

tomy established. It seems that if the perforation is low, a sigmoid colostomy is more advisable.

Accurate fluid balance, adequate antibiotics, and careful nursing care are essential to recovery after operation. In the fatality of the four-day-old infant, overloading with fluid as a factor cannot be entirely eliminated. Edema of the eyes developed a few hours before the first appearance of cyanosis and persisted until death six hours later.

Drainage does not seem advisable because of the absence of any localization and the inability to drain adequately the general peritoneal cavity. If any localized collections occur in the postoperative course they should be drained at an optimal time.

Gastric suction must be maintained until gas passes from the colostomy and bowel sounds are adequately audible. The colostomy should be opened in 24 to 48 hours after operation.

CONCLUSIONS

It is the opinion of the authors that rupture of the normal colon at the time of barium enema is due to over-distention of the balloon on the rectal catheter at a point where the colon is narrowed and fixed by the peritoneal reflexion. The balloon in the wide rectal ampulla could probably be fully inflated without injury.

This places great responsibility on the physician ordering a barium study of the colon to be sure that there is, first, an indication for such a study and, second, that adequate precautions to prevent this tragic complication are taken by those performing the study. When such an injury does occur, prompt operation, as described, is indicated.

BIBLIOGRAPHY

1. Berk, J. E.: Perforation Following Barium Enema. *J. A. M. A.*, 148: 766, 1952.
2. Best, C. H. and N. B. Taylor: *Physiological Basis of Medical Practice*, 4th edition. Williams and Wilkins Co., Baltimore, 1945.
3. Burt, C. A. V.: Pneumatic Rupture of Intestinal Canal. *Arch. Surg.*, 22: 875, 1931.
4. Hamit, H. F.: Perforation of the Colon after Barium Enema and Air Contrast Studies. *Am. Surgeon*, 21: 1226, 1955.
5. Isaacs, I.: Intraperitoneal Escape of Barium Enema Fluid Perforation of Sigmoid Colon. *J. A. M. A.*, 150: 645, 1952.
6. Kaulich, L.: Perforation des Geschwurig Dickdarmens Durch den Kontrasteinlauf. *Med. Klin.*, 26: 1042, 1930.
7. Kleinsasser, L. J. and H. Warshaw: Perforation of Sigmoid Colon During Barium Enema. *Ann. Surg.*, 135: 560, 1952.
8. Scheidt, R.: Darmperforation nach Kontrastdarstellung bei Stenosierendem Sigma-Carcinom. *Chirurg.*, 21: 602, 1950.
9. Serjeant, J. C. B. and J. A. Raymond: Perforation of Apparently Normal Colon after a Barium Meal. *Lancet*, 2: 1245, 1952.

DISCUSSION.—DR. MARK M. RAVITCH, Baltimore, Md.: As I passed him on the way to the platform, Dr. H. W. Scott of Nashville wanted to know how large our series of ruptures was. It is zero, although we can add one of which a correspondent recently informed me in a suspected case of intussusception in which the barium was noticed in the peritoneal cavity almost at once. The baby was immediately operated upon, no intussusception was found, and a perforation in the rectosigmoid like those Dr. Hartman described was found and closed. I would be inclined to agree with his explanation that it is the balloon and not the pressure of the barium, because certainly in intussusceptions the barium probably is at a

greater pressure. We use 3 to 3.5 feet of pressure without any manipulation. We are very careful just barely to introduce the balloon with the fingers, and then inflate it as indicated. We do this ourselves rather than turning it over to anyone else. In some 70 intussusceptions and in perhaps an equal number of children suspected by the pediatricians of having intussusception, and given diagnostic barium enemas, we have not seen this accident.

DR. ALBERT W. HARTMAN, San Antonio, Texas (closing): I have nothing to add, and I want to thank Dr. Ravitch for his discussion.