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A new instrument and operation for aseptic end-to-end intestinal anastomosis.

By JEROME P. WEBSTER (by invitation).

[*From the Department of Surgery, Peking Union Medical College, Peking, China.*]

An instrument, employed successfully in 86 operations on dogs and one on man, was devised in 1921 for cutting purse-string ligatures about the occluded stumps of intestine after the ends had been abutted and enterorrhaphy practically completed. It consists of (1) a cylindrical steel needle with a round eye at one end for the ligature, (2) a tubular knife of two pieces joined by threads, and (3) a tubular thumb-cap with thumb-screw at one side. The knife is revolved and passes down over the eye of the needle when the latter is inserted in the tubular knife and held at its other end by the thumb-cap with the thumb-screw acting as a vise.

After cutting the mesentery and ligating the vessels, the bowel is doubly clamped slightly obliquely with Kocher clamps on each side of the loop to be resected, and the loop is cut away between clamps with electric cautery or by cutting and carbolizing. On either side of the clamps at about 1 cm. distance, purse-string sutures of catgut or silk are laid about the bowel with the ends left free opposite the mesenteric border. The clamps are approximated and six mattress sutures of fine silk or catgut, which pick up the submucosa, are laid but not tied between the bowel loops, coming 2 to 3 mm. from the purse-string sutures. The bowel loops are placed parallel. The cylindrical needles are threaded on one of the loose ends of each purse-string suture, and the latter are tied and cut. The bowel is severed just beyond the purse-string sutures and the stumps are cauterized. The cut ends are abutted, the mattress sutures are tied and reenforced with intermediate sutures. All are tied except those about the needles at the free border. The tubular knives are sheathed over the needles. The thumb-caps are applied over the ends of the needles holding them tightly by the thumb-screws. The tubular knives are revolved cutting the purse-string sutures, and the knives are withdrawn. The last mattress suture is tied and the mattress

sutures are pulled outwards radially opening up the lumen. The rent in the mesentery is then sutured.

During 1922, a series of anastomoses on the small bowel using this instrument, was performed on dogs, tying off the catgut sutures and severing the bowel before suturing the apposed ends together with mattress or other types of sutures. These sutures were placed as closely as possible to the bowel ligatures to reduce the diaphragm. The lumen was not opened at operation but peristalsis was depended upon to re-establish the lumen. Difficulty was encountered in placing the sutures evenly and 40 per cent of the dogs died as a result of the operation. Other dogs sacrificed showed clinical symptoms of partial obstruction and had more or less dilatation of the proximal loops.

Twenty-eight consecutive anastomoses were performed by the technique first described. Specimens were recovered from zero hours to 44 days after operation. One ileo-colostomy and two colo-colostomies were performed in this series, the remainder being on the small bowel. Two dogs died from penumonia and one the 21st day from intussusception below the anastomosis, but with a satisfactory lumen and no adhesions. The diaphragm was satisfactorily opened. Solid food, including bones, was given 24 hours after operation. There was but little adhesion formation about the suture line in these cases and clinically no symptoms of obstruction.

Another series was performed according to Bidgood's modification of Halsted's operation. Three operations were on the large bowel. One dog died on the 63rd day from other causes. One died on the 15th day from pneumonia but showed complete blocking of the lumen by a large diaphragm. The third dog was sacrificed after operation. Of three operations on the small bowel, one died of marked intestinal obstruction the third day, and another died on the second day following operation to relieve marked intestinal obstruction. In the third operation Bidgood's technique was followed, but the mattress sutures were taken as closely as possible to the purse-string sutures. At operation 2 days later, moderate dilatation of the proximal loop was found.

Another series of anastomoses, according to the author's technique, was performed. Of nine consecutive operations, one dog died five hours after operation to relieve intestinal obstruc-

tion caused by Bidgood's operation. One died the 41st day from marked distemper. The remaining dogs were operated upon or sacfificed, recovering specimens from 33 to 107 days after operation. Three of these anastomoses were incidental to other operations. Double zero catgut mattress sutures on welded needles were used throughout. There were no symptoms of obstruction, no dilatation nor constriction from the diaphragm and no adhesions about the bowel as a result of anastomosis.

CONCLUSIONS.

An instrument has been devised for cutting purse-string sutures used with satisfaction and precision in 87 operations. It cuts without tension on the suture material; it is simple; it can be sharpened readily and repeatedly; the needles are light and do not pull on the purse-string sutures.

Twenty-eight consecutive operations with removal of specimens from zero hours to 44 days, have been performed with a minimum of adhesions with no signs of obstructions and with no death that could be attributed to the operation. Eight consecutive operations with specimens recovered from 33 to 107 days have been performed without a death from the operation, and with no adhesions. In this type of anastomosis on the small bowel, the sutures must be taken close to the purse-string sutures and the lumen should be opened at operation. Aseptic end-to-end anastomosis of the bowel can be safely and easily performed by this method.

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Healing of aseptic end-to-end intestinal anastomoses by the author's method.

By JEROME P. WEBSTER (by invitation).

[*From the Department of Surgery, Peking Union Medical College, Peking, China.*]

A study was made of specimens of 86 end-to-end anastomoses performed on dogs using a revolving tubular knife for cutting ligatures or purse-string sutures placed about the closed abutted ends of severed bowel after enterorrhaphy was practically complete. Several types of silk or catgut sutures were used. Stitches