

Exploring the Clinical Response of Childhood Functional Gastro-Intestinal Disorder Symptoms to Deep Tissue Massage of Psoas Muscles: Results of Two-Year Clinical Audit with Telephone Follow-Up

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Background & Purpose: There is a high incidence of chronic recurrent functional abdominal pain in children causing significant disruption to schooling, quality of life, and costs to the health care system. Treatment routinely includes behavioral, pharmacological, and invasive surgical interventions, with varying levels of impact. This study aims to examine the response of symptoms of functional gastro-intestinal disorders (FGID) in children to treatment of psoas muscle tension and tenderness using remedial massage therapy.

Setting & Participants: Pediatric surgeon's rooms, remedial massage therapist rooms, consenting children aged 2–18.

Research Design: Two years of clinical observations were analyzed including patient-reported symptoms, surgeon and remedial massage therapist observations, with 122 children suffering from moderate to severe FGID symptoms. Over the two year observation period, 96 children with FGID symptoms completed a course of remedial massage therapy to their psoas muscles.

Results: Improvement in psoas tension and tenderness on palpation was observed for all participants after an average of 5 treatments (range 2–12). Complete resolution of all symptoms of abdominal pain, reflux, vomiting, nausea, and bowel upset was seen in 88/96 (92%) participants at the time of treatment completion without side effects. Over the observation period, 72 children were followed up after completing remedial massage therapy; 75% reported they remained symptom free, 18% continued to have marked improvement and 7% mild improvement.

Conclusion: Despite study design limitations, more research is warranted on the potential for this low-cost, noninvasive therapeutic intervention to assist

symptom management for children with FGID.

KEY WORDS: Children; abdominal pain; FGID; remedial massage therapy; psoas

INTRODUCTION

Up to an estimated 30% of children and adolescents,^(1,2) male and female, will experience chronic recurrent functional abdominal pain (functional gastro-intestinal disorders, or FGIDs, Rome IV)⁽³⁾ during their childhood, often lasting for months to years, potentially into adulthood. The costs from missed schooldays and use of health care resources are high, yet the cause and pathogenesis of the condition is not well understood.

Contributory factors to chronic abdominal pain are believed to include visceral sensation, hormonal changes, inflammation, disturbances in gastrointestinal motility, psychological factors, and family dynamics,⁽⁴⁾ although no studies have demonstrated that stressful life events significantly differentiate children with functional abdominal pain from other patient groups.^(5,6) Treatment strategies include dietary or pharmacological interventions, including analgesics, antispasmodics, sedatives, and probiotics. However, such interventions have been shown to have variable and limited effect.⁽⁷⁾ Best practice guidelines suggest, in the absence of alarm symptoms, that treatment focus more on reassurance of the child and parent, or use of other cognitive behavioural therapy techniques, with avoidance of diagnostic interventions or procedures. The North American Society for Pediatric Gastroenterology, Hepatology and Nutrition (NASPGHAN) Committee on Chronic

Abdominal Pain suggests that the main aim of treatment is the return to normal function rather than the complete disappearance of pain.⁽⁶⁾

This study came about as one author (GH, a remedial massage therapist) had results in relieving gastrointestinal symptoms in adults when tightness in their psoas muscles resolved. This prompted us to postulate that tight psoas muscles may be implicated in FGIDs in children. Since then, we have found in clinical practice that many children who present with varied FGID symptoms also present with tenderness of psoas muscles on trans-abdominal palpation, and when the muscle is relaxed following massage their varied symptoms resolve.

Previous studies have shown increased muscular tension, including anterior abdominal wall muscles, in these children compared to controls.^(8,9) We postulate that a tight and irritated psoas may cause inflammation of the psoas sheath and irritation of adjacent neural and gut structures. Sympathetic irritation (“fight or flight”) may lead to gastrointestinal symptoms and anxiety, as well as muscle tightness.⁽⁸⁾ This observed association between tight psoas muscles and symptoms of functional abdominal pain in children has not been systematically examined in the evidence base. This paper, therefore, describes routinely collected data from a cohort of 122 children between 2014 and 2016 who received remedial massage to their psoas muscles after presenting to a pediatric surgeon’s rooms for assessment and treatment of their FGID symptoms. Specifically, the objective of this study is to describe how the symptoms of functional abdominal pain in children behave in response to remedial massage therapy for tight and/or tender psoas muscles using routinely collected clinical observation data.

METHODS

Design

This paper presents a descriptive analysis of routinely collected observational and patient reported data obtained from a cohort of children over a two-year period. Routine clinical observational data were collected before, during, and after a remedial massage therapy intervention to tight and/or tender psoas muscles that was tailored to

each child’s presenting needs. The study design developed over the course of data collection. It became apparent that follow-up data needed to be collected; as such, follow-up phone calls were introduced shortly after data collection started.

Setting

Routinely collected clinical data from children presenting to a single pediatric surgeon and remedial massage therapist between 2014 and 2016 are included in the study. The pediatric surgeon and remedial massage therapist are situated in a regional centre in New South Wales, Australia.

Participants

Data from all children aged 2-18 years who presented to a single pediatric surgeon’s rooms for assessment and treatment of their FGID symptoms over a two-year time frame; who were deemed suitable for referral to a remedial massage therapist by the examining pediatric surgeon; and who subsequently “opted” to seek treatment from the remedial therapist were included in this study. Suitability for referral to the massage therapist was based on the following criteria: exclusion of organic etiologies; resistance to other treatment regimes; presence of superficial hyperesthesia of the anterior abdominal wall; and/or deep tenderness on palpation of their psoas muscles through the abdominal wall.

Recruitment

After children were assessed as suitable for referral to the massage therapist by the surgeon, they were provided with information about the massage therapy treatment, a symptom questionnaire, and a referral to the therapist. Parents and children chose whether or not they would attend the remedial massage therapist’s rooms for treatment and whether or not they would complete the symptom questionnaire (Figure 1). The children and parents consented to their data being collected and de-identified to gain information about outcomes of this treatment for research and publication purposes. They gave consent for the original questionnaire and a follow-up questionnaire. All were asked if they wished to receive a summary at the end of the data collection. They were

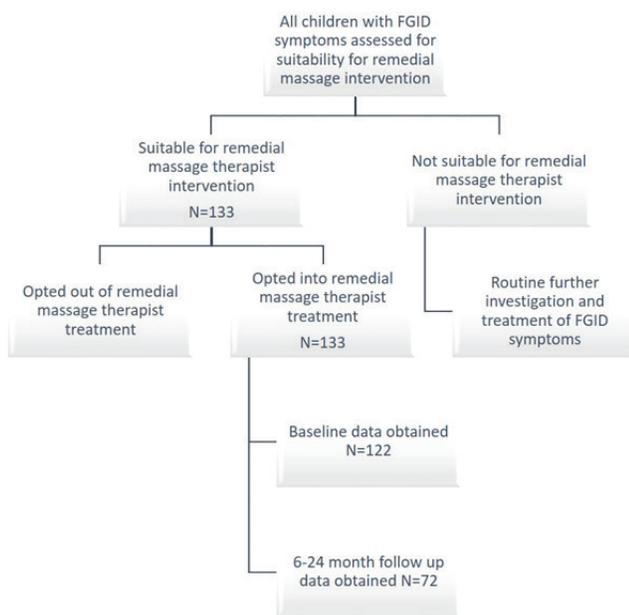


FIGURE 1. Recruitment & sample.

also notified that refusal to grant consent would have no effect upon their treatment. Ethics approval for the study was received from the local Human Research Ethics Committee [LNR/16/AWHEC/10].

Data Collection

Data were obtained from parent and participant questionnaires that were completed following the surgeon’s consultation, follow-up phone calls with parents and participants six months to two years post-remedial massage treatment, and from the surgeon and therapist’s treatment notes. History of the participant’s FGID signs, symptoms, previous treatments, and aggravating factors was collected using a questionnaire based on the ROME IV criteria for FGID.⁽³⁾ The questionnaire was provided to participants and their parents/carers after consultation with the pediatric surgeon and/or after they attended the first remedial massage session. Participants delivered or posted their completed proforma back to the pediatric surgeon’s rooms. A follow-up phone call, conducted by the therapist or surgeon, was undertaken with 72 participants six to twelve months following their last treatment with the manual therapist (Table 1).

Assessment/Outcome Measures

For all children who accepted the referral to the massage therapist, psoas tension

TABLE 1. Variables Collected

<i>Data Collection Tool</i>	<i>Variables Collected</i>	<i>Data Capture</i>
Patient Questionnaire	Age, sex, date seen by surgeon, pre-existing conditions, normal activities, hours per week spent on computer / tv / screen time, hours per week with abdominal pain, duration of symptoms, description of symptoms, site of symptoms, normal duration of pain, frequency of episodes, precipitating factors, relieving factors, presence of nausea, frequency of nausea, presence of vomiting, reflux symptoms, presence of regurgitation, flatulence and constipation, frequency of bowel movements, urinary symptoms, presence of back pain, presence of anxiety, presence of sleep disturbance, time off school, reduction in activity, investigations, prior treatment (including operations), hospital admissions, current medications.	Post consultation with surgeon or post first remedial massage therapist treatment
Surgeon History Taking and Medical Notes	Bloods taken, US, abdominal X-ray, stool sample, back X-ray, CT abdomen, CT back, MRI back, gastroscopy, helicobacter screen, colonoscopy, other, history of other treatments.	During surgical consultation
Therapist History Taking and Treatment Notes	Location of pain (LUP, LMP, LLP, RUP, RMP, RLP). Total number of treatments, treatment completed, symptom outcome, symptom description, stretches prescribed, side effects from massage treatment. Symptom outcome (no change, mild improvement, moderate improvement, near complete resolution, fully resolved); description of symptom outcome/change.	Initial & final consultation 6-12 months following last consultation with therapist

LUP = left upper psoas; M = middle; L = lower; RUP = right upper psoas; RMP = right middle; RLP = right lower.

and tone was manually assessed by the remedial therapist at the initial, subsequent, and discharge consultations using the palpation technique as described in Appendix A. The ability to judge tone and tenderness was gathered from twenty years of clinical experience. The therapist recorded location and presence of abnormal tension or tone.

Intervention

Digital sustained pressure⁽¹⁰⁾ to the tender points of the psoas trans-abdominally was utilized by the therapist for sessions of up to 45 min depending on severity or symptoms and tolerance to the treatment. Treatment was performed, with the patient supine, over the taut psoas fibres with the pads of three fingers applying the amount of pressure to the tissue that was “comfortably uncomfortable” to the patient. This pressure was sustained until the tissue tension started to lessen at which point the tenderness also reduced, allowing the fingers to gradually sink deeper into the tissue as it relaxed. The initial treatment was always performed in the midsection of the psoas lateral to the umbilicus. Once the midsection had largely resolved, then the upper area was treated in the same way. Where necessary the lower psoas was then treated. Treatment was repeated weekly until the patient reported having no symptoms for the week, the patient felt no discomfort with practitioner’s palpation, and the psoas tension was considered normal resting tension by the practitioner. Psoas stretches, akin to the Modified Thomas test, were applied immediately after massage when the muscle tightness had reduced and tenderness had settled. Participants were asked to continue psoas lunge stretches daily in between treatment sessions to maintain the psoas resting length.

This treatment was administered weekly, then biweekly when the patient had been symptom-free for a week. After one month, having been symptom-free and when the therapist had judged that the psoas muscle tone had returned to normal, the patients were discharged. Resting tone of the psoas muscle was considered normal when the therapist could feel the vertebral bodies and transverse processes through the psoas.

Outcome Measures & Follow-Up

The measures of interest were: presence and severity of FGID symptoms compared to before treatment; presence of abnormal tone and/or tenderness in the psoas muscle(s); association of symptom reduction with normalization of psoas tone and resolution of tenderness. Follow-up phone calls asked the following questions: Has your child been better after the treatment to their psoas? Have they needed any more treatment? What percentage improvement would they estimate in regard to pain frequency, severity, and overall well-being? Did they have any side effects from the treatment? Are they now taking any medications for their pain/nausea? Are they still doing psoas stretches? Did they have any comments in regard to the treatment overall? Had their diet improved or changed after the treatment? This final question was added towards the end of the study as parents had frequently commented that they felt their children’s diet had dramatically changed.

Bias

As this is an observational study without randomization or a control group, the authors acknowledge results will be influenced by observer and selection bias.

Study Size

As this study is observational by design, a sample size was not pre-calculated.

Data Analysis

Data were extracted from various data sources (Table 1) and analyzed descriptively using Statistical Package for the Social Sciences (SPSS) Version 24 according to the variables (mean, median, mode, range, etc.).

RESULTS

After being assessed as suitable for massage intervention by the surgeon, a total of 133 children attended the remedial massage therapist for treatment between 2014 and 2016. Eleven children were lost to follow-up. These 11 children were seen only once for treatment and did not return and were unable to be contacted for follow-up

or feedback. Their data have not been included in the findings reported here. The following results are from the remaining 122 children, with 96 completing the course of remedial massage therapy, 16 elected to stop treatment, and 10 were still undergoing treatment at the time of data analysis. A total of 72 children were able to be followed up six to twelve months following treatment (Figure 1).

The children were aged from 2–18 years, with a median age of 11 years. There were 70 females and 52 males. Table 2 outlines key presenting characteristics of participants. Abdominal pain was the presenting feature in almost all children. Most children had experienced pain for a significant length of time. The children were often described by referring doctors their parents as being anxious or highly strung, and reported they slept poorly with symptoms frequently worse at night. Over three-quarters of the children were missing school and had reduced activity secondary to their symptoms (Table 3).

Investigations had been undertaken in all children (Table 3). A few abnormalities had previously been found, but treatment of these had not reportedly made any significant difference to their symptoms. Most children had multiple attendances with their family physician, and many had seen pediatricians and general surgeons and other allied health practitioners (Table 3) prior to seeing the pediatric surgeon. Forty-eight children had been admitted to hospital on at least one occasion (range 1–8 admissions) due to their symptomatology, and 32 had undergone a surgical procedure (including gastroscopy, colonoscopy, and appendectomy). Medication had been tried unsuccessfully in the majority of children (proton pump inhibitors (n = 36) and regular analgesics (n = 64)). Abdominal pain was frequently reported to be aggravated by eating and exercise. Relieving factors were uncommon but included rest, defecation, or heat packs. Analgesics were frequently used but gave little relief. Physical examination of these children often showed a degree of superficial hyperesthesia of the anterior abdominal wall. All had deep tenderness on palpation of their psoas muscles through the abdominal wall.

Therapist Findings

One hundred and twenty-two (122) children were examined by the therapist and

confirmed to have tender psoas muscles with increased muscle tone. The middle and upper sections of the left psoas were most frequently tight (Figure 2).

Treatment Intensity and Completion Rates

This treatment was administered weekly, then biweekly when the patient had been symptom-free for a week. After one month, having been symptom-free, and when the therapist had judged that the psoas muscle tone had returned to normal, the patients were discharged. Resting tone of the psoas muscle was considered normal when the therapist could feel the vertebral bodies and transverse processes through the psoas (Table 4). 78.7% of children completed the recommended course of remedial massage therapy.

Treatment Outcomes

All 122 children had improvement in their psoas tension and tenderness on palpation. Ninety-six had reached normal tone and had no residual tenderness and, therefore, had completed their therapy. This was achieved after an average of 5 treatments (range 2–12). One child had no reported clinical improvement after 6 treatments and ceased therapy.

Complete resolution of all symptoms of abdominal pain, reflux, vomiting, nausea, and bowel upset was seen in 88/96 (92%) patients at the time of completing their treatment. Those who were contacted who reported back pain had also settled. No children reported any side effects due

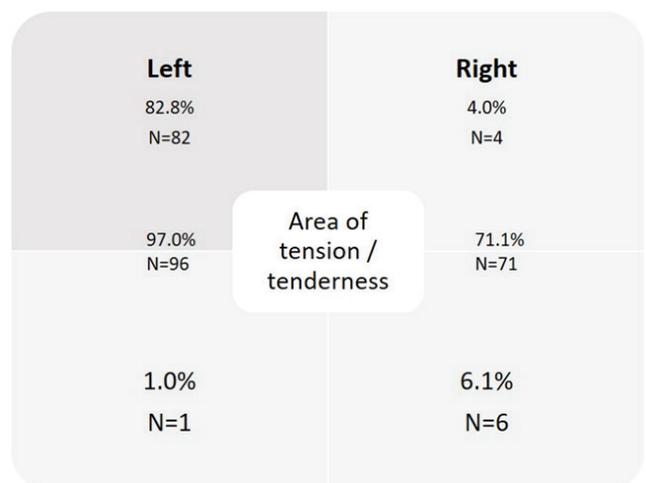


FIGURE 2. Areas of tension and tenderness.

to the massage treatment. 95% of children had returned to normal activities and were no longer missing days of school. One had residual reflux and one had fecal urgency. Of the 10 children still undergoing therapy, all had symptomatic improvement, with four having marked improvement and, in another four, symptoms had almost completely resolved. While several children (n=16) failed to complete the recommended full course of treatment until normal psoas tone was reached, seven of these children had mild improvement when last seen by the therapist, and nine had marked symptomatic improvement (Table 5).

Telephone Follow-Up

Longer term follow-up is available in 72 patients who completed treatment between six months to two years ago (the remainder had not yet reached this milestone). Of these, 75% report they have remained 100% symptom free; 18% report continued marked improvement; and 7% report mild improvement. 55% were still doing regular psoas stretches. Some children and their parents reported that a recurrence of nausea or pain could be ameliorated quickly with psoas stretches. A few children (n = 5) presented with recurrence of symptoms months later, with increased psoas tightness noted by the therapist, but all settled with a further 1 or 2 treatments with the therapist. Children reported they had significantly reduced, if not ceased, their medication requirements and had maintained normal activity and school attendance. Parents often told us that their children were now able to eat foods (i.e., dairy or gluten-containing) that before treatment they had been “unable to tolerate”.

DISCUSSION

This paper describes information pertaining to a cohort of 122 children with significant FGID symptoms who, after receiving treatment from a remedial massage therapist for treatment of abnormal tension and tenderness in their psoas muscles, reported improvements and, in the majority of cases, resolution of their FGID symptoms. This study has not set out to prove cause and effect and is not a RCT. It does, however, observe a possible low-cost noninvasive alternative treatment for these

children with a complex and profoundly disabling condition affecting a significant proportion of the population.

This paper describes an analysis of routinely collected observational data. As such, there are a number of methodological limitations that prevent us from drawing generalizable conclusions. These include:

1. Information Bias. The study was not blinded, one therapist performed both the intervention and outcome assessment; the assessment of psoas severity is via palpation and performed by the therapist who is also the observer/assessor; a standardized outcome measurement tool was not used (e.g., pain rating scale); the follow-up phone call was undertaken by the therapist allowing for observer bias and recall bias from participants; there was no control group, therefore a placebo effect cannot be ruled out; psoas stretches may act as a confounding variable.
2. Selection Bias. All participants were recruited from a single surgeon's rooms; as participants were recruited from a pediatric surgeon's rooms, it is likely the sample represents children with more extreme FGID symptoms.

Despite these limitations, patients reported improvement in their condition. Children and their parents reported that they had not re-presented with symptoms to their local doctors or missed time from school during the follow-up period, indicative of real improvement from the patient perspective.

Evolutionary changes, due to human's upright posture, have led to the psoas being pulled in an unusual way.⁽¹¹⁾ It is a strong hip flexor and a lumbar flexor. It originates from T12–L5 vertebral bodies and transverse processes, and runs forward over the pubis before turning backwards to attach into the lesser trochanter of the femur. The psoas runs down the para-vertebral gutter under the dense psoas fascia with the sympathetic chain running on its surface. The lumbar neural plexus lies within its substance, as do two accessory lumbar sympathetic ganglia from L1 and L2. The medial arcuate ligament runs across its upper part with the sympathetic trunk running under it. The splanchnic nerves run through the diaphragmatic crura on each side. The left crus of the diaphragm, forming part of the oesophageal hiatus,

originates over the surface of the upper left psoas, as does the sling from the right crus. The origin of the mesentery and the descending and sigmoid mesocolon lie over the left psoas.

This study allows us to reconsider what the etiology may be. Could a tight irritated psoas cause inflammation of the sheath and irritation of adjacent neural and gut structures? Sympathetic irritation (“fight or flight”) may lead to gastro-intestinal symptoms and anxiety, as well as muscle tightness.⁽⁸⁾ Nerve entrapment is also a possible etiology.

Apley et al. in 1958, studying 1000 children with chronic abdominal pain, saw the same range of symptoms as our group of patients,⁽¹²⁾ with only 8% thought to have an organic cause. More recently, El-Matary et al. reported that 30% have a diagnosable organic etiology.⁽¹³⁾ However, there is little evidence that the claimed etiology is directly causal, and treatment of these detected conditions often gives little symptom benefit.^(14,15)

Could symptom improvement be a placebo effect? The sample of children in this research was from one pediatric surgeon’s rooms. These children had been exposed to significant testing and consultations with a range of medical practitioners, reinforcing the notion of a diagnosable organic etiology as an explanation of their pain. They had, however, no previous success from treatments offered and were dubious that this therapy would work. Advocates of alternative medicine acknowledge that the placebo effect may play a role in the benefits that some receive from alternative therapies,⁽¹⁶⁾ but they also point out that this does not diminish their validity. Researchers who judge treatments using the scientific method are concerned by this viewpoint, since it fails to address the possible inefficacy of alternative treatments. Lorimer Moseley, an international leader in pain science, purports the idea that the placebo or nocebo are potentially simply umbrella terms for all the effects we haven’t identified yet.⁽¹⁷⁾

Treatment to the psoas muscle can avoid potential medication side effects that may be associated with pharmacologic management of abdominal pain, has minimal costs, and results can be obtained quickly. Patients with typical symptoms and tender psoas muscles could be treated first and investigated later if they have not resolved.

The AAP Subcommittee and NASPGHAN Committee on Chronic Abdominal Pain suggest that the main aim of treatment is the return to normal function rather than the complete disappearance of pain.^(6,15,16,18) Eradicating a child’s pain and associated symptoms must be our goal.

CONCLUSION

We have demonstrated in a large cohort of children that tight psoas muscles exist in children with FGID and resolution of symptoms may be readily achieved through remedial massage therapy. Are tight psoas muscles a long-missing piece of the puzzle? Further investigation is warranted to explore this possibility.

CONFLICT OF INTEREST NOTIFICATION

The authors declare there are no conflicts of interest.

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APPENDICES

Appendix A. Psoas palpation and assessment technique

Psoas palpation is performed with the participant lying supine in a neutral, anatomical position. The initial assessment is performed just lateral to the rectus abdominus muscle in the mid-region lateral to the umbilicus. The direction of palpation is slightly diagonal so as to be deep to the rectus abdominus muscle. Light, gentle pressure is initially applied to test the sensitivity of the abdominal wall and to get an initial feel of the resistance of the underlying tissues. As tolerated by the participant, the examiner then applies a gradually increasing pressure whilst gently moving medially and laterally to feel for the middle psoas fibres (MP). Both left (L) and right (R) sides are palpated for presence of abnormal tension and tenderness. This method was then repeated in the epigastric region to feel the superior psoas (UP) fibres and inferiorly (LP) to the level of a line that bisects the anterior superior iliac spines. The tone of the psoas muscle was then gauged by the examiner as a benchmark for treatment, as well as signs of pain or discomfort such as wincing, withdrawing, facial clues, or pain-related noises.
