

Effects of Decompression During Removal of Intestinal Obstruction

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ALTHOUGH decompression of the bowel at the time of surgical relief of intestinal obstruction has been advocated since the early part of this century, the value of such a procedure remains a controversial subject among surgeons.

An experimental study was carried out in 30 pairs of dogs of similar size and of the same sex. Under intravenous nembutal anesthesia using aseptic technic, the abdomen was opened and the small bowel was ligated with umbilical tape 20 cm. proximal to the ileocecal valve and the wound closed. Five hundred cubic centimeters of 10% glucose in saline were given intravenously. The animals were allowed to take food and water at will. Five days after operation, the wound was reopened. Distention was present and generally comparable in each pair. One of each pair was decompressed by enterotomy gently expressing the gas and liquid contents of the bowel into a basin. The bowel was cleaned with a 0.25% Neomycin solution and the opening closed with interrupted Lembert sutures of fine silk. No decompression procedure was performed upon the other member of the pair. The obstructing tie was removed from both dogs. Of the two, the one member whose bowel appeared slightly more distended was selected for decompression. The abdomens were closed and the animals were sacrificed 24 hours later.

At that time the appearance, volume and weight of the bowel was determined. Blood electrolytes, urea nitrogen, and hematocrit determinations were made during the entire period of the experiment.

The first day following the creation of the obstruction, there was no appreciable change in the blood chemical test values (Table 1). By the fifth day there was an increase in serum carbon dioxide, blood urea nitrogen, and hematocrit. Serum sodium, potassium, and chloride were decreased. Twenty-four hours after removal of the obstruction and before sacrificing, the values of the decompressed animals returned to within normal range with the exception of an elevated hematocrit in one dog, but the abnormal figures persisted in those not decompressed.

The bowel content at the time of decompression measured an average of 480 cc. of liquid feces plus much gas (Table 2). The fluid in the nondecompressed animal averaged approximately 360 cc. as compared to 120 cc. in the decompressed dogs. At sacrifice, there was one and one-half to three times as much distention in the nondecompressed animals as in the decompressed animals in which very slight distention was present. The weighed small intestine was two to three times as heavy in the nondecompressed animal, being hyperemic and feeling rougher, tenser, and more thickened than in the decompressed dogs. Frequent intussusception of the nondecompressed bowel was also encountered which was not present in the other animals.

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TABLE 1. *Effect on Blood Values of Obstruction and Release of Obstruction With and Without Bowel Decompression*

	1st Day of Obstruction	5th Day of Obstruction	24 Hours After Release of Obstruction	
			Decompressed Bowel	Nondecompressed Bowel
Sodium	Normal	Decreased	Normal	Decreased
Potassium	Normal	Decreased	Normal	Decreased
Carbon dioxide	Normal	Increased	Normal	Increased
Urea nitrogen	Normal	Increased	Normal	Increased
Chloride	Normal	Decreased	Normal	Decreased
Hematocrit	Normal	Increased	Normal	Increased

TABLE 2. *Comparison of Decompressed and Nondecompressed Bowel 24 Hours After Removal of a 5-Day Mechanical Obstruction*

	Distention	Bowel Weight	Appearance	Intussusception	Average Contents
Decompressed (Av. 480 cc. fluid) (much gas)	Slight	—	Normal	None	120 cc. fluid; little gas
Nondecompressed	1½–3× above	2–3× above	Hyperemic Rough tense thickened	Frequent	360 cc. fluid; much gas

No shock or other ill-effects resulted from the decompression.

Discussion

Although Monks⁶ in 1908 and later Moynihan⁸ and Holden⁴ in 1926 advocated decompression of the obstructed bowel at the time of operation, Laewen⁵ (1927), Morton⁷ (1932), Ochsner and Storck⁹ (1936) condemned the procedure believing that stripping of the bowel was hazardous. Many of us remember when rapid decompression of any distended organ was frowned upon whether it was gallbladder or urinary bladder on the grounds that it was shocking to the patient. Elman³ (1934) stated in an article entitled, "Danger of Sudden Deflation of Acute Distended Bowel in the Late Low Intestinal Obstruction," that shock resulted from the evacuation of fluid from the bowel. Wangenstein¹³ suggested that such effects described were due to trauma to the bowel wall rather than to release of the bowel

contents. Sperling and Kremen¹¹ reported that, while stripping of the small bowel in the obstructed dog was tolerated under pentobarbital sodium anesthesia, there were difficulties under ether anesthesia. With better preoperative preparation and better anesthesia administration many of these previously described problems seem less evident at the present. Although some surgeons retain their fear of decompression because of the danger of contamination, resulting shock to the patient and with the feeling that fluid merely reaccumulated in the bowel, others in recent years believe that decompression is most helpful and without ill-effect. With the use of special trochars, such as devised by Wangenstein¹³ and by Barnes,² a relative aseptic technic of evacuation of the bowel may be carried out with greater ease and without fear of rupturing the dilated bowel. Lack of distention facilitates abdominal closure and lessens the risk of abdominal dehiscence. There is an immediate improvement of

respiratory exchange with decrease of abdominal distention. Our clinical experience, as well as those of others using these techniques, indicates a more rapid return to a more normal physiological state following decompression. Trauma to the bowel wall during the evacuation procedure can and should be kept to a minimum.

Summary

Mechanical obstruction of the small bowel 20 cm. proximal to the ileocecal valve was created in thirty pairs of dogs and then removed 5 days later. In one of the pair the bowel was decompressed by enterotomy removing the gas and liquid content. The other was not. At sacrifice 24 hours later the nondecompressed bowel was found to be one and a half to three times as distended and was two to three times as heavy as the decompressed animal. No shock or other ill-effects resulted from the decompression. A decrease in the serum potassium, sodium and chloride and a slight increase in the serum carbon dioxide, blood urea nitrogen, and hematocrit, which had been present in the animals at the time of the release of the obstruction, were restored to normal in the decompressed animals 24 hours later in contrast to the nondecompressed animals where abnormal values persisted.

DISCUSSION

DR. JAMES C. DRYE (Louisville): I respect no team of surgeons more than the elder and the younger Drs. Singleton, but I do have a question as to the relevancy of the appearance 24 hours later of the bowel in the dog, the chemical findings and the relationship to actual mortality in the course of the human patient after a matter of days.

The dogs were sacrificed 24 hours after decompression. (I have been of two minds about this procedure; and have abandoned decompression of the bowel.)

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I wonder how the mortality rates compare with patients who have had the bowel recompressed and with those who have not. I would have liked to have seen these dogs followed longer, perhaps for 10 days, 2 weeks, and 1 month, to learn about the mortality rate at those points.

DR. A. O. SINGLETON, JR. (Closing): We felt that the 24-hour period postoperatively was the more critical. We did carry other animals longer, and as far as we could see, there was no problem. The differences between the two simply became less and less as the non-decompressed bowel gradually returned to a more normal state.