Bowel Prep Prior to Colon / Rectal Surgery: A thing of the past

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Grand Rounds

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Objectives

- History of bowel preparation
- What are bowel preps? How to perform?
- What do colorectal surgeons in the US do?
- Bowel preparation for colorectal surgery is overrated-The data do not lie.
- Closing Remarks

Colonic Flora

- Enormous reservoir of bacteria
- Colonic microflora-anaerobic
- *Bacteroides fragilis* 10^{11}CFU/g stool
- Aerobic coliforms 10^{7} CFU/g stool

- Prior to 1975 postoperative infection-10-40%

History

- 1898-Halsted-aseptic anastomosis-suture over inflatable cylinder
- Early methods included:
  - Charcoal, chlorine, salicylates
  - No influence on post-op infection
  - Toxic complications
- 1970 - VA cooperative study - clinical efficacy of the antibiotics in preventing septic complications following elective colon operations

History

- 1972 - Hughes proposes bowel prep can be omitted (largely ignored)
- 1987 – Irving argues MBP is “time consuming, expensive and unpleasant.
- 1992 – Brownson – 1st prospective randomized trial showing minimal benefit of MBP

Bowel preparation

- Old methods-castor oil, senna, dulcolax
  - Side effects-cleaning insufficient
    - Required addition of enemas
- Mannitol
  - Side effects-dehydration, electrolyte disturbances and colonic explosion

Bowel preparation

TABLE 1. Colon Cleansing Preparation Methods

Diet and Cathartics	
Diet:	Clear liquids for 3 days, or a diet designed to leave a minimal colonic fecal residue for 1-3 days
Cathartic:	Extract of senna fruit (X-Prep) 240 ml or magnesium citrate 240 ml
Additional Cathartic:	Bisacodyl 20 mg orally and suppositories
Enemas:	Sodium Phosphate or tap water
Kits:	Liqui Prep, Nutra Prep, LoSo Prep System
Gut Lavage Methods	
Polyethylene Glycol-Electrolyte Lavage Solution (PEG-ELS)	
Sodium sulfate and polyethylene glycol (PEG)	
GoLYTELY, CoLyte	
Sulfate-Free-Electrolyte Lavage Solution (SF-ELS)	
PEG without sulfate	
NuLYTELY	
Reduced volume with bisacodyl or magnesium citrate	
Half Lytely	
Phosphate Preps	
Oral sodium phosphate	
Fleet's Phosphosoda	
Phosphate Tablets	
Visicol	

Current Agents

- Polyethylene glycol(PEG-ELS)-1980, osmotically balanced
- Benefit-less electrolyte/water changes
  - Down side-4 liters salty fluid
  - Nausea, vomiting, fullness
- At least 5-15% are unable to complete the prep

Grundel et al. Improvements in mechanical bowel preparation for elective colorectal surgery. *Dis Coln Rectum*1997; 40:585-91*0*

- Sulfate-free electrolyte lavage solution-(NuLytely, SF-ELS)
  - Benefit-No rotten egg smell
  - Slightly better compliance
- Reduced Volume Lavage-Bisacodyl 20 mg at 12 p.m. and 6 p.m. 2L SF-ELS
  - Benefit-less fullness, N/V

- Phosphates
  - Oral sodium phosphate(Phosphosoda)-45 ml solution with water given evening before surgery and repeated 12 hours later

Mechanical Bowel Preparation is Overrated

Mechanical bowel preparation for colonic resection and anastomosis

Type of resection	N	Elective	Emergency	Wound infection
Sigmoid / Descending Colon	24	18	6	4 (2 emer, 2 elective)
Anterior Resection				
High	12	9	3	1 (elective
Low	10	7	3	-
Right Hemicolectomy	26	19	7	1 (emergent)
Totals	72	53	19	6 (8%)

Ivring and Scrimgeour. Mechanical bowel preparation for colonic resection and anastomosis. *Br J Surgery*1987; 74:580-581

Mechanical bowel preparation for elective colorectal surgery: a multicentre randomised trial

Caroline M E Contant, Wim C J Hop, Hans Pieter van 't Sant, Henk J M Oostvogel, Harm J Smeets, Laurents P S Stassen, Peter A Neijenhuis, Floris J Idenburg, Cees M Dijkhuis, Piet Heres, Willem F van Tets, Jos J G M Gerritsen, Wibo F Weidema

- Prospective RCT
- 1431 patients
  - 707 MBP vs 724 No MBP

- Primary outcome - Anastomotic Leakage
- Secondary outcome
  - Mortality, Peritonitis, Reoperation, Wound infection, Infectious extra-abdominal and non-infectious extra-abdominal

	With mechanical bowel preparation† n=670	Without mechanical bowel preparation† n=684	Difference (95% CI)	p value
No postoperative complication	462 (69·0%)	452 (66·1%)	−2·9 (−7·9 to 2·1)	0·28
Anastomotic leakage	32 (4·8%)	37 (5·4%)	0·6 (−1·7 to 2·9)	0·69
Minor anastomotic leakage	6 (0·9%)	6 (0·9%)	0·0 (−1·0 to 1·0)	1·0
Major anastomotic leakage	26 (3·9%)	31 (4·5%)	0·6 (−1·6 to 2·8)	0·64
Wound infection	90 (13·4%)	96 (14·0%)	0·6 (−3·2 to 4·4)	0·82
Mild wound infection	49 (7·3%)	51 (7·4%)	0·1 (−2·7 to 2·9)	1·0
Severe wound infection	41 (6·1%)	45 (6·6%)	0·4 (−2·2 to 3·0)	0·83
Fascia dehiscence	19 (2·8%)	16 (2·3%)	−0·5 (−2·2 to 1·2)	0·69
Urinary tract infection	71 (10·6%)	70 (10·2%)	−0·4 (−3·6 to 2·9)	0·90
Pneumonia	39 (5·8%)	51 (7·5%)	1·6 (−1·0 to 4·3)	0·27
Intra-abdominal abscess	15 (2·2%)	32 (4·7%)	2·4 (0·5 to 4·4)	0·02
Abscess without anastomotic leakage	13 (1·9%)	15 (2·2%)	0·3 (−1·3 to 1·8)	0·85
Abscess with anastomotic leakage	2 (0·3%)	17 (2·5%)	2·2 (0·9 to 3·4)	0·001
Secondary intervention	58 (8·7%)	58 (8·5%)	−0·2 (−3·2 to 2·7)	0·99
Deaths	20 (3·0%)	26 (3·8%)	0·8 (−1·1 to 2·7)	0·50
Faecal contamination*	..	..	..	0·42
Clean contaminated	389 (58·1%)	380 (55·8%)	−2·3 (−7·6 to 2·9)	0·41
Contaminated	250 (37·4%)	276 (40·5%)	3·2 (−2·0 to 8·4)	0·26
Dirty	30 (4·5%)	25 (3·7%)	−0·8 (−2·9 to 1·3)	0·54
Operation time (min)	120 (90–150)	120 (90–144)	0·0 (−5·0 to 5·0)	0·48
Resumption of normal diet (days)	6 (4–8)	6 (4–8)	0·0 (−0·4 to 0·4)	0·91
Hospital stay (days)†	10 (8–14)	10 (8–13)	0·0 (−1·0 to 1·0)	0·40

Data are number (%) or median (IQR) unless otherwise specified. The number of patients for whom data were missing was less than 1% for all variables except for days until resumption of a normal diet (n=31) and hospital stay (n=29). *Clean contaminated=colon resection with minimal spill; contaminated=colon resection with severe spill of bowel contents, no pus; and dirty=intraperitoneal pus or bowel perforation. †Excluding postoperative deaths.

Table 2: **Postoperative complications, surgery data, and hospital stay for the 1354 patients who had bowel resections**

Mechanical Bowel Preparation for Elective Colorectal Surgery

- Cochran Review in 2003. 5 RCT
  - No difference in wound infection or anastomotic leak
- Update in 2005. 4 additional RCT
  - Anastomotic leakage rate higher in MBP group
- Update in 2009. 5 additional RCT
  - No difference in wound infection or anastomotic leak, though trend toward increased leak rate.

Guenaga, K. Mechanical bowel preparation for elective colorectalsurgery. *The Cochrane Collaboration*2009;1-44

Mechanical Bowel Preparation for Elective Colorectal Surgery

- Retrospective review of 13 prospective RCT
- 4777 patients
  - MBP 2390 vs No MBP 2387
- Main outcome - Anastomotic Leakage
- Secondary outcome
  - Mortality, Peritonitis, Reoperation, Wound infection, Infectious extra-abdominal and non-infectious extra-abdominal

Guenaga, K. Mechanical bowel preparation for elective colorectalsurgery. *The Cochrane Collaboration*2009;1-44

Comparison 1. Mechanical bowel preparation versus no preparation

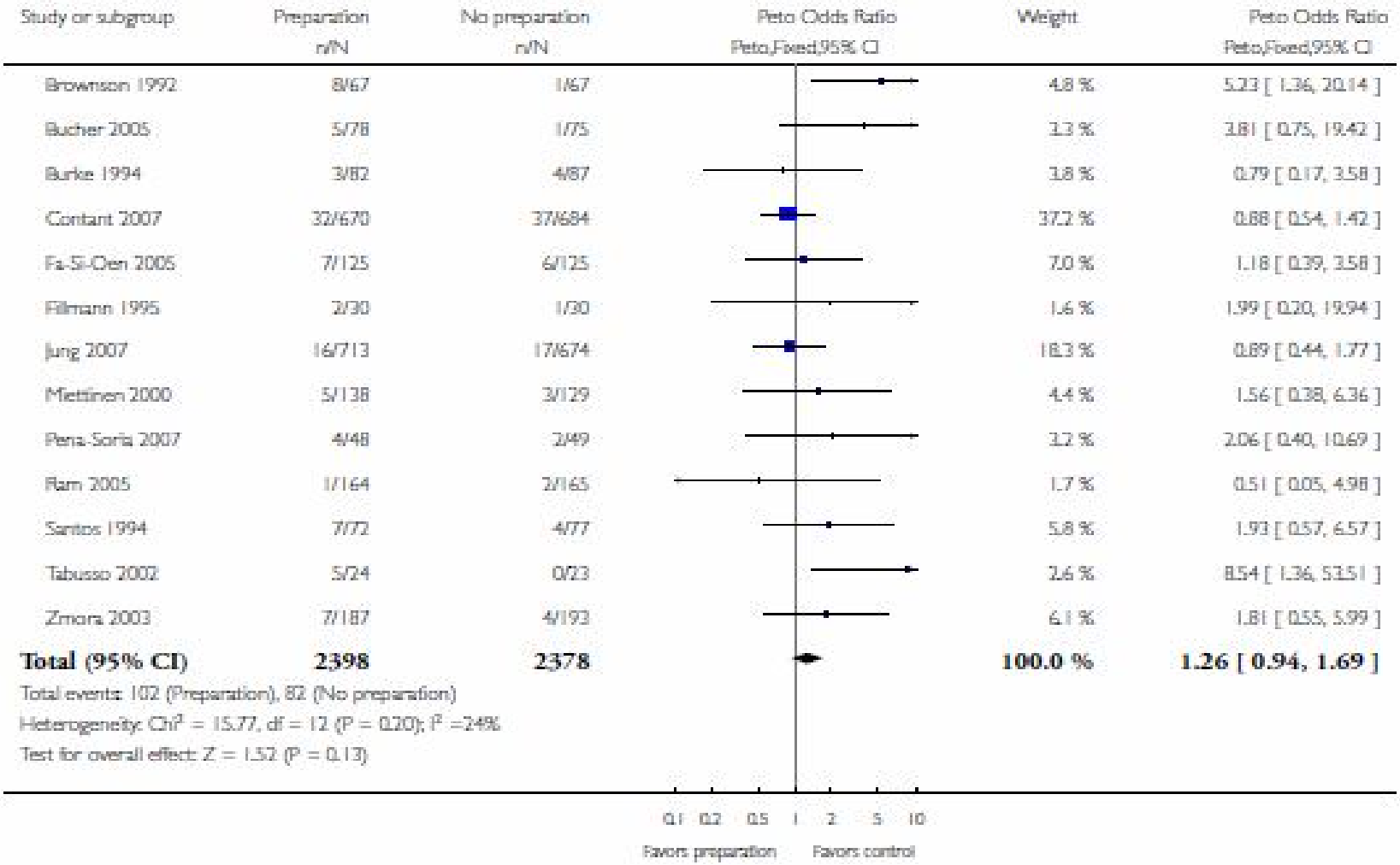
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Anastomosis leakage stratified for colonic or rectal surgery	8		Peto Odds Ratio (Peto, Fixed, 95% CI)	Subtotals only
1.1 Leakage after low anterior resection	5	275	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.73 [0.73, 4.10]
1.2 Leakage after colonic surgery	7	2454	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.13 [0.69, 1.85]
2 Overall anastomotic leakage for colorectal surgery	13	4776	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.26 [0.94, 1.69]
3 Mortality	10	4345	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.93 [0.59, 1.47]
4 Peritonitis	10	4078	Peto Odds Ratio (Peto, Fixed, 95% CI)	0.82 [0.55, 1.22]
5 Reoperation	10	4165	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.07 [0.82, 1.38]
6 Wound infection	13	4821	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.19 [0.98, 1.45]
7 Infectious extra-abdominal complications	6	3550	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.08 [0.88, 1.33]
8 Non-infectious extra-abdominal complications	7	2570	Peto Odds Ratio (Peto, Fixed, 95% CI)	1.19 [0.87, 1.62]

Analysis 1.2. Comparison 1 Mechanical bowel preparation versus no preparation, Outcome 2 Overall anastomotic leakage for colorectal surgery.

Review: Mechanical bowel preparation for elective colorectal surgery

Comparison: 1 Mechanical bowel preparation versus no preparation

Outcome: 2 Overall anastomotic leakage for colorectal surgery

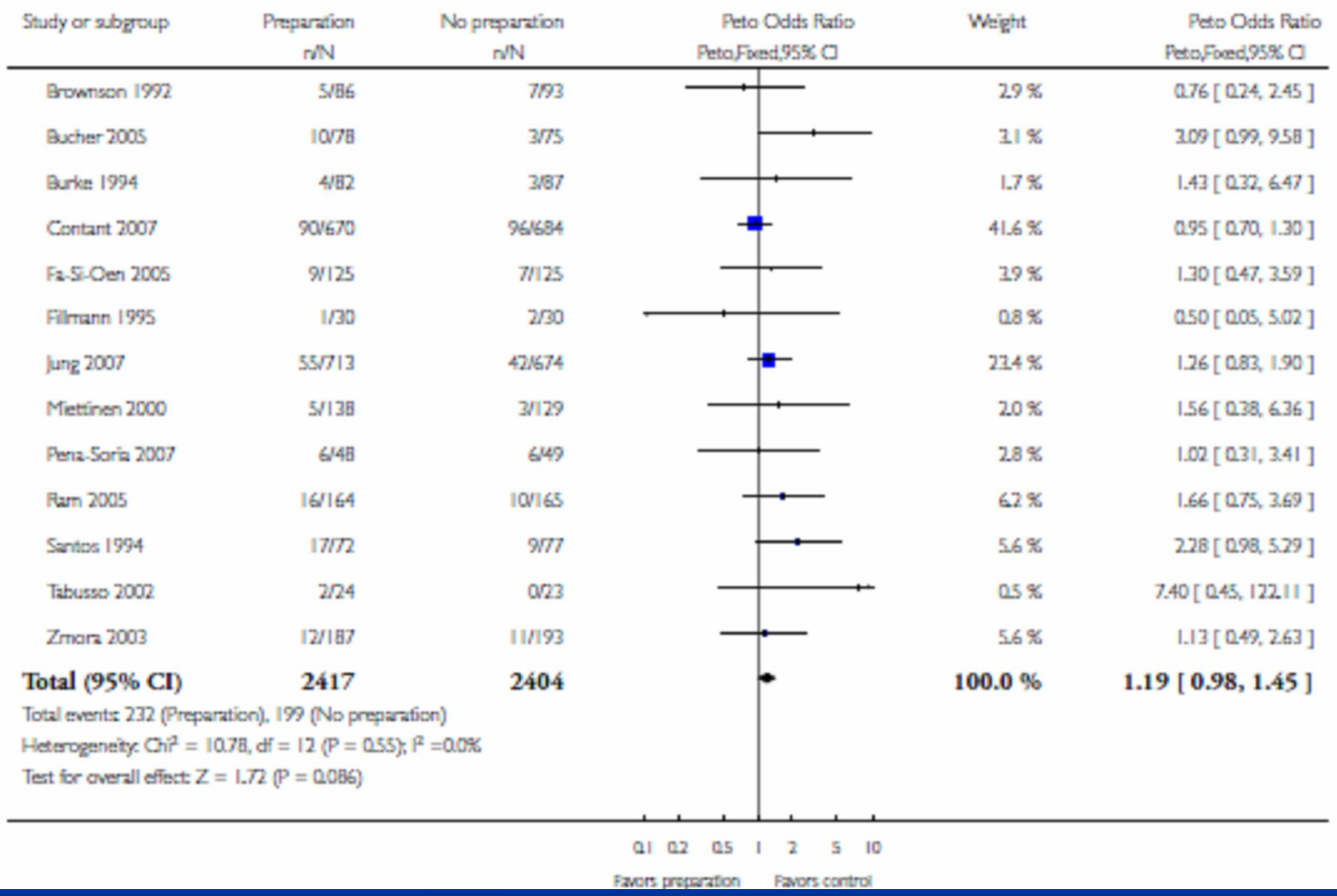


Analysis 1.6. Comparison 1 Mechanical bowel preparation versus no preparation, Outcome 6 Wound infection.

Review: Mechanical bowel preparation for elective colorectal surgery

Comparison: 1 Mechanical bowel preparation versus no preparation

Outcome: 6 Wound infection



Adverse affects of Bowel prep

- **Theories**
  - Bowel wall edema
  - Compromises microcirculation / ischemia
  - Bacterial translocation
  - Local inflammatory process

Morphologic Alterations Associated With Mechanical Bowel Preparation Before Elective Colorectal Surgery: A Randomized Trial

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Table 1.
Bowel Wall Histologic Characteristics According to MBP Status

	No-MBP Group (n = 25)			MBP Group (n = 25)			
	+	++	+++	+	++	+++	*P* Value
Superficial mucus loss	12	13	0	1	12	12	<0.001
Epithelial cell loss	15	10	0	3	14	8	<0.01
Edema in lamina propria	18	7	0	8	11	6	<0.01
Lymphocytes infiltration	21	3	0	11	9	3	<0.02
PMN infiltration	23	2	0	12	8	5	<0.02
Goblet cell loss	21	4	0	18	7	0	>0.5
Submucosal congestion	11	10	4	9	12	4	>0.5
Preulcer lesion	22	3	0	17	6	2	>0.05

MBP = mechanical bowel preparation; PMN = polymorphonuclear cells.

Adverse affects of Bowel prep

- **Theories**
  - Liquid feces ->spillage into peritoneum
  - Unprepared->bulky stool
  - Bowel handling

Bowel Preparation Is Associated With Spillage of Bowel Contents in Colorectal Surgery

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Table 3.
Factors Associated With Spillage of Bowel Contents

	Spillage	*P* Value
Type of anastomosis		
Ileocolonic/ileoanal (n = 116)	12 (12)	0.39
Colocolonic/colorectal (n = 199)	32 (16)	
Mechanical bowel preparation		
Without preparation (n = 181)	22 (12)	0.21
With preparation (n = 152)	26 (17)	
Stool consistency		
Solid contents (n = 66)	2 (3)[a]	
Semisolid contents (n = 64)	6 (10.6)[a]	
Liquid contents (n = 96)	24 (31.2)[a,b]	
Clean (n = 107)	0	

- 333 patients
- 152 prep vs 181 no prep
- Spillage of stool in 48 pt (14 %)
- Liquid stool in MBP group (56%) vs (41%) in no prep
- Increased risk of spillage

Renal Failure

- Diabetics receiving oral sodium phosphate have increased risk of renal failure
  - Beware of phosphate preps
  - Using diuretics
  - NSAIDS
  - ARBs/ACEI

Ma, Chow, et al. Acute renal failure following oral sodium phosphate bowel preparation in diabetes. *Diabetes Care* 2007;30:182=83.

What can be done to prevent complications during colorectal surgery?

- Timely administration of PA
  - Within 1 hour of incision
- Correct antibiotic choice
  - Parenteral-Cefotetan, Cefoxitin, Cefazolin + metro or amp-sulbactam

Conclusions

- Costly
- Increased complications
  - Anastomotic dehiscence (trend toward leakage)
  - Wound infection
  - Renal failure/electrolyte imbalance
  - Diarrhea
- Uncomfortable
- Future studies are needed

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Thank You