Effect of Osteopathic Manipulative Treatment on Incidence of Postoperative Ileus and Hospital Length of Stay in General Surgical Patients

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Context: Postoperative ileus is a known complication after abdominal operations, and the clinical efficacy of osteopathic manipulative treatment (OMT) in postoperative surgical patients has seldom been the subject of research.

Objective: To determine whether there is a relationship between postoperative use of OMT and postoperative outcomes in gastrointestinal surgical patients, including time to flatus, clear liquid diet, and bowel movement and postoperative hospital length of stay (LOS).

Design: A retrospective cohort study.

Setting: A 350-bed urban community hospital with an osteopathic residency program in general surgery.

Patients: Fifty-five patients who underwent a major gastrointestinal operation, who did not die, and who had complete perioperative medical records.

Main Outcome Measures: We evaluated demographic data; American Society of Anesthesiologists physical status class; preoperative comorbid conditions; postoperative complications; postoperative time to flatus, clear liquid diet, and bowel movement; postoperative hospital LOS; electrolyte abnormalities; and types of narcotics used.

Results: Of the 55 patients who met the study criteria, 17 had received postoperative OMT and 38 had not. The mean age was 60.3 years in the OMT group and 62.1 years in the non-OMT group ($P=.70$). The 2 groups were similar in terms of American Society of Anesthesiologists class, number of comorbid conditions and of postoperative complications, presence of electrolyte abnormalities, and narcotic use. The time to bowel movement and to clear liquid diet did not differ significantly between the groups. The mean (standard deviation [SD]) time to flatus was 4.7 (0.4) days in the non-OMT group and 3.1 (0.6) days in the OMT group ($P=.035$). The mean (SD) postoperative hospital LOS was also reduced significantly with OMT, from 11.5 (1.0) days in the non-OMT group to 6.1 (1.7) days in the OMT group ($P=.006$).

Conclusion: Osteopathic manipulative treatment applied after a major gastrointestinal operation is associated with decreased time to flatus and decreased postoperative hospital LOS.

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Postoperative ileus (POI) is the most common cause of prolonged hospital stay after an abdominal operation.[1] Impairment of bowel function may be expected in the early postoperative period, depending on the type of operation performed. However, ileus persisting longer than 48 hours after an operation may be considered pathologic.[2]

Postoperative ileus has been described since the late 1800s.[3] Its exact pathophysiologic process has yet to be delineated, to our knowledge; hence, only the avoidance of opiates (known suppressors of bowel activity) and the correction of electrolyte imbalances have been shown to be effective treatments. Multiple interventions have been suggested to address various possible etiologic mechanisms of POI, with varying success.[4] Recently, study findings implicating a range of biochemical and neurologic mechanisms for POI have suggested the benefits of using particular treatment patterns and medications. Fanning and Hojat[5] demonstrated that early postoperative feeding and bowel stimulation with magnesium hydroxide may decrease the rate of POI after major gynecologic surgical procedures. Ohno and colleagues[6] suggested that administration of glutamine, a preferred nutrient for small bowel enterocytes, may enhance postoperative recovery of bowel function. Prokinetic agents, such as ghrelin agonists, and μ-receptor antagonists, such as methylnaltrexone, have been shown to improve POI.[7,8]

Osteopathic manipulative treatment (OMT) is a set of manual adjustments to the musculoskeletal system that modulates the autonomic nervous input to the gastrointestinal tract by reducing sympathetic tone and, to a lesser degree, augmenting parasympathetic effects.[9] This approach may reduce POI without the use of pharmacologic interventions, which may be costly and associated with their own complications.[10] The efficacy of OMT in the prevention and management of POI was initially described by Herrmann[11] in 1965, and a 2009 retrospective analysis[12] of 331 patients demonstrated a 2.8-day shorter hospital length of stay (LOS) among patients with POI who had received postoperative OMT. To increase our understanding of the effect of OMT on POI, we investigated whether there is a relationship between postoperative use of OMT in general surgical patients and postoperative outcomes, including postoperative time to flatus, clear liquid diet, and bowel movement and postoperative hospital LOS.

Methods

After presenting our study as retrospective and noninterventional and the data set as encrypted, we received institutional review board exemption. We then retrospectively reviewed the electronic medical records of all general surgical patients who underwent major gastrointestinal operation (defined as small- or large-bowel resection or gastric resection or repair) at a 350-bed urban community hospital from January 1 through December 31, 2011. Demographic data; American Society of Anesthesiologists (ASA) physical status class[13]; preoperative comorbid conditions; types of operations performed; postoperative complications; postoperative time to flatus, clear liquid diet, and bowel movement; postoperative hospital LOS; postoperative electrolyte abnormalities; and types of narcotics used were tabulated from the electronic medical records. The ASA class, which classifies physical status on a scale of 1 to 6 (1, healthy; 6, brain dead), served as a standardized measure of perioperative complication risk. The only additional inclusion criterion was a complete data set at the time of chart review, and the only exclusion criterion was death.

We reviewed progress notes for the use of OMT and categorized patients into 2 groups: those who received OMT during the early postoperative course (OMT group) and those who did not receive any OMT (non-OMT group). We also noted the type of OMT techniques used (eg, muscle energy, myofascial release), the duration of the OMT session, the body areas treated, and whether the OMT was performed by physicians, residents, students, or a combination.

We compared tabulated data between the groups by

using 1-way analysis of variance and used StatPlus software (Mac version 4.8.0; AnalystSoft Inc, Vancouver, British Columbia, Canada) to perform statistical analyses. We used a *P* value of .05 as a standard cutoff for statistical significance.

Results

Of 69 patients who underwent a major gastrointestinal operation during the review period, 61 (88%) had complete data sets at the time of chart review. Six (10%) of these patients had died and were thus excluded from the study. Data for the remaining 55 patients were categorized and compared. Seventeen of these patients (31%) received postoperative OMT in addition to patient care dictated by attending physicians; the remaining 38 patients did not receive postoperative OMT (*Figure 1*).

The mean (standard deviation [SD]) age of the patients was 60.3 (17.7) years in the OMT group and 62.1 (15.8) years in the non-OMT group (*P*=.70), and the mean (SD) ASA class in these groups was 2.5 (0.6) and 2.7 (0.7), respectively (*P*=.31) (*Table 1*). The numbers of preoperative comorbid conditions, postoperative complications, and electrolyte abnormalities were similar in the 2 groups. Morphine sulfate was the only parenteral narcotic used in both cohorts (*Table 2*).

The operations performed included small- and large-bowel resection and gastric resection or repair, and the percentages of patients who underwent each type of operation were similar in the 2 groups (*Table 2*).

The times to bowel movement and clear liquid diet did not differ significantly between the 2 groups. The mean (SD) time to flatus was 3.1 (0.6) days in the OMT group and 4.7 (0.4) days in the non-OMT group (*P*=.035). The postoperative hospital LOS was also significantly different between groups, with a mean (SD) LOS of 6.1 (1.7) days in the OMT group and 11.5 (1.0) days in the non-OMT group (*P*=.006) (*Table 1* and *Figure 2*).

Each patient who received OMT underwent a single treatment session performed by a surgical resident within 48 hours of the major gastrointestinal operation. The durations of treatment ranged from 15 to 35 minutes, and the types of treatment ranged in amount of force from cranial manipulation to direct myofascial release. Frequently treated areas included the costophrenic and costovertebral areas and the cervical spine.

Comment

Multiple review articles have suggested that a multimodal approach should be used to prevent and manage POI.[2,14] We compared 2 similar groups of general surgical

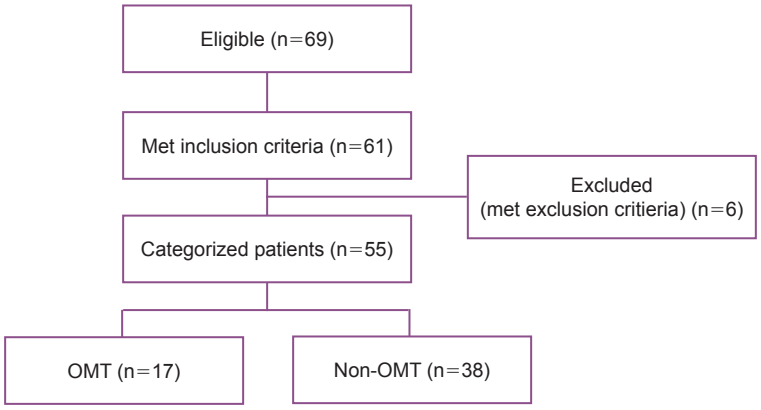

Figure 1.
Flow diagram of patients who received or did not receive osteopathic manipulative treatment (OMT) after gastrointestinal operation. Eligible patients were defined as those who underwent small- or large-bowel resection or gastric resection or repair. Patients who died were excluded from the study.

Table 1.
Characteristics and Outcomes in General Surgical Patients Who Did or Did Not Receive Postoperative OMT (n=55)

Characteristic or Outcome	Mean (SD)		*P* Value
	OMT Group (n=38)	Non-OMT Group (n=17)	
Age, y	60.3 (17.7)	62.1 (15.8)	.70
ASA Physical Status Class[a]	2.5 (0.6)	2.7 (0.7)	.31
Time to Flatus, d	3.1 (0.6)	4.7 (0.4)	.035
Time to Clear Liquid Diet, d	4.6 (3.8)	5.6 (7.0)	.59
Time to Bowel Movement, d	4.8 (2.3)	5.8 (4.9)	.43
Postoperative Hospital LOS, d	6.1 (1.7)	11.5 (1.0)	.006

[a] Physical status was classified on a scale of 1 to 6, with 1 being healthy and 6 being brain dead.

Abbreviations: ASA, American Society of Anesthesiologists; LOS, length of stay; OMT, osteopathic manipulative treatment; SD, standard deviation.

patients and demonstrated that the use of OMT within 48 hours after a major gastrointestinal operation is associated with less postoperative time to flatus and a shorter postoperative hospital LOS.

The mechanism of action of OMT in this patient population is unclear. Osteopathic manipulative treatment has a known modulatory effect on the autonomic nervous system,[9] and recent studies have shown that OMT may have distinct biochemical and anesthetic effects. Salamon et al[15] suggested that OMT may function by increasing nitric oxide levels in the blood. Nitric oxide production has the potential to attenuate cellular damage from intestinal ischemia and may improve healing.[16] McPartland et al[17] suggested that OMT may elicit cannabimimetic effects, which in the gastrointestinal system include modulation of intestinal motility.[18] Postoperative pain levels and the amount of narcotics used have also been shown to decrease after OMT.[19] Decreased pain and opioid use may lead to earlier ambulation and improved intestinal motility. Taken together, the biochemical and neurologic effects of OMT may affect the gastrointestinal tract during the postoperative period and allow more rapid return of bowel function.

The present study demonstrated that patients receiving OMT had a shorter postoperative hospital LOS, an important component of hospital costs. Although it is complicated to quantify the absolute cost of prolonged LOS, a mean decrease of 5.4 inpatient days represents a substantial improvement in cost-effectiveness. Further studies directly analyzing the cost-effectiveness of OMT are warranted.

In accordance with the osteopathic medical curriculum for the surgical residency, our institution permits the use of OMT for any patient but has no specific OMT protocols. Similarly, all general surgery attending physicians (allopathic and osteopathic) encourage osteopathic residents to use OMT but do not require its use. Our review demonstrates that some general surgery residents perform postoperative OMT and that the use of a single OMT session is associated with improved outcomes.

Similar to findings in what is, to our knowledge, the only other recent study of OMT and POI,[12] our study demonstrated an association between the use of OMT and a decrease in postoperative hospital LOS. In their study, Crow and Gorodinsky[12] analyzed findings in patients who had undergone any abdominal surgery, demonstrated a mean age difference between the cohorts (ie, OMT and non-OMT), and did not measure time to return of bowel function. Our study analyzed a more homogeneous population of patients who underwent only major

Table 2.
Characteristics of General Surgical Patients Who Did or Did Not Receive Postoperative OMT (n=55)

Characteristic, No. (%)[a]	OMT Group (n=17)	Non-OMT Group (n=38)
Preoperative Comorbid Conditions		
Range	0-9	0-6
Mean (SD)	2.8 (2.5)[a]	2.6 (1.8)[b]
Median	2	2
Area of Operation		
Colon	10 (59)	27 (71)
Small intestine	3 (18)	6 (16)
Stomach	2 (12)	3 (8)
Multiple	2 (12)	2 (5)
Electrolyte Abnormalities		
Hypocalcemia	12 (71)	26 (68)
Hypophosphatemia	11 (65)	20 (53)
Hypokalemia	4 (24)	12 (32)
Hypomagnesemia	2 (12)	4 (11)
Combined	12 (71)	25 (66)
None	2 (12)	5 (13)
Postoperative Parenteral Narcotic	Morphine sulfate	Morphine sulfate
Major Postoperative Complications[c]	2 (12)	4 (11)

[a] Data are presented as No. (%) except where otherwise stated.
[b] $P=.75$.
[c] Not including postoperative ileus.

Abbreviations: OMT, osteopathic manipulative treatment; SD, standard deviation.

gastrointestinal operations and in whom there was no statistically significant difference in mean age between treatment cohorts; it also demonstrated a statistically significant difference between cohorts in time to return of bowel function.

Our study has some important limitations. First, because of its retrospective design, we are unable to demonstrate whether OMT caused the differences observed between treatment cohorts. A prospective, randomized, blinded study, similar to that of Mills et al,[20] would be necessary to establish a cause-effect relationship. The addition of a "sham-OMT" group, such as a light-touch protocol group of a study, would also help distinguish placebo effect.

Second, our sample size was small because of patient death or lack of complete data sets, allowing analysis of findings in only 80% of all patients who underwent major gastrointestinal operations during the period studied. Larger studies demonstrating an earlier return of bowel function with OMT would help validate our results. Third, without standardized use of OMT, there is a potential for selection bias. However, patient age, ASA physical status class, comorbid conditions, and operation type were similar in the 2 cohorts, suggesting that the use of OMT was spread evenly across the study population.

Conclusion

Osteopathic manipulative treatment applied after major gastrointestinal operation is associated with decreased time to flatus and decreased postoperative hospital LOS. We recommend that general surgeons consider the use of postoperative OMT.

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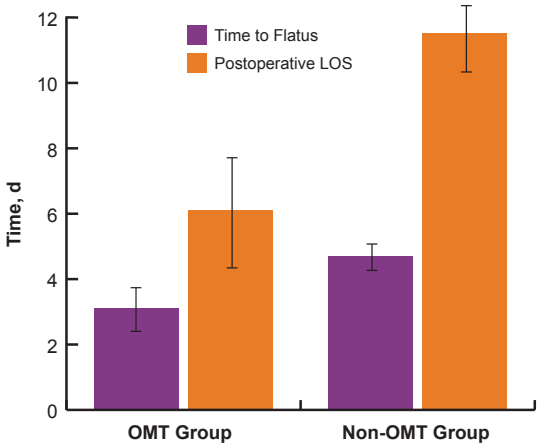

Figure 2.
Mean (standard deviation) postoperative days to flatus and postoperative hospital length of stay (LOS) for general surgical patients who did or did not receive postoperative osteopathic manipulative treatment (OMT).

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