REFERENCES FOR INTRAOPERATIVE RECTAL WASHOUT


“Besides, it is not impossible that young cancerous cells, sown, as it were, in new soil, well prepared by an increased blood-supply due to the healing process, will thrive much better in this unexhausted, well-irrigated ground than elsewhere...this important mechanical factor in the growth and dissemination of cancer ought to receive some recognition.”

Ryall C. Cancer infection and cancer recurrence. Lancet 1907;2:1311-6

“The question of cancerous infection of wounds during operation is a real and exceedingly grave danger and one which I regard of the utmost importance. Moreover, it is a danger that cannot be too carefully guarded against and any failure to avoid it has an important bearing on the question of cancer recurrence.”


“Therefore no operation, however elaborate, however extensive, nor however skilfully carried out, can hope for a successful issue unless the entire disease be removed and cancer cells prevented from escaping from the growth and implanting themselves in the wound.”


“The question of implantation following resection operations is, I believe, one to be considered seriously. Handling and pressure on the growth from without, before division of the bowel, may explain early recurrence at the anastomotic line...”


“The main risk of implantation of carcinoma cells presumably arises from dissemination of bowel contents when the rectum is sectioned below the growth rather than when the colon is divided above it. We have therefore made it our routine in carrying out these operations to wash out this lower part of the rectum per anum immediately before the bowel is severed. To do so satisfactorily at the precise juncture it is essential that the patient should be in the lithotomy-Trendelenburg position, because it alone permits of easy access to the anal region during an abdominal dissection. The procedure is to apply a crushing clamp to the rectum 1 in. below the growth to prevent the descent of any further faecal matter or discharge which might contain cancer cells. An assistant then passes a proctoscope and irrigates the rectum below the clamp...The solution used is 1/500 perchloride of mercury...The irrigation usually continued for five minutes, and the rectum is then divided by the abdominal operator ¾-1 in. distal to the clamp...”

“To explore the possibility of recurrent carcinoma of the bowel arising from tumor cells lying free in the lumen of the colon and becoming implanted by the suturing needle or on cut surfaces at lines of anastomosis, Papanicolaou smear preparations of mucus from the lining surface of colon specimens removed for carcinoma were examined. Apparently well-preserved and possibly viable malignant cells were present in smears of 42% of the proximal ends and 65% of the distal ends of the resected colons at average distances from the tumors of 21 cm. and 10 cm., respectively... This strongly suggests that occasional implantation and growth of these free cells may be responsible for recurrences. The evidence indicates that the cells are disseminated by manipulation during operation and not by peristalsis or preoperative enemas, since occlusive ligatures placed around the colon early in the operative procedure prevented their spread. Accordingly, there appears to be presumptive evidence that prophylactic measures, consisting of ligation of the colon proximal and distal to the tumor before any operative manipulation is carried out, should be adopted.


“...we have found that a buffered 0.5% sodium hypochlorite solution and 2 mg. % mechlorethamine are the most effective and yet least toxic chemicals in preventing tumor growth in the animal. When prepared as a fresh solution in the manner described 0.5% sodium hypochlorite has not resulted in any local or systemic toxicity. The buffered 0.5% sodium hypochlorite solution should remain in contact with the tissues for a minimum of four minutes. One four-minute irrigation of the wound just prior to closure at the conclusion of surgery is recommended.”


“As a further precaution against intraluminal seeding of cancer cells, the bowel may be irrigated just before performing the anastomosis.”


“It would thus seem that the local recurrence rate without using mercury bichloride washouts varies between 10 and 16 per cent, while the recurrence rate at St. Mark’s Hospital (using mercury bichloride) has been reduced to 2.6 per cent in 229 patients (2.1% when only 187 radical operations are considered). Mercury bichloride will not prevent all local recurrences, but appears to prevent many suture line recurrences thought to be due to implantation. The results with its use apparently confirm the importance of implantation as a cause of local recurrence after anterior resection for carcinoma.”

“At the conclusion of the resection, prior to the performance of the anastomosis, the lumen of the bowel should be irrigated for approximately four minutes with aspiration of the fluid... we are using it (buffered sodium hypochlorite) for irrigation at the present time in a concentration of 0.25 per cent... In the entire group in which recurrent disease has developed we have been unable to find a single instance of recurrence at the suture line.”

Yu SK, Cohn I. Tumour implantation on colon mucosa. Arch Surg 1968;96:956-8

“In the present study, there was no tumor implantation on colon mucosa either at the suture line or in the normal mucosa in any experiment. Therefore, we conclude that the tumor cells do not implant on the mucosa except where their original growth begins... The incidence of tumor growth on the serosal surface was much greater when tumor cells were injected directly in the peritoneal cavity than into the lumen of the bowel. This is further support for the importance of tumor spread by spillage during an intestinal anastomosis for gastrointestinal cancer. Tumor implantation on the serosal surface following intraluminal injection is believed to be the result of tumor cell leakage through the completed suture line.”


“Conglomerate groups of cancer cells were found in cultures made from washings obtained from the hands of surgeons, surgical instruments, the pelvic cavity and the serous surface of the rectum in 34% per cent of cases... Cancer cells torn away from the primary lesion at operation preserve their ability to grow in tissue cultures... we believe that cancer cells can cause implantation metastases after operations performed for cancer of the rectum.”

Alexander HC. Colonic decompression and lavage in anterior resection of the rectosigmoid. Surg Gynecol Obstet 1972;135(2):284

“Prior to sterile draping of the patient, a No. 24 catheter, with several extra holes cut in the distal end, is inserted well into the rectum. It is attached by way of a Y connector both to an elevated liter of sterile saline solution, to which 2 grams of kanamycin and 1000,000 units of bacitracin have been added, and to a plastic bag hung below the patient. The latter tubing has a clamp attached to halt the flow... A rectosigmoid lavage of 400 to 500 milliliters is given prior to placing the ligatures proximally and distally and, again, after resection, before the distally placed intestinal clamp is removed and the anastomosis begun.”

“After induction of anesthesia, all patients with carcinoma of the rectum or rectosigmoid colon were irrigated transanally using tap water. The irrigating balloon catheter was then left in place. During the operation the rectum was irrigated through this catheter with 500 ml of a 1 per cent oxychlorosene (Clorpactin) solution. This irrigation was performed after the bowel had been ligated distal to the tumor but prior to final clamping of the bowel distally. A Y time was employed to allow repeated easy irrigations with gravity drainage of the rectal stump...The absence of local suture-line recurrence in all patients but those who had Dukes’ C carcinomas of the rectum would seem to indicate that our local techniques of lavage preoperatively and intraoperatively, as well as early isolation and ligation, were adequate in preventing recurrence.”


“Forty-eight of 72 surgeons canvassed in the South West of England (67%) routinely use an intraluminal cytotoxic agent to prevent suture-line recurrence following partial resection of the large bowel for cancer...When assayed for cytotoxicity against tumour cells freshly prepared from human colorectal carcinomas (n=10), both chlorhexidine-cetrimide and povidone-iodine were rapidly lethal at a wide range of concentrations (5-100%). Mercuric perchloride (0.2%) was similarly effective, but up to 20% of tumour cells remained viable after exposure to noxythiolin and nearly 30% with water alone.”


“Thus viable exfoliated tumour cells were demonstrated in 52 of 74 specimens (70 percent). Their presence in large numbers at the site of intestinal anastomoses supports a potential role in the aetiology of suture-line recurrence.”


“We report the results of a randomized trial of preoperative irrigation with 10% aqueous solution of povidone-iodine (Betadine) versus water in patients undergoing major resection for large bowel carcinoma. All patients had mechanical bowel preparation, preoperative topical povidone-iodine and peri and postoperative antibiotics...These results suggest that povidone-iodine irrigation before large bowel resection reduces wound sepsis.”

“Irrigation with saline alone achieved an excellent bowel preparation. No residual feces could be seen when the lumen was examined at surgery...However, as many as $10^6$ bacteria per ml could be cultured even after 10 liters of irrigation when the aspirate appeared clear... Lower bacteria counts were achieved when antiseptic (Clorpactin WCS-90) was used in conjunction with saline... No organisms could be cultured from the bowel aspirate at the end of irrigation... Whereas preoperative preparation by any known method cannot reliably reduce the total bacterial concentration of colonic contents below $10^5$ bacteria per ml, we have shown that this intraoperative method can eliminate all feces and produce near sterile conditions.”


“Saline washout was shown to have no effect on bacterial counts in the rectal stump. By contrast, washout with povidone-iodine significantly reduced the counts of B. fragilis but not E. coli. However, sodium hypochlorite significantly reduced counts of both E. coli and B. fragilis in the rectal stump... The data suggest that sodium hypochlorite is better than povidone-iodine or saline as a rectal washout for colorectal anastomosis.”


“Cells were obtained from primary tumour, uninvolved mucosa, mesorectum, lumen of the bowel, luminal mucus, serosal surface of the bowel and washings of the tumour bed after dissection. Colonies grew in vitro in monolayer culture from 21/30 primary tumours; 11/41 mesorectum specimens; 11/27 luminal washings; 14/29 luminal mucus specimens; 1/27 serosal surface washings and 3/13/post-dissection washes. Cells capable of in vitro growth are present in these various sites and, if spilled at operation, may well be implicated as one of the factors leading to local recurrence.”

Goodson G. Peroperative rectal washout using the irrigating proctoscope. Int J Colorectal Dis 1987;2:30-1

“Anterior resection is now the most common operation for carcinoma of the rectum; two of the major problems associated with it are infection and local recurrence. Intraoperative rectal washout aims to minimize these hazards by reducing the risk of contamination by faecal fluid, and by destroying free cancer cells using an appropriate anti-cancer agent.”

Keighley MRB, Hall C. Anastomotic recurrence of colorectal cancer – a biological phenomenon or an avoidable calamity? Gut 1987;28:786-791

“Until the results of a randomized clinical trial comparing preoperative cytocidal washout with a placebo washout are available, clinicians will never know whether this time honoured practice is justified.”

“...intraluminal fixation of cancer cells before opening the bowel is an effective method of reducing local recurrence after resection of colorectal cancer.”


“In this study we have shown that, of the anastomotic materials tested, the two braided sutures were able to entrap and transfer significantly greater numbers of free intraluminal tumour cells in vivo than were either of the monofilament materials.”


“This retrospective review examined the efficacy of using 10 percent povidone iodine for both intraperitoneal and intraluminal irrigation during colonic anastomosis...In this series there was no evidence of wound infection or intra-abdominal abscess formation with the previously describe protocol.”


“Our model shows that exfoliated colon cancer cells derived from a chemically induced colon cancer in syngeneic rats can get implanted at a suture line... Only local irrigations of the colon lumen with sodium hypochlorite 0.2% prior to anastomosis produced a significant decrease in implantation rate.”


“Free intraluminal cancer cells can cross a sealed anastomosis and may be a potential cause of extraluminal recurrence.”


“No lavage of the rectal stump with a cytotoxic agent was conducted before the anastomosis was performed. Having completed the anastomosis, the stapler and the doughnuts were washed with saline, which was collected for cytologic examination...In 9 of 10 cases, malignant cells were identified in the centrifuged saline. It may be that malignant cells collected by the stapler are implanted during anastomosis and cause subsequent anastomotic recurrence.”


“Indeed, thorough washing of the rectal stump may render the stump sterile of any malignant cell...This may be the reason for the low incidence of anastomotic line recurrences seen from centers that practice rectal lavage routinely.”

“It is therefore of fundamental importance to use a washing technique that obviates contamination of both the operating field and the operating theater.”


“This study identified which tumoricidal agents are currently used in Scotland and investigated their efficacy in vitro and in vivo. Overall 70 percent of surgeons used a tumoricidal agent during colorectal cancer surgery. With $10^3$ cells in vivo povidone-iodine and sodium hypochlorite significantly ($p<0.02$) reduced the incidence of tumour growth...”


“We recommend the use of sodium hypochlorite 0.2 per cent for patients undergoing colorectal surgery. We use it for bowel lavage before anastomosis...”

Hool GR, Church JM, Fazio VW. Decision-making in rectal cancer surgery. Dis Colon Rectum 1998;41:147-152

“Fifty-three respondents (48 percent) irrigated the rectum before dividing it, and the most common agents used were povidone-iodine (28) and water (10).”


“Of the ten patients who had rectal washout performed, none had malignant cells seen. Of the ten patients who did not have rectal washout performed, eight had malignant cells seen in the cytology... Rectal washout eliminates exfoliated malignant cells in the rectum in the vicinity of the anastomosis.”


“The findings suggest that free intraluminal cancer cells of colonic origin may penetrate through watertight anastomoses and implant on the anastomotic or peritoneal surface and initiate tumor growth.”


“On-table whole-colon washout using 5 per cent povidone-iodine seems clinically feasible. This technique deserves further study as a substitute for preoperative bowel preparation and may help to prevent recurrent cancer due to implantation of viable exfoliated tumour cells”

“*The anastomotic tumour growth was significantly reduced after tumour cell inoculation followed by whole-colon lavage and luminal incubation for 20 min with povidone-iodine 5%. Application of intra-operative whole-colon washout to remove the luminal ‘organic matter’ followed by luminal application of povidone-iodine 5% for a sufficient incubation time could reduce the risk of anastomotic recurrence in colorectal cancer surgery.*”


“*The results of the present study suggests that a beneficial effect of intraoperative bowel lavage with PVP-I in patients undergoing colorectal cancer surgery may be expected.*”


“*Free malignant cells are shed into the rectal stump during anterior resection. Mechanical lavage with saline effectively eradicates these cells; however, the completeness of cleansing is volume related...We suggest that rectal stump washout during anterior resection for carcinoma should be routine, and the volume of the lavage fluid should be larger than 500 ml.*”


“The present observations suggest that it may also be beneficial to prevent cell implantation from the colon above the specimen. A simple procedure is to ligate the sigmoid at the beginning of the procedure and after rectal resection to irrigate the proximal segment of the colon used for the pouch construction with a tumoricidal solution. These are the methods currently employed by the authors.”


“A rectal washout can easily be extended to a retrograde irrigation of the whole colon in elective colorectal cancer surgery. This may help to prevent anastomotic and local recurrence due to implantation of viable exfoliated tumour cells.”


“We believe that the time has come for a large-scale multicenter trial to address this important question.”

“The irrigation volume determined the efficacy of rectal washout. With our method 1.5 liters of saline irrigation appears to clear contents form cancer cells in patient with tumors below the peritoneal reflection whereas at least 2 liters is recommended for patients with tumor above the peritoneal reflection.”


“Local recurrence caused by anastomotic implantation is a relatively rare event, with 5 to 15 percent of all local recurrences caused by staple line implantation. If we assume that local recurrence after anterior resection is as high as 10 percent and that anastomotic staple line recurrence is responsible for 10 percent of these recurrences, then 1 percent of all resections would develop recurrence by staple line implantation. If rectal washout prevented one-half of these cases, to conduct a randomized, controlled trial with sufficient numbers to detect this difference with a power of 80 percent and a P of < 0.05 would require a minimum of 3766 patients to be enrolled and followed for 5 years, with no dropouts ...In any case, the cost and time to perform a washout is so low that we will continue to perform this technique until strong evidence suggests otherwise.”


“Intraoperative rectal washout, before an anastomosis, is performed by many surgeons with the intention of reducing locoregional recurrence. There is insufficient evidence to recommend this practice.”


“There is a need for a randomized, controlled, large-scale, multicenter trial to establish the clinical relevance of intraoperative rectal washout.”