

The Impact of Black Sea Sand Treatment Effectively Reducing Different Type of Pain

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Abstract

Purpose: Low back pain (LBP), Gonarthrosis, knee, and Carpal Tunnel Syndrome have been regarded as affecting more than three-quarters' of individuals in their lifetime. The aim of this study was conducted to determine and compare the effects of topical patients with sand compared with control related to Gonarthrosis, LBP, knee, and Carpal Tunnel Syndrome pain. **Methods:** This is a prospective case and control designed study based on 101 pain case with Sand and 101 control subjects. The interventional groups in addition either topical sand or without sand 2 months after the intervention were assessed. We assessed tolerability of an established pain perception scale by the Numeric Rating Scale (NRS). Categorical variables were compared using the chi-square (χ^2) test. The paired t-test was used to compare the two groups before and after the intervention. One-way analysis of variance (ANOVA) was employed for comparison of several group means. **Results:** The study was based on 202 patients, 41 males (20.3%) and 161 females (79.7%). There were statistically significant differences between subjects with and without Sand in term of Gonarthrosis, Rheumatoid Arthritis LBP, knee, and Carpal Tunnel Syndrome pain ($p = 0.033$). Majority of patients were over age 55 years old (55%) and females 78 (77.2%). The mean score of total pain experience before and after the intervention was 7.41 ± 1.1 for black sand, and 4.24 ± 2.38 for without sand as control group. The mean scores of these 5 groups

were highly significant before and after the intervention ($p < 0.001$). There was statistically highly significant in regarding subjects with Sand as compared with those before Sand after treatment mean score specifically with gonarthrosis before pain 7.23 ± 1.86 vs after treatment 4.54 ± 2.18 $p < 0.001$; rheumatoid arthritis before 8.28 ± 1.48 vs after treatment 4.80 ± 3.71 $p < 0.001$; Low Back Pain before 8.42 ± 1.83 vs after treatment 4.37 ± 1.52 $p < 0.001$; knee pain before 8.93 ± 0.89 vs after treatment 4.24 ± 0.24 $p < 0.001$; Carpal Tunnel Syndrome before 7.664 ± 1.04 vs after treatment 4.26 ± 1.03 $p < 0.001$. **Conclusion:** The current study has revealed that the topical treatments with sand could have a significant effect on the perception of pain compared to those in the control group with respect of gonarthrosis, rheumatoid arthritis, LBP, knee, and Carpal Tunnel Syndrome pain.

Keywords

Therapies, Sand, LBP, Musculoskeletal, Rheumatoid Arthritis, Carpal Tunnel Syndrome

1. Introduction

Psammotherapy is an traditional therapeutic of sand used for the treatment of several chronic conditions, mainly rheumatic gonarthrosis, low back pain, Carpal tunnel chronic diseases [1] [2] [3]. Psammotherapy is defined as an “external thermal therapy that uses dry heat” with the effects of a chemophysical and bioclimatic therapy and its multicomponent treatment [3] [4]. Nowadays, various pharmacological and non-pharmacological therapies are employed for relieving and treating pain. The Low Back Pain (LBP) and Carpal Tunnel syndrome pain are a complex medical condition produced by multiple factors and it has negative impact on quality of life and leads to psychological distress [4].

Psammotherapy sand baths have long been practiced in several coastal and desert countries, including Egypt [4], Rome [5], Italy [6], Portugal [7], Japan [8], China [9], Iran [10], Morocco [11], Saudi Arabia [12] and Iran [13]. Although some studies have been conducted to investigate and assess the efficacy of psammotherapy, such as osteoarthritis, traumatic injury outcomes, articular or extra-articular chronic rheumatic conditions, osteoporosis, gout, and fibromyalgia syndrome, [1] [2] [7] [14].

LBP is common major public health problem as worldwide and LBP disability has reached epidemic proportions in many industrialized [14]-[20] and newly developing societies. Musculoskeletal disorders have emerged as the third leading cause of global DALYs among adolescent and young over the past three decades [15]. LBP is ranked as first as a cause of handicap as disability and inability to work [15] [16] [17]. The most prevalent form of chronic musculoskeletal pain affects life [17] [18] [19] [20]. Further, every eight adults out of ten adults will be affected from the LBP in their life time [17] [18] [19].

The purposes of this current study were to investigate the effects of fabrics produced to contain magnetic particle sand on pain at Black Sea side, especially in cases such as fibromyalgia, migraine, etc., where treatment cannot be performed for pain that cannot be attributed to an organic cause, or in cases such as arthropathy, disc hernia, etc., where temporary relief is provided only by giving painkillers. Even if the organic cause is known, the pain reappears when the painkillers are discontinued and side effects due to long-term drug use can be seen. The aim of this study was conducted to determine and compare the effects of topical patients with sand compared with control related to Gonarthrosis, LBP, knee, and Carpal Tunnel Syndrome pain.

2. Participants and Methods

2.1. Participants

It is believed that the black sand, which is found on the coasts of Black Sea and contains intense magnetic particles, has a pain-reducing effect among the people and is traditionally used by people with rheumatic pains to reduce pain by taking a sand bath on the beach where this magnetic black sand is located. We computed the sample size based on 25% prevalence of low back pain in population [17], assuming 5% bound on error estimation, and taking 95% confidence level, the required minimum sample size for this study was $N = 285$. Total 285 patients were approached and 202 subjects agreed to participate in this study (70%).

All procedures executed in this study appropriately followed the declaration of Helsinki, 1964. Consent was obtained from all the respondents provided in the study. Ethical clearance was granted by the Research Ethics Committee of the Istanbul Medipol University and Clinical Research at Istanbul Medipol University, School of Medicine Hospital with the approval of the Institutional Review Board (IRB) in accordance with the principles of the Helsinki Declaration of 1964 and its later amendments (Research Protocol IRB# E.10840098-772.02.819).

The study is prospective case and control study. In this, case and control design study patients were collected randomly from the Black Sea side conducted as interventions matching with one control. The cases of 101 subjects with pain used Sand and 101 control were received daily physiotherapy in the same manner for a period from January to September, 2023. The inclusion criteria based on the following: voluntary participation; age over 18 years old; to be able to expressing the degree of pain; not having malignancy or progressive disease, agree not to use pain killers for 10 days.

2.2. Measurements

The pain levels of 202 volunteers who agree to participate in the study and have pain in accordance with the criteria whose measured and assessed with the Pain Scale before starting the study. Afterwards, a material made of fabrics applied to the Black Sea sand in the size to be applied to the aching place of the volunteer

who will not use any painkillers during the study will be placed on the aching area. After 10 days in that area, the patient will be asked to score the pain with the help of the same Pain Scale. Whether there is a positive or negative difference between the two measurements was compared.

We assessed tolerability of an established pain perception scale by the Numeric Rating Scale (NRS) [20] [21]. Patients rated pain from 0 (no pain) to 10 (worst possible pain) to score classified as mild burden is defined with scores 1 - 4, moderate burden is defined with scores 5 - 6, and severe burden is defined with scores 7 - 10 [20] [21].

2.3. Statistical Analysis

To evaluate the normality of the data, the one-sample Kolmogorov-Smirnov test was used. Categorical variables were compared using the chi-square (χ^2) test. The paired t-test was used to compare the two groups before and after the intervention. Pearson's correlation was utilized for continuous variables. One-way analysis of variance (ANOVA) was employed for comparison of several group means. In all tests, a 95% confidence interval, and a significance level of $\alpha = 0.05$ were considered.

3. Results

Table 1 shows comparison of socio-demographic characteristics among subjects with pain use Sand and control. The study based on 202 patients were 41 males (20.3%) and 161 females (79.7%). There were statistically significant differences between subjects with and without Sand in term of Gonarthrosis, Rheumatoid Arthritis LBP, knee, and Carpal Tunnel Syndrome pain ($p = 0.033$). Majority of patients were over age 55 years old (55%) and females 78 (77.2%).

Table 2 gives clinical characteristics of the pain patients with use sand and control. As can be seen from this table there were statistically significant differences between subjects with sand control in term of Gonarthrosis ($p < 0.001$), Rheumatoid Arthritis ($p < 0.001$), LBP ($p < 0.001$), knee ($p < 0.001$), and Carpal Tunnel Syndrome ($p < 0.001$).

Table 3 compares diagnosed subjects with specific pain type among before mean score and after treatment with Sand usage score. The overall mean score of total pain experience before and after the intervention were 7.41 ± 1.1 for hot sand, and 4.24 ± 2.38 for without sand as control group (ANOVA $p < 0.001$). The mean scores of these 5 groups were highly significant before and after the intervention ($p < 0.001$). Statistically highly Significant regarding subjects with Sand as compare those before Sand after treatment mean score specifically with gonarthrosis pain 7.23 ± 1.86 vs after 4.54 ± 2.18 $p < 0.001$; rheumatoid arthritis before 8.28 ± 1.48 vs after treatment 4.80 ± 3.71 $p < 0.001$; Low Back Pain before 8.42 ± 1.83 vs after treatment 4.37 ± 1.52 $p < 0.001$; knee pain before 8.93 ± 0.89 vs after treatment 4.24 ± 0.24 $p < 0.001$; Carpal Tunnel Syndrome before 7.664 ± 1.04 vs after treatment 4.26 ± 1.03 $p < 0.001$.

Table 1. Socio demographic characteristics of the subjects with pain use sand and control subjects (n = 202).

Variable	Sand n = 101 n (%)	Control n = 101 n (%)	p-value & significance
Age Group			
<35	20 (19.9)	24 (23.8)	0.173
35 - 49	25 (24.8)	23 (22.8)	
50 - 64	33 (32.7)	42 (41.6)	
>65	23 (22.8)	12 (11.9)	
Gender			
Male	23 (22.8)	18 (17.8)	0.447
Female	78 (77.2)	83 (82.2)	
Pain region/locations*			
Musculoskeletal	40 (29.6)	67 (66.3)	0.003
Rheumatoid Arthritis	14 (13.9)	11 (10.9)	
Low Back Pain	12 (11.9)	7 (6.9)	
Knee Pain	23 (22.8)	12 (11.9)	
Carpal Tunnel Syndrome	12 (11.9)	4 (4.0)	
Fabrics Products used*			
Knee batch/cover	47 (46.5)	45 (44.6)	0.605
Sock	9 (8.9)	13 (123.9)	
Gloves	22 (21.8)	21 (20.8)	
Elbow brackets	11 (10.96)	15 (14.9)	
Waist brackets	12 (11.9)	7 (6.9)	

& The chi-square (χ^2) test was used for comparison of categorical variables. *p value significant at the 0.001 level.

Table 2. Clinical characteristics of the pain patients with Sand and control (n = 202).

Variables	Sand n = 101 n (%)	Control n = 101 n (%)	p-value & significance
Gonarthrosis*			
Yes	65 (64.4)	37 (36.6)	0.001
No	36 (35.6)	64 (65.4)	

Continued

Rheumatoid Arthritis*				
Yes	42 (41.6)	19 (18.8)		0.001
No	59 (58.4)	82 (81.2)		
Low Back Pain (LBP)*				
Yes	41 (40.6)	16 (15.8)		0.001
No	60 (59.4)	85 (84.2)		
Knee pain*				
Yes	38 (37.6)	12 (11.9)		0.001
No	63 (62.4)	89 (88.1)		
Carpal Tunnel Syndrome*				
Yes	46 (45.5)	15 (14.9)		0.001
No	55 (54.5)	86 (85.1)		

& The chi-square (χ^2) test was used for comparison of categorical variables. *p value significant at the 0.001 level.

Table 3. Comparison diagnosed clinical characteristics of specific pain type before treatment score and after treatment mean score with Sand use (n = 101).

Clinical Diagnosis	Before treatment Mean \pm SD	After treatment Mean \pm SD	Change Before-After (95%CI)	t-test value	p value & significance
Gonarthrosis*	7.23 \pm 1.87	4.54 \pm 2.18	2.68 (2.27 - 3.09)	12.930	0.001
Rheumatoid Arthritis*	8.28 \pm 1.46	4.80 \pm 3.71	3.48 (1.38 - 4.57)	4.683	0.001
Low Back Pain*	8.42 \pm 1.83	4.94 \pm 1.52	3.47 (1.36 - 4.57)	4.571	0.001
Knee pain*	7.94 \pm 0.87	4.28 \pm 0.92	3.65 (2.46 - 3.97)	23.892	0.001
Carpal Tunnel Syndrome*	7.68 \pm 1.01	4.31 \pm 1.03	3.37 (2.76 - 3.98)	11.765	0.001

& The Paired t-test was used to compare the two groups before and after the intervention. CI = Confidence Interval.

4. Discussion

The current study provided fact evidence that the effect of sand reduced substantially severity of pain. The black Sea sand practice thought that the fabrics produced to contain the magnetic particles in sand can be applied to the painful areas and can reduce the pain in people similar to the sand baths and thus have a relaxing effect. We adopt the relational approach suggested by Conradson [22] to understand the sand therapy outcome better.

Sand therapy' is one of the as traditional therapy discovered and inherited by the Uyghur people in China [23]. This is a traditional natural therapy for treating arthritis, rheumatism, carpal tunnel syndrome, legs, hands, back and wrist [24]. Although, rheumatic diseases include a group of disorders that primarily target the musculoskeletal system, including joints, bones, muscles, and connec-

tive tissue [25]. In fact, the effects of sand therapy might differ for each individual, because an individual's experience is the key to measuring the therapeutic effects. The sand therapy patients suffered from were chronic, the onset time was seasonal although recover expectation was high, but the therapy would gradually work later on.

Low back pain is a common problem affecting most adults at some point during their life time [15] [16] [17]. There is strong correlation between chronic LBP and depressive disorders, anxiety, stress, anger, personality and somatoform disorders [16] [17].

Also, Bener *et al.* [17] [18] [19] found high rates of psychopathology in chronic low back pain group with higher rates of major depressive disorder, and personality disorders than the patients with acute low back pain. However, acute patients were also diagnosed with more anxiety disorders [5] [17] [18] [19].

Furthermore, black sand is enriched in Na, Ca, Mg, K, Cl and So₄ and other chemical elements [4]-[13] and increasing skin permeability. It is assumed that during sand therapy there by enriching the liquid biofilms with elements such as calcium and magnesium [4]-[13]. Although, which mineral are suitable for various diseases risk factors would lead to target their therapies more accurately and rationally [5]. Black sand induces hyperthermia as an important stimulus for immune system and to modulate cortisol levels [5] [13].

Several studies reported [17] [18] [19] as evidence that pain problems increase the risk of mental health and somatoform disorders in population, and this attracted physicians working on chronic pain. LBP is considered most common one of the highest burdens diseases worldwide. Several authors reported that nutrition, calorie intake, poor diet quality pain, caffeine, heavy alcohol consumption, and heavy smoking can be associated with chronic LBP [14]-[20].

5. Study Limitations

The current study has several limitations. Firstly, the design of current study is not ideal matched case and control, limited to make causality or the temporal relationship of pain factor clustering with diseases. Second, the study may not reach to the target subject in population as a bias, which is very hard to avoid. Third, the clinical assessment and test performed for the co-morbidity in relation to pain might be misclassified; therefore, the results should be interpreted with great caution. Finally, in sand may play key role in the subjective healing and needs the academic or professional experts to give advice and support for painful therapeutic issues.

6. Conclusion

The findings have revealed that the topical treatments with sand could have a significant effect on the perception of pain compared to those in the control group with respect of gonarthrosis, rheumatoid arthritis, LBP, knee, and Carpal Tunnel Syndrome pain.

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Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contribution Statement

MT, AB, contributed to conception, design, organized study, collected data, performed statistical analysis and wrote the first draft of the article, and contributed to the to the interpretation of the data and writing, revised critically and approved final version of manuscript. FNK, BD, SAA, and ZEA contributed to conception, collected data, contributed to the interpretation of the data and writing final version of manuscript. All authors approved the final version.

Ethics Committee Approval

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