

## The effectiveness of connective tissue massage in the treatment of primary dysmenorrhea among young women

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## Efetividade da massagem do tecido conjuntivo no tratamento da dismenorréia primária em mulheres jovens

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### Abstract

*Objective: to evaluate the possible effectiveness of connective tissue massage for the non-medical treatment of primary dysmenorrhea.*

*Methods: this was a pilot observational cohort study. SETTING: University clinics. PARTICIPANTS: Seventy two young women presenting primary dysmenorrhea. INTERVENTION: Physiotherapy students in their last year at university and physiotherapists were trained for 20 hours to apply the massage. All volunteers were submitted to lumbar connective tissue massage twice weekly, while they were not menstruating, during the three menstrual cycles that followed admission. The following regions were manipulated: sacral, lumbar, last thoracic vertebrae and subcostal. INDICATORS: Pain score, use of pain medication and other menstrual systemic symptoms over time (before treatment, after each of the three menstrual periods during treatment, and in the second and in the third month following treatment).*

*Results: after the first treatment month, the pain score decreased significantly ( $p < 0.001$ ). The percentage of women requiring pain medication and reporting systemic symptoms decreased over time, although there was no correlation between the number of massages and the pain score in the multiple regression analysis.*

*Conclusions: connective tissue massage may cause a reduction in menstrual pain but the study design does leaves open the possibility of a placebo effect. The results justify performing a randomized clinical trial to confirm whether such an effect exists or not.*

**Key words** *Dysmenorrhea, Connective tissue, Women*

### Resumo

*Objetivo: avaliar a possível efetividade da massagem do tecido conjuntivo para o tratamento não medicamentoso da dismenorréia primária.*

*Métodos: estudo piloto, do tipo observacional de coorte com setenta e duas mulheres jovens com dismenorréia primária em Clínica Universitária. Estudantes de fisioterapia e fisioterapeutas receberam treinamento de 20 horas para aplicar a massagem. Todas as voluntárias receberam massagem do tecido conjuntivo lombar duas vezes por semana, no período intermenstrual durante os três ciclos menstruais após a admissão. As regiões manipuladas foram: sacral, lombar, última vértebra torácica e sub-costal. Desfechos avaliados: Escore de dor, uso de medicamentos e ocorrência de outros sintomas sistêmicos ao longo do tempo (antes do tratamento, após cada ciclo menstrual durante o tratamento e nos dois meses após o tratamento).*

*Resultados: o escore de dor diminuiu significativamente após o primeiro mês de tratamento ( $p < 0,001$ ). A porcentagem de voluntárias que precisou de medicamentos para dor e que relatou sintomas sistêmicos diminuiu com o tempo de tratamento, mas não houve correlação entre o número de massagens e o escore de dor na análise multivariada.*

*Conclusão: a massagem do tecido conjuntivo pode causar uma redução da dor menstrual, mas o tipo de estudo não permite excluir um efeito placebo. Os resultados justificam a realização de estudo clínico randomizado para confirmar ou não esse efeito.*

**Palavras-chave** *Dismenorréia, Tecido conjuntivo, Mulheres*

## Introduction

Dysmenorrhea is defined as the cramps or hypogastric pain, whether associated with systemic symptoms or not, that precede or accompany menstruation in some women.<sup>1</sup> It is more frequently observed in adolescents and young women, among whom the incidence varies widely from 30 to 90% according to different authors.<sup>2-4</sup> Dysmenorrhea is classified as secondary when it is a symptom of a well-defined gynecological, pelvic or orthopedic traumatic condition, and as primary when there is no other associated disease to explain the complaint.<sup>1</sup>

The main factor associated with primary dysmenorrhea is an increase in the production and release of prostaglandins (mainly PGF<sub>2</sub>) in the endometrium during menstruation, causing an increase in the amplitude and frequency of uterine contractions that cause pain.<sup>5</sup> In clinical gynecological practice, the intensity of pain is classified as light, moderate, severe or very severe according to the information provided by the women or evaluated according to a Visual Analogue Pain Scale (VAPS).<sup>6</sup>

The therapeutic options for the treatment of dysmenorrhea are few and are not totally effective. They include analgesics, anti-inflammatory drugs and oral contraceptives.<sup>7</sup> A non-pharmacological alternative is physiotherapy, which uses therapeutic exercises (kinesiotherapy), electrotherapy, therapeutic massage<sup>8,9</sup> and complementary therapy such as chiropractic, osteopathy and spinal manipulation. However, few studies have been carried out to evaluate spinal manipulation. The number of subjects has been small and little effect has been observed when comparing these therapies with the use of a placebo or no treatment at all.<sup>10</sup> Therapeutic tissue massage includes connective tissue massage (CTM), which the scant literature on the subject and the personal clinical experience of one of the authors (CAASR) suggest could be useful for the treatment of dysmenorrhea.<sup>8,11-13</sup>

Connective tissue massage, a form of massotherapy, has been used for the treatment of several pathological conditions including primary dysmenorrhea.<sup>14-16</sup> CTM was developed in 1935 by the German physiotherapist Elizabeth Dicke. Dicke experienced endarteritis obliterans of her right leg and she initially stroked the painful areas and palpated thickenings, infiltrations and her skin felt tight over the sacrum and over the right iliac crest. By stroking the sensitive area with her fingertips she observed that the pain eased. Dicke developed the technique unaware of Henry Head's theory of reflexive zones.<sup>11,12,17</sup> According to Head, in the

case of diseases of the internal organs, certain cutaneous zones of the same embryonic origin (metameres) and innervated by the same medullar segments, become hyperalgesic. These hypersensitive zones were mapped by Head in such a way as to reveal the correspondences between surface skin areas and internal organs.<sup>12,18,19</sup> Dicke proposed the physiotherapeutic treatment of internal organs using a massage technique that stimulates the corresponding cutaneous tissue with the intention of affecting the internal organ through reflex communication.<sup>11,12,18,19</sup>

CTM consists of cutaneous stimulation that aims to activate the mechanical receptors of the connective tissue. According to Head's theory, the stimulus is transmitted by the sensory nerves through the sympathetic ganglia to the spinal cord. This stimulus would act by releasing opiates such as enkephalin in the posterior root nerve of the spinal cord, inhibiting the transmission of pain by the small-diameter fibers.<sup>20</sup>

Studies of CTM, for treatment of various different dysfunctions, often report improvement and even total remission of pain in the individuals treated using this method.<sup>14-16</sup> However, the authors failed to describe the methods used to test this efficacy or to provide the data on which they based their conclusions regarding the effectiveness of this therapeutic technique in the treatment of various sources of pain, including dysmenorrhea.<sup>11,13,16</sup> This article describes the results of a pilot study in which the possible effectiveness of CTM for the treatment of dysmenorrhea was explored. The idea was to obtain information that would enable a decision to be made as to whether it would be worthwhile to perform a randomized clinical trial.

## Methods

This was a pilot observational cohort study in which each subject was her own control. The study included 85 women who met the following criteria: aged 10 to 28 years, presenting primary dysmenorrhea confirmed in writing by a physician (no specific test to confirm the diagnosis was uniformly required), having used medication for menstrual pain and not having used oral contraceptives during the three months prior to admission to the study. Women were invited to participate in the study by way of a pamphlet distributed among students at a public school and university students of Physiotherapy, occupational therapy, psychology, biology, Medicine and Nutrition at a private university. The principal investigator gave a detailed oral descrip-

tion of the study to students, individually or in groups. Those who agreed to participate and fulfilled the inclusion criteria signed an informed consent form. In the case of volunteers under 18 years of age, the consent form was signed by the young woman's legal guardian. The study was approved by the Institutional Review Board of the Pontifícia Universidade Católica de Campinas.

All volunteers were invited to return for a pretreatment evaluation immediately after the menstrual period that followed their admission to the study. The maximum intensity of menstrual pain experienced during this last menstrual period was evaluated using the VAPS,<sup>6</sup> which rates the pain from zero (no pain) to 10 (unbearable pain). The scale was applied by trained research assistants (physiotherapists or final year students of physiotherapy). Information on pain, use of pain medication during the last menstruation and on symptoms such as nervousness, tiredness, back pain, swelling, headache, dizziness, nausea, increased appetite and vomiting were registered in the evaluation chart.

All volunteers were submitted to massage treatment twice a week while they were not menstruating, during the three menstrual cycles that followed admission. This is the frequency with which patients in Brazil attend public physiotherapy health services that are free of charge. After each menstrual period during treatment and after each of the two menstrual periods following termination of CTM women were asked about the symptoms mentioned above and use of pain medication using a standard questionnaire.

Thirteen of the 85 volunteers initially enrolled were excluded from the study: 11 after missing two consecutive sessions, and two because secondary dysmenorrhea was diagnosed after admission. The remaining 72 women were included in the analysis. Seven women requested discontinuation from the study after completing two months of therapy, because their other obligations conflicted with attending the massage sessions. They agreed, however, to participate in the one- and two-month post-treatment evaluations. For this reason only 65 women are reported after the third "during treatment phase", but 72 volunteers are included in the analysis of all other treatment and post-treatment time points.

### **Training of research assistants**

Physiotherapy students in their last year at university (13) and physiotherapists (6) were trained to apply CTM. Training was carried out in five sessions of four hours each.

The manual prepared for the study was read and the instructions on how to perform the evaluation, how to record the data and how to perform the massage were discussed. Trainees were provided with a copy of pages from Ebner's book that show a photo with the position of the hand and fingers when applying tension as well as drawings showing the strokes used in a basic session. The trainees practiced CTM on each other in accordance with the protocol and they all performed one CTM each on women volunteers, other than the study participants, under the supervision of the principal investigator. In order to ensure that the massage was performed in accordance with the protocol, the principal investigator supervised how the massage was being performed by each one of the research assistants at least once a month throughout the period of the study. Corrections in the technique followed were suggested when necessary.

### **Connective tissue massage**

CTM may be applied to three sections of the back: base, thoracic and cervical, depending on the dysfunction to be treated (Figure 1a). For dysfunctions involving pelvic organs, CTM is applied to the basic section. The basic section CTM consists of the manipulation of the following regions: sacral, lumbar, last thoracic vertebrae and subcostal region. Six different sets of strokes were used, as proposed by Ebner.<sup>11</sup> The strokes were short (approximately three cms) and long (approximately 10 cms). Each set of strokes was repeated three times, first on the right and then on the left lumbosacral and dorsal regions.

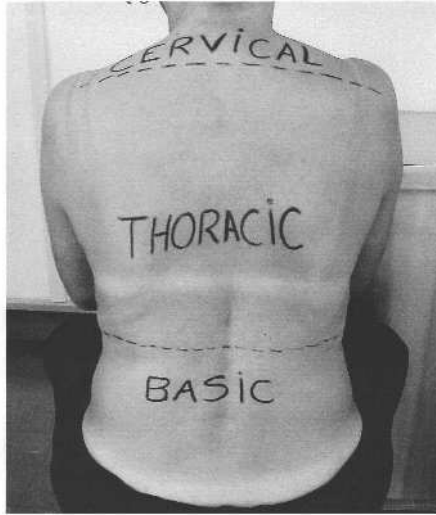
The therapist initiated CTM, using the index and middle finger of one hand, alternating with the middle and ring fingers. The fingers were placed on the skin at an approximately 45 degree angle and moved to cause traction, but never forced through the tissue, controlling them with the shoulders and upper hand. The first set consisted of short strokes ending at the edge of the sacroiliac joint and of the iliac crest (Figure 1b); the second group consisted of long strokes descending along the border of the sacroiliac joint, towards the gluteal cleft (Figure 1c); the third group short strokes perpendicular to the spine and ending at the joint of L5 with the S1 vertebrae (Figure 1d); and the fourth three long strokes starting from the external border of the sacrum and moving outwards. The first stroke passes close to the iliac crest, starting at the transverse process of L5 and moving towards the anterior superior iliac spine, where it comes to an end. The second starts at the

widest part of the sacrum, passes laterally and forward, and finishes in the same manner as the first stroke. The third stroke starts at the gluteal cleft, and passes forward above the great trochanter and ends in same way as the first and second strokes (Figure 1e). The fifth group consists of five short strokes,

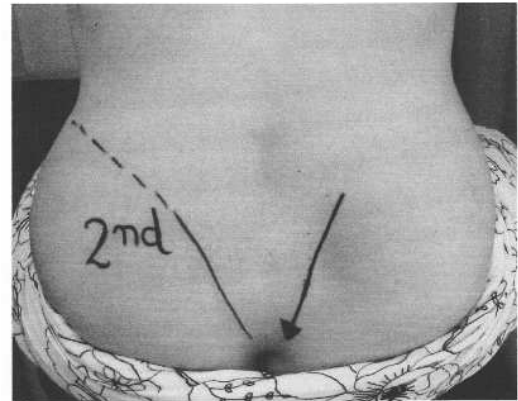
approximately, which move from lateral to medial over the erector spinae area, following the space between the transverse processes of the lumbar vertebrae (Figure 2a). The sixth group is one long stroke, moving from medial to lateral following the lower edge of the last rib (Figure 2b).

**Figure 1**

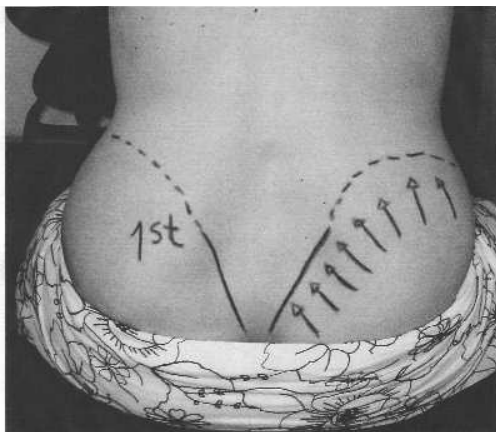
Areas and directions of massage or strokes for treatment of primary dysmenorrhea in young women.



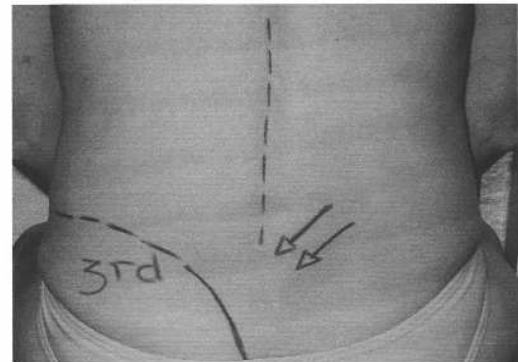
**1a** =Three areas of the back where connective tissue massage can be used depending on the dysfunction treated.



**1c** = Descending direction of connective tissue massage along the border of the sacroiliac joint toward the gluteal cleft.



**1b** =Direction of connective tissue massage applied over the sacral and lumbar regions.



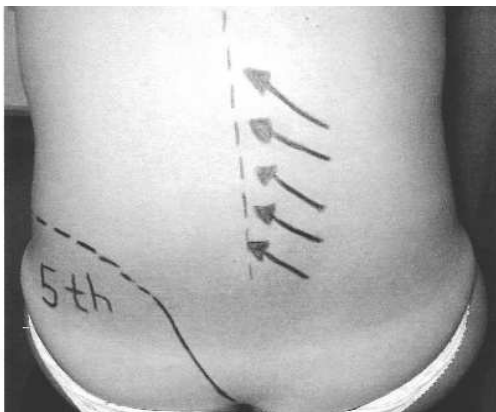
**1d** = Direction of shorts strokes applied perpendicular to spine ending at L5/S1 region.



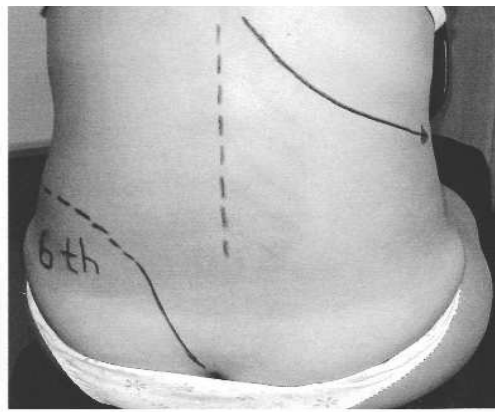
**1e** = Directions of three long strokes from L5, the sacrum and the gluteal cleft toward the iliac spine.

Figure 2

Directions of short or long strokes for treatment of primary dysmenorrhea in young women.



2a = Directions of five shorts strokes: from lateral to medial following the space between the lumbar vertebrae.



2b = Direction of one long stroke from medial to lateral following the lower border of last rib.

The purpose of the CTM strokes is to produce traction that decreases adherence of the skin to the deeper layers of tissue such as fascias and muscular fibers. Traction should cause a sensation described as “a cut, scratch or local pain”. Some autonomic reactions, usually transitory, may occur such as an increase in intestinal peristalsis, urinary disturbances, sleep disturbances (insomnia), changes in the temperature of limbs, an increase in glandular activity and relief of visceral symptoms.<sup>11,12,17,19</sup>

#### Data collection

Data were recorded using two data collection instruments: a questionnaire and a physical evaluation chart. The questionnaire was used to register socio-demographic data and information on dysmenorrhea reported by each volunteer at the time of admission to the study. The chart was used to register the maximum degree of pain according to the VAPS, the use of pain medication and other symptoms, at each of the monthly evaluations and the two re-evaluations after discontinuing CTM, as described above. Information was recorded by the research assistant responsible for admitting a subject to the study and later by the therapist responsible for the CTM session.

#### Data analysis

Data entry was performed twice by two different

computer operators, using the Data Entry (DE) module of the SPSS software. Bivariate analysis over time was performed for the dependent “pain score” variable, using Wilcoxon’s nonparametric test and Friedman’s test for paired samples. McNemar’s test for paired samples was used for the bivariate analysis of qualitative dependent variables over time. Multiple linear regression analysis, using stepwise selection, was performed with twelve predictor variables for three models of “pain score”, after the end of each month of treatment. The predictor variables included in the analysis were age (years); schooling; menarche age (years); age at beginning pain (years); marital status; intercourse; prior pregnancy; stronger pain score in any menstruation; initial pain score; practice of physical exercise more than twice a week; socio-economic status; number of massage sessions. A 5% level of significance was adopted.

#### Results

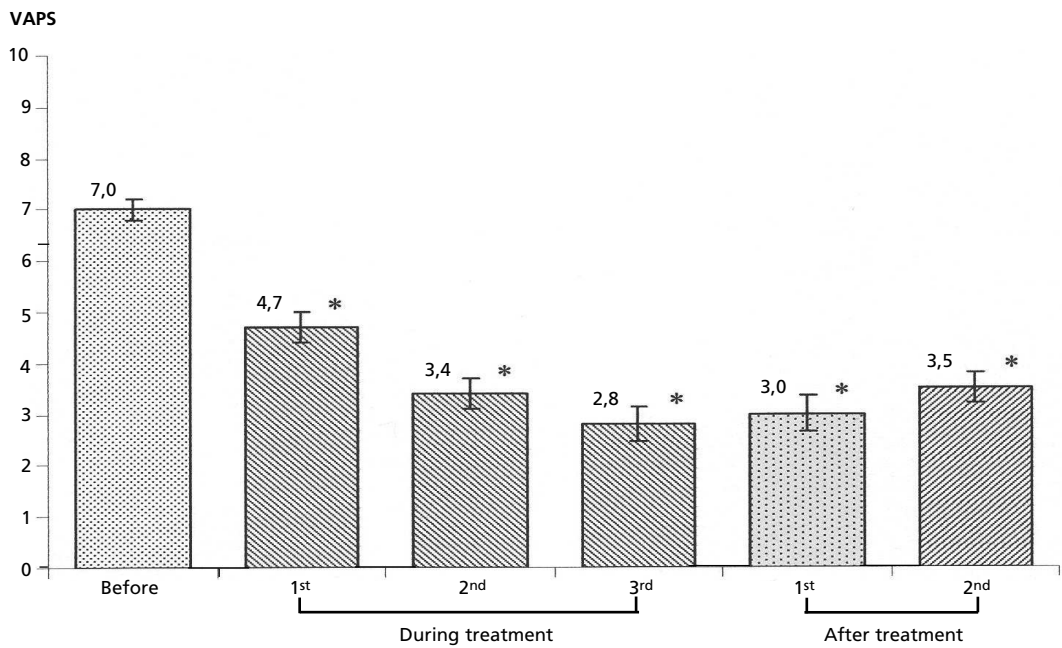
Approximately half the volunteers (53%) were 15 to 19 years of age, while the mean age of all participants in this study was 18.8 years (SD 3.0). Most participants had completed high school or were university students (82%). Almost two thirds (61%) had their first menstrual period at age 11 or 12 and more than one fourth (28%) at age 13 or 14 (Data not shown in table). The 65 volunteers who completed the study had an average of 23 (minimum 16,

maximum 39) massage sessions over the three months of therapy. The seven volunteers who discontinued after the second cycle had an average of 14 (minimum 11, maximum 19) massage sessions. The initial mean pain score was 7.0 (1.7). The mean pain score decreased by about one-third after the first month of treatment, further diminishing to about half the initial values after two months and to 40% of the initial value after the end of the third month of therapy. The differences in mean pain score between the initial evaluation and each month of treatment were all statistically significant ( $p < 0.001$ ). The mean

pain score increased slightly in the first and second months after termination of treatment, but the difference between these scores and the initial score remained significant ( $p < 0.001$ ) (Figure 3). The proportion of women with a pain score of 7 or more decreased from 59% before treatment to 26% after the first treatment month, and 13% at months two and three. This proportion increased to 14% during the first evaluation and decreased to 12% on the second evaluation following the end of treatment (Table 1).

**Figure 3**

Mean pain score: before, during and after treatment.



\* Wilcoxon's non-parametric test for paired samples: before x each evaluation ( $p < 0.001$ ); General comparison: Friedman's non-parametric test for paired samples ( $p < 0.001$ ),  $n=65$ ; VAPS= visual analogue pain scale.

**Table 1**

Distribution of women (N=72) according to pain score and period of evaluation.

Pain score	Before CTM %	1 <sup>st</sup> evaluation %	2 <sup>nd</sup> evaluation %	3 <sup>rd</sup> * evaluation %	1 <sup>st</sup> reevaluation %	2 <sup>nd</sup> reevaluation %
Up to 4	6	50	63	75	71	64
5-6	36	24	24	12	15	24
7-8	37	22	10	11	8	8
9-10	21	4	3	2	6	4

CTM= connective tissue massage; \*3<sup>rd</sup> evaluation: only 65 women.

There was a slight association between the number of massages received and the pain score for the following menses in the simple regression ( $r=0.513$ ). This association disappeared in the multiple regression analysis where the higher pain score for any past menstruation before treatment was the only variable associated with the pain score after first and second evaluations, and the initial pain score was the only variable associated with the pain score after the third month of treatment (Table 2).

The proportion of women who reported the use of painkillers during menstruation fell to almost a half (56%) after one month of treatment, and decreased further to 43% and 35% in the following

two months. The percentage of women who used analgesics increased slightly to 36% and 44% in the first and second months after termination of treatment (Figure 4). A significant reduction in the percentage of women reporting all the other symptoms evaluated (nervousness, tiredness, back pain, swelling, headache, dizziness, nausea, increased appetite and vomiting) was observed at the first evaluation and reduced further after the second and third month of treatment. The reduction in the proportion of women with these symptoms remained significant up to two months after treatment (Table 3).

**Table 2**

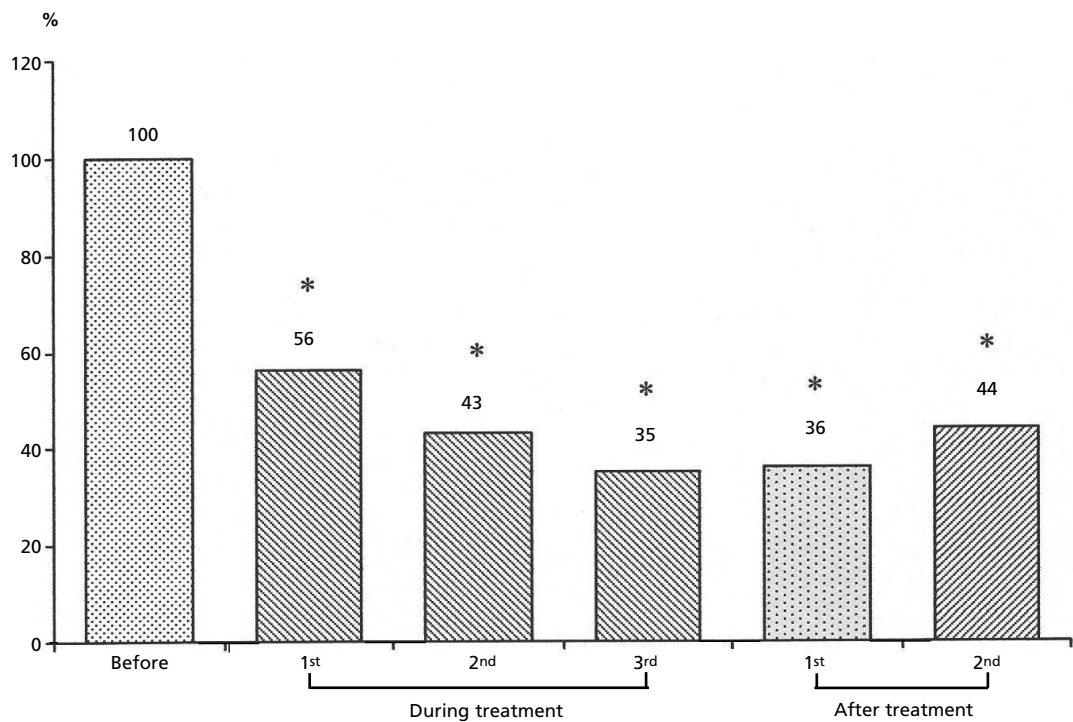
Variables associated to pain score in the several models.

Model/ Variable	Coefficient (r)	SE coef.	p	N
Model 1: pain score after the first month of treatment				72
Stronger pain score during any menstruation	0.56	0.03	<0.001	
Model 2: pain score after the second month of treatment				72
Stronger pain score during any menstruation	0.41	0.03	<0.001	
Model 3: pain score after the third month of treatment				65
Initial pain score	0.40	0.04	<0.001	

Predictor variables: Age (years); schooling; menarche age (years); age at beginning pain (years); marital status; intercourse; prior pregnancy; stronger pain score during any menstruation; initial pain score; physical exercise more than twice a week; socio-economic status; number of massage sessions.

**Figure 4**

Distribution of women who declared using pain medication before, during and after treatment.



\* Comparisons: McNemar's chi-square test for paired samples: before x each evaluation ( $p < 0.001$ ).

**Table 3**

Distribution of women (N =72) who reported systemic symptoms associated with menstruation before connective tissue massage and during the next menstrual periods.

Symptoms	Before	1st	2nd	3rd	1st	2nd
	CTM %	evaluation %	evaluation %	evaluation %	reevaluation %	reevaluation %
Nervousness/Irritation	82	65	57	33	38	42
Tiredness	79	56	44	28	33	38
Back pain	75	47	39	26	32	35
Swelling	50	39*	31	24	28	26
Headache	56	39	31	26	26	26
Dizziness	44	17	14	7	11	14
Increased defecation	39	28*	24*	25*	18	15
Nausea	33	11	8	4	7	11
Increased appetite	31	22*	14	10	17*	15*
Vomiting	25	-	3	1	4	3

Comparisons: (Test of McNemar) between each evaluation and before CTM; \*  $p < 0.05$ ; in all the other cases comparisons indicated  $p < 0.001$ ; CTM= connective tissue massage.



## Discussion

The first analysis of our data suggested that there could be a possible effect of CTM in reducing menstrual pain in a high proportion of women with primary dysmenorrhea. Almost 90% of the treated women reported a reduction in menstrual pain or the complete disappearance of pain after an average of 22 sessions of CTM over three consecutive months of therapy. Furthermore, while all women used pain killers at the time of admission, this proportion fell to 56% after one month and to 35% after three months of treatment. These results are in agreement with those described by Ebner<sup>11</sup> in the only publication that we were able to find that reported results of this treatment.

Ebner<sup>11</sup> proposed that CTM sessions should be carried out twice a week for 15 days following menstruation and daily thereafter until the next menstruation. We used twice weekly sessions of CTM in this study to permit adaptation to the routine schedule of Brazilian outpatient physiotherapy services and because this schedule is usually more convenient for the patients. It is possible that in the context of other health systems the number of sessions required may not be covered for a large proportion of the population.

Our finding of pain relief after just one month of therapy is in agreement with the findings of Ebner,<sup>11</sup> who stated that most women report a reduction in menstrual pain after the eighth session of treatment. In our study, patients had completed an average of eight sessions of CTM by the end of the first cycle of treatment. This author also described that the maximum effect is achieved after three cycles. We also found that improvement continues to occur during up to three months of CTM, but the design of our study does not allow us to verify whether any further improvement would be achieved by prolonging the treatment beyond three months.

Our results also suggest that the effect of pain reduction may persist after the three cycles of treatment, with only a small increase in pain, at least during the two months following termination of therapy. The observation of total pain remission in 23% of our subjects after the three months of treatment is also in agreement with the findings of Ebner,<sup>11</sup> who affirms that remission occurs in some cases. The relatively small increase in the average pain score and in the use of medication after interruption of treatment may be an indication that the effect has a limited duration and should be repeated at periodic intervals. In this case, the cost effectiveness of this treatment as opposed to other thera-

peutic alternatives should be evaluated.

Although the diagnosis of primary dysmenorrhea was one of the inclusion criteria for this study, in most cases diagnosis was only clinical, allowing us to eliminate the possibility of an underlying organic cause for the menstrual pain, particularly endometriosis. In such cases, no improvement in the pain would be expected with CTM treatment.

One of the limitations of this study is that the diagnosis of primary dysmenorrhea was mostly clinical. It would have been better to have included only women who had already undergone a meticulous battery of examinations, including laparoscopy, to be certain that all volunteers really had primary dysmenorrhea. On the other hand, as very few women with dysmenorrhea have access to such diagnostic procedures, it would have been practically impossible to carry out this study if that had been one of the inclusion criteria. This problem, however, suggests that the results may have been better if all cases of secondary amenorrhea had been excluded.

The fact that several different research assistants performed the massages may be criticized, since it precluded the possibility of ensuring homogeneity of the therapeutic procedure. It could, on the other hand, be regarded as a positive trait of this study, as it indicates that anyone with appropriate training can produce the same results, which do not depend on the particular expertise of any one individual.

The most important issue, however, relates to the interpretation of the results of this study. There is a strong possibility that the improvement observed may be merely the result of a placebo effect. Many women suffering from dysmenorrhea fail to obtain any sympathy from their families or partners, who tend to view menstrual pain as an expected nuisance that women should endure without bothering those around them. The simple fact that someone was paying continuous attention to this problem may have already had a positive effect on pain relief. If the reduction in pain was the result of CTM and not of the overall care provided, a direct association should have been found between the number of CTM sessions received and pain reduction. However, although a weak association was found in the simple regression, such an association disappeared after controlling for other factors in the multiple regression analysis. It thus appears that the encouraging results obtained may have been the result of the attention given to the study subjects and not necessarily a direct effect of the CTM. A randomized placebo-controlled study would have been a much better design, but in view of the absence of any evidence in the literature, it seemed

appropriate to begin by performing the before-and-after kind of trial described here.

In view of our inconclusive results, which cast doubt on the possible effect of CTM on menstrual pain, the next step is to carry out a randomized controlled study comparing CTM with placebo. Although it is impossible to design a blind study, it is perfectly feasible to randomly assign the volunteers to CTM or placebo. In such a study, it would also be interesting to control for personal variations in the consistency of the elastic tension of the skin and the amount of adipose tissue and edema in each subject.

To the best of our knowledge, this is the first trial carried out to evaluate CTM for the treatment of

primary dysmenorrhea. Given the limited effectiveness of current pharmacological treatments and the increasing demand for non-pharmacological alternatives, there is an urgent need for a proper evaluation of the real effectiveness of each of the proposed alternative treatments.

## Acknowledgments

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