Surgical treatment of perforation of the bowel in typhoid fever : with a table of 158 cases / W.W. Keen.

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Surgical Treatment of Perforation of the Bowel in Typhoid Fever

WITH A TABLE OF 158 CASES

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TABLE OF 158 CASES OF OPERATION FOR PERFORATION IN TYPHOID FEVER, PREPARED BY DR. MARTIN B. TINKER.[5]

No.	Operator and reference.	Age and sex.	Location and character of lesion.	Day of the disease.	Interval between perforation and operation.	Operation.	Result.	Remarks.
84	Abbe, R. Personal communication.	M. 29	Two perforations of ileum; one 8 in. from ileo-cecal valve; the other 14 in. from valve.	During 2nd week of a relapse.	7 hours.	Median celiotomy; abdominal cavity filled with greenish turbid extravasation and all small intestine injected; suture of openings; saline irrigation; glass drainage tube into pelvis. Upper opening in bowel reopened and stitched into wound with rubber tube draining it for relief of intestinal contents.	D	Patient a soldier from Cuba, exhausted by long camp illness and hardships. Died 11 hours after operation.
85	Abbe, R. Personal communication.	M. 30	Perforation 1½ feet from ileo-cecal valve.	Typho-malarial fever for 8 wks.	12 hours.	Abdominal cavity fouled by intestinal contents and general peritonitis; suture of perforation; irrigation; drainage from pelvis by glass tube and gauze.	D after 3½ days.	Patient a soldier from Cuba, exhausted before operation. Died 3½ days after operation.
86	Anderson, A. R. Handford & Anderson, Brit. M. J., 1898, ii, 220.	M. 27	Within 3 feet of cecum; hole size of a bean.	Probably 33d day.	22½ hours.	Incision 4 inches long below umbilicus in median line; gas and feculent matter escaped; intestines congested and covered with lymph; perforation closed with silk Lembert sutures; intestine pulled out loop by loop and wiped with sponges saturated in biniodid sol. 1:2000; abdomen closed without drainage.	R	Renal complications delayed recovery. Wound healed several weeks at time of report.
87	Beach, Fitz & Beach, Boston Med. and Surg. Jour., 1898, cxxxix, 389.	M. 15	Short distance from cecum.	During 3d week.	. . . . .	Incision 8 inches in median line; escape of gas and fecal fluid; flakes of fibrin on intestines; feces pouring from ulcer which was closed by Lembert sutures at right angles to axis of intestine; flushing with hot boiled water; hot salt solution left in abdomen, which was closed without drainage; operation lasted 30 minutes; 8 days later reopened wound, evacuated pint of fecal fluid coming from ulcer near cecum; closed perforation with Lembert sutures; flushed with hot water; gauze drainage.	D	Condition fair after first operation; then several bloody stools; stitch abscesses. At 2nd operation former suture found in good condition; gradually failed and died same afternoon. Necropsy showed large necrotic area in cecum, many ulcers lower 3 feet of ileum.
88	Beckett, W. W. So. California Prac., 1899, xiv, 111.	F. 22	Loop of small intestine in Douglas cul-de-sac; opening small.	22d day.	24 hours.	Abdominal cavity distended with gas; general peritonitis; perforation closed with Lembert sutures; flushing with normal salt solution; gauze drainage.	D	Death from general peritonitis 24 hours after the operation.
89	Bigger, E. C., and Campbell, R. Brit. Med. Jour., 1899, i, 89.	M. 36	Two feet from cecum, ½ inch from mesenteric attachment; about size of a pea.	About first of 3d week.	10½ hours.	On opening abdomen gas and yellowish fluid escaped; intestines injected and covered with patches of lymph; perforation closed with 2 rows Lembert sutures; coils of intestine and pelvis sponged clean; irrigation with boiled water; glass drainage tube from lower part of abdomen.	D	Died during 4th day after operation.
90	Cushing, H. W. Johns Hopkins Bull., 1898, ix, 267.	M. 9	Two operations; first, perforation about 2 mm. in diameter; about 25 cm. from cecum in free surface of bowel; 2nd, perforation few cm. beyond first perforation; thinned Peyer's patches seen at first operation.	1st perforation end of 2nd week; 2nd perforation 14 days later.	4 hours.	1st operation. Median laparotomy below umbilicus; sero-purulent fluid in peritoneal cavity; serosa injected, particularly in right iliac fossa; fibrinous deposit in ileum; feces flowing from perforation, which was closed by circular suture, fine silk; irrigation with salt solution; gauze drainage. Second laparotomy 12 days later; no cause for symptoms of apparent perforation found; closure with drainage. Third laparotomy 2 days later for intestinal obstruction; no peritonitis; obstruction from kink in adherent omentum; second perforation at site of kink found and sutured with single purse-string suture of fine silk; gauze drainage. Operation lasted 20 minutes.	R	Patient rallied well after first operation but fecal fistula developed on 2nd day; discharged for few days. After 2nd operation condition not materially affected. After 3d operation, distention, peristaltic cramps, serious condition; typical typhoidal condition for 10 days, convalescence tedious; abscesses over back and shoulders incised; broke down and slow healing, but ultimate recovery.
91	Cushing, H. W. Johns Hopkins Bull., 1898, ix, 267.	M. 18	First loop of ileum 3 large ragged holes about 1.5 cm. in diameter.	Fifth week.	Probably 3 6 hours or more (personal).	Cocain anesthesia; incision through right linea semilunaris; rush of gas followed by escape of stinking fluid like pea-soup stools; bowels bluish, distended, covered with lymph and fecal extravasation; suture of perforations with Halsted matress sutures; cleansing abdominal cavity and irrigation with salt solution; drainage of pelvis and at seat of suture.	D	Rallied somewhat under stimulants and salt infusion but died 4 hours later.
92	Cushing, H. W. Johns Hopkins Bull., 1898, ix, 267.	M. 31	About 10 cm. above cecum.	Fourth week after prolonged abdominal symptoms.	Possibly 2 4 hours (personal).	Incision through right rectus; escape of gas and sero-purulent fluid on opening abdomen; serosa injected, ileum distended and covered with fibrinous lymph; perforation and thin patch turned in with Halsted sutures; wiping, irrigating, drainage of pelvis and site of suture. Operation lasted 30 minutes.	D	Stood operation fairly well, but died 8 hours later, apparently of acute general toxemia.
93	Cushing, H. W. Personal.	M. 25	8 inches (20.4 cm.) above cecum.	. . . . .	5½ hours.	Perforation and two thin Peyer's patches inverted and sutured; operation under cocain anesthesia.	D	General peritonitis; death 3 days later second operation.
94	Cutler, E. G. & J. W. Eliot, Per. Med. Rec. 547, Mass. Hosp. Rec.[6]	M. 19	Ileum 4 feet above cecum.	Last of 2nd or beginning of 3d week.	4 hours.	On opening abdomen considerable slightly cloudy serous fluid in abdominal cavity; some serous flakes on intestines; gut folded longitudinally and sutured by two rows of Lembert sutures; small wick of gauze.	R	Relapse of fever 7th day after operation lasting about 16 days; good recovery, man now perfectly well.
95	Dalton. Med. Rev., St. Louis, 1898, xxxvii, 392. Proceedings of the St. Louis Med. Soc.	. . . .	. . . . .	14th or 15th day.	. . . . .	. . . . .	R	Urgent symptoms (collapse, pain, rapid pulse, etc.), disappeared after operation; patient had regular course of typhoid fever and died from the fever on 34th day. Necropsy showed wound nicely healed.
96	Dalton. Med. Rev., St. Louis, 1898, xxxvii, 392. Proceedings of the St. Louis Med. Soc.	. . . .	2 perforations 6 or 8 inches above ileo cecal valve and 2 feet above.	. . . . .	. . . . .	Perforation nearest ileo-cecal valve was closed; second perforation overlooked.	D	Died from shock; second perforation found at necropsy.

[5] Cases 1 to 83 will be found in my book on "The Surgical Complications and Sequels of Typhoid Fever," Philadelphia, 1898. The following remarks as to cases in the additional table may be proper: No. 95 is marked as a recovery, as he recovered from the operation and died on the thirty-fourth day from the fever. Nos. 111, 113, 114, 115, 140, 141 and 143 are only of value as determining the recovery rate. Nos. 118, 153 and 155, though somewhat doubtful, are reasonably certain to have been cases of typhoid perforation.

[6] To be published in Boston Medical and Surgical Journal.

No.	Operator and reference.	Age and sex.	Location and character of ileum.	Day of the disease.	Interval between perforation and operation.	Operation.	Result.	Remarks.
97	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	. . . .	. . . . .	. . . . .	26 hours.	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	D	In extremis at time of operation.
98	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	. . . .	. . . . .	. . . . .	. . . . .	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	D	In extremis at time of operation.
99	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	M. 24	3 perforations, in last 18 inches of bowel; general plastic effusion.	End of 2nd week.	16 hours.	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	D	
100	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	M. 16	. . . . .	End of 2nd week.	13 hours.	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	D	Would probably have had a good chance but for hemorrhage the day after operation.
101	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	. . . .	. . . . .	. . . . .	36 hours.	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	D	In extremis at time of operation.
102	Dalziel, T. K. Personal to Prof. Wm. Osler. Courtesy of Prof. J. M. T. Finney of Johns Hopkins University.	F. 13	. . . . .	Probably in 4th week.	11 hours.	Median incision; irrigation of peritoneal cavity; parts gently dried; drainage.	R	Mild attack, condition good; day after operation felt well and complained of hunger; wound sound on 16th day, except where drainage tubes removed; general condition excellent.
103	Deaver, J. B. Transactions Col. Phys., Phila., 1898, 3 s., xx, 9.	M. 27	Not located.	About middle or end of second week.	Perforation took place after dinner Operation next morning; probably 12-18 hrs.	Free gas and pus, on opening abdomen; appendix congested and removed; no attempt to locate perforation; thorough irrigation and drainage.	R	Second attack of typhoid; diagnosis confirmed by Widal reaction; first attack 10 yrs. before. Fever ran typical severe course; several hemorrhages; ulceration of appendix.
104	Deaver, H. C. Transactions Col. Phys., Phila., 1898, 3 s., xx, 9. Report by J. B. Deaver.	M. 36	Pin-hole perforation in ileum.	In the 3rd week.	36 hours.	Pus found in peritoneal cavity.	D	Death during 3rd day after diagnosis of perforation.
105	Deaver, J. B. Annals of Surgery, Phila., 1898, xxviii, 144.	F. 23	7 inches from ileo-cecal valve, opposite mesentery.	21st day.	15½ hours.	Median incision; pus and gas escaped; perforation closed with silk sutures; flushing with sterile warm water; glass drainage tube inserted; operation lasted 17 minutes.	D	Died on 3rd day after operation; necropsy showed general peritonitis, many ulcers; sutures holding well, no other perforation.
106	Finney, J. M. T. Personal. To appear in Johns Hopkins Hospital Reports.	M. 12	About 2 feet (61 cm.) from ileo-cecal valve.	During 2nd or 3d week.	About 3 days	Incision in right iliac region; escape of gas, pus, and fecal matter; intestines distended, covered with lymph, chocolate color; thorough irrigation with warm salt solution; perforation sutured.	D	Entered hospital in extremis. Death before recovery from anesthetic. Widal reaction; numerous ulcers, some nearly ready to perforate.
107	Finney, J. M. T. Personal. To appear in Johns Hopkins Hospital Reports.	M. 26	Ragged perforation about 4 mm. in diameter, about 50 cm. from ileo-cecal valve.	During 3rd week.	20 hours.	Right lateral 4 in. incision; escape of odorless sero-purulent fluid; intestines congested and distended; perforation closed with two rows mattress sutures; wiping with gauze and irrigation with salt solution; no drainage; operation lasted about 1 hour. Second operation for intestinal obstruction on 25th day.	R	Condition excellent after operation; stitch abscess; fecal fistula which closed spontaneously. At second operation fecal fistula reopened but after a week interrupted convalescence and perfect recovery.
108	Gray, F. D. N. Y. Med. Record, 1899, lv, 566, case ix.	M. 44	Lower part of ileum.	During 6th to 8th week of walking typhoid.	48 hours.	Incision over appendix; appendix entirely normal; fecal matter exuding from ulcer had produced intense general peritonitis; closed perforation with deep sutures and 2d row Lembert sutures; cleansed with hydrogen dioxid and normal salt solution; 3 gauze drains.	D	Rallied and lived 3 days; necropsy showed suture successful and numerous healed typhoid ulcers.
						Closure of perforation and drainage	D	

No.	Operator and reference.	Age and sex.	Location and character of lesion.	Day of the disease.	Interval between perforation and operation.	Operation.	Result.	Remarks.
	St. Louis, 1898, xxxvii, 392. Rep. by Lutz in Proc. of St. Louis Med. Soc.		verticulums.					
110	Jackson, Thos. W. N. Y. Med. Record, 1899, lvi, 519.	M. 26	In small intestine; ¼ inch in diameter.	Wk. after entering hosp. about end of 2d week	About 3 days	Incision over cecum; abscess in right inguinal region; foul, fecal-smelling fluid in abdominal cavity; adhesions between intestines; flushing with normal salt solution; gauze drainage; incision left open and packed.	D	Died in about an hour.
111	Kropowski, Gesselewitsch, St. Petersb. Med. Wcch., 1898, n. f. 15, xxiii, 23.	. . . .	. . . . .	. . . . .	. . . . .	. . . . .	R	Gesselewitsch states that this case was reported to the Russian Medical Society.
112	Lund, F. B. Personal to Prof. J. M. T. Finney of Johns Hopkins Univ.	M. 38	Punched out perforation ¼ inch (6 mm.) in diameter, 8 inches (20.3 cm.) from ileo-cecal valve.	During 3rd week.	12 hours.	Incision in right iliac region; intestine injected, distended, covered with lymph flakes; abdominal cavity full of sero-purulent fluid; clotted blood and feces in pelvis; perforation closed with fine silk mattress sutures; thorough flushing with salt solution; drainage with glass tubes and gauze from pelvis, l. hypochondrium, subhepatic region; operation lasted 30 minutes.	D	Died from general peritonitis 48 hours later; no other perforations; ulcers and other lesions of enteric fever; perforation firmly closed.
113	Lutz. Med. Rev., St. Louis, 1898, xxxvii, 392. Proc. St. Louis Med. Soc.	. . . .	. . . . .	. . . . .	. . . . .	Lutz stated in discussion reported in Proceedings of St. Louis Med. Soc. that he had operated 3 times for perforation occurring during typhoid fever.	R R D	2 recoveries; 1 death.
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116	Margarucci. Bull. d. Societa. Lancisiana d. osp. di Roma, 1898, xviii, 319.	F. 50	In the ileum a short distance from the cecum.	Probably during 2nd wk. (about 10 d. after entering hospital).	16 hours.	Abdomen opened below the umbilicus; escape of yellowish fluid containing fibrinous flocculi; loops of small intestine much congested; about 30 c.c. of ileum thinned by ulceration was resected and joined by end-to-end anastomosis; thorough cleansing of abdominal cavity and irrigation; gauze drainage from the pelvis, lumbar fossæ and site of operation; operation lasted 50 minutes.	D	Patient rested quietly during night after operation; but died the middle of the next day.
117	Martin, E. University Med. Mag., 1899, xi, 502.	M. 12	Lower part of ileum, probably not far from the ileo-cecal valve.	About the latter part of 3rd wk.	33 hours.	Incision in linea alba below umbilicus; escape of pus on opening peritoneum; intestines glued together by fibrinous exudate; perforation sutured with catgut Lembert sutures; peritoneal cavity wiped with gauze sponges, flushed with saline solution, drained with glass tubes; pelvis drained with ganze; oper. lasted ½ hr.	D R	Partial recovery under hypodermoclysis and stimulating enemata; fecal vomiting recurred, death 16 hours after operation. Patient recovered with fecal fistula.
118	Martin, E. Univ. Med. Mag., 1899, xi, 502.	. . . .	Ileum.	. . . . .	Perfor'n had probably existed several days.	Operation consisted in opening large abscess containing feces, pus and gas; exudate limited by plastic peritonitis.		
119	Moore, J. E. Northwestern Lancet, 1898, xviii, 135.	F. 30	About 1½ feet above ileo-cecal valve near mesenteric attachment; opening had punched out appearance.	Third week.	4 to 6 hours.	Median incision; perforation found within 2 minutes and closed with fine silk Czerny-Lembert sutures; some time required to wash out abdomen, which was full of liquid feces, by large quantities of salt solution.	D	Death about 14 hours after operation.
120	Moynihan. Brit. M. J., 1899, i, 1097. Proceedings Leeds & W. Riding Med. Chir. Soc.	M. 16	. . . . .	About last of 3rd or beginning of 4th week.	About 24 hours.	Median incision below umbilicus; escape of turbid fluid containing lymph flakes; intense peritonitis; perforation found at once and closed with three Halsted sutures; flushing with hot sterile salt solution; gauze drainage.	D	Survived 8 days, during which time violent vomiting and diarrhea.
121	Munro, J. C. Personal to Prof. J. M. T. Finney of Johns Hopkins Univ.	M. 30	In a loop of ileum.	During 4th week.	4 hours.	Right lateral incision; feces escaping from perforation, which was closed by 2 rows of sutures; irrigation with normal salt solution; drainage with gauze and glass tube; operation lasted 30 minutes.	D	Condition excellent until about 40 hours after operation, then sudden collapse, cyanosis, high pulse; death 8 hrs. later. Necropsy showed mild peritonitis; but nothing to account for sudden death.
122	Munro, John C. Reported by Burrell and Bottomley, Boston City Hosp. Rep. 1898, 126.	M. Adult.	Not found.	About the 11th day.	3 days.	Incision halfway between umbilicus and right ant. sup. spine; well walled-off cavity size of fist filled with pus opened; condition critical and impossible to search for perforation; drainage.	D	Death in 10 hours.
123	Netschaieff and Trianoff. Ietropice rousskoi Kirourgie, 1897, ii, 406, in Presse Médicale, 1898, May 18, 271.	M. 30	Ileum.	Had been in hospital 10 days.	. . . . .	On opening abdomen, peritonitis with effusion found; fecal matter in abdominal cavity; perforated part of intestine resected.	D	
124	Netschaieff and Trianoff. Ietropice rousskoi Kirourgie, 1897, ii, 406, in Presse Médicale, 1898, May 18, 271.	M. 28	About 21 cm. above the ileo-cecal valve.	. . . . .	About 17 hours.	Four cm. of intestine at seat of perforation resected; abdominal wall not sutured until 8 days after operation; until then wound packed with sterile gauze.	R	Complete recovery.
125	Pearson, A. E. Brit. M. J., 1899, i, 1097. Proc. Leeds & W. Riding Med. Chir.	M. 14	. . . . .	16th day of disease.	9 days.	Abdomen opened in left iliac region and about a pint of fecal-smelling pus evacuated; drainage tubes inserted.	R	Satisfactory progress for 14 days, then relapse lasting 2 weeks, followed by perfect recovery.
126	Pick. T. P. Report by Rolleston, Brit. M. J, 1898, i, 1328.	M. 21	Perforation of appendix near cecum.	. . . . .	. . . . .	Appendix resected, stump invaginated into cecum, peritoneum washed out, tube left in for drainage.	D	Rallied temporarily, but died on 2d d. after operation, probably from grave constitutional symptoms; Widal reaction; had worked within 5 days of death.
127	Platt, J. E. Lancet, 1899, i, 505, and Brit. Med. Jour., 1899, i, 345.	M. 37	In a loop of ileum near pelvic brim; opposite mesenteric attachment; 1½ inches in length.	About 11th day.	About 22 hours.	Incision 4 inches long in right semilunar line; escape of gas and feculent fluid on opening peritoneum; opening inverted and sutured with continuous silk sutures; difficult to return intestines because of distention; irrigation with hot saline solution; drainage tube passed down toward pelvis; oper. lasted 50 min.	R	Convalescence complicated by relapse; after which rapid progress to recovery. Left hospital 64 days after operation.
128	Platt, J. E. Lancet, 1899, i, 505, and Brit. Med. Jour., 1899, i, 345.	M. 17	Peforation of the ileum 9 in. from cecum.	About 27th day.	18 hours.	Incision as in preceding case; gas and feces in abdomen; intestines much distended; perforation closed with difficulty with Lembert sutures because of cutting out; flushing with hot saline solution; drainage of pelvis; operation lasted 40 minutes.	D	Rallied from operation, but died about 9 hours later; necropsy showed general peritonitis.
129	Platt, J. E. Lancet, 1899, i, 505, and Brit. Med. Jour., 1899, i, 345.	M. 22	About 9 inches from ileo-cecal valve.	About 18th day.	19 hours.	Incision as above; gas and feculent fluid in adbomen; edges of opening inverted and Lembert sutures inserted; flushing with warm saline solution; drainage from pelvis; oper. lasted 45 min.	D	Died about 12 hours after operation; necropsy showed peritonitis limited to pelvis and right iliac region.
130	Platt, J. E. Personal.	M. 26	3½ inches from the ileo-cecal valve.	. . . . .	About 36 hours.	Incision in linea alba; peritoneum slightly inflamed but no free gas, feces or fluid found at time of operation. A short search revealed no evidence of perforation and abdomen closed.	D	Death 15 hours after operation. Necropsy: perforation in a coil of intestine in the pelvis; numerous adhesions limiting peritonitis chiefly to right side of pelvis.
131	Platt, J. E. Personal.	M. 25	Perforation oval in shape, the long diameter being in the transverse direction of the gut.	. . . . .	About 96 hours.	Incision in linea alba; large amount of fecal matter in pelvis; one large perforation sutured; a second perforation in loop of bowel adherent to pelvis could not be closed because bound down by firm adhesions.	D	Death 7 hours after operation. Necropsy: General peritonitis; pus and feces in pelvis; numerous large sloughing ulcers in small intestine, extending upward 4 feet from cecum; appendix uninvolved; one ulcer at hepatic flexure; sutures firm.
132	Porter, C. B. Personal letter.	M. 19	Six inches (15.2 cm.) from cecum.	14 days after first malaise.	11 hours.	Incision through right rectus; turbid serum in pelvis, no fecal matter; 2 or 3 places near perforation seemed about to perforate; adjacent intestinal coils covered with fibrin; perforation closed by double row Lembert sutures, transverse to long axis of bowel; serum wiped out with gauze sponges; 2 wicks of gauze to seat of suture.	D	Patient made good recovery from operation; some vomiting for two days after operation; on third day pulse became weak and rapid; temperature rose; fecal vomiting and death. Necropsy showed intestinal obstruction due to solid feces at site of suture; no peritonitis; would probably have recovered except for obstruction.
133	Porter, C. A. Personal letter.	F. 35	Perforation with ragged edges ¾ inch, 7 inches (17.8 cm.) from cecum.	About the 13th day.	5 hours (delayed by religious rites).	Incision through right rectus muscle; turbid fluid in pelvis and lower abdomen; perforated area excised and closed with Lembert sutures; another ulcer 4 inches from cecum about to perforate and a few sutures inserted; pelvis wiped; flushing with hydrogen dioxid and normal saline solution; gauze wick to line of suture; operation lasted 45 minutes.	D	After-operation condition poor; infusion normal saline solution; strychnia, etc., repeated twice in 12 hours; condition became worse, and death the next day. Necropsy showed general peritoneal cavity apparently normal; some injection in pelvis.
134	Powers, Chas. A. Personal letter	M. 35	About 15 inches (38.1 cm.) from cecum.	. . . . .	18 hours.	Median incision; excision of edges of ulcer; suture of intestinal wound; peritonitis apparently limited to right side of abdomen; collapse prevented as thorough irrigation and cleansing as was desired; drainage to seat of suture.	D	Death 4 days later from general progressive peritonitis.
135	Price, J. Canada Lancet, 1897, xxx, 385.	F. 26	Large ragged perforation in ileum.	Ill 2 wks. before admission to hos.	. . . . .	On opening abdomen general adhesions found in region of ileum and right groin; perforation trimmed and sutured; irrigation drainage with gauze and glass tube.	R	For 2 days after operation temperature high, pulse rapid and feeble.
136	Richards and Goodall. Med supplement to Rep. Statistical Com., Metropolitan Asylums	F. 8	Perforation ½ inch (6 mm.) in diameter, 30 inches (75 cm.) from ileo-cecal valve.	End of 4th week.	12 hours.	Median incision; escape of turbid serum on opening peritoneum; intestines distended, ecchymosed, patches of lymph adherent; perforation closed by interrupted continuous suture; irrigation with warm water; drainage; operation lasted 1 hour.	D	Patient lived nearly 4 days. Necropsy showed general peritonitis and a second perforation caused by suture passing through adjoining ulcer.

No.	Operator and reference.	Age and sex.	Location and character of lesion.	Day of the disease.	Interval between perforation and operation.	Operation.	Result.	Remarks.
137	[illegible], London, 1895. Ryan, C. Australasian Med. Gaz. 1899, xviii, 334.	M. 38	18 inches from cecum; about size of a pea; on free surface of bowel.	During 3d week.	6 hours.	On opening abdominal cavity escape of gas; small intestine distended and congested; covered with flakes of adherent lymph; offensive, turbid fluid with fecal odor in pelvis; ulcer closed by double row Lembert sutures; intestines washed and abdominal cavity and pelvis flushed with hot sterile water; abdomen closed without drainage.	D	During anesthesia vomited matter entered the air passages; death resulted from broncho pneumonia 36 hours after operation. Necropsy showed extensive areas of collapse in lungs; perforation firmly closed; no peritonitis.
138	Saquépée, M. E. Bull. et mem. de la Soc. Anat., Paris, 1899, lxxiv, 443.	M. 23	In ileum 74 cm. above ileo-cecal valve; 3 mm. in diameter.	About the 8th day.	About 14 hours.	Incision in the right flank; on opening abdomen purulent, odorless fluid escaped; perforation readily found and sutured; irrigation with boiled water.	D	Death a few minutes after operation; necropsy confirmed diagnosis of typhoid; intestine deeply ulcerated but no other perforations.
139	Senn, N. Personal letter.	M. 50	. . . . .	During 3rd week.	4 days.	Celiotomy; perforation and large intraperitoneal abscess found; perforation sutured.	D	Recovered from operation and did well fifth day; hemorrhage from another ulcer caused death.
140	Senn, N. Personal letter.	. . . .	. . . . .	. . . . .	. . . . .	Operated for typhoid perforation in two cases.	R D	One recovery and one death.
142	Taylor, H. M. Va. Med. Semi-Monthly, iii, 1898-99, 719.	M,	About 12 inches above cecum, circular, punched-out opening.	3 days after fever from relapse of 10 days after fever of 6 weeks.	15 hours.	Incision over cecal region; sero-purulent fluid escaped on opening peritoneum; perforation readily found and closed with deep mattress and Lembert sutures; intestines wiped and thorough irrigation with hot saline solution; multiple gauze drainage; operation lasted 37 minutes.	R	Convalescence uneventful.
143	Taylor, H. M. Va. Med. Semi-Monthly, iii, 1898-99, 719.	M.	. . . . .	. . . . .	Several days.	. . . . .	D	Lived but a few hours after operation.
144	Taylor, H. M. Maryland Med. Jour., 1899, xlii, 101.	M. Young adult.	Lower part of ileum, about 12 in. (30.5 cm.) from ileo-cecal valve; 2 perforations on free margin of bowel about 4 in. (10.2 cm.) apart.	Had been sick 6 wks.	About 4 hours.	Median incision; escape of bile-colored serum on opening peritoneum; perforation closed by deep and superficial sutures; wiping and prolonged irrigation of intestines; gauze drainage; operation lasted about 50 minutes.	D	Death about 9 hours after operation; thought to be due to acute suppression of urine. Patient had specific urethritis when taken with fever.
145	Taylor, W. J. Therapeutic Gaz., June 15, 1899.	M. 34	About 10 in. from ileo-cecal valve. Size lead pencil.	About 18th day.	About 4 hours.	Celiotomy; ulcer invaginated and 2 rows fine silk sutures inserted; abdominal cavity washed with sterile salt solution; operation lasted 20 minutes.	D	Death before abdominal wall was sutured. Patient was in very low condition at time of operation.
146	Taylor, W. J. Therapeutic Gaz., June 15, 1899	M. 47	About 8 inches from cecum; pin-head opening.	24th day.	1½ hours.	Celiotomy; on opening peritoneal cavity gas and serous fluid escaped; marked general peritonitis; ulcer invaginated and 2 rows silk sutures inserted; abdomen flushed with normal salt solution; drainage introduced and wound closed.	D	Death in 24 hours from septic peritonitis.
147	Tiffany and Gamble. Personal to Prof. J. M. T. Finney.	M. 26	Perforation 5 mm. in diameter, edges sharply marked; 8 in. (20.4 cm.) above ileo-cecal valve.	In 3d week.	36 hours.	Abdomen contained fluid but no feces seen; general peritonitis; perforation sutured; intestines and abdominal cavity wiped; abdominal wound left open, packed with gauze.	D	Condition very bad after operation; rallied somewhat, but died 12 hours later.
148	Thurston, E. O. Hawkins and Thurston. Lancet, 1899, ii, 1004.	F. 11	Perforation in anterior cecal wall; ⅛ inch in diameter, surrounded by indurated tissue.	41st day.	About 15 hours.	Median, 4-inch incision below umbilicus; on opening peritoneum escape of large amount of sero-purulent fluid with faint fecal odor; margin of perforation excised; closed by Lembert sutures; thorough irrigation of abdominal cavity with sterilized water; mopping with marine sponges especially pelvis and lumbar regions; drainage tubes from pelvis and right loin; gauze drain parsed upward; operation lasted 25 minutes.	R	Day after operation condition good; escape of considerable purulent fluid for several days. On fifth day after operation, right parotid bubo developed and abscess of buttock at site of injection of saline solution; 21st day, double otitis media; 24th day, effusion into left knee; 60th day, relapse lasting 14 days; Widal test positive; spleen enlarged. A year after illness patient fat and well.
149	Van Duyn, J. Personal.	M. 43	8 inches from cecum; size and outline of a small bean.	19 days after confined to bed; ill several days before.	9 hours.	Median incision; on opening peritoneum escape of gas and thin yellow feces; lymph on intestines and mesentery in vicinity of perforation; closure of perforation with 2 rows of sutures; abdomen cleansed and closed without drainage.	D	Death 55 hours after operation from peritonitis.
150	Wanach, R. Rep. by Gesselewitsch M. St. Petersburger med. Woch., 1898, xxiii, n. f. 15, 21.	M. 24	Two perforations, 21.6 cm. and 41.6 cm. from cecum.	About end of 2d week.	18 hours.	Median incision from umbilicus to symphysis; escape of sero-purulent fluid on opening abdomen; peritoneum injected; fibrinous deposits on intestine; perforations closed with Czerny-Lembert suture; numerous antiseptic tampons inserted in all directions; wound left open.	D	Patient in very low condition after operation; stimulants and infusion of salt solution unavailing. Death 43 hours after operation; disease of very severe type; at necropsy very numerous intestinal ulcers, abscesses of spleen and mesenteric glands, ulcer of larynx, etc., were found.
151	Willard, De Forest. Annals of Surg., 1899, xxix, 503.	M.	4 in (10.2 cm.) above ileo-cecal valve; just large enough to admit grooved director.	15th day.	Between 5 and 6 hours.	Incision in right semilunar line; escape of ill smelling, greenish-yellow serum and feces; ileum greatly congested, several thin ulcerated areas; perforation closed by interrupted Lembert and second continuous sutures; irrigation with hot sterile water; large glass drainage tube inserted.	D	Death almost immediately after operation.
152	v. Winiwarter. Rep. A. Polis. Ann. Soc. Méd. Chir. de Liége, 1897, xxxvi, 266.	M. 18	3 perforations found in small intestine near cecum.	. . . . .	About 2 days.	Median incision; escape of sero-purulent fluid with feces; lymph flakes adherent and appearance of septic peritonitis; perforations sutured; operation hastily completed by tamponing abdominal cavity because of patient's bad condition.	D	Death 18 hours after operation; necropsy confirmed diagnosis of typhoid fever.
153	Wladissiew, C. W. Rep. by Gesselewitsch, St. Petersb. med. Woch. 1898, xxiii, n. f. 15, 21.	. . . .	. . . . .	. . . . .	. . . . .	Perforation not found at operation, but fecal fistula developed a few days later.	R	Recovery.
154	Woodward, S. B. Boston Med. and Surg. Jour., 1898, cxxxix, 544.	M. 18	Small intestine; opposite mesentery; size of a pea.	About the end of 2d week.	About 9½ hours.	Median 3-inch incision; 6 inches of intestine thickened, red, coated with lymph; whitish fluid and feces in abdominal cavity; edges of perforation excised and closed with double row Lembert sutures; flushing with normal salt solution; suture without drainage.	D	Patient nearly moribund at operation; free stimulation, oxygen inhalation, elevated foot of bed, etc.; lived 9 days in typhoid state; no symptoms of peritonitis; wound gangrenous at time of death; abdominal cavity uninflamed except slightly in region of sutures.
155	Champlin, S. H. Personal com. "The Plexus," v. 5, 164.	M. 10	Perforation not found.	During 6th week.	3 days.	Incision; turbid fecal fluid; cavity entered, formed by firm peritoneal adhesions, left of median line, below McBurney's point; tube and gauze drainage.	R	Recovery; bacteriologic examination demonstrated typhoid bacilli, colon bacilli and various monococci. Widal reaction positive.
156	Champlin, S. H. Personal com. "The Plexus," v. 5, 164.	M. 22	Perforation of ileum, about 30 cm. from ileo-cecal valve.	14th day.	. . . . .	Median incision; fecal fluid in abdominal cavity; intestines and omentum much inflamed; perforation closed by transverse continuous suture and omental graft stitched over; toilet of the peritoneum and drainage.	D	Reacted well, but was taken with vomiting and persistent cough, and died 3 days after operation. Necropsy showed suture unchanged; peritonitis limited to pelvis about perforation; hypostatic congestion of lungs; purulent infiltration right side chest and abdomen; Peyer's patches all thickened; Widal reaction positive. Bacteriologic examination showed muscles infiltrated with streptococci.
157	Champlin, S. H. Personal com. "The Plexus," v. 5, 164.	M.	Perforation 20 cm. from ileo-cecal valve.	At the end of 1 month.	. . . . .	Operative treatment as in preceding case.	D	In spite of free stimulation patient did not react and died 10 hours after operation.
158	Saleeby, N. M. Philadelphia Medical Jour., 1899, iv, 270.	M.	Pin-hole perforation in thickened and inflamed Peyer's patch, 18 in. from ileo-cecal valve.	13th day.	About 24 hours.	Incision 3¾ in. along outer border of rectus abdominis below umbilicus; escape of straw-colored serous fluid; longitudinal infold of intestinal wall and continuous silk suture, reinforced by continuous catgut suture; 2 other thinned areas sutured; intestines wiped; gauze drainage from both iliac fossæ and from Douglas' pouch; operation lasted 1 hour.	R	Slight nausea and vomiting during first day after operation, but no pain nor tenderness; nutrient enemata and free stimulation; recovery from operation was uneventful. Fever lasted 25 days and relapse 16 days, but eventually perfect recovery.

SURGICAL TREATMENT OF PERFORATION OF THE BOWEL IN TYPHOID FEVER.*

WITH A TABLE OF 158 CASES.

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In the brief limits allowed to this paper, among so many others, it is impossible to discuss more than the treatment of perforation of the bowel in typhoid fever. The diagnosis of this serious complication, which is equally, if not more, important, must, unfortunately, be omitted. What I have to say may, perhaps, be best stated in answer to four questions.

1. *Shall we operate at all?* This question can now be answered absolutely in the affirmative. Thirteen years ago, when Prof. James C. Wilson and I first discussed the advisability of operation in a case of apparent typhoid perforation, not a single case had been operated on in America, and only one in Europe, by Mikulicz, and of this we were ignorant. Then, the question was debatable; now, experience has given us a positive solution.

In my book on the "Surgical Complications and Sequels of Typhoid Fever," published early in 1898, I published a table by Dr. Thompson S. Westcott, in which he collected for me 83 cases of operation, of which 67 died and 16 recovered, a recovery rate of 19.3 per cent. Appended to this paper is a continuation of that table up to the present time, compiled by Dr. Martin B. Tinker, containing 75 additional cases, of which 54 died

*Read in the discussion on Typhoid Fever, at the meeting of the N. Y. State Medical Association, held in New York City, Oct. 25-26, 1899. A number of cases have been added since the paper was read.

and 21 recovered[1], a recovery rate of 28 per cent., a gain over the rate of the first 83 cases of over 40 per cent. The recovery rate of the entire 158 cases is 23.41 per cent. The list includes cases operated on many hours and often many days after perforation presumably took place. If all physicians were alive to the fact that the healing process after operation during typhoid progresses just as well as if there were no typhoid and were alive to the good results of operation, and especially if they called the surgeon promptly, I do not doubt in the least that the recovery rate would be 30 per cent., or possibly even one in three. Twenty-eight per cent. is within hailing distance. In somber contrast to this is the estimate of Murchison, that the recovery rate in unoperated cases is only 5 per cent., and Fitz states that 83.4 per cent. die within the first week, 37.3 per cent. even within the first day.

The papers of Cushing and Finney and my book in America, and the papers of Platt, of Monod and Vanverts, and of Gesselewitsch and Wanach in Great Britain, France and Russia, respectively, have, evidently, borne good fruit.[2] From 1884, when the first operation was done, to January, 1898, 14 years, only 83 cases were reported. Two years have added 75—158 in all. Of the whole number, 97 are reported by American surgeons—including Canada—21 by British and 15 by Russian surgeons.

2. *In what cases shall we operate?* To this I would answer, practically every case of perforation, unless the condition is such that recovery is evidently hopeless. The better the general condition, the better the prospect of cure, and perforation occurs quite as often in mild cases as in severe, and possibly even more frequently. One case was operated on twice (87) with a fatal result;

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[1] I count Case 95 as an operative recovery. Possibly Case 154, which survived nine days, might be so classed, but to be on the safe side I classed it as a death.

[2] References to these papers will be found in the table of cases. I must express my obligations to Dr. Finney for advance sheets of a paper on the same subject, soon to appear in the Johns Hopkins Hospital Reports, vol. viii.

one case (90) three times, and yet recovered. The operation has been followed, as is possible after any abdominal section, by intestinal obstruction. Cushing's case (90) and Finney's (107) were operated on for such a post-operative obstruction, and both recovered. C. B. Porter's patient (132) died of an unrelieved obstruction; possibly a second operation might have averted death. Finney's remarkable one (68) of seven later complications, yet happily resulting in recovery, encourages us never to despair.

No *age* is a barrier, yet, as the subjoined table—derived from the entire series of 158 cases—shows, age apparently has considerable influence on the recovery rate:

TABLE OF RECOVERIES AND DEATHS WITH REFERENCE TO AGE.

Age.	Recovered.	Died.	Recovery Per cent.
Under 15	7	6	53.84
15 to 25	4	39	9.30
26 to 35	10	33	23.26
Over 35	6	14	30

This shows that from 15 to 25 is the most unfavorable time to operate, while the most favorable are over 35, and especially under 15.

Again, *sex* seems to have considerable influence on the mortality rate, so far as can be judged from 158 cases. In my table the sex is mentioned in 125 cases, of which 106 were males and 19 females—84.8 per cent. of males. This preponderance of males would be even greater were military and naval surgeons alive to the possibilities of saving life in this perilous condition. I have been informed of a considerable number of such cases dying without operation during our late war with Spain. Of the males 85 died and 21 recovered, a recovery rate of 18.1; 11 females died and 8 recovered, a recovery rate of 42.1 per cent. In other words, while the number of operations in males has been over five times as many as in females, the recovery rate of females has been over twice that of males.

Again, I have analyzed the recovery rate in the various *weeks of the disease.* The third week gives, as is well

known, the largest number of cases of perforation, the second following close upon it. As is seen by the subjoined table, the mortality rate of these two weeks is by far the worst, yet even these two weeks yield a recovery rate of over 16 per cent., more than three times that of unoperated cases, and in the fourth week this recovery rate is doubled.

TABLE OF RECOVERIES AND DEATHS WITH REFERENCE TO THE WEEK OF THE FEVER.

	Recovered.	Died.	Recovery per cent.
First week	2	1	
Second week	5	22	18.57
Third week	8	42	16
Fourth week	4	8	33.3
Fifth week	1	5	
Sixth week	14	2	
Seventh week	2	3	
Eighth week		1	
Ninth week		1	
Eleventh week	1		

The numbers in other weeks, not rated, are too small to make the percentages of value.

3. *When shall we operate?* Next to the first question, which I regard as settled, this is the most important to be considered. As exception has been taken, especially by Cushing and Taylor, to my views as set forth in my book, I may be permitted to quote precisely what I wrote: "First, the time of operation should be wisely chosen. The best time is not during the immediate primary shock which lasts during the first few hours. Happily, in fact, it is very rarely the case that operation can be done within several hours after perforation, since, the case being under the care of a physician, it requires time to obtain a consultation with the surgeon, and, when the diagnosis has been reached, still further time must elapse before suitable preparations for operation can be made. The table on page 227 [of my book] shows that the *second twelve hours after perforation, all things considered, has been the most favorable up to this time.* Abbe well says that it is essential that 'the surgeon

should never be so hasty in getting at his work that he enters upon it handicapped by poor assistants, poor light, poor arrangements for irrigation and sponging, or inadequate plans for restoration from shock.' *The earlier the moment at which the operation can be done after the immediate shock of the perforation, provided, of course, there has been any, as is sometimes not the case, the better it will be for the patient. Every hour then counts, since the infection of the peritoneum becomes more diffuse and more intense*[3]."

Looking carefully at what I said, it is hardly just, it seems to me, for Cushing to say: "it is hard to understand Dr. Keen's advocating delay until symptoms of shock have passed away and *his preference of the second twelve hours* for operating, when one appreciates that extravasation, perhaps of virulent organisms, is with all probability continually taking place while we are waiting." Taylor says: "I believe, to be successful, the abdomen should be opened at the earliest possible moment after the diagnosis is made and that no delay whatever should be permitted for reaction, or, indeed, for any purpose whatever," and again, "I do not believe it wise to wait for reaction, as Dr. Keen suggests, for the shock and lowered temperature is due to the large amount of septic material in the abdominal cavity and to the resulting purulent peritonitis, and not to the shock of perforation of the bowel. The fact that the greatest number of recoveries occurred when the operations have been performed within the second twelve hours only carries out this contention. They are, as a rule, the cases where the perforation is small and the onset of the peritonitis slow."

I think that what I wrote may be fairly summarized in two rules: 1, operation should be done as soon as possible after perforation; 2, but no prudent surgeon would operate in perforation any more than in any other condition during profound shock. I did not state that I "*preferred* the second twelve hours," but only that "*all*

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[3] The italics are used here to call attention to my position.

things considered, this has been the most favorable *up to this time."*

Let us appeal again to the facts. In the subjoined table I have made a more minute analysis of the influence of the time of operation on the rate of recovery than in my book, and, on consulting it, we see that the recovery rate in the first four hours is 25 per cent.; from four to eight hours, 8.33 per cent.; and for all cases operated on within the first eight hours the average is 15 per cent. In the third four hours, from eight to twelve, the recovery rate is 25 per cent., which is still below the recovery rate of operations done from eight to twenty-four hours, which is 29.09 per cent.; or in the second twelve hours, which is 30.76 per cent.; after twenty-four hours the recovery rate falls to 13.63 per cent.

TABLE SHOWING RECOVERY RATE OF OPERATION ACCORDING TO THE NUMBER OF HOURS AFTER PERFORATION OCCURRED.[4]

	Died.	Recovered.	Percentage of recoveries.			
Under 4 hours	6	2	25.	19.44	15	25.33
4 to 8 hours	11	1	8.33			
8 to 12 hours	12	4	25.		29.09	
12 to 18 hours	17	8	32.	30.76		
18 to 24 hours	10	4	28 57			
Over 24 hours	38	6	13.63			
Not given	27	12	30.74			
Total	121	37	23.41			

These figures, so far as the number of cases justify us in drawing a conclusion, certainly carry out the statement which I first made. It should be modified, however to read that during the first eight hours, the chances of recovery are only about one-half of that which obtains during the rest of the first twenty-four hours.

It is to be remembered that most of the operations done under four, or even eight, hours must have been in hospitals, for in a private case it is practically impossi-

[4] Cases operated on "8" hours, "12" hours, etc., after perforation are included, respectively, under "4 to 8 hours," "8 to 12 hours," etc.

ble to summon the physician and then the surgeon, make preparations and do the operation in so short a period after the perforation has occurred. Moreover, the patients operated on in hospitals have not only facilities which do not exist in any private house, even the best, but they would have the services of men on the hospital staffs, on the whole more skilled than many of those who operated on other cases, yet the mortality rate is almost twice as great in the first eight hours as in the next sixteen.

I am convinced that this is due to shock. If there be no shock or it is only slight, no surgeon would allow the contents of the intestine to flow into the abdominal cavity for a moment longer than is possible, but if there be shock and, especially grave shock, I believe it to be the duty of the surgeon to wait for a reasonable time for at least a partial recovery from that serious condition. I can not agree with Taylor when he states that the shock is due to sepsis and not to the perforation. Thus Fitz states that of 80 cases, the onset of the symptoms was *sudden* in 56, while in 15 they were gradual or latent, and in 5 there were none. Finney says: "where marked symptoms of shock and collapse were present at the time of operation, the prognosis was distinctly influenced for the worse," and again, "the signs upon which most dependence is to be placed are sudden pain in the abdomen with symptoms of collapse accompanied by an abrupt fall in the temperature, it may be even several degrees." All that we know of shock, it seems to me, corroborates this view. How many of us have seen the serious shock produced by a finger pinched in a door, or other similar accident in which the element of sepsis can not possibly enter. Look at the records of perforation in gastric ulcer and see in how many such cases, similar to those of typhoid perforation, the patients fall down in collapse. It is the pain of the perforation and extravasation and not the sepsis which produces the initial shock. The first moment possible after this has subsided is the time to operate. Were it due to sepsis, then the initial shock should be slight and should steadily increase with the

increasing sepsis; but as a matter of fact the initial shock is the greatest and is followed by more or less subsidence of shock.

Taylor's view that the shock is due to the size of the opening, and, therefore, to the rapidity of extravasation, while theoretically true, is scarcely substantiated by a reference to the tables. This point not having been in mind when the tables were made, the size of the opening is not noted in each individual case, but I find 54 cases in which the size is stated. I have tabulated those as "large" openings that were larger than a lead pencil (about a quarter of an inch) and as "small," of lead-pencil size or less. I find that in 25 cases with large or multiple openings, the deaths were 19 and the recoveries 6, a recovery rate of 24 per cent.; in 29 cases of small openings, the deaths were 20 and the recoveries 10, an operative recovery rate of 33 per cent., or 9 per cent. more.

It is possible that larger statistics by changing the facts will change my views to some extent, but I doubt if operations done during the presence of severe shock will ever prove as successful as those undertaken as quickly as possible after primary shock has passed away.

On the one side is the shock, on the other the increasing infection of the peritoneum. He will be the best surgeon, as he is the best sailor, who avoids both Scylla and Charybdis.

To avoid both of these dangers, if possible, Cushing has proposed to operate in what he terms the "preperforative" stage. Should it ever prove possible accurately to diagnosticate the preperforative stage, that, unquestionably, will be the most favorable time for operation. I quite agree with Finney in his belief that so far as operative technique is concerned—with the exception of one point to be alluded to a little farther on—we have probably progressed nearly as far as we ever shall. Our future increased success will depend far more on our accuracy of early diagnosis, and especially if it should prove possible accurately to diagnosticate an impending rather than an actual perforation.

I would urge most strenuously, therefore, that, as in appendicitis, the surgeon should be called in at the earliest moment when any abdominal symptoms indicate possible perforation. Preparations can then be made beforehand and, should the symptoms call for it, an exploratory operation should be done after the fashion proposed by Finney. These, I think, are the two most distinct advances that we have made in the last two years in the treatment of typhoid perforation; viz., the possible diagnosis of an impending perforation, followed by immediate operation and exploratory operation under cocain.

4. *How shall we operate?* As already indicated, the most important recent advance in the technique is the use of cocain instead of a general anesthetic. This was first used by Cushing in two cases. In a personal letter to me he reinforces his suggestion and says: "I think local anesthesia is a great step in advance. I shall never use general narcosis again in typhoid." To this Finney adds the suggestion "that in any case in which the diagnosis is obscure and there is reason to suspect the existence of a perforation, a small incision be made under cocain anesthesia . . . and that cultures be taken from the abdominal cavity. . . . This exploratory incision would be followed by very little disturbance to the patient and very slight risk. If the presence of a septic peritonitis is determined, this incision can be enlarged and the operation for the relief of the perforation and peritonitis can at once be carried out." Still more, if we can diagnosticate the preperforative stage and anticipate both shock and sepsis, we shall have made an important further step in advance.

A very brief summary will be sufficient to indicate the further technique. The incision would be best made in the right linea semilunaris, or through the rectus muscle. If such a general peritonitis be present that this will not enable us thoroughly to cleanse the abdominal cavity, a second incision may be made in the left iliac fossa.

The perforation should be sought: 1, in the ileum;

2, in the adjacent cecum and appendix, and 3, in the sigmoid, where it occasionally occurs. One case of perforation in Meckel's diverticulum (109) has been reported. When found, the perforation should be sutured without paring the edges, which is both a loss of time and tissue, and also involves possible hemorrhage, to arrest which more time must be consumed. All of the thinned area should be included in the suture. The occasional wide extent of this area is well shown in Plate V in my book. The suture should not be continuous, but Halsted's mattress suture. If a second row of sutures is deemed necessary, this may be continuous, as it saves time. The amount of inversion of the bowel must not be such as seriously to impair the lumen of the gut. Should the perforation be very extensive, or should two or more adjacent perforations render it necessary, a resection and anastomosis of the bowel may be made. Of 7 cases of resection, 3 (31, 40 and 124) recovered. Should there be found other points of impending perforation, these should be sutured as a preventive measure. Some patients who apparently should have recovered have been lost by a later perforation; 2 died from subsequent hemorrhage (100, 139). In 5 the appendix was removed without a recovery.

The cleansing of the peritoneal cavity is one of the most important steps in the operation. Unless this is thoroughly carried out the operation will certainly prove futile. Whether it shall be done by flushing or wiping or both must be decided by each operator at the time.

Drainage in most cases will be necessary, but I quite agree with Finney that "many cases in which we have heretofore been accustomed to drain would recover more promptly without it. . . . If the inflammatory process has not been of too long standing and the peritoneal cavity can be at all satisfactorily cleansed, it will be better to fill the cavity with salt solution and close the wound." Of seven cases not drained, two recovered.

Speed in operation is an important factor in recovery, as would naturally be supposed in cases which are so unfavorable in consequence of the existing fever and its

concomitant exhaustion. Only one case (107) in which the operation lasted an hour or over was followed by recovery. A number have been done in from seventeen to thirty minutes. On the other hand, in our anxiety to complete the operation quickly, we must never sacrifice thoroughness, both of closure of the perforation and of cleansing the peritoneal cavity.

One criticism by Cushing, of a statement in my book, I feel is just. I said: "I can scarcely think that we would ever be justified in reopening the abdomen. . . Possibly a very exceptional case might justify such a procedure, but a typhoid patient rarely escapes with his life even after one operation and could not be expected to survive a second. The same remark would apply to any new perforation which might occur. Such cases must, unfortunately, be left to their fate." The experience in Cushing's first case in which three operations were done and yet recovery followed, and the extraordinary vitality exhibited in Finney's third case "who, subsequent to the operation, suffered two relapses, one of great severity, a suppurating otitis media, a left sided pleurisy, a right sided femoral phlebitis, a severe neuritis of both legs and the painful toes so common after the cold bath treatment," and his fifth case, "who, on the twenty-second day was again operated upon for relief from obstruction of the bowels," show that we ought never to despair of any case.

CONCLUSION.

My views on the operative treatment of typhoid perforation may be summarized, therefore, as follows:

1. The surgeon should be called in consultation the moment that any abdominal symptoms indicative of possible perforation are observed.

2. If it be possible to determine the existence of the preperforative stage, exploratory operation should be done under cocain anesthesia before perforation, shock and sepsis have occurred.

3. After perforation has occurred, operation should be done at the earliest possible moment, provided:

4. That we wait till the primary shock, if any be present, has subsided.

5. In a case of suspected, but doubtful perforation, a small exploratory opening should be made under cocain to determine the existence of a perforation, and if hospital facilities for a blood count and for immediate bacteriologic observation exist, their aid should be invoked.

6. The operation should be done quickly, but thoroughly and in accordance with the technique already indicated.

7. The profession at large must be aroused to the possibility of a cure in nearly, if not quite, one-third of the cases of perforation, provided speedy surgical aid is invoked.

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