Orthopedic & Muscular System: Current Research

Goldenshluger M et al., Orthop Muscular Syst
2017, 6:2
DOI: 10.4172/2161-0533.1000232

Research Article OMICS International

Long Term Effect of Weight Change on Clinical Manifestation of Knee Osteoarthritis among Women Treated with Orlistat

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Received date: March 24, 2017; **Accepted date:** April 18, 2017; **Published date:** April 30, 2017

Abstract

Background: Combined therapy of weight loss and exercise provide today the best treatment for Knee Osteoarthritis. Most studies evaluating the effect of this therapy focus on the active intervention phase or immediately after the end of the treatment.

Objectives: To describe the of long term effectiveness of weight loss and exercise treatment on Knee Osteoarthritis.

Methods: Medical charts of 10 overweight women who suffered from Knee Osteoarthritis and had been treated for six months with a combined treatment of weight loss with Orlistat in the recommended dose, aerobic exercise and muscle mass strengthening, were retrospectively reviewed. Knee Osteoarthritis symptoms were assessed before treatment, at the end of treatment and following 6 months using the Western Ontario and McMaster Universities Osteoarthritis Index.

Results: In comparison to baseline, we documented a statistically significant improvement in pain, stiffness, and function at the end of the treatment (37.0 vs. 21.0, P=0.007, 44.5 vs. 28.3, P=0.037 and 45.5 vs. 27.1, P=0.005, respectively) together with reduction in BMI (32.9 vs. 29.5, P=0.007). Six months later, although the mean BMI had returned to its baseline (31.1, P=0.126), the improvement in all parameters still existed (23.9, P=0.028, 27.1, P=0.028 and 32.9, P=0.037, respectively).

Conclusions: Weight reduction together with muscle strengthening can improve function, stiffness, and pain symptoms in women with knee Osteoarthritis. Our case series suggest that this combined intervention may potentially maintain clinical improvement even when patients return to their baseline weight.

Keywords: Knee osteoarthritis; Body mass index; Weight loss; Exercise; WOMAC

Introduction

Osteoarthritis (OA) of knee and obesity are two common disorders which may lead to substantial disability of the population in industrialized countries. A positive association between obesity and OA has been established [1,2]. It has been shown, that obesity is probably the most important risk factor for the development of knee OA (KOA), more than other predisposing factors [3,4]. Current therapy for KOA most often focuses on pain relief, using nonsteroidal anti-inflammatory medications or Paracetamol that have only modest functional benefit and do not slow disease progression. Disease modifying OA drugs that may efficiently modify and slow joint destruction of KOA have not been introduced yet. Modern approaches to KOA management recommend targeting modifiable risk factors, including obesity, malalignment, and improvement of muscle weakness [5].

Weight loss is now considered to be the best potential non pharmacologic intervention for prevention or slowing disease progression [5]. According to one study, disability in obese patients with KOA significantly improved when weight was reduced by more than 5% at a rate of >0.25% per week; accordingly, a loss of 11% of weight over a period of 8 weeks resulted in a 3-fold improvement in self-reported function relative to a control group [6]. Therefore, it is recommended that overweight patients with KOA should be encouraged to lose weight.

Muscle strengthening exercises are of primary importance in the treatment of KOA. Systematic reviews and several studies have established the beneficial effects of exercise in patients with KOA, including muscle strengthening and aerobic exercises [7]. Strengthening hip muscles and mild aerobic exercises have a beneficial effect on pain, physical function, and patient global assessment [8]. In obese people with KOA the combined therapy of weight loss and exercise provides better results according to self-reported measures than either intervention alone [9].

Most studies that showed a beneficial effect of weight loss and exercise on KOA symptoms focused on short term results, studying the effect of therapy during the active intervention or immediately after the end of treatment. The purpose of our case series is to describe a

possible long term effectiveness of weight loss and exercise in the treatment of KOA.

Methods

Patients

Consecutive patients, taking part in a weight reduction project of the Barzilai Medical Center among women of the hospital nursing medical staff between 2010 and 2011 were included. The patients were followed up on a regular basis at the hospital staff clinic. Those with knee complains were also treated in the Rheumatology unit of Barzilai medical Center.

Medical charts of these patients were examined in a retrospective manner. Inclusion criteria were as follows. KOA assessment was done as part of the patient's routine treatment in the rheumatology unit. A board certified radiologist scored the degree of arthritis present on previous X-Rays using the Kellgren and Lawrence (K&L) scoring system [10]. Patients' records with K&L score of 2 and 3 were evaluated. Among them, only patients who had Numeric Pain Rating Scale score greater than 4 were analyzed.

All patients enrolled did not receive treatment for KOA other than the intervention project with Orlistat and exercise. The therapeutic approach for weight reduction included medical treatment with Orlistat (Xenical) in the recommended dose (120 mg × 3/d with each main meal) in addition to a three days/week exercise program that was prescribed to each participant. The exercise program included an aerobic phase (15 minutes), resistant-training phase (15 minutes), second aerobic phase (15 minutes) and a cooling phase.

Exclusion criteria were incomplete data, any other knee pathology, K&L scores of 1 or 4 and Numeric Pain Rating Scale score of 4 and below.

The study conformed to the Declaration of Helsinki and was approved by the institutional ethics committee of Barzilai Medical Center, Ashkelon, Israel. The waiver of patient's informed consent was received by the Helsinki committee because of the retrospective nature of the study.

Data acquisition

Each patient, who attended the Rheumatology Unit was asked to complete the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). The WOMAC is a self-administered questioner which specifically targets symptoms of pain, stiffness, and physical function [11]. It consists of 24 questions: 5 questions directed to pain, 2 to stiffness, and 17 to physical function. On the Visual Analog version, a ruler is used to measure the distance (in mm) from the left end marker to the patient's mark. Therefore, for each item, the possible range of scores is 0-100. Items are summed for each subscale, resulting in the following range: pain=0-500, stiffness=0-200, physical function=0-1700. To ease interpretation, each subscale was divided by 5, 2 and 17, respectively, to reach a standardized scale of 0-100. WOMAC scores of the most painful knee of each patient were chosen.

The data of each subject's weight and height before the treatment, at the end of the treatment (6 months), and six months after the treatment (12 months) were scaled and registered by a medical staff personnel (nurse/physician). Body Mass Index (BMI) was calculated.

Data analysis

Time series analysis adhering to a prospective design was performed. The statistical analysis was conducted with the SPSS package (version 21.0, SPSS, Inc). Due to a small number of cases, the non-parametric Wilcoxon Signed Rank was applied to detect changes in WOMAC and BMI scores from baseline to six and twelve months. A P value of <0.05 was considered statistically significant. Statistical analysis was performed using data from all subjects.

Results

Medical charts of 32 women, who were treated in the medical staff clinic and the Rheumatology unit of the Barzilai Medical center between 2010 and 2011 and underwent the Orlistat treatment and exercise program intervention were found. Of them, 10 women who were treated in the Rheumatology unit for KOA met the inclusion criteria. These patients' charts were analyzed.

The mean age ± SD of our patients was 54.1 years ± 5.6. The mean BMI before the treatment with Orlistat and exercise was 32.9 ± 3.7. Six months afterwards, at the end of the treatment, the mean BMI decreased to 29.5 ± 4.3 (P=0.007). At 12 months, 6 months after the end of treatment, mean BMI score raised again, almost to baseline level, 31.1 ± 5.5 (P=0.126 in comparison to baseline BMI). The 6 months WOMAC score, at the end of active treatment, showed significant improvement in comparison to the baseline score in all three parameters: pain (21.0 vs. 37.0, respectively, P=0.007), stiffness (28.3 vs. 44.5, respectively, P=0.037), and function (27.1 vs. 45.5, respectively, P=0.005). Six months after the end of the treatment, although the mean BMI had returned to its baseline, the improvement in all parameters still existed (23.9, P=0.028, 27.1, P=0.028 and 32.9, P=0.037, respectively). Complete BMI and WOMAC scores are presented in Table 1.

Discussion

Our case series examined the influence of weight reduction together with muscle strengthening on pain, stiffness, and physical function in women with established OA of the knee during a six month period of active intervention, and six months following it. Results of previous short term studies suggested that combination of weight loss and exercise was effective in improving pain and physical function [9,12]. Similarly to these studies, we have demonstrated that intensive weight loss together with aerobic and isometric exercises resulted in significant improvement in patient's KOA symptoms. Pain, stiffness, and physical function were the specific parameters studied using the WOMAC score and all showed marked improvement. The achieved improvement was stable following the next six months, even in patients who returned the previous weight level (Table 1).

The results are very intriguing and to our knowledge were not observed in previous studies. There are only several studies that examined patients long beyond interventional period. Most of them analyzed the long term effect of exercise treatment on pain and/or function without follow up of weight changes. These studies showed a slow decline in pain and physical function improvements during the follow up period [13,14]. Our work showed that weight gain after the achieved improvement did not worsen knee pain and function. The improvement observed in the studied group 6 months after cessation of active intervention, in spite of weight gain, may be explained by achieving better muscle strength of the lower extremities and lower back. Our assumption is that increased weight may be one of risk

factors for KOA development and chronic pain appearance, but has no pathogenic role in maintenance of the achieved results during the treatment. With the increase of body weight, both muscle and fat mass increase, yet the volume of muscle mass remains relatively low and inadequate to match the loads placed upon it. Obese patients have lesser muscle strength than their normal-weight counterparts including the quadriceps and lumbar muscle groups [15,16]. Over time the cumulative effects of excessive body fat, mechanical load and loss of muscle strength, contribute to the pathophysiology of KOA and onset of inflammation with chronic pain [17]. We can speculate, that lowering body weight together with muscle strengthening during the active phase of intervention provide the patient an opportunity to improve walking mechanics and therefore to reduce knee pain and maintain physical function even after weight gain.

	BMI			WOMAC-pain			WOMAC-stiffness			WOMAC-function		
Patient	**Baseline**	**6 mo.**	**12 mo.**	**Baseline**	**6 mo.**	**12 mo.**	**Baseline**	**6 mo.**	**12 mo.**	**Baseline**	**6 mo.**	**12 mo.**
1	29.7	28	29	49.9	38.2	36.4	37	49	30	52.9	42.3	36.2
2	32.2	25	24	62.2	61	65.4	93	68.5	80	81.8	68.2	77.1
3	42	38.5	42.5	31.6	31.8	46	73.5	41.5	50.5	60.8	54.7	46.8
4	33	27.9	29.5	11.2	4.5	6.8	46	3.5	5.4	12.2	4.5	5.4
5	30.5	27.1	28.5	39.8	3.4	13	7.5	5	6	27.7	9	19.9
6	36.5	33.7	36	17.6	2	1.6	29.5	15	2	15.1	0.8	1
7	31.4	28.8	32	24.6	1	1.4	9	2	1	39.9	1	1
8	30.1	24.2	25	36.8	1	0.6	16	1	2	32.6	1.2	0.8
9	31.2	32.6	35	61	40.2	51.4	50	59.8	72	47.3	45.8	62.8
10	32.3	28.7	29.5	35.4	26.4	16.4	83	38	22	84.9	43.2	77.7
Mean(±SD)		29.5(4.3)	31.1(5.5)	37.0(17.0)	21.0(21.5)	23.9(23.9)	44.5(30.6)	28.3(26.0)	27.1(30.3)	45.5(25.2)	27.1(26.2)	32.9(31.7)
P Value to : Baseline		0.007	0.126		0.007	0.028		0.037	0.028		0.005	0.037
6 mo.			0.014			0.24			0.878			0.173
BMI=Body Mass Index; WOMAC=Western Ontario and McMaster Universities Osteoarthritis Index; mo. = month; SD = standard deviation.												

Table 1: BMI and WOMAC at baseline, 6 months and 12 months.

There are some limitations to our study, starting with its retrospective nature. The main limitation is the small number of participants. Further studies with a larger sample of patients are desired to evaluate in greater depth these findings. Another weakness of our study is a lack of a control group allowing adjustment for potential confounders. Unfortunately, a control group was not available to us, as all potential participants had underwent intervention as part an Orlistat treatment and exercise program. Thus, our findings are limited by their observational nature and should be seen as a longitudinal study solely. Finally, a selection bias might influence our results, as we included only women of the medical stuff. The results might be different for other groups of participants with less awareness and exposure to medical facilities.

Conclusion

To summarize, obesity is one of the main factors for developing KOA. Reduction of body fat percentage together with muscle strengthening can improve function and reduce pain and stiffness in women with knee Osteoarthritis. Our case series suggest that combined intervention of weight reduction with muscle strengthening might potentially maintain this clinical improvement even when patients return to their baseline weight. The achieved improvement in pain, stiffness, and function seems to have a longer lasting effect beyond the duration of weight reduction. Large scale studies with longer follow-up periods are desired to validate our findings.

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