

Grand Rounds:
Wireless Capsule Endoscopy/Enteroscopy
vs.
All Other Diagnostics for “Obscure” Gastrointestinal Bleeding

Traci A. Kimball, MD
The University of Colorado
Health Sciences Center

Objectives

- Epidemiology
- Classifications of GI Bleeding
- Wireless Capsule
 - Evidence (PCT/metanalysis)
- Enteroscopy- Push vs Intraoperative
 - Evidence
- Conclusions
- New Innovations

Epidemiology

- Annual Incidence ~ 100/100,000 persons
- Hospitalizations ~ 300,000 per annum
- Colorectal screening programs for occult bleeding
 - 2-8% incidence in at-risk populations
- 1% incidence of obscure in a large series of patients (n=2751) with acute gi bleeds
- Avg. medicare reimbursement for hospitalizations= \$4,264/ event
- Avg. cost per patient= \$33,630 (hospitalization, transfusions, endoscopy, radiology)

Apples to Oranges

■ Occult GI bleeding

- Stedman's: bleeding too small to be seen but detectable by chemical tests (eg. Iron-deficiency, +FOBT)
- focal symptoms do not correlate with location of bleed, can only direct type of testing
- 30-50% episodes with negative upper/lower endoscopy
- 83% resolve after iron administration
- No repeat diagnostic testing needed unless recurs

■ Obscure GI bleeding

- Intermittent-recurrent bleeding of unknown origin with negative upper/lower endoscopy/SBFT
- Obscure-occult
 - IDA and/or *recurrent* +FOBT
- Obscure-overt
 - Recurrent passage of visible fecal blood (most relevant)
 - 0.5-1.2% incidence of all GI bleeds

Wireless Capsule Endoscopy

■ Technology-

- Given Technologies, Israel
- FDA approved 2001

■ Advantage-

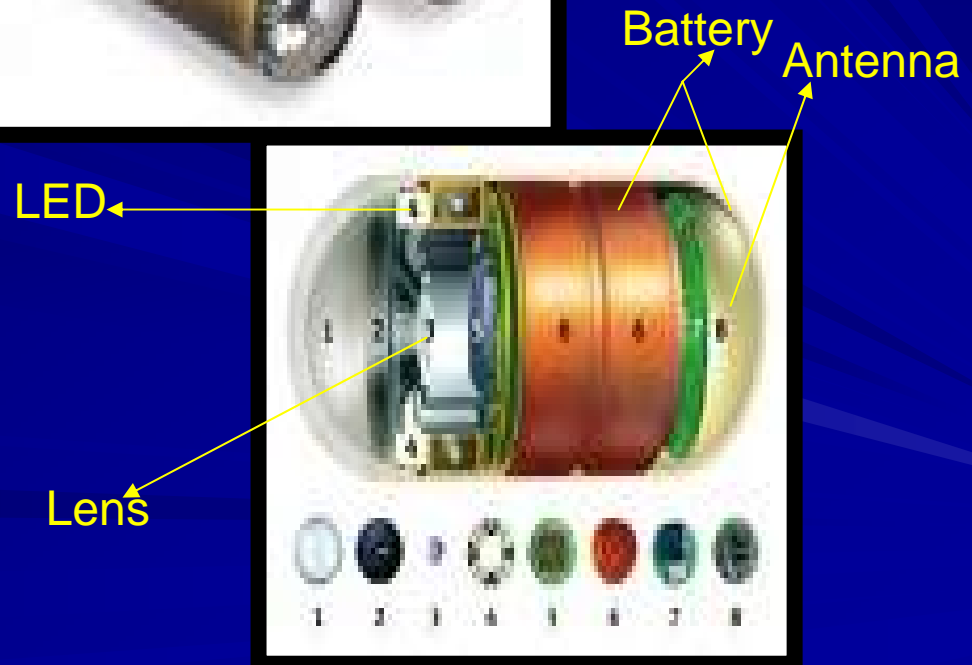
- Sensitive diagnostic imaging of small bowel, less invasive

■ Disadvantage-

- No tissue sampling, not therapeutic
- Capsule Retention (<1%)

■ Indications-

- Obscure GI bleeding
 - eg. Angioectasia, eval for suspected Crohn's Dz, Celiac Dz, tumors, mucosal injury



Outcomes of patients w/ Obscure GI bleeding after capsule endoscopy (CE): Report of 100 consecutive cases

- *Gastroenterology*, 2004
- Prospective Study, Italy (n=100)
 - 3 groups (all underwent CE) w/ previously negative workups; HgB 4.5-11.5 g/dl, 88% required at least 1 hospitalization, 73% had required transfusions
- Lesions found: Angiodysplasias (29%), Crohn's (6%), gastric ulcers, polyps
- Assessing Diagnostic Yield
- Sensitivity/Specificity/PPV/NPV/Accuracy
- Does it impact outcomes, help guide treatment, and indicate the need for more workup?

Diagnostic Yield

Table 3. Diagnostic Yield of Capsule Endoscopy According to Type of Bleeding

Type of bleeding	Type of finding (%)		
	Positive	Suspicious	Negative
Overt-ongoing (n = 26)	24 (92.3)	0 (0.0)	2 (7.7)
Overt-previous, overall (n = 31)	4 (12.9)	5 (16.1)	22 (71.0)
10-14 days (n = 3)	2 (66.6)	0 (0.0)	1 (33.3)
3-4 weeks (n = 3)	1 (33.3)	2 (66.6)	0 (0.0)
2-3 months (n = 9)	0 (0.0)	2 (22.2)	7 (77.8)
4-6 months (n = 11)	1 (9.1)	0 (0.0)	10 (90.9)
7-12 months (n = 5)	0 (0.0)	1 (20.0)	4 (80.0)
Occult (n = 43)	19 (44.2)	10 (23.2)	14 (32.6)

Yield decreases in parallel with length of interval

Overall Yield= 40.4%, $p < 0.0001$

Diagnostic Yield

Table 4. Diagnostic Yield of Capsule Endoscopy and Push Enteroscopy in 51 Patients Undergoing Both Procedures

Findings	Type of bleeding (%)			Total (%)
	Obscure-overt ongoing	Obscure-overt previous	Obscure-occult	
CE+, PE+	10 (50)	0 (0)	2 (12)	12 (23.5)
CE+, PE-	9 (45)	0 (0)	9 (53)	18 (35.3)
CE-, PE+	0 (0)	2 (14)	1 (6)	3 (9)
CE-, PE-	1 (5)	12 (86)	5 (29)	18 (35.3)
Total	20 (100)	14 (100)	17 (100)	51 (100.0)

**67% yield;
95% CI:
54-80%**

Capsule Endoscopy Statistics

	Lesion Present	Lesion Absent	
CE +	Sensitivity= 88.9%	False positive ^{\$} =1 Polyp by CE=Dieulafoy lesion by intraoperative enteroscopy	PPV= 97%
CE -	False negative ^{&} = 4 3-duodenal AVMs 1-colon adenoCa	Specificity=95% Accuracy= 91%	NPV= 82.6%

*True positives=Confirmatory test with surgery/IOE, endoscopy, angio, nuclear Scan

~True negatives= [1]negative capsule with resolution without further intervention [2] lesions outside small bowel found on subsequent workup

^{\$}False positive= positive CE with a different lesion found on subsequent workup

[&]False negative= negative CE with lesion found on by different means and treated with resolution.

Outcomes

- Mean followup=20months
- In 23 of the 26 patients w/ ongoing obscure-overt bleeding, CE dictated subsequent management that led to resolution of the clinical problem in 86.9%
- In another 40 patients (avg. procedures=5.3 per patient), could have had their diagnosis if CE was used as the third procedure following a negative upper and lower endoscopic workup

Metanalysis of the Yield of CE Compared to Other Diagnostic Modalities in Patients with Obscure GI Bleeding

- *Am J Gastroenterology*, 2005
- Mayo Clinic Scottsdale
- 20 prospective studies, n= 537 patients
- Incremental yields calculated when comparing both modalities (CE-other modality). Yields calculated for all findings and “clinically significant” findings.
 - a lesion with active bleeding
 - definitely or probably the source of bleeding

Metanalysis of the Yield of CE Compared to Other Diagnostic Modalities in Patients with Obscure GI Bleeding

Comparison	Diagnostic Yields	Incremental Yield: All findings	Incremental Yield: Clinically Significant Findings
CE vs PE N=396	63% vs 28%	35%, p<0.00001	30%, p<0.00001 NNT=1/IY= 3
CE vs SBFT N=88	67% vs 8%	59%, p<0.00001,	36%, p<0.00001 NNT=3
CE vs IOE N=42	83% for both	0%, p=1.00	
CE vs CT N=8	Not provided	38%, p=0.08	
CE vs Angio N=17	47% vs 53%	-6%, p=0.73	
CE vs SBMRI N=14	Not provided	36%, p=0.007	

PE= push enteroscopy; SBFT= sm. bowel follow-thru; IOE=intraoperative enteroscopy; SBMRI=small bowel MRI

Push Enteroscopy

Table 3. Push Enteroscopy in Obscure GI Bleeding

Study	Presentation ^a	No. of patients	Bleeding source found	Source within upper endoscopy range	Complications	Overall diagnostic yield
Messer et al. ⁹⁴ 1984	"Chronic occult or acute overt"	52	20	Not mentioned	0	38%
Foutch et al. ¹⁴ 1990	"Acute overt," chronic occult, IDA	39	15	Not mentioned	Not mentioned	38%
Willis et al. ⁶⁶ 1997	Acute bleeding, anemia	54	29	13	0	54%
Chong et al. ⁶⁵ 1994	"Occult"	55	35	21	1 ^b	64%
Barkin et al. ⁸⁵ 1992	"Occult"	28	21	11	5 ^c	75%
Rutgeerts et al. ⁸⁸ 1993	"Occult"	57	27	Not mentioned	Not mentioned	47%
Harris et al. ⁶⁷ 1994	"Occult," IDA	31	19	5	0	61%
Pennazio et al. ⁸⁹ 1995	"Occult," IDA	41	24	6	Not mentioned	59%
Schmit et al. ⁸⁶ 1996	IDA	83	49	10	0	59%
Kessel et al. ⁹³ 1995	Recurrent bleeding	40	20	15	0	50%
Vakil et al. ⁶⁷ 1997	"Occult," "overt"	29	18	5	0	62%
Chak et al. ²²⁵ 1998	"Occult," "overt"	129	91	45	Not mentioned	71%
O'Mahony et al. ⁹⁵ 1996	"Overt," "occult"	39	24	5	Not mentioned	62%
Zaman and Katon ⁶² 1998	"Overt," "occult"	95	39	25	0	41%

^aPresentations fit the definition of obscure bleeding (Table 1).

^bPharyngoesophageal tear.

^cAbdominal pain, Mallory-Weiss tear, pancreatitis.

Intraoperative Enteroscopy

Table 4. Intraoperative Enteroscopy in Obscure GI Bleeding

Study	Presentation	No. of patients	Positive diagnoses	Insertion technique	Endoscope used	Serious complications ^a	Diagnostic yield
Szold et al. ¹² 1992	Obscure	30	28	Oral	Colonoscope	2%	93%
Lau et al. ¹⁶ 1987	Obscure	15	12	Anus, enterotomy	Colonoscope	Not mentioned	80%
Lewis et al. ⁹⁹ 1991	Obscure	23	20	Oral	Colonoscope, regular enteroscope	13%	87%
Lopez et al. ¹¹³ 1996	"Occult"	16	14	Oral	Sonde enteroscope	13%	88%
Ress et al. ¹⁵ 1992	"Occult"	44	31	Oral, enterotomy, nasal, ileostomy	Not mentioned	27%	70%
Bowden et al. ¹¹⁷ 1980	Obscure	18	16	Oral	Colonoscope	Not mentioned	89%
Desa et al. ¹¹⁵ 1991	Obscure	12	10	Oral	Colonoscope	42%	83%
Flickinger et al. ¹¹⁴ 1989	"Recurrent bleeding"	14	13	Oral	Colonoscope	29%	93%

^aSerious complications included bowel ischemia or perforation, prolonged ileus, wound infection, intestinal obstruction, and death.

Death reported as high as 11%; most studies do not publish mortality stats.

Conclusions

- Wireless capsule endoscopy, standard of care?
 - Higher diagnostic yields, 47%-83% vs other modalities
 - Acceptable PPV and NPV in patients with “active” bleeding
 - Reduces medical utilization (ie. repeated, inconclusive tests) and net-costs of obscure gi bleeding workups when used in appropriate settings.
 - Improves quality of life (comfort to patients/ease of use/fast track to treatment) with little risks.
 - Complements push enteroscopy

New Innovations

■ Dissolvable capsule

- determines bowel patency prior to video-capsule endoscopy and helps to exempt patients at higher risk for capsule retention.
- diagnostic for suspected bowel strictures
- constructed with lactose to dissolve in 40-80 hours after ingestion

Questions?