

Treating Small Bowel Obstruction with a Manual Physical Therapy: A Controlled Prospective Efficacy Study

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Abstract

Background

Small bowel obstructions (SBO) caused by adhesions are a common post surgical complication with few treatment options available for patients to address the adhesions that cause recurrent SBOs. We have developed a manual therapy regimen that focuses on deformation of adhesions between and within the organs throughout the abdomen and pelvis. In this prospective, internally controlled study the impact on quality of life in patients with a history of SBO after treatment with a manual physical therapy regimen was assessed.

Methods

Twenty-seven subjects with a history of recurring adhesive small bowel obstructions completed a manual therapy regimen (median=53 years range=10.7-89.4 years) focused on abdominal adhesion deformation. Outcomes were measured via administration of validated questionnaires specific to subjects with SBO to allow for quantification of degree of impact on their quality of life for six domains. Questionnaires were completed before and 90 days after treatment (117.4 ± 25.9 days post treatment follow up). The degree of adhesion deformation was quantified by the improvement in range of motion and tissue mobility as compared to prior to treatment.

Results

A total of 26 subjects completed the study and demonstrated significant improvements in four domains in the SBO-Q. Improvements in the domains for pain ($p=0.0087$), overall quality of life ($p=0.0016$) and pain severity ($p=0.0006$) were significant when average scores before treatment were compared with scores after treatment. The gastrointestinal symptoms ($p=0.0258$) domain was marginally significant. There was no statistically significant improvement identified in the diet or medication domains in the SBO-Q for this population. Significant improvements in range of motion in the trunk ($p\leq 0.001$) were also observed for all measures.

Discussion

This manual physical therapy protocol is an effective treatment option for patients with adhesive small bowel obstructions. This study demonstrates significant improvement in reported symptoms and overall quality of life of subjects.

Introduction

Small bowel obstruction (SBO) is a common life-threatening complication of surgery or abdominal trauma, typically caused by adhesions that form as a normal part of the healing process. When healing from surgery, an inflammatory response is initiated to recruit the cells necessary to close the surgical incision and repair the tissues. As a side effect of this inflammatory response, adhesions form in tissues at and near the surgical repair due to the presence of collagen and scar tissue mediators. Adhesions have been suggested to begin forming within hours after abdominal surgery; complications related to surgery are common in both pediatric and adult populations.

Surgery is frequently cited as the primary cause of bowel obstruction. In 2010, 381,364 subjects in the United States underwent surgery for adhesiolysis at an average cost of \$65,955 each with 42,126 patients readmitted to the hospital within 30 days of surgery, an 11% rate for hospital readmission. Additionally, 100,335 subjects had surgical small bowel resections and 15,050 subjects were readmitted within 30 days of the bowel resection, a 15% readmission rate. Bowel resection surgery patients averaged 14.2 days in the hospital in 2010, at an average cost of \$114,175.¹ The literature reports that more than one third of the surgical small bowel resection patients will undergo additional surgery due to adhesions within 10 years.² Thus, adhesion related disease causes significant surgical efforts, hospital resources and comprise major expenditures each year. There is often considerable pain and negative impact on the patients' quality of life from these recurrent obstructions and hospital readmissions.

Manual physical therapy (mPT) is used to treat adults with a wide variety of adhesive conditions including burns, adhesive capsulitis, radiculopathy, pain, infertility and lessening of scars and has shown promise in preventing adhesion formation in animal models. The Clear Passage Approach (CPA), a mPT protocol, hypothesized to deform the adhesions that cause SBO episodes, has been demonstrated previously in case reports to negate the need for surgery in patients with recurrent SBOs and to deform adhesions (Fig 1 and 2). In this study, we report on the use of the CPA, a manual physical therapy protocol, to treat abdominal and pelvic adhesions causing SBOs and improve the quality of life (QOL) of study subjects.

Introduction

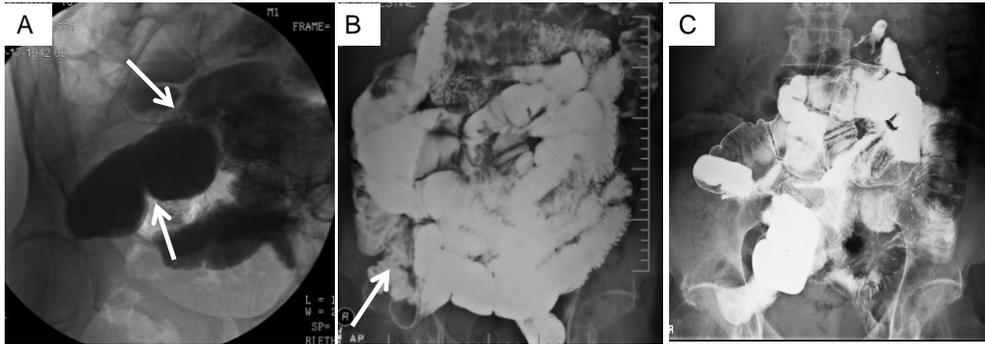


Figure 1. Small bowel radiographs. Arrows note areas of obstruction. (A) Before therapy incomplete SBO due to adhesions visualized by X-ray showing dilation of the proximal mid ileum. (B) Mid treatment: mild stricture at the terminal ileum with no other small bowel abnormalities. (C) Post treatment: normal small bowel series.³



Figure 2. Adhesion deformation via transverse ultrasound imaging of the scrotum. (A) Before therapy: thickened scrotal wall with complex echogenicity. (B) After treatment: improvement in the scrotal wall and echogenicity.⁴

Materials and Methods

Subjects with a history of adhesive bowel obstruction were included. Exclusion criteria included BMI ≥ 36 , active infection, abnormal ovarian cysts, surgery within the last 90 days, active cancer and bleeding disorder. This study was approved by MaGil IRB, Rockville, MD.

Study Design

Single center prospective study patient reported questionnaire based study, with all treatment at a private physical therapy clinic located in Gainesville, Florida. Post treatment change was evaluated for each patient and then compared to historical control normal population for improvements. The validated SBO Questionnaire (SBO-Q) was used in this study.⁵ Questionnaires were completed prior to treatment and 90 days post treatment.

Sample size calculation

A sample size of 25 gave a power of detecting a significant difference in at least one domain of 81%. A total of 27 subjects were included to allow for a 10% loss to follow up.

Treatment

The CPA, an intensive manual physical therapy protocol, uses techniques from a variety of manual modalities to treat the subject in an individualized, whole body approach. Treatment addresses mobility and motility of tissues and interstitial spaces in the abdomen and pelvis. Subjects received 4 hours of manual physical therapy each day, with the typical subject completing 20 hours of treatment over the course of 5 days.

Statistical tests

We used permutation tests throughout selecting the minimum P-value based on a paired t-statistic. Multiplicity adjusted P-values were used to determine specific areas within each domain that contributed to overall improvement with $p \leq 0.025$ being significant. The statistical package R was used for all statistical analyses.

Results

Table 1. Study participant characteristics.

Characteristic		No. of subjects
Age, years	Median	53
	Range	10.7-89.4
Sex	Male	10
	Female	17
Prior Surgery	0	3
	1-2	9
	3-5	7
	>6	7
Prior partial obstruction	0	4
	1-10	16
	11-20	2
	>20	4
Prior total obstruction	0	13
	1	5
	2	3
	3	3
	4	2

*1 female subject was lost to follow up.

Results

Table 2. Average scores and permutation p-values for each domain and question in the SBO-Q to assess changes in scores before and after CPA treatment.

Domain Survey Question	Pre-treatment score mean (s.d)	Post treatment score mean (s.d)	n	p-value
Diet				0.8191
I was on a totally liquid diet	3.46 (0.90)	3.81 (0.40)	26	1.0000
I was on a soft food diet	2.65 (1.32)	3.42 (1.17)	26	1.0000
I could easily ingest and digest solid food	2.48 (1.39)	2.38 (1.81)	25	0.9031
I could eat whatever I liked, without problems	0.92 (1.52)	1.85 (1.64)	26	1.0000
Pain				0.0087
I had pain	2.04 (1.73)	1.12 (1.37)	26	0.0216
I had pain at or above my belly button	1.50 (1.56)	0.69 (1.05)	26	0.0662
I had pain below my belly button	1.31 (1.52)	0.85 (1.22)	26	0.3930
I had pain with bowel movements	0.81 (1.06)	0.50 (1.14)	26	0.6378
I experienced head or neck pain	1.08 (1.16)	0.50 (1.10)	26	0.0100
I had migraine headache(s)	0.15 (0.46)	0.19 (0.57)	26	0.9814
I experienced tailbone (coccyx) pain	0.54 (1.07)	0.04 (0.20)	26	0.1605
Eating caused my abdomen to hurt	1.58 (1.50)	0.77 (1.14)	26	0.0413
Drinking liquids caused my abdomen to hurt	0.58 (1.14)	0.31 (0.97)	26	0.6040
I had back pain	1.69 (1.62)	1.15 (1.41)	26	0.1263
GI symptoms				0.0258
I had nausea after eating	0.80 (1.04)	0.31 (0.62)	25	0.0850
I vomited after eating	0.35 (0.85)	0.04 (0.20)	26	0.4006
I experienced digestive spasm	0.92 (1.35)	0.42 (0.90)	26	0.4650
I had constipation	1.38 (1.30)	0.85 (1.08)	26	0.4623
I had diarrhea	1.04 (1.18)	0.85 (0.97)	26	0.7867
I eliminated blood-stained, or jelly-like mucus	0.20 (0.58)	0.27 (0.67)	25	0.9814
I had gas/bloating/distension	2.04 (1.43)	1.28 (1.28)	25	0.0497
I had increased bowel sounds	1.69 (1.46)	1.00 (1.17)	26	0.1802
I was unable to have bowel movements when I wanted or needed to go	1.31 (1.41)	0.77 (1.27)	26	0.1321
My bowel movements looked abnormal	1.58 (1.68)	0.96 (1.22)	26	0.2276
Eating or drinking caused me to swell, bloat, or have gas	1.96 (1.48)	1.24 (1.36)	25	0.0388
Medication				0.8191
I took medications for my symptoms	1.81 (1.88)	1.77 (1.75)	26	0.9689
Quality of Life				0.0016
I was unable to work due to my condition	1.28 (1.37)	0.29 (0.62)	24	0.0018
I was unable to have a normal social life due to my condition	1.35 (1.57)	0.42 (0.99)	26	0.0095
My sex life suffered due to my condition	1.68 (1.76)	0.57 (1.16)	19	0.0662
I had decreased ability to participate in normal daily activities	1.65 (1.52)	0.54 (1.14)	26	0.0023
I would be reluctant to eat at a restaurant or a friend's house	1.62 (1.55)	0.85 (1.46)	26	0.1072
I felt that I could decrease my own symptoms using my hands	3.31 (1.05)	3.08 (1.24)	24	0.8785
I worried about having another bowel obstruction	2.23 (1.63)	1.12 (1.28)	26	0.0064
Pain Severity				0.0006
The duration of the worst pain	4.20 (1.44)	2.50 (2.14)	25	0.0006
Maximum pain in bowels over the last 4 weeks	6.10 (3.37)	4.15 (2.96)	25	0.2276
Minimum pain in bowels over the last 4 weeks	2.12 (2.24)	1.42 (1.36)	25	0.6378
Average pain in bowels over the last 4 weeks	3.96 (2.76)	2.08 (1.90)	25	0.0599

Results

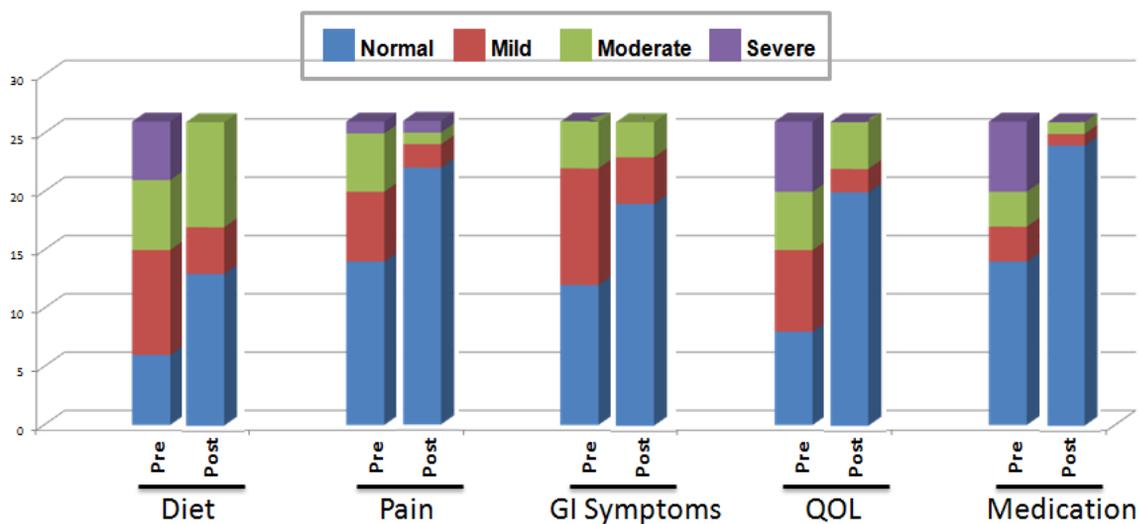


Figure 3. Distribution of subjects classified by cumulative scores for each domain per the standard scoring of the SBO-Q. There was a clear shift in the number of subjects to the classification of normal after treatment. n=26

Results

Based upon observations in the SBO patient population by this group, subjects with a history of SBO typically have decreases in range of motion (ROM) associated with mechanical factors such as abdominal and/or pelvic adhesions; therefore, these measurements are integrated in the assessment of subject outcome post CPA treatment.

All subjects with decreased ROM demonstrated improvement for at least one of the measurements presented in Table 4. Furthermore, 28.6% of total measurements exhibiting a decreased ROM returned to normal. Although not all subjects had a normal ROM after treatment, all subjects demonstrated overall improvements.

The improvement in extension suggests that the adhesions present in the abdomen and pelvis that prevented the subject from bending backwards improved for trunk extension following treatment. The improvements in side bending and rotation also suggest that the decreased adhesions present in the abdomen and pelvis had a decreased effect on trunk ROM. These findings indicate that decreased trunk rotation may be used as a non-invasive indicator of abdominal adhesions, and that improvements in trunk ROM measurements may be an appropriate predictor for degree of adhesion deformation post CPA treatment. (Table 4)

Table 4. Analysis for range of motion measurements before and after CPA treatment. n=25

	Measure (normal°)	Pre-treatment mean (s.d.)	Post-treatment mean (s.d.)	p value*
	Flexion (80°)	69.20 (10.07)	73.80 (6.17)	0.000003
	Extension (25°)	14.68 (7.72)	20.60 (5.27)	0.000008
	Left side bending (45°)	35.20 (8.95)	40.40 (7.63)	0.000005
	Right side bending (45°)	35.20 (9.63)	40.60 (6.82)	0.000003
	Left rotation (45°)	32.80 (10.81)	39.40 (7.54)	0.000008
	Right rotation (45°)	34.40 (10.54)	39.00 (7.50)	0.000003

Discussion

It is widely accepted that the adhesions that cause SBO and symptomology in subjects are typically caused from prior abdominal or pelvic surgery. The current study is the first prospective study to assess the changes in quality of life for subjects with a history of SBO treated with the CPA using the validated SBO-Q. It introduces the option of using a nonsurgical approach to treat the adhesions that cause SBO in stable, non-emergency situations. This manual physical therapy regimen presents few risks as compared to surgical approaches. Research thus far supports the observation that unlike surgical approaches, adhesions are not re-formed after treatment with the CPA.⁶ The results from this study suggest that the CPA can be used to treat adhesions and scar adherence safely in the recurrent SBO subject population, demonstrating significant improvements in overall pain, quality of life and severity of pain and nearly significant improvements in gastrointestinal symptoms. Further, patients who were previously concerned about having another SBO episode reported a significant decrease in that concern three months after treatment. Although improvements in diet and requirements for medication were not significant, trends demonstrated improvement for all subjects with follow up in this study.

Based upon changes in range of motion, it is inferred that tissue and organ mobility was improved as the subjects demonstrated an increased range of motion in active movement tests. Improvements in range of motion allowed subjects to perform daily tasks more easily and contributed positively to their overall QOL.

Conclusions

- ❑ The CPA treatment is a beneficial treatment option for patients with a history of adhesive SBO;
- ❑ CPA treatment improved both patient reported overall quality of life and functional range of motion;
- ❑ This manual physical therapy regimen is an alternative to surgery in patients at risk of or with history of, adhesive small bowel obstruction;
- ❑ This treatment is safe. There were no adverse events reported over the course of this study;
- ❑ Range of motion is a noninvasive tool for assessing functional impact of adhesions.

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