



GI M&M

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Presentation

- 70 year-old man presented to the outpatient GI lab for a surveillance colonoscopy.
 - Last colonoscopy (at an outside facility) was in 08/2008, found to have polyps.
 - Prior to that, a screening colonoscopy in 1996 was normal.
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Presentation...

■ **PMH:**

- Hypertension (on Benicar)
 - Borderline diabetes mellitus (on Actos)
 - Seizure disorder (on Keppra)
 - Prostate cancer- pT2b, N0, M0; treated with radical retropubic prostatectomy in July, 2001.
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Presentation...

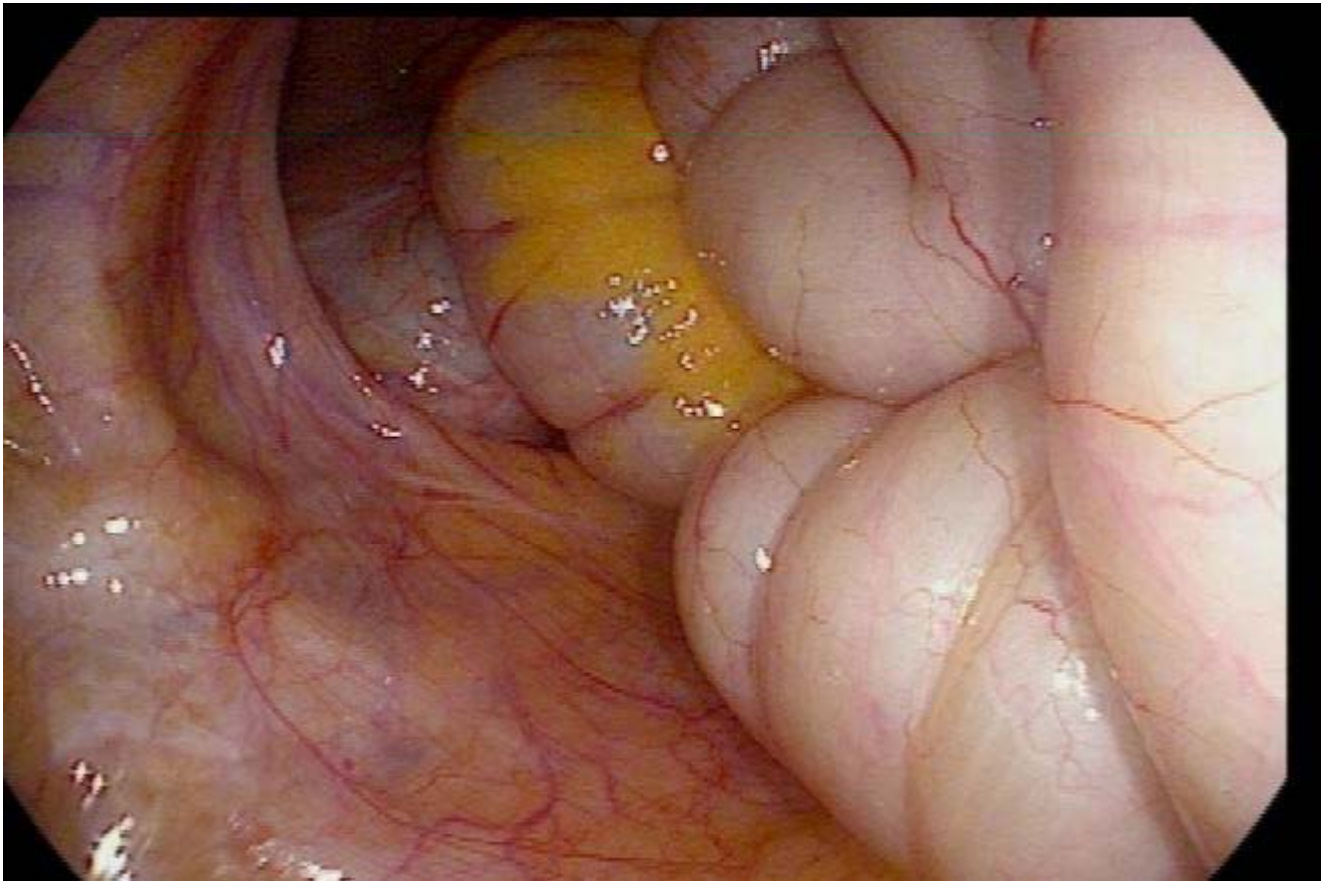
- **Family history:** No history of colorectal cancer
 - **Outpatient Medications:** Actos, Benicar and Keppra; no NSAIDs/ASA/Antiplatelet agents or anticoagulants
 - **ROS:** No hematochezia / hematemesis / abdominal pain/weight loss/change in bowel habits.
 - **Social:** No alcohol/tobacco/drug use.
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Procedure

- Colonoscopy

- Propofol sedation
 - No difficulty reaching cecum
 - No polyps/masses/diverticula seen
 - On withdrawal, large perforation noted in the sigmoid colon at around 30-40 cm.
 - Colonoscope withdrawn completely; no additional air insufflation; no retroflexion in rectum.
 - Surgery called right away.
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What is that??



Course...

- Chest x-ray and KUB done
 - Large pneumoperitoneum
 - Bowel loops air-filled and displaced upwards from the pelvis.
 - Surgery:
 - Exploratory laparotomy
 - 7 cm tear at the anterior rectosigmoid junction.
 - Sigmoid resection with primary anastomosis performed.
 - Path specimen: 12 cm length; transmural perforation with hemorrhage and fat necrosis; viable margins.
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Colon Perforation Secondary to a Colonoscopy

- Incidence
- Risk factors



Incidence

- Ranges between 0.016 to 0.090%, depending on the study.
 - Between 0.03% and 0.8% for diagnostic colonoscopy.
 - Between 0.15% and 3% for therapeutic colonoscopy.
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Incidence

Table 1 Frequency of perforation in recently published studies.

	Type of study	No. of colonoscopies	No. of perforations overall (%)	No. of therapeutic colonoscopies	No. of therapeutic perforations (%)	No. of deaths (%)
Anderson et al. [11], 2000	Retrospective	10485	20 (0.19)	4194	8 (0.19)	2 (0.019)
Sieg et al. [23], 2001	Prospective	82415	13 (0.015)	14249	9 (0.06)	1 (0.001)
Tran et al. [12], 2001	Retrospective	26162	21 (0.08)	9214	10 (0.11)	1 (0.006)
Nelson et al. [24], 2002	Prospective	3195	0 (0)	1672	0 (0)	0 (0)
Korman et al. [15], 2003	Retrospective	116000	37 (0.03)		13	0 (0)
Gondal et al. [14], 2003	Prospective	2524	6 (0.23)	1807	6 (0.33)	0 (0)
Gatto et al. [13], 2003	Retrospective	39285	77 (0.19)			4 (0.01)
Misra et al. [16], 2004	Retrospective	7425	10 (0.13)	2955	4 (0.13)	1 (0.013)
Cobb et al. [17], 2004	Retrospective	43609	14 (0.032)		4	0 (0)
Heldwein et al. [22], 2005	Prospective	24382	26 (0.1)	24382	26 (0.1)	0 (0)
Iqbal et al. [18], 2005	Retrospective	85824	72 (0.08)		33	5 (0.005)
Rathgaber and Wick [20], 2006	Retrospective	12407	2 (0.016)	5074	0 (0)	0 (0)
Levin et al. [21], 2006	Retrospective	16313	15 (0.09)	11083	12 (0.1)	0 (0)
Tulchinsky et al. [19], 2006	Retrospective	12067	7 (0.05)		2	0 (0)
Luning et al. [8], 2007	Retrospective	9209	23 (0.24)		15	3 (0.009)
Total		491311	343 (0.07)	74630*	75 (0.1)*	17 (0.003)

Study	Publication year	No. colonoscopies	Perforation rate (%)
Smith and Nivatvongs ³⁸	1975	7959	0.264
Rogers et al ³⁵	1975	31,512	0.054
Smith ³⁷	1976	20,139	0.358
Fruhmorgen and Demling ²⁰	1979	35,892	0.217
Macrae et al ²⁹	1983	5000	0.12
Vincent and Smith ⁴²	1983	1547	0.388
Brynitz et al ¹⁴	1986	1748	0.629
Reiertsen et al ³⁴	1987	4593	0.152
Carpio et al ¹⁵	1989	5424	0.258
Soon et al ³⁹	1990	1832	0.38
Christie and Marrazzo ¹⁶	1991	4784	0.15
Hall et al ²⁴	1991	17,500	0.086
Luchette et al ²⁸	1992	4593	0.588
Reed et al ³³	1992	1025	0.1
Waye et al ⁴³	1992	2097	0.095
Mandel et al ³⁰	1993	12,246	0.033
Jentschura et al ⁸	1994	8390	0.191
Lo and Beaton ⁷	1994	26,708	0.045
Foliente et al ¹⁹	1996	6684	0.22
Gedebou et al ²³	1996	9106	0.2
Farley et al ⁶	1997	57,028	0.075
Basson et al ¹²	1998	5163	0.058
Wexner et al ⁴⁴	1998	2069	0.145
Anderson et al ¹¹	2000	10,486	0.19

Incidence

Study	Publication year	No. colonoscopies	Perforation rate (%)
Wexner et al ⁴⁵	2001	13,580	0.074
Araghizadeh et al ⁹	2001	34,620	0.089
Dafnis et al ¹³	2001	6066	0.1
Tran et al ⁴⁰	2001	26,162	0.08
Sieg et al ³⁶	2001	82,416	0.005
Kirchgatterer et al ²⁵	2002	781	0.128
Korman et al ²⁶	2003	116,000	0.032
Gatto et al ²²	2003	39,286	0.196
Biandrate et al ¹³	2003	7358	0.081
Misra et al ³¹	2004	7425	0.13
Cobb et al ¹⁷	2004	43,609	0.032
Iqbal et al ¹⁰	2005	78,702	0.084
Tulchinsky et al ⁴¹	2006	12,067	0.058
Levin et al ²⁷	2006	16,318	0.09
Rathgaber and Wick ³²	2006	12,407	0.016
Garcia Martinez et al ²¹	2007	16,285	0.092

Putative Risk Factors

- Age
 - Gender
 - Comorbidity
 - Prior abdominal or pelvic surgery
 - Colonic obstruction
 - Dilation/stent placement/EMR/ESD
 - Biopsy/polypectomy
 - Race
 - Operator specialty
 - Deep sedation
 - Fellow involvement
 - Pedunculated vs. sessile polyp
 - Right colon vs. left colon polyp
 - More than 1 polyp
 - Colorectal cancer
 - Poor bowel prep
 - Snare/hot biopsy
 - Prolonged procedure time
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Colonic perforation from a colonoscopy

- In a study of 277,434 colonoscopies over a 10-year period in the Medicaid population, 228 perforations were noted (0.082% or 82/100,000)
- Increasing age, significant comorbidity, obstruction as an indication for the colonoscopy, and performance of invasive interventions during colonoscopy were significant positive predictors.
- Performance of biopsy or polypectomy did not affect the perforation risk. The rate of perforation did not change significantly over time.

Arora et al. Gastrointestinal Endoscopy. March 2009

Risk Factors

	Adjusted OR (95% CI)*	P value
Age at colonoscopy	1.01 (1.00-1.02)†	.007
Sex		
Women	1 (referent)	
Men	1.09 (0.83-1.44)	.533
Charlson comorbidity score		
0	1 (referent)	–
1	0.99 (0.69-1.42)	0.959
≥ 2	1.52 (1.12-2.06)	.007
Indication		
Screening	1 (referent)	–
Nonobstruction	1.04 (0.72-1.50)	.830
Obstruction	5.09 (3.17-8.20)	<.001
Procedure during colonoscopy		
None	1 (referent)	–
Biopsy	1.20 (0.86-1.68)	.285
Polypectomy	1.10 (0.79-1.54)	.562
Dilation	n/a	n/a
Other‡	6.12 (3.16-11.83)	<.001
Operator specialty		
Gastroenterologist	1 (referent)	–
Surgeon§	1.47 (0.87-2.49)	.149
Primary care	0.71 (0.51-0.99)	.049
Other¶	0.64 (0.44-0.93)	.019

Polypectomy

Table 2 Perforations per polypectomy.

	Heldwein et al. [22], 2005	Gondal et al. [14], 2003	Levin et al. [21], 2006	Sieg et al. [23], 2001
Type of study	Prospective	Prospective	Retrospective	Retrospective
No. of polypectomies	3976	2208	11 083	14 249
Percentage of polyps larger than 1 cm	50	19	38	39
Percentage of patients with > 1 polyp	35.6	6.5	49.3	-
No. of perforations	26	6	12	9
Perforations/polypectomies	1/153	1/368	1/923	1/1583

EMR

1 in 500 overall

Table 3 Perforation rate in endoscopic mucosal resections of colonic lesions.

	No. of lesions	Type of lesions	Size of lesions, mean, mm	No. of perforations
Iishi et al. [35], 2000	56	Sessile	20 – 50 (range)	0
Tanaka et al. [40], 2001	81	LST	31	1
Ahmad et al. [30], 2002	41	Sessile–LST	20	0
Bergmann and Beger [31], 2003	71	Sessile–flat	25.4	1
Higaki et al. [32], 2003	24	Flat	35.5	0
Tung and Wu [41], 2003	91	Polypoid/flat	20	0
Tamura et al. [39], 2003	67	LST	23	0
Hurlstone et al. [33], 2004	58	LST	24 – 42 (range)	0
Conio et al. [27], 2004	139	Sessile	25	0
Hurlstone et al. [34], 2004	599	Sessile–flat	6.8	1
Su et al. [38], 2005	152	Flat–LST	19.4	0
Katsinelos et al. [37], 2006	59	Sessile	20 – 60 (range)	0
Bories et al. [23], 2006	52	Sessile	29.8	1
Jameel et al. [29], 2006	30	Polypoid/flat	20	0
Arebi et al. [26], 2007	161	Sessile–LST	32.5	0
Wei et al. [42], 2007	61	Polypoid/flat	14	0
Kaltenbach et al. [36], 2007	116	Flat	16.7	0
Total	1858			4

LST, laterally spreading tumour.

Panteris V et al. Colonoscopy perforation rate, mechanisms and outcome... Endoscopy 2009; 41: 941–951

ESD

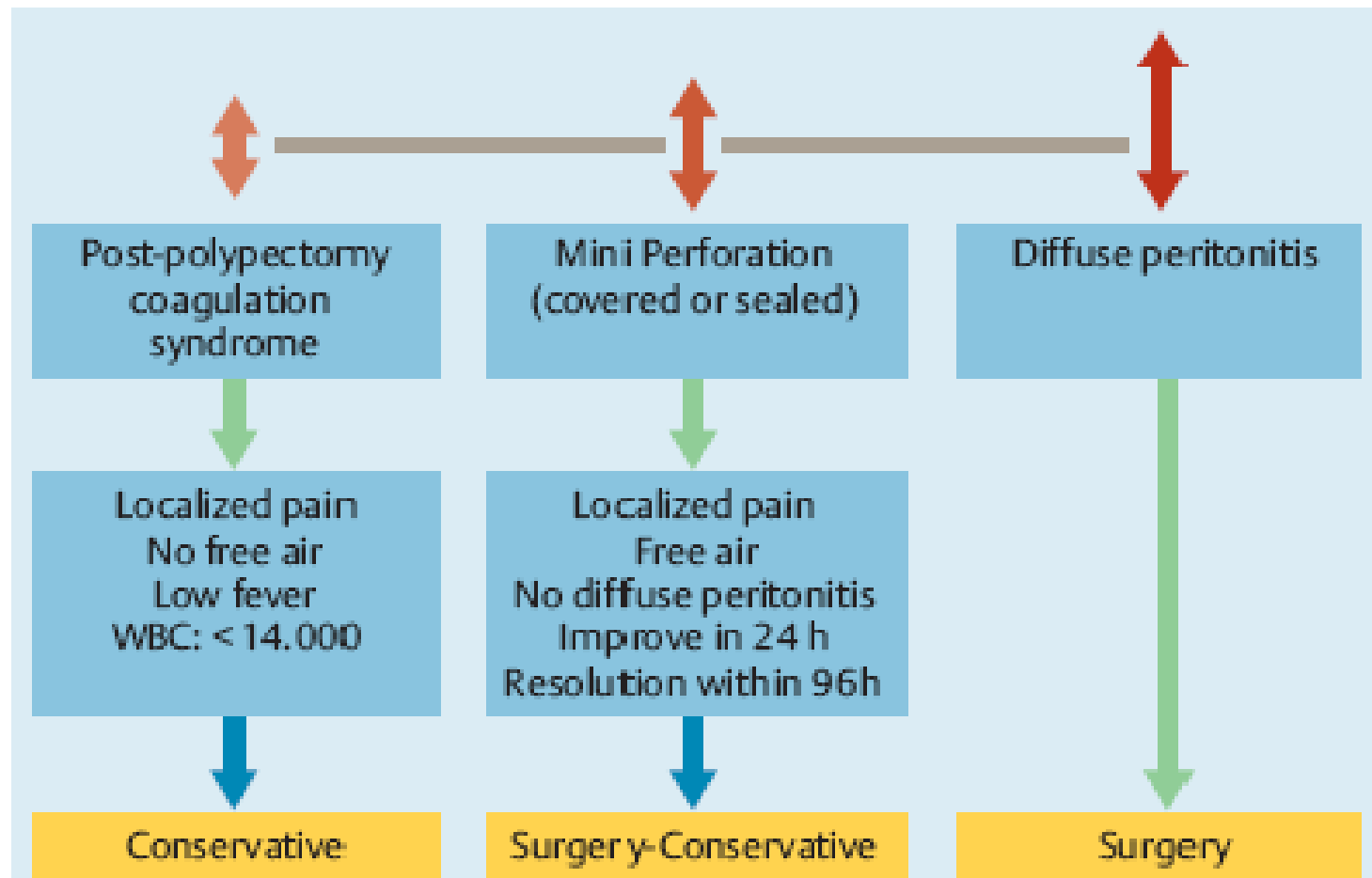
5% overall

	No. of lesions	Size of lesions, mean, mm	No. of perforations
Fujishiro et al. [43], 2006	35	32.8	2
Tanaka et al. [45], 2007	70	28	7
Tamegai et al. [46], 2007	71	32.7	1
Onozato et al. [44], 2007	30	26.2	1
Saito et al. [47], 2007	200	35	10
Hurlstone et al. [48], 2007	42	14–44 (range)	1
Fujishiro et al. [49], 2007	200	29.9	11
Total	648		33

Time to diagnosis of perforation

	Total no. of perforations	Time to diagnosis		
		Immediate	Within 24 h	24–96 h
Anderson et al. [11]	20		16	3
Korman et al. [15]	37		20	17
Misra et al. [16]	10	6	9	1
Cobb et al. [17]	14	7	14	
Iqbal et al. [18]	72	19	58	14
Heldwein et al. [22]	26	9	20	6
Tulchinsky et al. [19]	7		6	1
Luning et al. [8]	35	13	19	14
Lohsiriwat et al. [50]	15		14	1
Total	236	54 (23%)	176 (74.6%)*	57 (24%)

Spectrum of tissue damage after polypectomy



Management

- Conservative (Bowel rest, fluids, antibiotics).
 - Laparoscopic repair
 - Open surgical repair
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Follow-up

- Patient did well after surgery and was discharged 3 days later in stable condition.
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Take Home Points

- Perforation rate from a colonoscopy varies according to the underlying risk factors.
 - Most of the cases will be recognized within 96 hours.
 - Early therapy can greatly improve outcomes.
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