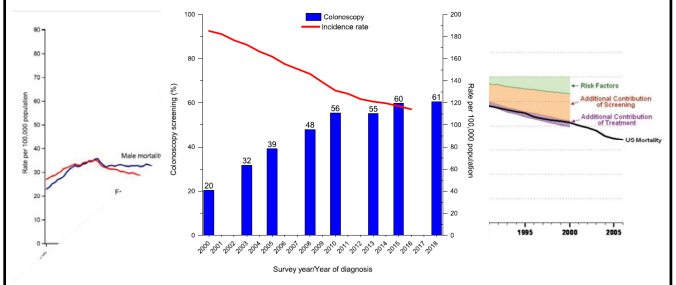
Disclosures

Olympus America (research support)

(NCCN Colorectal Cancer Screening Panel)
(US-MTSF on Colorectal Cancer)

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



Siegel et al. CA Cancer J Clin 2020;70:145-164.
Edwards et al. Cancer 2010;116:544-73.

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

The New England
Journal of Medicine

©Copyright, 1993, by the Massachusetts Medical Society

Volume 329 DECEMBER 30, 1993 Number 27

PREVENTION OF COLORECTAL CANCER BY COLONOSCOPIC POLYPECTOMY

Sidney J. Winawer, M.D., Ann G. Zauber, Ph.D., May Nah Ho, M.S., Michael J. O'Brien, M.D., Leonard S. Gottlieb, M.D., Stephen S. Sternberg, M.D., Jerome D. Waye, M.D., Melvin Schapiro, M.D., John H. Bond, M.D., Joel F. Panish, M.D., Frederick Ackroyd, M.D., Moshe Shike, M.D., Robert C. Kurtz, M.D., Lynn Hornsby-Lewis, M.D., Hans Gerdes, M.D., Edward T. Stewart, M.D., and the National Polyp Study Workgroup*

Colonoscopy and adenoma removal → 76-90% reduction in CRC incidence

Winawer et al. NEJM 1993;329:1977-81.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 FEBRUARY 23, 2012 VOL. 366 NO. 8

Colonoscopic Polypectomy and Long-Term Prevention of Colorectal-Cancer Deaths

Ann G. Zauber, Ph.D., Sidney J. Winawer, M.D., Michael J. O'Brien, M.D., M.P.H., Iris Lansdorp-Vogelaar, Ph.D., Marjolein van Ballegooijen, M.D., Ph.D., Benjamin F. Hankey, Sc.D., Weiji Shi, M.S., John H. Bond, M.D., Melvin Schapiro, M.D., Joel F. Panish, M.D., Edward T. Stewart, M.D., and Jerome D. Waye, M.D.

Colonoscopy and adenoma removal → 53% reduction in CRC mortality

Zauber et al. NEJM 2012;366:687-96.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Effectiveness of screening colonoscopy in reducing the risk of death from right and left colon cancer: a large community-based study

Annals of Internal Medicine

ORIGINAL RESEARCH

Colonoscopy and Colorectal Cancer Mortality in the Veterans Affairs Health Care System

A Case–Control S

Annals of Internal Medicine

ORIGINAL RESEARCH

Long-Term Colorectal Cancer Incidence and Mortality After a Single Negative Screening Colonoscopy

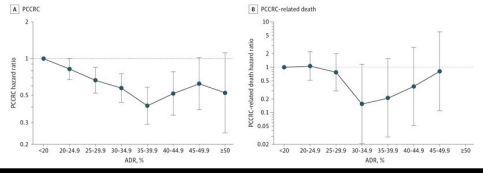
University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp

JAMA | Original Investigation

Association of Physician Adenoma Detection Rates With Postcolonoscopy Colorectal Cancer

Joanne E. Schottinger, MD; Christopher D. Jensen, PhD; Nirupa R. Ghai, PhD; Jessica Chubak, PhD; Jeffrey K. Lee, MD; Aruna Kamineni, PhD; Ethan A. Halm, MD; Celette Sugg-Skinner, PhD; Natalia Udaltsova, PhD; Wei K. Zhao, MPH; Rebecca A. Ziebell, BS; Richard Contreras, MS; Eric J. Kim, MS; Bruce H. Fireman, MA; Charles P. Quesenberry, PhD; Douglas A. Corley, MD



Shottinger et al. JAMA 2022;327(21):2114-22.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp

Serrated polyp detection and risk of interval post-colonoscopy colorectal cancer: a population-based study

David E F W M van Toledo, Joep E G IJspeert*, Patrick M M Bossuyt, Arne G C Bleijenberg, Monique E van Leerdam, Manon van der Vlugt, Iris Lansdorp-Vogelaar, Manon C W Spaander, Evelien Dekker*

Posted on August 11, 2022

ADR Isn't the Only Game in Town: Proximal Serrated Lesion Detection Rates Predicts Interval Cancer Risk

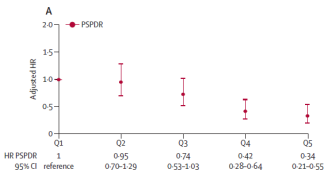
Swati G. Patel, MD, MS

Associate Professor of Medicine
University of Colorado Anschutz Medical Center; Rocky Mountain Regional Veterans Affairs Medical Center, Denver, Colorado

This summary reviews: van Toledo DEFWM, IJspeert JEG, Bossuyt PMM, et al. Serrated polyp detection and risk of interval post-colonoscopy colorectal cancer: a population-based study. Lancet Gastroenterol Hepato 2022; 7(8):747-54. https://pubmed.ncbi.nlm.nih.gov/35550250/

Correspondence to Swati G. Patel, MD, MS. Associate Editor. Email: EBG@gi.org

Swati Patel, MD
Associate Editor



Toledo et al. Lancet Gastroenterol & Hepatol 2022;7(8):747-54.
Patel SG. Evid Based GI Aug 2022.

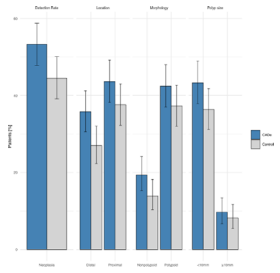
University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp

Original research

Artificial intelligence and colonoscopy experience: lessons from two randomised trials

Alessandro Repici,[1,2] Marco Spadaccini,[1,2] Giulio Antonelli,[3,4] Loredana Correale,[2] Roberta Maselli,[1,2] Piera Alessia Galtieri,[2] Gaia Pellegatta,[2] Antonio Capogreco,[1,2] Sebastian Manuel Milluzzo,[5] Gianluca Lollo,[6] Dhanai Di Paolo,[7] Matteo Badalamenti,[2] Elisa Ferrara,[2] Alessandro Fugazza,[2] Silvia Carrara,[2] Andrea Anderloni,[2] Emanuele Rondonotti,[7] Arnaldo Amato,[7] Andrea De Gottardi,[6] Cristiano Spada,[5] Franco Radaelli,[7] Victor Savevski,[8] Michael B Wallace,[9] Prateek Sharma,[10,11] Thomas Rösch,[12] Cesare Hassan[3]



Repici et al. Gut 2022;71:757-65.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Image based		
CT capsule	X-ray imaging capsule; emits low-dose X-ray beams by a rotating miniature electric motor in the colon; bowel preparation is not required	Radiation dose equivalent to an X-ray; large capsule can be difficult to swallow; delayed transit can cause incomplete exam (if exceeds battery time)
MR colonography	Uses MR-based imaging of the colon; allows for the evaluation of extracolonic findings and cancer metastases; advantages over CTC are the absence of ionizing radiation	Incidentally found extracolonic findings lead to downstream testing and treatment; requires bowel preparation and colon distention with air; contraindicated in those with metallic implants; no sedation or anaesthesia required; generally safe

Shaukat & Levin. Nat Rev Gastroenterol & Hepatol 2022:19:521-531.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

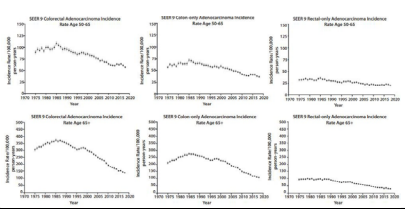
Two major gaps in CRC screening in US

- Rising burden in young
- Low adherence to screening, particularly in young

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



Patel et al. Gastroenterol 2022;162(1):285-99.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

HEALTH

Chadwick Boseman died from colon cancer and was just 43. What's the risk for young people?

Grace Hauck, USA TODAY

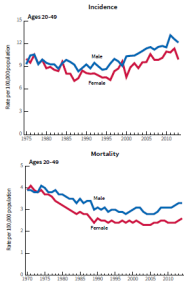
Published 3:24 p.m. ET Aug. 29, 2020 | Updated 5:20 p.m. ET Aug. 29, 2020

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

- 2nd most common cancer, 3rd leading cause of cancer-related death
- 51% increase in incidence 1994-2014
- 11% increase in mortality 2005-2015
- 75-90% occur between ages 40-49
- For those age < 55 from 1989-1990 vs 2012-2013
  - Colon: 11.6% 16.6%
  - Rectal: 14.6% 29.2%



Seigel et al. JAMA 2017;318(6): 572-74.
Bhandari et al. J Inv Med 2017; 65(2): 311-15.
Bailey et al. JAMA Surg 2015;150(1):17-22.
Fairley et al. Cancer 2006; 107(1):153-61.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

National Comprehensive **NCCN Guidelines Version 2.2021**

NCCN Guidelines Index
Table of Contents

Population	Recommendation	Grade
Adults aged 50 to 75 years	The USPSTF recommends screening for colorectal cancer in all adults aged 50 to 75 years. See the "Practice Considerations" section and Table 1 for details about screening strategies.	A
Adults aged 45 to 49 years	The USPSTF recommends screening for colorectal cancer in adults aged 45 to 49 years. See the "Practice Considerations" section and Table 1 for details about screening strategies.	B
Adults aged 76 to 85 years	The USPSTF recommends that clinicians selectively offer screening for colorectal cancer in adults aged 76 to 85 years. Evidence indicates that the net benefit of screening all persons in this age group is small. In determining whether this service is appropriate in individual cases, patients and clinicians should consider the patient's overall health, prior screening history, and preferences.	C

Joseph C. Anderson, MD,[5,6] Carol A. Burke, MD,[7] Jason A. Dominitz, MD, MHS,[8] Seth A. Gross, MD,[9] Brian C. Jacobson, MD, MPH,[10] Aasma Shaukat, MD, MPH,[11] and Douglas J. Robertson, MD, MPH[5]

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

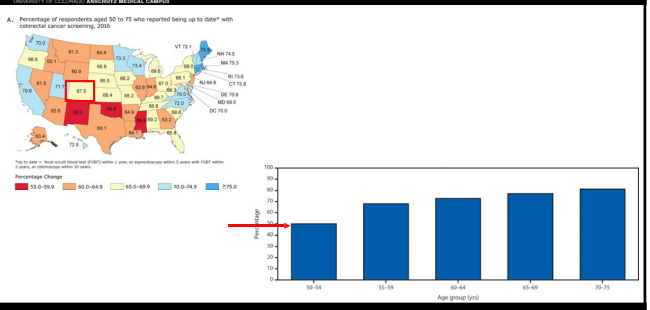
Under Section 2713 of the Affordable Care Act, private health plans must provide coverage for a range of preventive services and **may not impose cost-sharing** (such as copayments, deductibles, or co-insurance) on patients receiving these services.

Insurers must cover evidence-based services for adults that have a rating of "A" or "B" in the current recommendations of the United States Preventive Services Task Force (USPSTF).

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



Joseph et al. Prev Chronic Dis 2018;15:170535.
Joseph et al. MMWR 2020;69(10);253-59.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Blood tests	Stool-based tests	Structural Tests
Septin9	Guaiac Fecal occult blood testing (gFOBT)	CT Colonography
Others	Fecal Immunochemical Testing (FIT)	Barium Enema
	FIT-Fecal DNA	Flexible Sigmoidoscopy
		Colonoscopy
		Capsule Colonoscopy

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp

Which is the *best* test?

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp

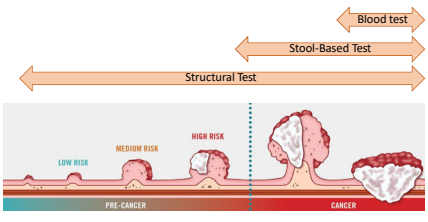
Disease
- High burden
- Detectable in pre-clinical phase
- Early detection improves survival

Screening Test
- Optimal test characteristics
- Acceptable & affordable
- Accessible

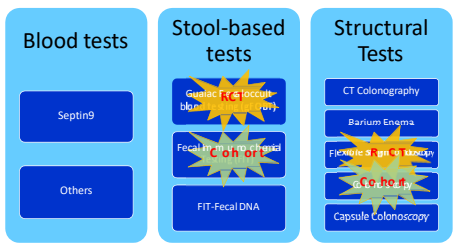
Successful Screening Program

University of Colorado Anschutz Medical Campus

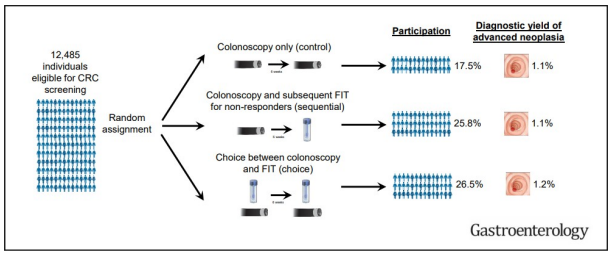
Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp



University of Colorado Anschutz Medical Campus



	Cancer Sensitivity	Advanced Adenoma Sensitivity	Advanced Serrated Lesion Sensitivity
FIT	75-80%	15-44%	5.1%
FIT + Fecal DNA	92%	25-27%	42%
Colonoscopy	>99%	97%	85-90%
CT Colonography	>95%	86%	40-50%
Capsule	>95%	92%	33%



Pilonis et al. Gastroenterology 2021;160:1097-1105.

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

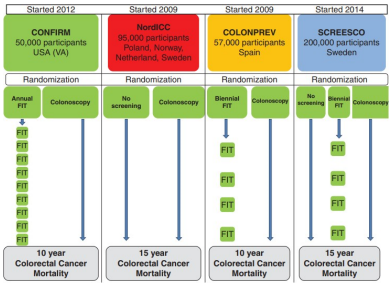
@swatigp

	Cancer Sensitivity	Advanced Adenoma Sensitivity	Advanced Serrated Lesion Sensitivity	Cost	Adherence
FIT	75-80%	15-44%	5.1%	$28	60-80%
FIT + Fecal DNA	92%	25-27%	42%	$500-600	70-90%
Colonoscopy	>99%	97%	85-90%	>$1000	50%
CT Colonography	>95%	86%	40-50%	>$1000	?
Capsule	>95%	92%	33%	>$1000	?

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



Robertson et al. Gut 2015;64:982-990.

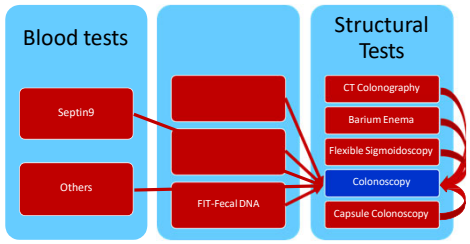
University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

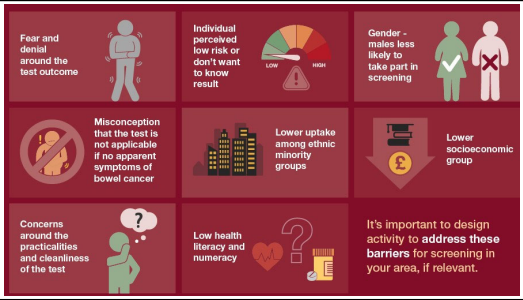
	Age to Start	Modality
USPSTF, 2021	Grade A: 50-75 Grade B: 45-49	hsFOBT, FIT, FIT-DNA, Colonoscopy, CTC, FS, FS+FIT
NCCN, 2021	Recommend ≥ 45	Colonoscopy, hsFOBT, FIT, FIT-DNA, FS, CTC
ACS, 2018	Strong recommendation: 50 Qualified recommendation: 45-49	FIT, FIT-DNA, hsFOBT, Colonoscopy, CTC, FS
USMSTF, 2021	Recommend 50-75 Suggest 45-49	Tier 1: Colonoscopy or FIT Tier 2: FS, FIT-DNA, CTC Tier 3: Capsule

University of Colorado Anschutz Medical Campus

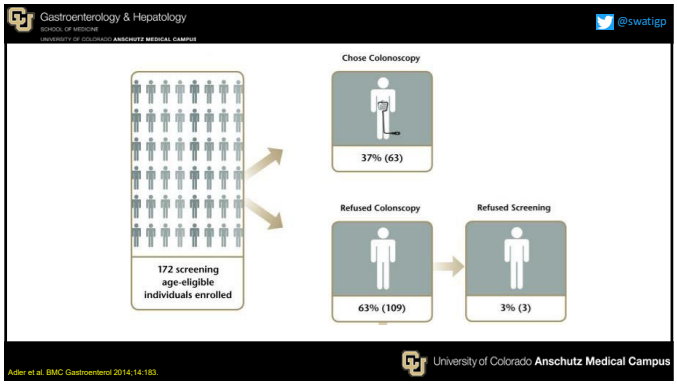


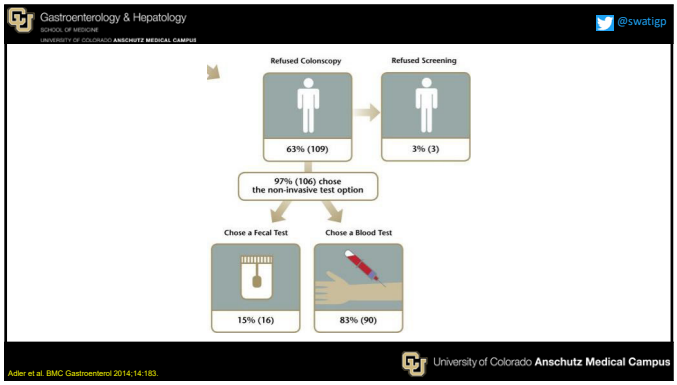
Under Se… Act, private health … range of preventi… st-sharing (such as c… urance) on …

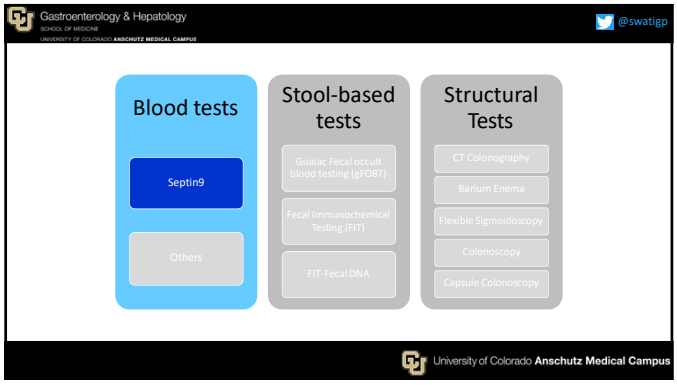
Insurers mus… have a rating of "A" or "B" in … ates Preventive Services Task Force (USPSTF).



https://phescreening.blog.gov.uk/2017/01/18/gps-can-help-patients-engage-with-bowel-cancer-screening

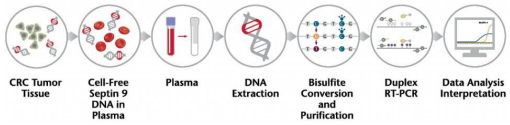

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp
Chose Colonoscopy
37% (63)
Refused Colonscopy
Refused Screening
172 screening age-eligible individuals enrolled
63% (109)
3% (3)
Adler et al. BMC Gastroenterol 2014;14:183.
University of Colorado Anschutz Medical Campus


Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp
Refused Colonscopy
Refused Screening
63% (109)
3% (3)
97% (106) chose the non-invasive test option
Chose a Fecal Test
Chose a Blood Test
15% (16)
83% (90)
Adler et al. BMC Gastroenterol 2014;14:183.
University of Colorado Anschutz Medical Campus


Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS
@swatigp
Blood tests
Septin9
Others
Stool-based tests
Guaiac Fecal occult blood testing (gFOBT)
Fecal Immunochemical Testing (FIT)
FIT-Fecal DNA
Structural Tests
CT Colonography
Barium Enema
Flexible Sigmoidoscopy
Colonoscopy
Capsule Colonoscopy
University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



	Overall Sensitivity	Stage Sensitivity	Advanced Adenoma Sensitivity	Specificity
mSEPT9	48.2%	I: 35.0% II: 63.0% III: 46.0% IV: 77.4%	11.2%	91.5%
mSEPT9, v2	68.0%	I-III: 64.0%	22.0%	80.0%

Church et al. Gut 2014;63:317-325.
Potter et al. Clinical Chemistry 2014;60:1183-1191.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Decision Memo for Screening for Colorectal Cancer - Blood-Based Biomarker Tests (CAG-00454N)

CMS will cover a blood-based test every 3 years if it meets all three criteria:

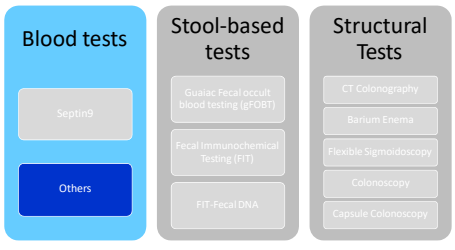
- ☑ FDA authorized for CRC screening
- ☑ Sensitivity ≥74%
- ☑ Specificity ≥90%

Decision Memo for Screening for CRC- Blood-Based Biomarker Tests (CAG-00454N) (cms.gov)

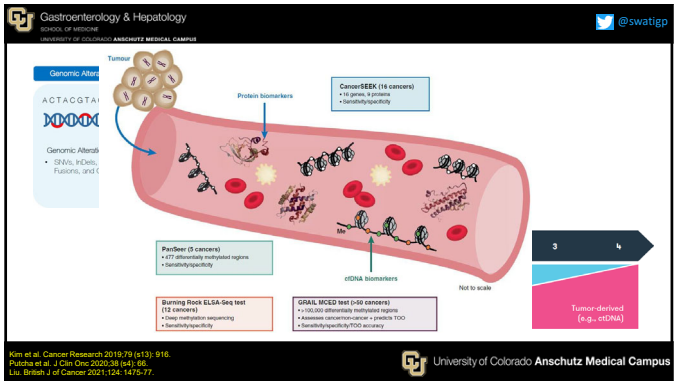
University of Colorado Anschutz Medical Campus

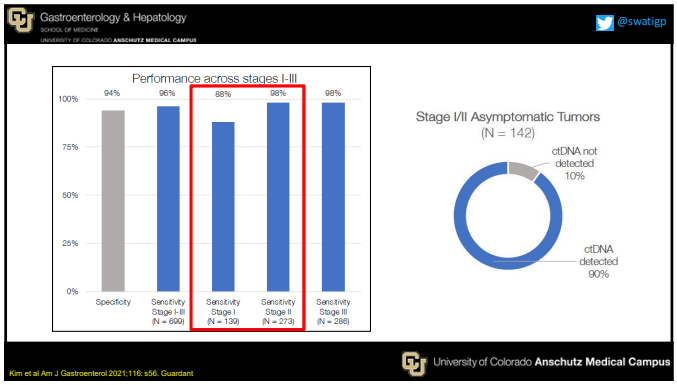
Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

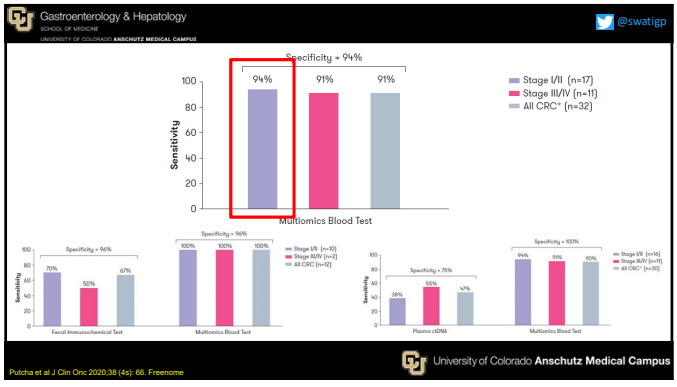
@swatigp



University of Colorado Anschutz Medical Campus

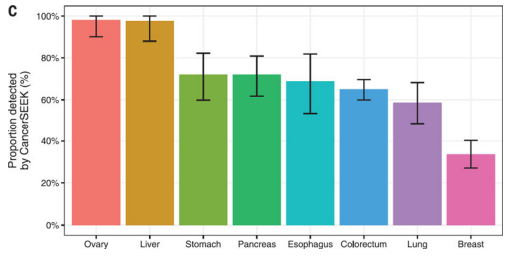

Gastroenterology & Hepatology
@swatigp
Tumour
Protein biomarkers
CancerSEEK (16 cancers)
ctDNA biomarkers
PanSeer (5 cancers)
Burning Rock ELSA-Seq test (12 cancers)
GRAIL MCED test (>50 cancers)
Not to scale
3
4
Tumor-derived (e.g., ctDNA)
Kim et al. Cancer Research 2019;79 (s13): 916.
Putcha et al. J Clin Onc 2020;38 (s4): 68.
Liu. British J of Cancer 2021;124: 1475-77.
University of Colorado Anschutz Medical Campus


Gastroenterology & Hepatology
@swatigp
Performance across stages I-III
100%
75%
50%
25%
0%
94%
96%
88%
98%
98%
Specificity
Sensitivity Stage I-III (N = 690)
Sensitivity Stage I (N = 130)
Sensitivity Stage II (N = 273)
Sensitivity Stage III (N = 286)
Stage I/II Asymptomatic Tumors
(N = 142)
ctDNA not detected 10%
ctDNA detected 90%
Kim et al Am J Gastroenterol 2021;116: s56. Guardant
University of Colorado Anschutz Medical Campus


Gastroenterology & Hepatology
@swatigp
Specificity = 94%
94%
91%
91%
Sensitivity
Multiomics Blood Test
Stage I/II (n=17)
Stage III/IV (n=11)
All CRC* (n=32)
Specificity = 96%
70%
50%
67%
Fecal Immunochemical Test
Specificity = 96%
100%
100%
100%
Multiomics Blood Test
Specificity = 75%
38%
55%
47%
Plasma ctDNA
Specificity = 100%
94%
91%
90%
Multiomics Blood Test
Putcha et al J Clin Onc 2020;38 (4s): 66. Freenome
University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



Cohen Science 2018;359:926-930. Exact Sciences

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

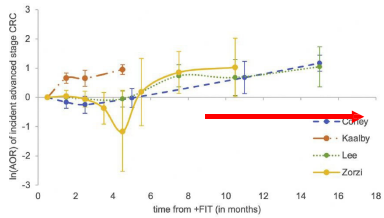
Challenges with 2-step screening

- Adherence to more frequent testing
- Cost
- Navigation to colonoscopy (same day for CTC, Capsule)
- Coverage for follow up colonoscopy
- Discordant results

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp



We suggest the following strategies to improve adherence to follow-up of a positive screening test: mail and phone reminders, patient navigation, and provider interventions	Conditional	Very low

Forbes et al. Clin Gastroenterol & Hep 2021;19: 1344-54.
Shaukat et al. Am J Gastroenterol. 2021;116:458-79.

University of Colorado Anschutz Medical Campus

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

January 11, 2022

"Must cover and **may not impose cost sharing** with respect to a **colonoscopy conducted after a positive non-invasive** stool-based screening test or direct visualization screening test for colorectal cancer for individuals described in the USPFTF recommendation."

Plans are required to implement the new USPFTF screening benefit for those 45 and older for plan or policy years beginning on or after May 31, 2022.

University of Colorado **Anschutz Medical Campus**

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

FIT-Fecal DNA + ❼Colonoscopy

–

	FIT-DNA Positive (n=205)	FIT-DNA Negative (n=1011)	Crude RR 95% CI
Colonoscopy Negative	"discordant"	"concordant"	
Aerodigestive Cancer During Follow-up	5 (2.4%)	11 (1.1%)	2.3 (0.8-6.6)

CONCLUSIONS: **In a retrospective study with a median follow-up time of 5.4 years, incident [illegible] cancers were uncommon among subjects with negative [illegible] of discordant or concord[illegible]**

Berger Clin Gastroenterol Hepatol 2020;18:864-871

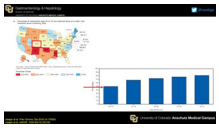
University of Colorado **Anschutz Medical Campus**

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Where I see things going

- Comparative data will be available soon (FIT vs colonoscopy)
- Value-based medicine ❼ population based screening models
  - The best test is the one that actually gets done by most of the population
- Colonoscopy isn't going anywhere…but it will be different
  - 2nd step test
  - Therapeutic test
  - Evolved quality metrics
- We will continue to struggle with
  - dyssynchronous 2 step tests
  - Cost to the system



University of Colorado **Anschutz Medical Campus**

Gastroenterology & Hepatology
SCHOOL OF MEDICINE
UNIVERSITY OF COLORADO ANSCHUTZ MEDICAL CAMPUS

@swatigp

Swati G. Patel, MD MS
Swati.Patel@cuanschutz.edu
@swatigp

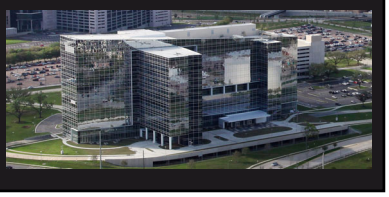
University of Colorado **Anschutz Medical Campus**

Large Colon Polyps: EMR, ESD, FTRD or Surgery

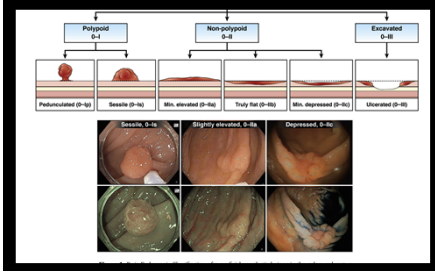
Mohamed Othman, MD
William T. Butler Endowed Chair for Distinguished Faculty
Professor of Medicine, Gastroenterology and Hepatology Section
Baylor College of Medicine
Chief, Gastroenterology Section at Baylor St Luke's Medical Center
Houston, TX

Large Colon Polyps: EMR, ESD, FTRD or Surgery

Mohamed Othman, M.D.
Chief of Gastroenterology Division, BSLMC
Professor of Medicine
Baylor College of Medicine



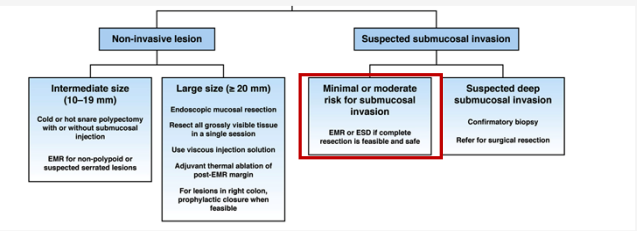
Paris Classification for Colon Polyps



- ❑ Endoscopic inspection classification
- ❑ Depressed lesions are associated with the highest risk of submucosal invasion

Kaltenbach T. et al, GIE, 2020

US Multi-Society Task Force



No clear distinction between EMR/ESD indications

Kaltenbach T. et al, GIE, 2020

Granular versus Non-Granular LST

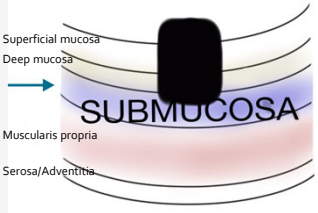
Lesion	Number	% submucosal invasion	P Value
Granular	311	10 (3.2)	<.001
Nongranular	98	15 (15.3)	
Mixed granular and nongranular	30	3 (10)	

Non-granular polyps have the highest risk of submucosal invasion

Moss A et al, Gastro , 2011

Endocut Q

Plane of Dissection



SP2811V01

EMR versus ESD

EMR ESD

EMR versus ESD

	EMR	ESD
Lesion size	Less than 20mm	No size limit
Complexity	simple	Complex (require advanced skills)
Curative	small lesions (less than 20 mm)	Yes, with careful selection of lesions without SM invasion
En-bloc R for lesions > 20 mm	No	Yes
Complications	Less compared to ESD	Higher rates than EMR
Procedure time	Shorter (20-40 minutes)	Longer than EMR (45-120 minutes)

Yahya Ahmed, Othman MO, Current Gastro Report, 2020

EMR versus ESD

	EMR	ESD
Pathology evaluation	No ability to assess the lateral margin in piece meal resection	Ability to assess lateral and deep margins in addition to lymphovascular invasion
Availability	Widely available	Selected tertiary referral centers
Manage recurrence	No	Yes
Recurrence for lesions >20 mm	High	Very low
Indicated in unusual lesions (diffuse, flat)	No	Yes
Learning curve	Short, flat	steep
Device Used	Injection needle, Cap and snare	Injection needle, cap, specialized knifes for dissection

Yahya Ahmed, Othman MO, Current Gastro Report, 2020

EMR versus ESD

	Total papers	Sample size (ESD)	Pooled proportions	Sample size (EMR)	Pooled proportions	RR (CI)	*P* value	Publication bias
En bloc resection	11	1641	89% (0.83-0.94)	1411	47% (0.36-0.59)	1.837 (1.464-2.305)	< 0.001	0.0025
Positive lateral margin	2	123	3% (0.01-0.06)	187	14% (0.09-0.19)	0.292 (0.089-0.995)	0.042	-
Positive vertical margin	1	38	5% (0.00-0.17)	83	1% (0.00-0.07)	4.368 (0.409-46.710)	0.223	-
Complete resection	8	918	82% (0.74-0.88)	1012	56% (0.34-0.77)	1.504 (1.041-2.174)	0.03	-
Lymphovsacular invasion	1	54	6% (0.03-0.13)	23	0% (0.00-0.04)	4.352 (0.248-76.483)	0.315	-
Mean procedural time	8	1087	-	838	-	72.709 (54.487-90.931)	< 0.001	-
Additional surgery	2	99	13% (0.07-0.21)	153	5% (0.02-0.09)	3.139 (1.360-7.243)	0.007	-
Perforation	18	19470	5% (0.03-0.09)	260901	0% (0.00-0.01)	7.597 (4.281-13.479)	< 0.001	0.301
Bleeding	14	20048	3% (0.02-0.04)	257065	3% (0.02-0.04)	1.277 (0.896-1.820)	0.175	0.139
Recurrences	12	1822	2% (0.01-0.03)	37721	10% (0.04-0.17)	0.269 (0.112-0.648)	0.003	0.725

Lim X et al , World Journal of Gastro,2021

R0 Resection Concept

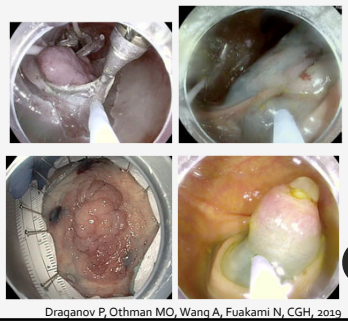
- R0 :resection for cure or complete remission.
- R1 : microscopic residual tumor
- R2 : macroscopic residual tumor.

- Hermanek P et al, Seminal Surg Oncol, 1994

SP2811V01

Example of lesions removed by colonic ESD

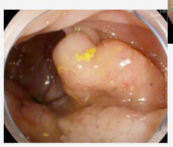
- Lateral spreading tumors:
  - Non granular
  - Granular >3cm
- Kudo VI-type pit pattern
- Large depressed-type tumors
- Large protruded-type lesions
- Mucosal tumors with submucosal fibrosis



Draganov P, Othman MO, Wang A, Fuakami N, CGH, 2019

Example of lesions removed by colonic ESD

- Sporadic localized tumors in conditions of chronic inflammation such as ulcerative colitis
- Local residual or recurrent early carcinomas after endoscopic resection



Challenges with colonic ESD

- ❑ Thin colon wall
- ❑ Limited expandability of the colonic submucosal space
- ❑ Colonic muscularis propria can be easily disrupted with inadvertent cauterization by the dissection knife or simply via pressure from the tip of the endoscope.
- ❑ Colonic looping
- ❑ Lesion's location behind folds or around flexures

Toolbox for Tissue Resection

- Electrosurgical Unit
- Injection devices
- Resection devices (Snares and Knifes)
- Hemostasis devices
- Ablation devices

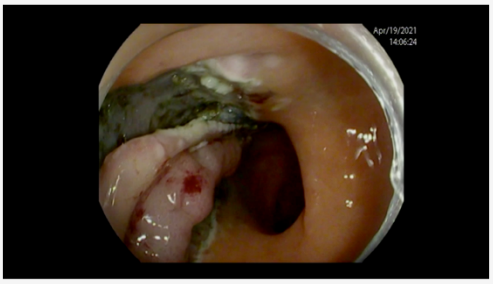
Facilitate Colonic ESD ⇦

- Traction devices
- Tissue Opposition Devices
- Stabilizing Device

Traction assisted ESD

- Lifting the mucosal flap in the oral side with an attachment fitted to the endoscope or outside the endoscope in order to allow space for adequate dissection under traction
- Requires working slightly far from the lesion margin to identify area of tension and plan for optimal dissection
- Benefit:
  - ✓Better visualization of the dissection plan
  - ✓Faster dissection
  - ✓Avoid deep muscle injury

Traction assisted ESD



Toolbox for Tissue Resection

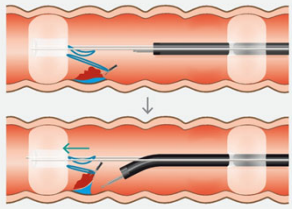
- Electrosurgical Unit
- Injection devices
- Resection devices (Snares & Knifes)
- Hemostasis devices
- Ablation devices
- Traction devices
- Tissue Opposition Devices
- Stabilizing Device

Stabilizing Devices
Double Balloon Device for Colonoscopy

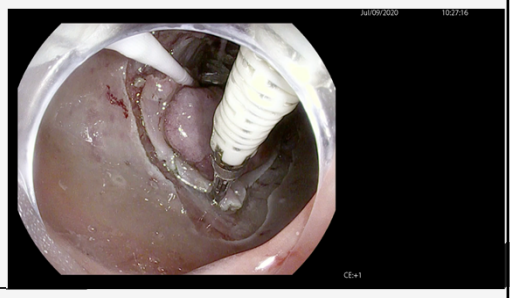
- Manipulation of colon anatomy for greater access
- Stabilization of the endoscope tip in relation to the intestinal wall
- Repeated removal and reinsertion of endoscope without losing position
- Visualization is improved, especially around flexures and folds
- Dynamic retraction of mucosal tissue during procedures

Dynamic Retraction

- Expedite the dissection time
- Avoid deep muscle injury
- Allow accurate dissection at the required depth in the submucosa

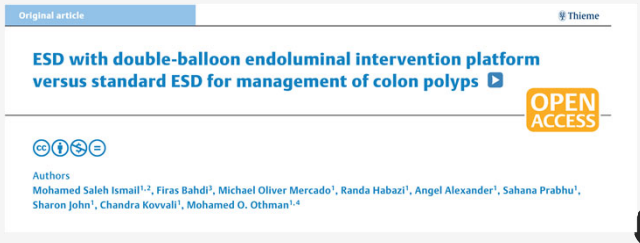


Dynamic Traction with Flexible Grasper



Othman et al, video GIE, 2021

ESD Using DEIP versus standard ESD



Original article

Thieme

ESD with double-balloon endoluminal intervention platform versus standard ESD for management of colon polyps

OPEN ACCESS

Authors
Mohamed Saleh Ismail[1,2], Firas Bahdi[3], Michael Oliver Mercado[1], Randa Habazi[1], Angel Alexander[1], Sahana Prabhu[1], Sharon John[1], Chandra Kovvali[1], Mohamed O. Othman[1,4]

OMO2

ESD Using DEIP versus Standard ESD

Outcome	Number (%) Standard ESD (n=51)	DEIP (n=60)	*P* value
Mean (±SD) procedure time, minutes	81.9±35.4	96.4±42.2	.06
Post-operative complications			.2
• No	46 (90.2)	56 (93.3)	
• Abdominal pain	2 (3.9)	3 (5.0)	
• Bleeding	3 (5.9)	0	
• Perforation	0	1 (1.7)	
ESD operative complications			1
• No	51 (100.0)	59 (98.3)	
• Micro-perforation	0	1 (1.7)	
• En bloc resection	39 (76.5)	47 (78.3)	.8
• Curative resection	35 (68.6)	42 (70.0)	1
• Hybrid ESD	26 (51.0)	22 (36.7)	.2

Salah, M, Othman MO et al. EOI 2020

DEIP Prospective Registry

N=70	EMR	ESD converted to Hybrid EMR/ESD	ESD	P Value
Number (%)	27 (38.5%)	16 (25%)	27 (38.5%)	
Lesion Size (Means)	3.8 cm ± 1.9 cm	4.9 cm ± 2.2 cm	4.1 cm ± 1.1 cm	0.13
Dissection Time (min)	27 min ± 26 min	60 min ± 35 min	52 min ± 27 min	0.0006
Total Case Time (Means)	67 min ± 32 min	106 min ± 46 min	84 min ± 39 min	0.0075
Safety N=81				0.685
Device Adverse Events	0	0	0	
Procedural Adverse Events*	2	2	3	
Prolonged Stay‡ (≥ 2 nights)	0	0	1	
Device or Procedure Related Adverse Events 30 days	0	0	0	

Othman MO. Draganov P et al., DDW 2020

Slide 23

OMO2 Othman, Mohamed O., 9/22/2020

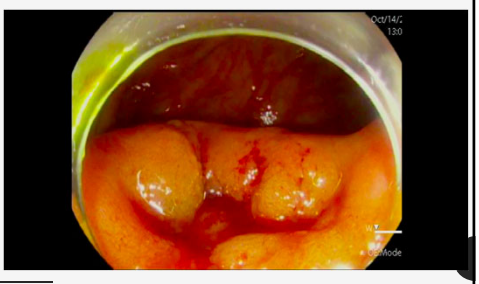
Transcecal Appendectomy via Double Balloon Device

Endoscopic Resection of Appendiceal lesions

	Total	EMR	ESD	Hybrid EMR/ESD
Total Patients (N)	19	5	5	9
Size (mm)	24.2 ± 11.3	28.0 ± 13.03	18 ± 7.58	25.56 ± 11.84
Polyp involving ≥ 50% of appendiceal orifice circumference	10 (52.63%)	2 (40%)	2 (40%)	6 (66.67%)
Granular, lateral-spreading	13 (68.4%)	3 (60%)	4 (80%)	6 (66.7%)
Duration of Procedure (minutes)	55.3 ± 23.4	37.0 ± 21.7	50 ± 18.71	68.3 ± 20
En bloc resection	15 (78.9%)	5 (100%)	5 (100%)	5 (55.6%)
Ro resection rate (/15 patients w/ en bloc resection)	13 (68%)	4 (80%)	5 (100%)	3 (60%)
Admission for Post-Procedure Observation	3 (15.8%)	0 (0%)	0 (0%)	3 (33.3%)
Duration of Admission (days)	One night			One night
Post-Procedure Pain	1 (5.3%)	0 (0%)	0 (0%)	1 (11.1%)
Delayed Complications	1 (5.3%)	0 (0%)	0 (0%)	1 (11.1%)

Othman et al, DDW, 2022

ESD of IC Valve Lesions



Endoscopic Resection of Resection of ICV Polyps

	Total	EMR	ESD	Hybrid EMR/ESD
Total Patients	29	27.6% (n=8)	44.8% (n=13)	27.6% (n=8)
Polyp size (mm)	42.2 ± 16.3	41.3 ± 21.7	41.5 ± 13.3	44.4 ± 16.8
Appearance in relation to ICV				
25% of circumference	13.8% (n=4)	12.5% (n=1)	23.1% (n=3)	
50% of circumference	58.6% (n=17)	62.5% (n=5)	46.2% (n=6)	75.0% (n=6)
75% of circumference	17.2% (n=5)	12.5% (n=1)	15.4% (n=2)	25.0% (n=2)
Full circumferential	10.3% (n=3)	12.5% (n=1)	15.4% (n=2)	
Resection				
En bloc	44.8% (n=13)	12.5% (n=1)	84.6% (n=11)	12.5% (n=1)
Piecemeal	55.2% (n=16)	87.5% (n=7)	15.4% (n=2)	87.5% (n=7)
Histopathological evaluation		Ro in one patient with en bloc resection	En bloc=11 Ro resection: 81.8% (n=9) R1 resection: 18.2% (n=2)	Ro in one patient with en bloc resection
Ro resection	41.4% (n=12)			
R1 resection	10.3% (n=3)			
Unknown	48.3% (n=14)			

Othman et al, DDW, 2022

Endoscopic Full Thickness Resection

- Perfect for benign or early malignant lesions particularly with history of prior manpulation
- Lesion should be less than 2 cm
- Can be achieved by ESD or specialized EFTR devices
- Requires experience in suturing

Endoscopic Full Thickness Resection

When to Consider Surgical resection?

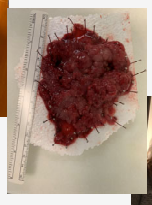
- ❑ Poorly differentiated adenocarcinoma
- ❑ Signet ring cell carcinoma
- ❑ Mucinous carcinoma,
- ❑ Deep submucosal invasion
- ❑ lymph vascular invasion
- ❑ Intermediate-to-high grade tumor budding

Park CH, Intest. Res, 2020

Conclusion

- ❑EMR is the first line treatment for granular lateral spreading tumors
- ❑ESD can be used in granular LST > 3 cm , non-granular LST , depressed or fibrotic lesions
- ❑EFTR is perfect for fibrotic colonic lesions less than 2 cm
- ❑Surgery should be reserved for lesions with high risk of deep submucosal invasion

Thank You



Preserving the Colon in the Setting of Strictures, Fistula and Leaks

Hazem Hammad, MD
Assistant Professor of Medicine
Director of Advanced Endoscopy, Rocky Mountain Regional VA Medical Center
Division of Gastroenterology & Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO

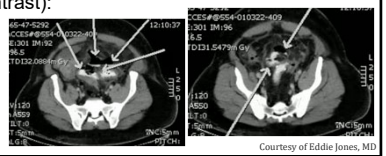
Preserving the Colon in the Setting of Strictures, Fistulae and Leaks

Hazem Hammad, MD, FASGE
Associate Professor of Medicine
Section of Advanced Therapeutic Endoscopy
University of Colorado Anschutz Medical Campus

University of Colorado
Anschutz Medical Campus

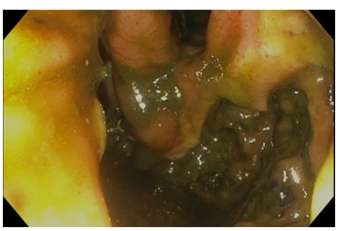
Case

- 48 yo with recurrent diverticulitis s/p lap sigmoidectomy
- Discharged on POD #2
- Readmitted POD #4 with abdominal pain and leukocytosis. Normal vital signs.
- CT scan (IV and rectal contrast):



Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus



Courtesy of Eddie Jones, MD

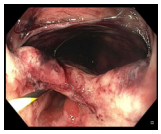
University of Colorado
Anschutz Medical Campus

- What is the best next step?
  1. Back to OR for exploration
  2. Conservative management (IV antibiotics, TPN…etc)
  3. Percutaneous drain placement
  4. Endoscopic vacuum therapy

- Interventional endoscopy techniques are emerging as first line treatment for GI leaks and fistulae….

Leak

- Pathological communication between the lumen and extra-luminal space due to a defect in the GI wall (spillage of luminal contents)
- Mostly due to anastomotic defect after surgical procedures.
- Majority of surgical mortality (up to 60% of cases if the treatment is delayed)



- Anastomotic leak after colorectal surgery occurs in ~ 11% of cases with a mortality ~ 12%.
- Proctocolectomy and total mesorectal excision/ileoanal or coloanal anastomosis: rate of leaks as high as 20%

Eur J Surg Oncol. 2014;**40**:1502–1509.

University of Colorado
Anschutz Medical Campus

Fistula

- Abnormal communication between two epithelialized surfaces.
- Internal (between organs) or external: Entero-vaginal, entero-vescical, entero-cutaneous…
- Prolonged anastomotic leaks, especially with extra-luminal fluid spillage and abscess, may result in chronic fistula

University of Colorado
Anschutz Medical Campus

Principles Of Treatment

- Identify the site of defect/leak
- Drain any leaked luminal contents
- Avoid further leak: diversion of luminal contents flow or by closure of the defect

University of Colorado
Anschutz Medical Campus

Therapy

- Conservative management: bowel rest, nutritional support and antibiotics
- Traditional approach: conservative management and revisional surgery (surgical drainage, defect repair or redo anastomosis)
- Surgical interventions is difficult and associated with high risk of morbidity and mortality

J Gastrointest Surg. 2009;**13**:239–245.

University of Colorado Anschutz Medical Campus

- Tailored treatment: clinical presentation and patient's general status, size of the defect, time of onset, defect location, endoscopic accessibility, ability to drain any associated collection and local expertise/accessories availability
- Difficult cases should be managed in referral centers with adequate case volume

University of Colorado Anschutz Medical Campus

- Surgery should be the first line treatment for patients with severe sepsis or multiorgan failure --->>> complete peritoneal washout and drainage)

University of Colorado Anschutz Medical Campus

Pre-procedure Assessment

- Defect site
- Assess defect and surrounding tissue (*e.g.,* healthy, inflamed, ischemic or chronic)….
- Intra-procedural contrast study and if possible, direct endoscopic cavity exploration

Endoscopic Techniques

- Through-the-scope clip
  - Limited pressure with natural tendency to dislodge spontaneously
  - If necrotic/inflamed tissue/fibrosis present, TTS clips will not succeed in most of the cases

Over-the-scope clip

- Full-thickness closure of GI defects up to 2 cm
  - Over-the-scope clips (OTSC) system
  - Padlock clip
- Consider de-epithelializing the edges of the defect and surrounding mucosa with APC or cytology brush before

- Systematic review:
- 1517 cases/30 studies between 2010 and 2018
- 388 fistulae and 97 anastomotic leaks were treated.
- Overall success rate: 52% (fistulae) and 66% (for anastomotic leaks)

J Gastroenterol Hepatol. 2019;**34**:22–30.

University of Colorado Anschutz Medical Campus

SEMS

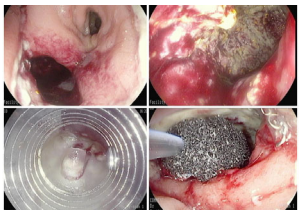
- A systematic review: 17 studies, 68 patients
- SEMSs for AL and AF
- High success rate: 75%
  - SEMSs should be avoided when sepsis is present
  - Should not be used in patients with low AL (< 1 cm above the dentate line)
  - Uncovered metal stents should NOT be used
  - Drain any perirectal abscess before stent placement

Surg Endosc. 2017;**31**:2720–2730.

University of Colorado Anschutz Medical Campus

Endoscopic Vacuum Therapy EVT

- Open-pored polyurethane foam
- Connected by a tube to a wound drainage system producing a continuous endo-luminal vacuum therapy
- Change Q 3-4 days



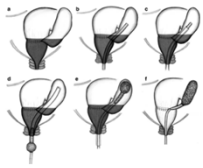
Cereatti et al. World J Gastroenterol 2020

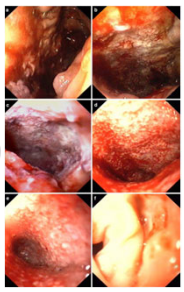
University of Colorado Anschutz Medical Campus

Surg Endosc (2008) 22:1818–1825
DOI 10.1007/s00464-007-9706-x

Endoscopic vacuum-assisted closure of anastomotic leakage following anterior resection of the rectum: a new method

Rolf Weidenhagen · Klaus Uwe Gruetzner · Timm Wiecken · Fritz Spelsberg · Karl-Walter Jauch





EVT – Advantages

- Continuous drainage
- Promotes granulation tissue/re-epithelialization (second intention closure)
- Negative pressure allows mechanical cleaning from microorganism/exudate
- increases perfusion via neovascularization

Argenta, L.C. et al. Ann Plast Surg, 1997

Metanalysis

- 24 studies, 690 patients with colorectal defects undergoing EVT.
- The mean rate of success : 81% (95% CI: 74.0%-87.1%).
- The proportion of diverted patients was 76%
- The mean rate of ostomy reversal across the studies was 67% (95% CI: 58.0%-74.4%).
- Mean of 6.8 sponge changes
- Mean of treatment duration was 23 days

Int J Colorectal Dis. 2022; 37(2): 283–292.

- EVT-associated complications rate was 12%:
  - Stenosis
  - Fistula
  - Abscess
  - Bleeding
- No mortality reported

Int J Colorectal Dis. 2022; 37(2): 283–292.

University of Colorado Anschutz Medical Campus

- The stoma was the only significant predictor for success
- Factors associated with EVT failure:
  - Late start of EVT
  - Neoadjuvant therapy
  - Lack of protective stoma,
  - age > 60 years
  - Male sex

→ Risk factors for anastomotic leakage after surgery

Colorectal Dis. 2020;**22**:243–253.

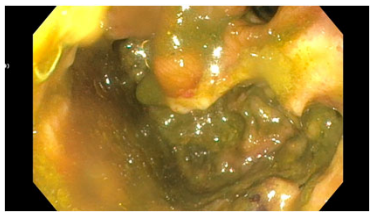
University of Colorado Anschutz Medical Campus

- Study:
  - 21 patients, treated with EVT for anastomotic colorectal leakage, and a historical cohort of 41 patients, receiving conventional treatment (intention-to-treat analysis)
  - EVT was more successful (95.2% *vs* 65.9%; *P* = 0.011).
  - EVT was associated with preservation of intestinal continuity in more patients (86.7% *vs* 37.5%; *P* = 0.001)

World J Surg. 2020;**44**:1277–1282.

University of Colorado Anschutz Medical Campus

Back to the case!



Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus

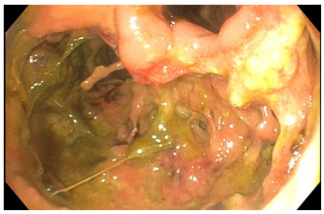
Preparing the sponge

Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus

Management

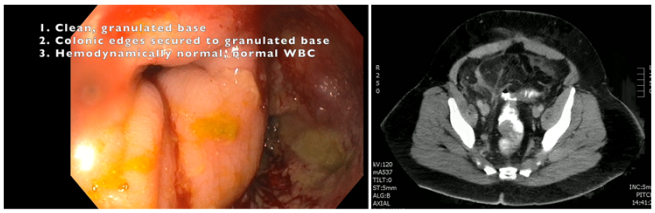
- IV antibiotics
- NPO
- TPN
- Sponge exchange Q 3-4 days



Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus

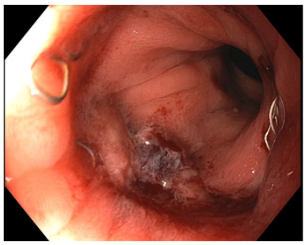
15 days and 4 sponges later…



Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus

6 weeks later…



Courtesy of Eddie Jones, MD

University of Colorado
Anschutz Medical Campus

Endoluminal Wound Vacuum Therapy of Gastrointestinal Leaks: Bridging the Gap

Number of Patients	13
Average Age, (range)	51.5 (27-76)
Male/Female	12/1
Malignancy Diagnosis	7 (54%)
History of chemotherapy/radiation	6 (46%)
Charlson Comorbidity Index, average (range)	3.3 (0-7)
Sequential Organ Failure Assessment score, average (range)*	5.5 (3-9)
Index Procedure	
Esophagectomy	3 (23%)
Paraesophageal hernia repair	1 (8%)
Gastrectomy	3 (23%)
Sigmoidectomy	4 (31%)
Endoscopic/Interventional Radiologic procedure	2 (15%)
Location of Defect	
Upper GI tract	8 (62%)
Lower GI tract	5 (38%)

Courtesy of Danielle Abbitt , MD and Edward L Jones, MD 2022

University of Colorado
Anschutz Medical Campus

	N (%)
Time from defect diagnosis to EVAC, average (range)	13.1 (0-109)
EVAC first-line, average (range)	1.5 (0-3)
EVAC after additional procedures, average (range)	23.0 (5-109)
Procedures prior to EVAC	7 (54%)
Re-operation	4
Stent	1
Radiographic-guided drainage	4
Duration of EVAC (days), average (range)	16.7 (range 4-41)
EVAC first-line, average	12.0
EVAC after additional procedures, average	20.7
Number of EVAC changes, average (range)	3.2 (0-7)
EVAC first-line, average	2.5
EVAC after additional procedures, average	3.4
Number of Sponge Insertions, average (range)	3.7 (1-8)

Courtesy of Danielle Abbitt , MD and Edward L Jones, MD 2022

University of Colorado
Anschutz Medical Campus

	N (%)
Healing of defect with EVAC	11 (85%)
Complete closure, EVAC only	9 (69%)
Alternative therapy (stenting)	3 (23%)
CCI	
Complete closure, EVAC only, average (range)	2.2 (0-7)
Alternative therapy (stenting), average (range)	5.3 (2-8)
Malignancy diagnosis	
Complete closure, EVAC only	3 (33%)
Alternative therapy (stenting)	3 (100%)
Procedures after EVAC initiation	
Surgery	1
Stent	3
Radiographic-guided drainage	2
Surgical salvage	1 (8%)
Complications, EVAC-related	
Stricture	3 (23%)
Bleeding	0 (0%)
Mortality	1 (8%)

Courtesy of Danielle Abbitt , MD and Edward L Jones, MD 2022

University of Colorado
Anschutz Medical Campus

Colon stricture management

- Common causes (benign):
  - Diverticular disease
  - IBD
  - Ischemic colitis
  - Radiation-induced colitis
  - Anastomotic strictures

University of Colorado
Anschutz Medical Campus

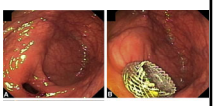
Colon Stricture Management

- Anastomotic stricture (AS):
  - Inability to pass a 12-mm endoscope
  - 30% of patients after colorectal surgery
  - Late complication
- Endoscopic balloon dilation: Technical success is seen in the majority of patients with good long-term clinical efficacy
- Repeat dilations are frequently needed

Ambrosetti P et al. Dis Colon Rectum. 2008

LAMS

- Lumen-apposing metal stent - covered and removable - with short length and wide flanges are good alternative for short anastomotic strictures (lower risk of stent migration)



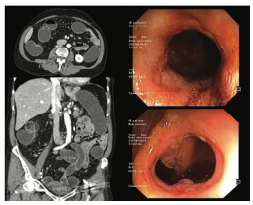
	LAMS	FCSEMS	BDS	LAMS vs. FCSEMS	FCSEMS vs. BDS	LAMS vs. BDS
Technical success	97.6% (94.0-99.0, 0)	96.5% (93.5-98.1, 0)	91.9% (85.6-95.6, 43.1)	0.52	0.06	0.05
Clinical success	78.8% (65.8-87.8, 69.6)	48.4% (37.1-59.8, 70.4)	34.9% (23.6-48.1, 55.5)	0.001	0.12	0.001
All adverse events	29.9% (19.7-42.6, 45.2)	47.6% (37.6-57.8, 65.4)	46.2% (34.7-58.2, 69.4)	0.03	0.89	0.06
Stent migration	13.7% (9.2-20.0, 0)	31.5% (26.1-37.5, 27.8)	11.5% (7.4-17.3, 0)	0.001	0.001	0.50
Bleeding	4.9% (2.5-9.3, 0)	2.6% (1.3-5.1, 0)	5.5% (3.0-10.0, 0)	0.20	0.11	0.79
Tissue hyperplasia	—	—	10.8% (4.6-23.4, 64.1)	—	—	—
Pain	1.9-11.8, 0	18% (10.7-28.7, 73.3)	17% (9.4-28.9, 60.2)	0.02	0.91	0.005

BDS indicates biodegradable stent; CI, confidence interval; FCSEMS, fully covered self-expanding metal stent; LAMS, lumen-apposing metal stent.

Mohan BP et al. J Clin Gastroenterol 2019

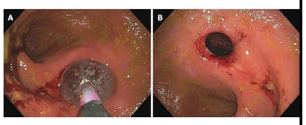
Colonic stricture management - IBD

- A systematic review:
  - 12 studies, 1991 to 2013
  - 3213 EBD procedures
  - EBD on small bowel or ileo-colonic anastomotic stricture
  - Technical success 90%, clinical efficacy 80%,
  - Surgical rate of 27%.



Inflamm Bowel Dis 2017;23:133–42.

- Study:
  - 57 patients with CD, 74% with symptomatic stricture
  - Technical success: 75% of the 161 EBDs
  - Clinical success: 55%
  - One perforation [0.6% of dilations]
  - Cumulative risk of colonic resection at 5 years was 47%



Bessissow et al. World J Gastroenterol 2018
Tilmant M et al. Clin Res Hepatol Gastroenterol. 2020

University of Colorado Anschutz Medical Campus

Endoscopic intralesional injection

- The data is conflicting for the use of intralesional injection of steroids in CD stricture….Routine use is not recommended!
- Intralesional injection of anti-TNF agent with or without concurrent balloon dilation in refractory inflammatory strictures remains to be investigated…

Shen B et al. Gastrointest Endosc 2019
Lichtenstein GR et al Am J Gastroenterol. 2009
Di Nardo G et al. Gastrointest Endosc. 2010

University of Colorado Anschutz Medical Campus

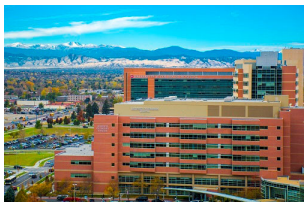
Recommendations – IBD stricture management

- Dilation can be done for native/anastomotic strictures (<5 cm)
- Multiple sessions of dilation [max of 20 mm] may be needed
- Fluoroscopy is needed for complex, angulated, long and multiple strictures
- DO NOT dilate of there are adjacent fistulae or abscesses
- Inflammation and superficial ulceration are not contraindications

Shen B et al. Gastrointest Endosc 2019

University of Colorado Anschutz Medical Campus

Thank You!



University of Colorado
Anschutz Medical Campus

Advanced Imaging in the Colon – From Virtual Chromoendoscopy to Artificial Intelligence

Vani J.A. Konda, MD
Medical Director, Baylor Scott and White Center for Esophageal Diseases
Medical Director, GI Physiology Lab at Baylor University Medical Center
Adj. Associate Professor, Texas A&M College of Medicine
Dallas, TX

Advanced Imaging in the Colon – From Virtual Chromoendoscopy to Artificial Intelligence

Vani J.A. Konda, MD, FASGE, FACG
Medical Director, Baylor Scott and White Center for Esophageal Disease
Medical Director, GI Physiology Lab, Baylor University Medical Center
Dallas, Texas

Disclosures

- Ambu (Consulting)
- Castle (Consulting / Advisory Board)
- Exact (Consulting / Advisory Board)
- Medtronic (Consulting)
- Lucid (Research)

Objectives

- To discuss ways to enhance **polyp detection**.
- To discuss optical technologies that may aid in colonic **polyp classification** by providing detailed characterization of tissue.
- To explore role of **computer aided detection**.

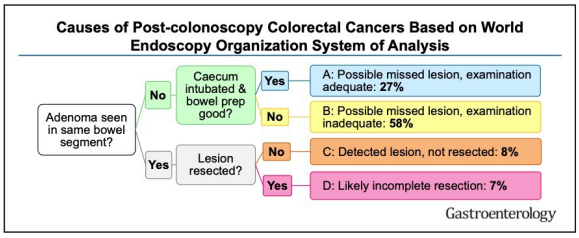
Quality Indicators

- Bowel preparation
- Cecal intubation rate
- Adenoma Detection Rate (ADR)
  - identify ≥1 adenoma in at least 25% of men 15% of women at age ≥50 years undergoing screening colonoscopy
  - Inversely associated with risk of interval CRC
- Withdrawal time (not single best but surrogate indictor)
- Polyp removal if less than 2cm

Corley et al. NEJM 2014
Schoenfeld and Cohen. GIE. 2013

4

Post colonoscopy Colorectal Cancer



Anderson R, Burr NE, Valori R. Causes of Post-Colonoscopy Colorectal Cancers Based on World Endoscopy Organization System of Analysis. Gastroenterology. 2020 Apr;158(5):1287-1299.e2.

Modifiable factors

- Patient related
  - Bowel preparation
- Endoscopist related
  - Gastroenterologist vs. General Surgeon vs. Other
  - Withdrawal time
  - Quality of mucosal inspection including fold examination
  - additional observers
- Procedure related
  - Incomplete vs. complete examination
  - water infusion
  - adequate distention
  - additional examination of right colon
  - change in position
  - antispasmodics
  - colonoscopy equipment and accessories
- Lesion characteristics
  - **Proximal** versus Distal

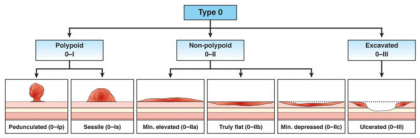
Chaptini and Laine. J Clin Gastroenterol. 2015
Dossa et June Colorectal Diseases 2020

6

Tools for Polyp Detection

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Morphology



BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

LST: NG-LST v GLST

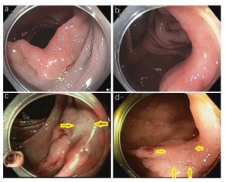
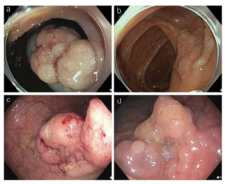
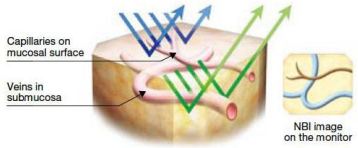



Figure 6. Nongranular laterally spreading tumors (LST-NG). (A, B) Smooth surface. (C, D) Pseudodepressed.

e 5. Granular laterally spreading tumors (LST-G). (A, B) Nodular surface. (C, D) mixed nodular morphology.

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Narrow Band Imaging (NBI)



ASGE PIVI Criteria: Colorectal Polyps

- Diagnose and Leave Strategy
  - Suspected rectosigmoid hyperplastic polyps 5 mm
  - 90% negative predictive value for adenomatous histology with high confidence
- Resect and Discard Strategy
  - 5 mm in size and smaller
  - 90% agreement in assignment of post-polypectomy surveillance intervals when compared to decisions based on pathology assessment of all identified polyps with high confidence

NBI 91% NPV

NPV for NBI Optical Biopsy

Study name	Mean	Lower limit	Upper limit	Total
East 2008	94.0	89.1	98.9	96
Rogart 2008	81.0	73.0	89.0	265
Ignjatovic 2009	82.3	73.8	90.7	213
Rex 2009	95.4	92.7	98.1	314
Sano 2009	90.0	82.9	97.1	150
Van Den Broek 2009	90.2	85.1	95.4	206
Henry 2010	90.7	84.5	96.9	90
Lee 2011	92.0	86.7	97.3	125
Gupta 2012	95.4	93.1	97.7	516
Hewett_1_2012	99.4	98.8	100.0	201
Hewett_2_2012	95.0	91.0	99.0	178
Kuiper_2012	86.6	79.8	93.3	231
Paggi_2012	86.4	80.9	92.0	399
Sakamoto_2012	62.2	46.9	77.5	270
Shahid_2012	75.0	66.1	83.9	103
Ladabaum_2013	91.4	86.3	96.5	219
Repici_2013	92.0	88.0	96.0	204
Singh_2013	100.0	79.9	100.0	40
Wallace_1_2014	96.0	93.0	99.0	104
Wallace_2_2014	97.0	95.0	99.0	89
Random	91.1	88.7	93.6	

NPV 90%

Abu Dayyeh, Thosani, Konda, et al GIE 2015

Subgroup by Confidence Level

Group by High Confidence		Study name	Statistics for each study			NPV 90%
			Mean	Lower limit	Upper limit	
	No	East 2008	94.0	89.1	98.9	
	No	Rogart 2008	81.0	73.0	89.0	
	No	Sano 2009	90.0	82.9	97.1	
	No	Van Den Broek 2009	90.2	85.1	95.4	
	No	Henry 2010	90.7	84.5	96.9	
	No	Gupta 2012	95.4	93.1	97.7	
	No	Sakamoto_2012	62.2	46.9	77.5	
	No	Shahid_2012	75.0	66.1	83.9	
Random	No		88.0	84.1	91.8	
	Yes	Ignjatovic 2009	82.3	73.8	90.7	
	Yes	Rex 2009	95.4	92.7	98.1	
	Yes	Lee 2011	92.0	86.7	97.3	
	Yes	Hewett_1_2012	99.4	98.8	100.0	
	Yes	Hewett_2_2012	95.0	91.0	99.0	
	Yes	Kuiper_2012	86.6	79.8	93.3	
	Yes	Paggi_2012	86.4	80.9	92.0	
	Yes	Ladabaum_2013	91.4	86.3	96.5	
	Yes	Repici_2013	92.0	88.0	96.0	
	Yes	Singh_2013	100.0	79.9	100.0	
	Yes	Wallace_1_2014	96.0	93.0	99.0	
	Yes	Wallace_2_2014	97.0	95.0	99.0	
Random	Yes		93.1	90.2	96.0	

Abu Dayyeh, Thosani, Konda, et al GIE 2015

13

Agreement with surveillance intervals

- 90% agreement achieved in the follow subgroups:
  - Academic settings
  - Experienced endoscopists
  - High confidence

Abu Dayyeh, Thosani, Konda, et al GIE 2015

14

I scan

Group by Expert	Study name	Statistics for each study			NPV 90%
		Mean	Lower limit	Upper limit	
No	Hong_1_2012	67.00	58.71	75.29	
No	Hong_2_2012	76.20	71.08	81.32	
No	Chan 2012	70.00	57.15	82.85	
No	Schachschal 2014	69.00	61.03	76.97	
Random No		72.31	68.59	76.04	
Yes	Hoffman_1_2010	97.00	94.52	99.48	
Yes	Hoffman_2_2010	96.50	93.65	99.35	
Yes	Lee 2011	94.74	90.72	98.76	
Yes	Pigo 2013	93.00	86.26	99.74	
Random Yes		96.16	94.39	97.93	

Abu Dayyeh, Thosani, Konda, et al GIE 2015

15

Classification systems and Learning Curve

- A learning curve for NBI is present but achievable in order to achieve reasonable accuracy.
- Agreement for a prediction of a specific pattern was moderate and was substantial for polyp prediction.

Kudo Group	Pit Pattern Type*	Description	VCI
A	I	Round, regular (normal)	Light
	II	Asteroid, stellar, papillary	
B	IIIL	Tubular, larger than normal	Medium
	IIIs	Small round or tubular	
	IV	Gyrus-, sulcus-, branched-, or dendritic-like	Dark
	V	Irregular, amorphous non-structural	

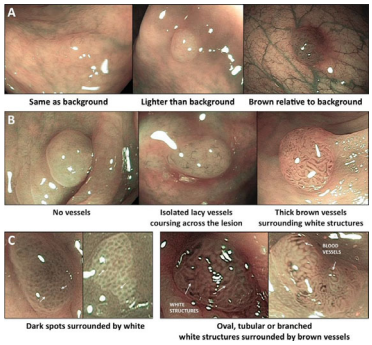
Rogart JN, et al. Gastrointest Endosc 2008;68:1136-45.
Rastogi A, et al. Gastrointest Endosc 2009;69:716-22.

NICE

Color

Vessels

Surface Pattern



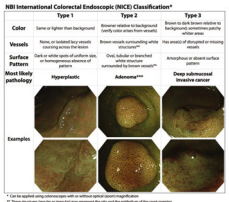
Hewett et al. GASTROENTEROLOGY 2012;143:599–607

NICE CLASSIFICATION

	Type 1	Type 2
Color	Same or lighter than background	Brown relative to background
Vessels	None or isolated lacy vessels	Brown vessels surrounding white structures
Surface Pattern	Dark or white spots of uniform size or homogeneous absence of pattern	Oval, tubular or branched white structures surrounded by brown vessels
Most Likely Histology	**Hyperplastic polyp/ Serrated Polyp**	**Adenoma**

Hewett et al. GASTROENTEROLOGY 2012;143:599–607

NICE classification



NBI International Colorectal Endoscopic (NICE) Classification*

	Type 1	Type 2	Type 3
Color	Same or lighter than background	Brown** relative to background (rarely color arises from vessels)	Brown to dark brown relative to background; sometimes patchy white areas
Vessels	None, or isolated lacy vessels coursing across the lesion	Brown vessels surrounding white structures**	Has area(s) of disrupted or missing vessels
Surface Pattern	Dark or white spots of uniform size, on homogenous background of lesion	Oval, tubular or branched pattern** or white structures surrounded by brown vessels**	Amorphous or absent surface pattern
Most likely pathology	Hyperplastic	Adenoma***	Deep submucosal invasive cancer
Examples			

* Can be applied using colonoscopes with or without optical (zoom) magnification

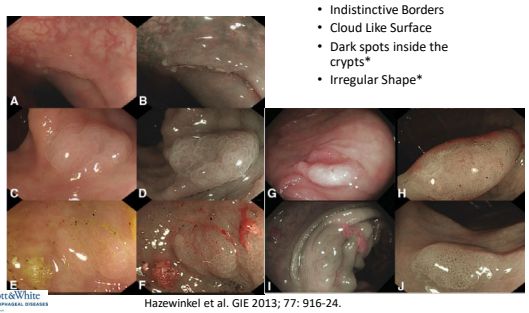
** Brown color is of lesion surface and may not be present in the periphery of the crypt opening.

*** Type 2 consists of types 2a (low grade dysplasia), 2b (high grade dysplasia), and 2c (intramucosal cancer with either low or high grade dysplasia, or with superficial submucosal carcinoma). The presence of high grade dysplasia or superficial submucosal carcinoma may be suggested by an irregular vessel or surface pattern, and is often associated with atypical morphology (e.g., depressed area).

Figure 1. The NBI international colorectal endoscopic (NICE) classification. *NBI,* narrow-band imaging.

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Sessile Serrated Polyps (SSP)

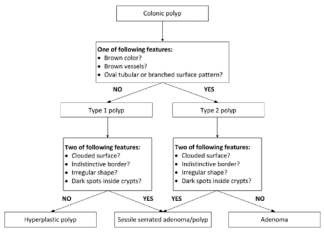


- Indistinctive Borders
- Cloud Like Surface
- Dark spots inside the crypts*
- Irregular Shape*

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Hazewinkel et al. GIE 2013; 77: 916-24.

Two step criteria



BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Ijspeert et al Gut 2015.

JNET

(b)

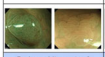
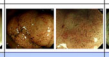
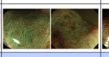
Scattered vessels

Coarsely distributed, irregular vessels, probably corresponding to desmoplastic reaction

Thick, linearized/ meandering atypical vessels in the tumor

Vessels similar to string sign described by Terai et al, but those found at the periphery are not taken into account

(c)

	Type 1	Type 2A	Type 2B	Type 3
				
	Dark or white spots of uniform size, or homogeneous absence of pattern	Regular	Irregular	Amorphous
	• Regular dark or white spots • Uniformly obscure structure	• Tubular or dendritic or papillary • Regular surface pattern • Corresponding to type III or IV pit pattern	• Visible surface pattern with irregularity • Corresponding to the type Vi pit pattern	• Invisible surface pattern • Corresponding to the type Vn pit pattern

vessel caliber in the lesion is the same as that in the surrounding normal mucosa • Lacy vessels coursing across the lesion	• Uniform and regular, relatively well-ordered reticular pattern (*Note that microvessels are often distributed in a punctate pattern and the well-ordered reticular pattern is not commonly observed in depressed lesions.)	• Uneven and irregular distribution of vessels • Vessel meandering • Approximately ≥ 1.5 times thicker than in adenomas	• Disrupted thick vessels

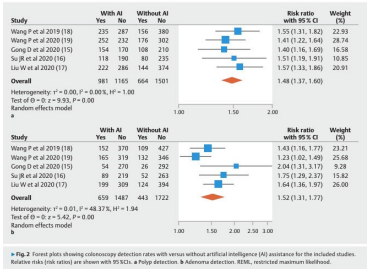
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

22

Computer Aided Detection

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

CAD Detection of Polyps



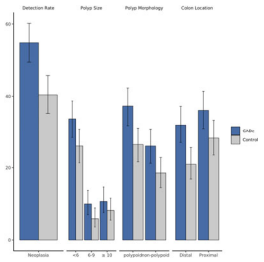
▶ **Fig. 2** Forest plots showing colonoscopy detection rates with versus without artificial intelligence (AI) assistance for the included studies. Relative risks (risk ratios) are shown with 95 %CIs. **a** Polyp detection. **b** Adenoma detection. REML, restricted maximum likelihood.

BaylorScott&White BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

24

CAD Detection of Polyps

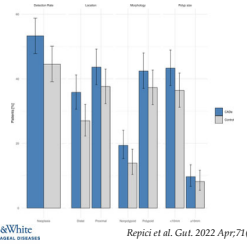
- RCT
- 685 patients
- ADR
  - CADe 54.8%
  - Control 40.4%
  - RR 1.30 (95% CI, 1.14-1.45)

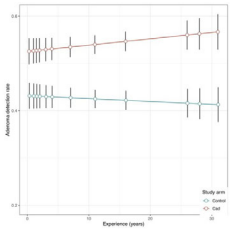


BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Repici et al. Gastroenterology 2020;159:512–520

CAD Detection of Polyps





BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Repici et al. Gut. 2022 Apr;71(4):757-765.

Conclusion

- Adenoma detection rate (ADR) is a key colonoscopy quality indicator and inversely associated with interval colon cancer risk.
- Polyp detection may be improved by protocols, techniques, and tools that enable the endoscopist to visualize an increased surface area.
- Polyp characterization may be performed by digital chromoendoscopy and may support a resect and discard strategy or diagnose and leave strategy for diminutive polyps.
- CAD may enable endoscopists to improve ADR.

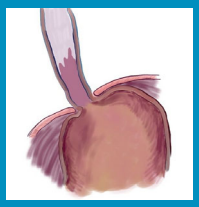
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

27

Optimizing Outcomes in Endoscopic Eradication Therapies for Barrett's Esophagus

Vani J.A. Konda, MD
Medical Director, Baylor Scott and White Center for Esophageal Diseases
Medical Director, GI Physiology Lab at Baylor University Medical Center
Adj. Associate Professor, Texas A&M College of Medicine
Dallas, TX

Optimizing Outcomes in Endoscopic Eradication Therapies for Barrett's Esophagus



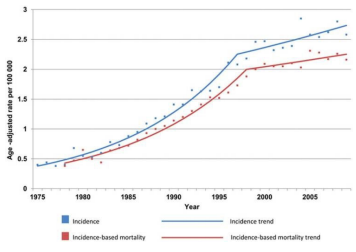
Vani J.A. Konda, MD, FASGE, FACG
Medical Director, Baylor Scott and White Center for Esophageal Disease
Medical Director, GI Physiology Lab, Baylor University Medical Center
Dallas, Texas

Disclosures

- Ambu (Consulting)
- Castle (Consulting / Advisory Board)
- Exact (Consulting / Advisory Board)
- Medtronic (Consulting)
- Lucid (Research)

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Incidence and Mortality of Esophageal Cancer

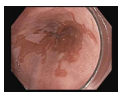


Hur et al. Cancer. 2013 Mar 15; 119(6): 1149–1158.

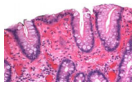
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Barrett's Esophagus (BE)

- BE is a known risk factor for esophageal adenocarcinoma.
- BE is a complication of chronic reflux.
- BE is the replacement of esophageal squamous lining by specialized intestinal mucosa.



Salmon colored mucosa



Columnar lined Epithelium With Goblet Cells

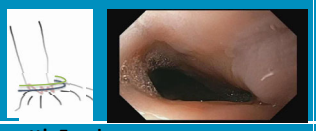
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

4

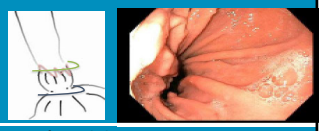
Landmarks

Diaphragmatic impression
Gastroesophageal Junction
Squamocolumnar Junction

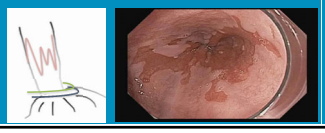
Normal



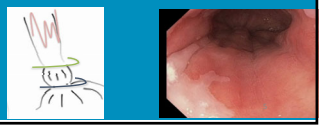
Hiatal hernia



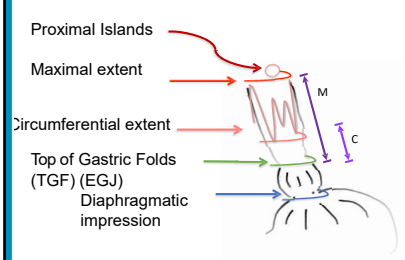
Barrett's Esophagus



Barrett's with hernia



Assessing Length of a Barrett's Segment



Prague Classification
C & M

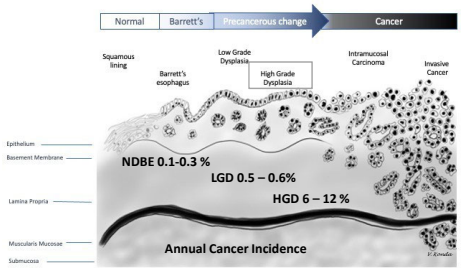
C = Circumferential extent of columnar lined epithelium from the TGF/EGJ

M = Maximal contiguous extent of columnar lined epithelium from the TGF/ EGJ

Sharma P et al. Gastroenterology. 2006

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Risk of Progression to Cancer



BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Wani CGH 2011; Yousef Am J Epidem 2008; Desai Gut 2012; Bhat J Natl Ca Inst 2011; Hvid-Jensen N Engl J Med 2011; Wani Gastro 2011; Singh S, Gastrointest Endosc. 2014; Curvers, AJG 2010; Rastogi GIE 2008; DeJonge Gut 2010

7

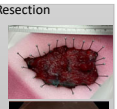
Management: Treatment

Non-Tissue Acquiring

Esophagectomy

Endoscopic Resection

Endoscopic Submucosal Dissection (ESD)



Endoscopic Mucosal Resection (EMR)

Ablation

Radiofrequency Ablation (RFA)

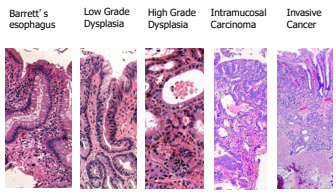
Cryotherapy (Cryoballoon)

Hybrid-APC

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Histologic Variability

- Difficult to distinguish between dysplasia and inflammatory changes
- Dysplasia is often overcalled
- Expert GI pathologists have lower IOV

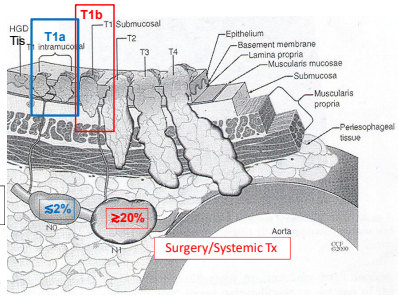


Confirm dysplasia with an expert GI pathologist before EET.
(TREAT-BE Threshold 90%)

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Curvers WL et al. Am J Gastroenterol 2010 ; Duits LC et al. Gut 2015 ; Montgomery E et al. Hum Pathol 1988 *; Ormsby AH et al. Gut 2002; Treat BE AJG 2017.*

Risk of Lymph Node Metastasis



Amenable to endoscopic resection

≤2%

≥20%

Surgery/Systemic Tx

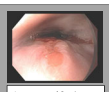
Rice TW. Esophageal Surgery 2002
Rice et al. Ann Thoracic Surgery 1998
Stein et al. Ann Surg 2000
Dunbar et al. AJG 2012

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

10

Risk of Prevalent Cancer & Visible Lesions

High grade dysplasia


Intramucosal Carcinoma

- HGD by Bx is associated with a 40% risk of prevalent cancer.
- Most of these cases are IMC.
- Approach is similar for HGD & IMC

Submucosal Carcinoma

- The risk of SMC is higher in protruding or depressed lesions.
- SMC rare in absence of visible lesions.

Visible Lesions require definitive diagnosis with Endoscopic Resection
TREATBE 90

Konda and Waxman et al, CGH 2008
Peters FP, et al. GIE 2008

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

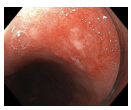
11

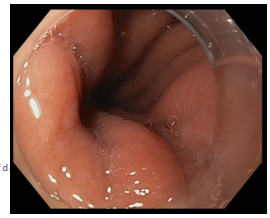
Look Carefully

•Tools
- High resolution endoscopy
- Soft distal attachment cap
- Enhanced endoscopic imaging

•Techniques
- Tip deflection
- Suction, Irrigation & Mucolytics
- Insufflation and Deflation
- Retroflexion

•Recognition
- Inspect
  - Longer Inspection time is associated with higher rates of d
  - Train to recognize subtle, flat lesions





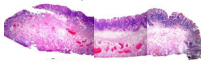
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

12

Endoscopic mucosal resection (EMR)

Perform endoscopic resection for visible lesions, including mucosal irregularities, to rule out cancer especially in the setting of dysplasia.

- More accurate than biopsies or EUS
  - EMR changes the diagnosis in up to ½ of cases
  - Less IOV among pathologists with EMR for neoplasia
  - EUS appropriate for N staging, but inadequate for early T staging.
- EMR capabilities should be present in centers performing EET



Konda et al. CGH 2014; Wani et al. CGH 2010; Wani et al. DDS 2013; Fernandez Sordo Ortiz, Konda, Waxman et al J GI Oncology 2012; Qumeseya et al. DDW 2014 Leung GIE 2009, Dunbar GIE 2009, Konda Dis of Eso 2010; Konda GIE 2014; TREAT-BE, AJG 2017 ; Sharma et al Gastro 2020.

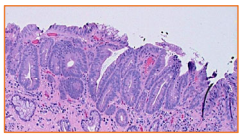
Endoscopic Eradication Therapy (EET)

Total Barrett's Eradication = Remove the Visible Neoplasia + Treat the rest of the at-risk Epithelium

14

Low grade dysplasia

- Poor interobserver agreement among pathologists
- 75-80% of LGDs are downgraded upon expert review
- Confirmed LGD has a higher risk of progression
- Persistent LGD also has a higher rate of progression



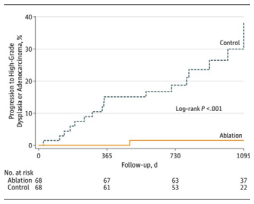
Curvers et al AJG 2010
Duits et al Gut 2015
Phoa et al. JAMA 2014

Kestens et al CGH 2015
Singh et al GIE 2014
Song et al Dis of Eso 2020

15

LGD: Treatment versus Surveillance ?

- SURF Trial : RCT Netherlands
  - 68 patients TX and 68 patients Surveillance
  - Risk of progression to HGD/Ca
    - 1.5% Ablation group
    - 26.5% Control group *
  - RFA reduced risk of progression by 25% in TX group
  - Study terminated early by DSMB
- ACG Guidelines
  - Confirmed LGD
    - Endoscopic treatment
    - Alternative : Close surveillance
- Still Area of Controversy
  - Inconsistent Marker
  - Variable rates of progression
- Clinical Prospective Study
  - SURVENT Randomized controlled trial in US



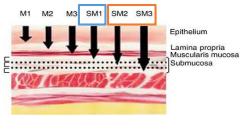
Phoa et al.JAMA 2014 2014 Mar 26;311(12):1209-17.
Shaheen et al. AJG. ACG117(4):559-587, April 2022.
Wani S, et al. Gastroenterology. 2022

Submucosal Cancer in Adenocarcoma

Table 3. Numbers of patients with positive lymph nodes, lymphatic and vascular invasion stratified by depth of tumor invasion and histologic type.

	sm1		sm2		sm3	
	SCC	*ADC*	*SCC*	*ADC*	*SCC*	*ADC*
N+						
	60/224 (27%)	4/65 (6%)	107/296 (36%)	10/44 (23%)	300/544 (55%)	33/57 (58%)
L+						
	58/111 (52%)	2/23 (9%)	88/135 (65%)	4/15 (27%)	118/184 (64%)	19/25 (76%)
V+						
	19/97 (20%)	1/7 (14%)	67/183 (37%)	0/2 (0%)	114/239 (48%)	0/12 (0%)

ADC: Adenocarcinoma; L: Lymphatic; N: Lymph node; SCC: Squamous cell cancer; sm: Submucosal; V: Vascular.



Low Risk Sm
- Sm1, < 500 um
- <2cm
- well – mod differentiated grade
- no lymphovascular invasion

Gockel, et al. Expert Review of Gastroenterology & Hepatology, 2011
Manner et al. CGH 2013
Scholvinck et al. Surg Endosc 2016

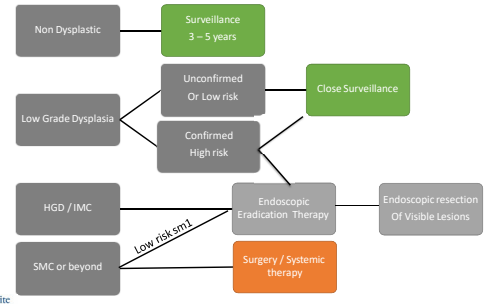
17

Management

Non Dysplastic → Surveillance 3 – 5 years

18

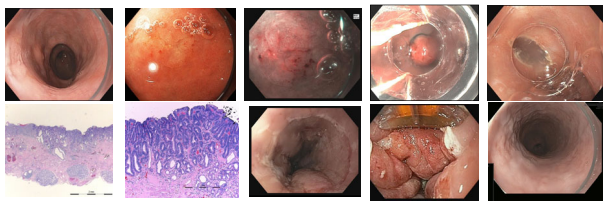
Management



BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

19

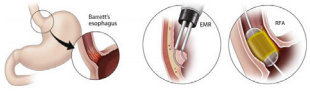
EET: Hybrid Approach with EMR-RFA

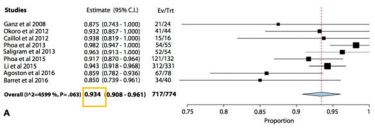


Centers with EET should have HDWLE, expertise in EMR and Ablation techniques.

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

EET: Hybrid Approach





Eradication of neoplasia
93.4%
Hybrid Therapy (EMR + RFA)

Complications: 10.2% Stricture Rate
1.1% Bleeding Rate
0.2% Perforation Rate

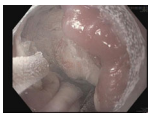
BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Desai et al GIE 2017

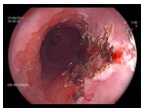
21

Radiofrequency Ablation

Cryotherapy



Hybrid APC



Adverse Events of Endoscopic Therapy

- Discussion about risk of adverse events should be included in counseling
- Stricture formation
  - 6% in most cases with focal EMR followed by ablation
  - ~30% if extensive resection with greater than 50% of the circumference of BE
- Bleeding and Perforation < 1%
- Adverse Events should be tracked

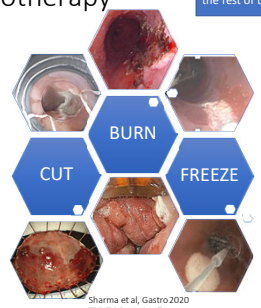
Barrett's Endotherapy

Treat known neoplasia
AND
the rest of the at risk epithelium

Target all visible lesions (including mucosal irregularities) with endoscopic resection

Treat all of rest of columnar mucosa in esophagus (flat, without inflammation) with ablative methods.

Extend treatment field at least 5-10 mm proximally above SCJ and distally below GEJ into cardia



Document specific intervals for next EET session (2 - 3 months)

GOAL for CE – Neoplasia
Within 18 months
→ 80%

GOAL for CE – IM
Within 18 months
→ 70%

Sharma et al, Gastro 2020
TREAT-BE AGJ 2017

Experience makes a difference

- Number of cases to achieve CE-IM decreased in regards to the increased number of cases of the endoscopist and centers (US RFA Registry), $p < 0.01$).
- Positive correlation between endoscopist volume of ablation and achieving CRIM (n = 417, 7 endoscopists, rho =0.85, p 0.014).

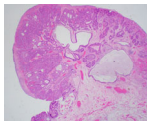
Pasricha et al Gastroenterology 2015; Fundman et al GIE 2014
Sharma et al. Gastroenterology 2020;

Resources and Environment

- WLE, NBI, EMR, Ablation
- High volume centers
- Access to cancer center
- Access to MDT

Endoscopic Submucosal Dissection (ESD)

- Mature technique in Asia & Evolving in the West
- Provides *en bloc* specimen
- Indicated for Squamous cell neoplasia of the esophagus and select cases of Barrett's neoplasia
- Systematic review (380 EMR, 333 ESD cases)
  - ESD lower recurrence rate than EMR (0.7 v 2.6%)
  - Comparable complication rates

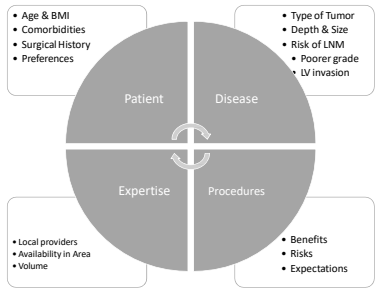


ESD may be beneficial in select cases with concern for SMC or large or non lifting lesions.

EMR (Focal or piecemeal) is non inferior to ESD and is adequate in most cases of BE w/ HGD/IMC.

Ishihara S et al. Annals Translational Medicine 2014; 3 (2) 24.
Gralnek Ian M et al. Endoscopy 2015; 47: a1–a46
Dragowave PV et al. CGH 2018; 17(1):16-25.e3.
Komeda Y et al. Endosc Int Open 2014; 02(02): E58-E64.

Decision Making



BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

28

Counseling on risks and benefits

- Patients should be counseled on cancer risk in the absence of BET, as well as after BET, to allow for informed decision-making between the patient and the physician.
- Documentation of discussion of these risks should be made

Documentation of risks, benefits, and alternatives.
TREAT-BE > 98%)

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Addressing Reflux Control

- BID PPI therapy during treatment and continuation of acid control after treatment
- Length of BE, Hiatal hernia, Persistent uncontrolled reflux (weakly acidic, despite PPI BID) associated with incomplete response to endotherapy
- Structured anti-reflux program improved eradication of metaplasia after EET

Krishnan et al. Gastro 2012
Komanduri et al Am J Gastro 2017

BaylorScott&White CENTER FOR ESOPHAGEAL DISEASES

Refractory to Treatment

- Cancer / Dysplasia / Risk of cancer
  - This is first an oncologic consideration
    - Esophagectomy
    - Don't burn bridges
- Reflux optimization
  - Medical Diet Lifestyle
    - Are they taking PPI correctly
    - Nocturnal regurgitation
  - PH impedance study Bravo study
  - Address Hiatal hernia / Anti-reflux surgery
- Ablation modalities
  - Cryotherapy
  - Hybrid APC

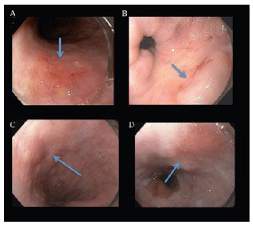
	Poor healing (PH)	Poor squamous regeneration (PSR)
	Active inflammatory changes +/- ulcerations	<50% squamous regeneration after complete healing

Results	Incidence	Failure	Progression
No PH/PSR	1245/1386 (90%)	29/1245 (2%)	6/1245 (1%)
PH only	134/1386 (10%)	2/67 (3%)	0/67 (0%)
PSR	74/1386 (5%)	47/74 (64%)	11/74 (15%)

van Munster SN, et al. Endoscopy 2022 Mar;54(3):229-240.

Risk of Recurrence

- Risk of recurrence exists after complete eradication with Barrett's endoscopic therapy
  - Pooled incidence rate (per patient-year)
  - Recurrent IM 7.1% (95% CI, 5.6-8.6)
  - Dysplastic BE 1.3% (95% CI, 0.8-1.7)
  - HGD/EAC 0.8% (95% CI, 0.5-1.1)
  - 97% of lesions were treated endoscopically.
- Lesions may appear subtle and challenging to appreciate.
- 4 QB of neosquamous lining and gastric cardia should be performed followed by appropriate treatment of any dysplasia/ metaplasia in the esophagus.
- IM of cardia alone should not warrant additional therapy.



Krishnamoorthi et al. GIE 2016
Stier et al. WJG 2016
Sharma et al Gastro 2020

Surveillance

ASGE GIE 2012; Bedi et al GIE 2013; Cotton et al. Gastro 2018; Sharma et al. Gastro 2020

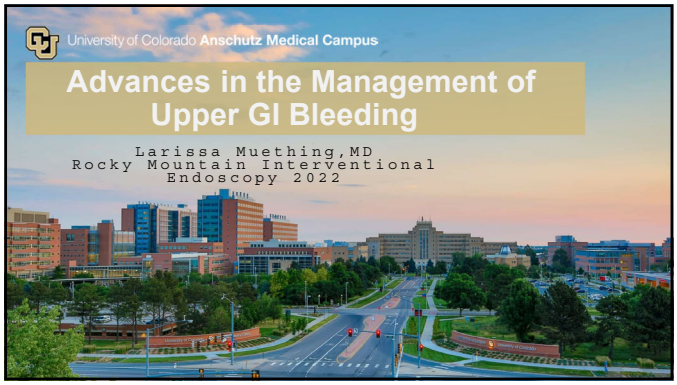
Conclusion

- Perform a high-quality endoscopic assessment
- Confirm dysplasia with an expert GI pathologist
- Counsel the patient benefits and risk of all options
- Consider volume, resources, and environment for EET
- Perform endoscopic resection of visible lesions
- Treat both known neoplasia and the rest of the at-risk epithelium
- Survey based on initial pathology and continue due to the risk of recurrence
- Optimization of reflux is a critical part of EET

Baylor Scott & White
CENTER FOR ESOPHAGEAL DISEASES

Advances in the Management of Upper GI Bleeding

Larissa Muething, MD
Assistant Professor of Medicine
Division of Gastroenterology and Hepatology
University of Colorado Anschutz Medical Campus
Aurora, CO



Disclosures

- None

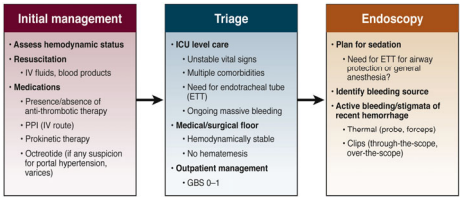
University of Colorado Anschutz Medical Campus

Objectives

- Review approach to non-variceal upper GI bleeding
- Discuss newer techniques and tools used in non-variceal upper GI bleeding

University of Colorado Anschutz Medical Campus

Approach to Upper GI Bleeding

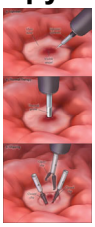


University of Colorado Anschutz Medical Campus

Gastroenterology 2020 1591120-1128DOI: (10.1053/j.gastro.2020.05.095)

Endoscopic Therapy in Non-Variceal Upper GI Bleeds: Traditional Therapy

- Diluted epinephrine (1:10,000) injection
  - If epinephrine used a second hemostasis modality should be employed
  - Dual therapy with epinephrine and another therapy has no advantage over properly applied therapy or mechanical monotherapy
- Through the scope clips vs Thermal therapy
  - There is no data to support superiority of one modality over the other
- When deciding on therapy, endoscopist should consider:
  - Location (posterior wall of duodenum, lesser curvature of the stomach
  - Ulcer characteristics (fibrosis, large ulceration, size of visible vessel



University of Colorado Anschutz Medical Campus

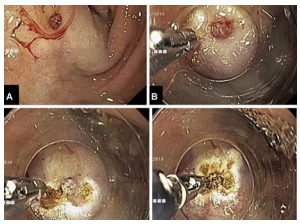
Marmo et al. Am J Gastroenterol 2007.
Mullady et al. Gastroenterology 2020.

So Is There Anything Else?

University of Colorado Anschutz Medical Campus

Monopolar Hemostatic Forceps

- Used to grasp and coagulate exposed submucosal vessels and treat active bleeding.
- Use the soft coagulation mode (80 W, effect 4) limits peak voltage thereby minimizing depth of penetration and tissue effect
- Technique: MHF are applied to the bleeding point closed (without first opening the atraumatic jaws to grasp the bleeding vessel), followed by applying soft coagulation for 1-2 sections and then retracting the forceps and retreating as needed
- Use in gastric and duodenal ulcers:
  Initial hemostasis success was 98% in the MHF soft coagulation group and 80% in the hemoclip group (p = 0.04)



University of Colorado Anschutz Medical Campus

Toka et al. GIE 2019

Monopolar Hemostatic Forceps: Advantages & Disadvantages

Advantages

- Can be used in difficult locations – particularly when clip application is difficult due to location or rigid fibrotic base
- The application of current is controlled by endoscopist and electrosurgical generator making treatment more controlled with less tissue injury

Disadvantages

- Large blood clot or fluid may dissipate the coagulation effect
- A large area of tissue may require repeated applications
- Cost
- Availability

University of Colorado Anschutz Medical Campus

Monopolar Hemostatic Forceps Video

University of Colorado Anschutz Medical Campus

What About Other Monopolar Devices?

- Snare Tip?
- Hot Biopsy Forceps?
- Use of thermal energy delivered to treat peptic ulcers have not been formally studied
- Switched to forced coag may help overcome pools of liquid/blood but could result in more tissue injury
- Would use with caution and only if have a good understanding of electrosurgical current settings and use of these techniques in advanced procedures

University of Colorado Anschutz Medical Campus

Over-the-Scope Clips

- Options:
  OTSC, Ovesco Endoscopy, Cary NC
  Padlock clip, Steris Endoscopy, Mentor OH
- Uses:
  - Salvage Therapy: RCT demonstrated over the scope clips were more effective than standard therapy in recurrent peptic ulcer bleeding (Persistent bleeding observed in 42.4% in the standard therapy group vs 6.0% in the OTSC group, p=0.001)
  - First Line Therapy: Large fibrotic ulcer beds with large visible vessel that may not be amenable for through the scope hemoclip fixation or when thermal therapy is predicted to be ineffective

Schmidt et al. Gastroenterology 2018

University of Colorado Anschutz Medical Campus

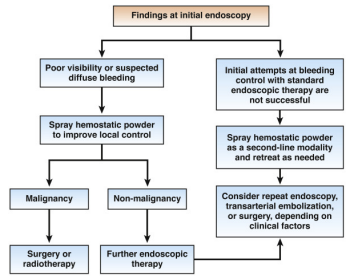
OTSC Video

University of Colorado Anschutz Medical Campus

Hemostatic Powder

- Available Products: Hemospray (Cook Medical, Bloomington, IN) & Endoclot (Micro-Tech, Dusseldorf, Germany)
- Useful when bleeding is diffuse, cannot be localized, or if visualization is poor due to bleeding
- Should be used as rescue therapy and not for primary hemostasis (except in malignancy bleeding

University of Colorado Anschutz Medical Campus

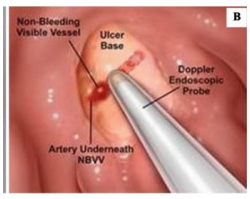


University of Colorado Anschutz Medical Campus

Mullady et al. Gastroenterology 2020.

Use of Through-the-Scope Doppler Probe

- Through-the-scope doppler probe can be used after hemostasis to confirm successful treatment
- Presence of doppler signal post hemostasis is a risk factor for rebleeding
- Can be also used to distinguish visible vessels from pigmented spots
- A single-blind RCT:
  - Rebleeding within 30 days: 26.3% control group vs 11.1% Doppler group (p=0.02)
  - OR for rebleeding with Doppler monitoring: 0.35 (95% CI, 0.14-0.86), NNT 7



University of Colorado Anschutz Medical Campus

Jensen et al. Gastroenterology 2017.

Take-Aways

- Be aware of all available tools and have a thorough understanding of the setting on your electrosurgery unit
- Monopolar hemostatic forceps can be used particularly for small or large vessels in large fibrotic ulcer bases or difficult locations
- Over-the-scope clips can be used for secondary hemostasis and primary hemostasis if alternatives are predicted to be unsuccessful
- Hemospray can be used as a temporizing agent to aid visualization or to temporarily stop malignancy bleeding
- Consider use of through to scope doppler US to help lower risk of rebleeding

University of Colorado
Anschutz Medical Campus

References

- Mullady DK, Wang AY, Waschke KA. AGA Clinical Practice Update on Endoscopic Therapies for Non-Variceal Upper Gastrointestinal Bleeding: Expert Review. Gastroenterology. 2020 Sep;159(3):1120-1128. doi: 10.1053/j.gastro.2020.05.095. Epub 2020 Jun 20. PMID: 32574620.
- Toka B, Eminler AT, Karacaer C, Uslan MI, Koksal AS, Parlak E. Comparison of monopolar hemostatic forceps with soft coagulation versus hemoclip for peptic ulcer bleeding: a randomized trial (with video). Gastrointest Endosc. 2019 Apr;89(4):792-802. doi: 10.1016/j.gie.2018.10.011. Epub 2018 Oct 17. PMID: 30342026.
- Schmidt A, Gölder S, Goetz M, Meining A, Lau J, von Delius S, Escher M, Hoffmann A, Wiest R, Messmann H, Kratt T, Walter B, Bettinger D, Caca K. Over-the-Scope Clips Are More Effective Than Standard Endoscopic Therapy for Patients With Recurrent Bleeding of Peptic Ulcers. Gastroenterology. 2018 Sep;155(3):674-686.e6. doi: 10.1053/j.gastro.2018.05.037. Epub 2018 May 24. PMID: 29803838.
- Jensen DM, Kovacs TOG, Ohning GV, Ghassemi K, Machicado GA, Dulai GS, Sedarat A, Jutabha R, Gornbein J. Doppler Endoscopic Probe Monitoring of Blood Flow Improves Risk Stratification and Outcomes of Patients With Severe Nonvariceal Upper Gastrointestinal Hemorrhage. Gastroenterology. 2017 May;152(6):1310-1318.e1. doi: 10.1053/j.gastro.2017.01.042. Epub 2017 Feb 4. PMID: 28167214; PMCID: PMC5613762.

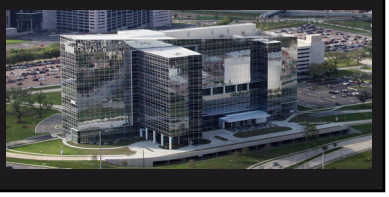
University of Colorado
Anschutz Medical Campus

Pragmatic Approach to Management of Esophageal Strictures

Mohamed O Othman, MD
William T. Butler Endowed Chair for Distinguished Faculty
Professor of Medicine, Gastroenterology and Hepatology Section
Baylor College of Medicine
Chief, Gastroenterology Section at Baylor St Luke's Medical Center
Houston, TX

Pragmatic Approach to Management of Esophageal Strictures

Mohamed Othman, M.D.
Chief of Gastroenterology Division, BSLMC
Professor of Medicine
Baylor College of Medicine



Esophageal Stricture

What to consider

- ❑ Nature of the stricture:
  - ❑ Benign
  - ❑ malignant
- ❑ Cause of the stricture:
  - ❑ Developmental
  - ❑ Inflammatory
  - ❑ Iatrogenic
  - ❑ Ischemic
- ❑ Length of the stricture

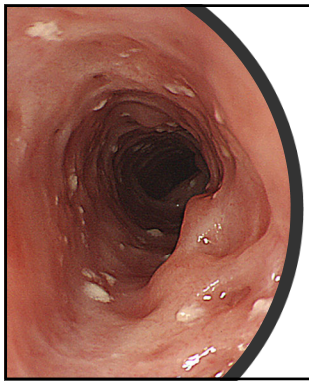
Ravich W et al, Current Gastroenterol Rep, 2017

Esophageal Stricture

What to consider

- ❑ Shape of the stricture:
  - ❑ Web
  - ❑ Ring
  - ❑ Tight GEJ
  - ❑ Achalasia
- ❑ Special considerations:
  - ❑ Eosinophilic esophagitis
  - ❑ Radiation stricture
  - ❑ Esophagitis Dissecans Superficialis
  - ❑ Graft Versus Host Disease

Ravich W et al, Current Gastroenterol Rep, 2017



What is a Complex Stricture

- ❑ long
- ❑irregular in configuration
- ❑With a shelf or diverticular depression

Kinguasa et al, J of Gastro and Hepatol, Volume: 34, Issue: 7, Pages: 1130-1130.

Target of Dilation

Begin 1-2 mm larger than estimated stricture diameter

Role of 3 Versus dilation till encountering resistance

Repeat Dilation in 1 to 2 weeks

Approach for Benign Esophageal Stricture

Dilation up to 15-18 mm

5 Sessions with 1-2 weeks interval

Dilation combined with intralesional steroid injection

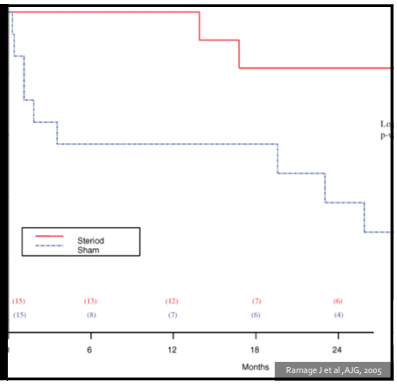
3 sessions

Temporary Stent Placement

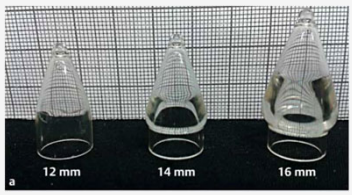
Fugazza et al, Dysphagia 2020

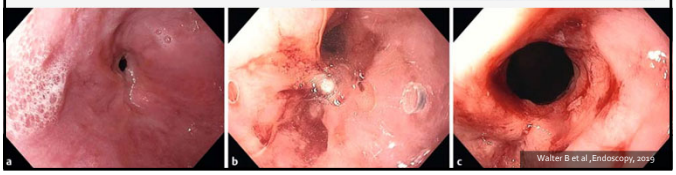
Role of Intralesional Steroid

- 30 patients with Recalcitrant peptic stricture
- Steroid injection into the stricture combined with acid suppression significantly diminishes
  - The need for repeat dilation
  - The average time to repeat dilation

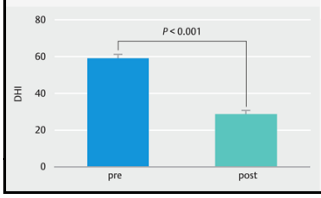


BougieCap for Benign Esophageal Stricture





BougieCap for Benign Esophageal Stricture



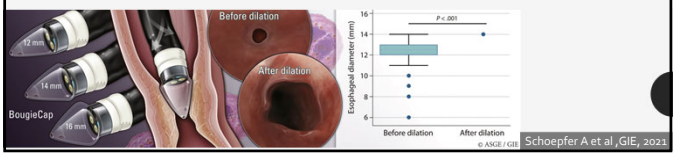
Endoscopic results	
Successful dilation, n	48
No. of BougieCaps used, mean (SD)[2]	2.3 (0.7)
Used stiff guidewire, n	
• Pediatric gastroscope	8
• Standard gastroscope	2
Adverse events (n)	
• BougieCap lost	2 (10, 14 mm)

- 50 patients with benign stricture
- 96 % success rate with Bougie Cap

Walter B et al ,Endoscopy, 2019

BougieCap in EE

- 50 patients with EE
- Median esophageal diameter increased from 12 mm to 16 mm (P< .001)
- Median symptom severity dropped from 32 points to 0



Schoepfer A et al ,GIE, 2021

ESD outcomes adverse events

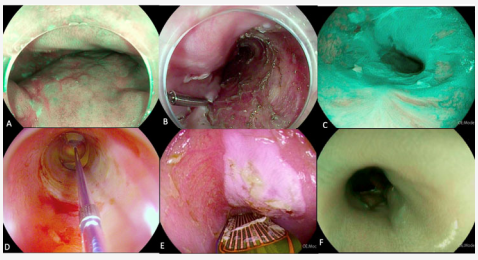
BCM Experience in Early Esophageal Adenocarcinoma

Adverse Events	Rates
Early:	
. Bleeding	1/42 (2.4%)*
. Perforation	1/42 (2.4%)*
Delayed:	
. Bleeding	0/40 (0%)
. Perforation	0/40 (0%)
. Stricture formation	7/40 (17.5%)*

* Both managed conservatively

Bhadi F, Othman et al, EJGH, 2021

Combined ESD with RFA Esophageal Stricture



All strictures resolved after 1 to 2 sessions of balloon dilations

Bhadi F, Othman Mo et al, Scandinavian J of Gastro, 2022

Fully Covered Esophageal Stents

Advantage:

- Rapid Resolution of Dysphagia

Disadvantage

- Recurrence of dysphagia in 1/3 of patients
- Stent related complications:
  - Migration
  - Pain
  - Fistula

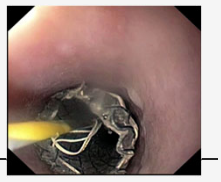
Didden P A et al ,Curr Gastro Rep , 2013

Fully Covered Metal Stents

Author [reference]	Year	Stent type (*n*)	Technical success	Improvement in dysphagia score (mean)	Recurrent dysphagia	Major complications
Siersema [12]	2001	Ultraflex (34)	97 %	3.3 to 0.7	26 %	24 %
		Flamingo (33)	100 %	3.2 to 0.5	33 %	18 %
		Gianturco-Z (33)	100 %	3.2 to 0.7	24 %	36 %
Sabharwal [13]	2003	Flamingo (22)	100 %	2.7 to 0.9	6.4 %	13.6 %
		Ultraflex (33)	100 %	2.7 to 1.0	9.6 %	16 %
Conio [14]	2007	Polyflex (47)	98 %	±2.8 to 1.2	44 %[a]	8.7 %[a]
		Ultraflex (54)	100 %	±2.8 to 1.2	33 %	5.5 %
Verschuur [15]	2008	Ultraflex (42)	100 %	3 to 0[b]	52 %[c]	21 %
		Niti-S (42)	95 %	3 to 0[b]	31 %	12 %
		Polyflex (41)	83 %[c]	3 to 1[b]	37 %	20 %
Van Heel [16][d]	2012	Ultraflex (40)	100 %	3.0 to 0.5	40 %	25 %
		Evolution (40)	100 %	3.0 to 0.5	8 %[c]	8 %[c]

Didden P A et al ,Curr Gastro Rep , 2013

Through The Scope FCMS

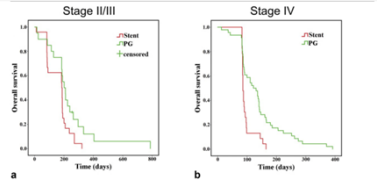


Early adverse events (<24 h) (bleeding, perforation, aspiration)	0/40 patients
Delayed AE (>24 h) (%)	Mild (recurrent dysphagia) 7/39 patients (18%) Severe (perforation, bleeding) 0/39 patients (0%)
Recurrent dysphagia	3/39 stent migration 3/39 tissue ingrowth 1/39 tissue overgrowth
Stent migration	3/15 FCSEMS 0/14 PCSEMS 0/10 UCSEMS
Time migration occurrence (mean [range])	10 (5–20) days
Time from diagnosis of stent migration and stent repositioning/replacement	3 and 6 h in stent repositioning 12 h in stent replacement
Tissue ingrowth	2/14 PCSEMS 1/10 UCSEMS
Tissue overgrowth In/overgrowth occurrence (mean [range])	1/12 FCSEMS 122 (41–254) days

Mangiavillano et al ,Digestive Endos, 2021

FCMS Vs PEG

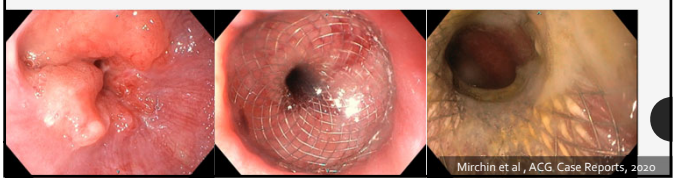
- ❑PG is associated with:
- ✓ better maintenance of nutritional status
- ✓ fewer complications
- ✓better survival



Wang TA et al ,JVIR, 2021

LAMS for Esophageal Stricture

- ❑ Perfect for short stricture
- ❑ Could be used for malignant stricture or anastomotic stricture



Mirchin et al , ACG Case Reports, 2020

Conclusion

- Serial esophageal Dilation is the mainstay for the treatment of benign esophageal stricture
- BougieCap is promising treatment for benign esophageal stricture
- FCMS is the main treatment for malignant esophageal stricture

Bariatric Endoscopy: State of the Art in 2022

Rehan Haidry, MD
Honorary Associate Professor
Consultant Gastroenterologist, Interventional Endoscopist
University College Hospital
London, England