

## EFFECT OF PROPRANOLOL ON HUMAN MYOELECTRIC ACTIVITY

Mark A. Carlson, MD, Kirk A. Ludwig, MD,  
Verne E. Cowles, PhD, Constantine T. Frantzides, MD, PhD,  
and Robert E. Condon, MD, MS, FACS

THE USE OF adrenergic blocking agents to shorten the duration of postoperative ileus has been previously studied, but such treatment has had only modest success.<sup>1</sup> However, studies of the effects of adrenergic blockers on human intestinal function in the postoperative period have utilized inexact measurements, such as the presence or absence of bowel sounds and the passage of flatus, as measures of bowel motility. Adrenergic stimulation and blockade in awake instrumented monkeys decreases and increases, respectively, the frequency of colonic contractions.<sup>2</sup> The site in the monkey in which postoperative ileus is most prolonged is the colon.<sup>3</sup> The objective of this study was to evaluate the acute effects in humans of

---

*From the Department of Surgery, Medical College of Wisconsin, Milwaukee. Supported by a grant from the National Institutes of Health.*

Table 1—Spike burst frequency of the right and left colon of humans before and after propranolol administration (20 mcg/kg IM)

Experimental state	Colon myoelectrical activity (mean events/h $\pm$ SD)	
	Right colon	Left colon
Baseline	13.4 $\pm$ 16.0	41.6 $\pm$ 57.4
Propranolol	14.8 $\pm$ 25.3	42.5 $\pm$ 53.6

$P > 0.05$

$P > 0.05$

propranolol, a beta-adrenergic blocker, on colonic myoelectric activity in the postoperative period. We used myoelectric activity to assess colonic function because myoelectric and contractile events have a 1:1 correlation when recorded simultaneously.<sup>2</sup>

### MATERIALS AND METHODS

With informed consent, the colons of five patients were instrumented at elective laparotomy as previously described.<sup>4</sup> None of the patients underwent vagotomy. Six bipolar electrodes of teflon-coated stainless steel wire (0.3 mm OD, Medwire Corp, Mt Vernon, NY) were placed in the anterior taeniae, three on the right and three on the sigmoid colon. Each bipolar electrode consisted of two wires placed 4 mm apart attached to the intestine with a single 3-0 chromic gut stitch. The distance between electrodes along the axis of the bowel was 5 cm. The wires were brought through the abdominal wall, fastened to the skin with a 3-0 nylon stitch, and covered with a bandage until needed for recording. More than five days postoperatively and after clinical resolution of ileus, baseline myoelectric activity was recorded for one hour on paper (Grass 79E polygraph) and magnetic tape (Hewlett Packard 3968A). Propranolol (20 mcg/kg intramuscularly [IM]) was then administered and recordings continued for another 1.5 hours. Two to six experiments were performed once daily on each patient. Analgesia was not administered during or in the two hours prior to an experiment. After the experiments were completed, the electrodes were removed by gentle traction. The taped data were band-pass filtered between 5 and 10 Hz to segregate the spike burst activity at each electrode. Spike bursts were manually counted before and after the propranolol injection. The raw polygraph recording was utilized simultaneously during counting to identify artifacts. The spike burst frequencies of the right and left colon were compared using the paired *t*-test.

### RESULTS

The spike burst frequencies of the right and left colon are recorded in Table 1. An IM injection of propranolol (20 mcg/kg) does not produce any change in the spike burst activity of either the right or left colon in the human.

## DISCUSSION

We have previously characterized the resolution of postoperative ileus in humans without therapeutic intervention<sup>4</sup> using the methods described above. We have identified patterns of myoelectric activity that are associated with resumption of colonic peristalsis, passage of stool, and tolerance of a general diet. Measurement of myoelectric activity is an accurate method to assess colonic function. Currently our intent is to identify interventions that will shorten the period of postoperative ileus. In this trial, we could not demonstrate a prokinetic effect of a single IM dose of propranolol on colonic myoelectric activity in humans who had already achieved clinical resolution ileus. We were expecting such an effect, because we anticipated beta blockade would increase myoelectrical activity in the colon. The reason for the observation of no effect may be a low level of beta blockade secondary to the route and dosage of propranolol used, which were restricted by our IRB. Alternatively, beta blockade following recovery from postoperative ileus may be without effect because beta stimulation has abated, or beta stimulation may not play a physiologic role in colonic motor control in humans.

## REFERENCES

1. Livingston EH, Passaro EP Jr: Postoperative ileus. *Digest Dis Sci* 35:121-132, 1990
  2. Esser MJ, Mahoney JL, Robinson JC, et al: Effects of adrenergic agents on colonic motility. *Surgery* 102:416-423, 1987
  3. Woods JH, Erickson LW, Condon RE, et al: Postoperative ileus: A colonic problem? *Surgery* 84:527-533, 1978
  4. Condon RE, Cowles VE, Schulte WJ, et al: Resolution of postoperative ileus in humans. *Ann Surg* 203:574-581, 1986
-