

# Can Telerehabilitation Add a New Dimension in the Treatment of Osteoarthritis Knee?

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## Abstract

Osteoarthritis (OA) is among the five most disabling diseases. Aims of this study were to assess the efficacy of telerehabilitation via videoconferencing when compared to telephonic consultation for home based treatment of osteoarthritis knee.

**Methods:** One hundred and twelve patients, 44 males and 68 females with average age of 51.35 years were divided into two groups A and B. After obtaining informed consent, a thorough evaluation was done to meet the inclusion and exclusion criteria.

Group A were taught exercises and instructed to complete the exercises under the supervision of the physiotherapist via videoconferencing technology. For supervision of exercise completion, progression of exercises, additional demonstration, and consultation the sessions were held once every week for 5 weeks. They were also instructed to perform the exercises at home every day as directed till the next telerehabilitation session.

Group B were taught the same exercises as group A and were given a home exercise program with week wise progression of the exercises illustrated for 5 weeks. Each week, a physiotherapist from the study contacted each participant by telephone for consultation and queries.

Both groups were evaluated for pain, stiffness, and physical function, pre-post-intervention using the WOMAC index.

**Results:** The percentage of difference for pain, stiffness, and physical function for group A were 53.7%, 58.94% and 50.05% respectively. On other hand for group B the percentage of differences was 31.8%, 47.78% and 26.73 % respectively.

**Conclusion:** THR via videoconferencing is better than telephonic consultation for home based exercise program in osteoarthritis of knee.

**Keywords:** Telerehabilitation; Osteoarthritis

## Introduction

When Alexander Graham Bell invented the telephone, he would never have imagined the subsequent change it would bring in the electronic media. Health care delivery systems in recent years highly dependent on the use of technology and electronic media to diagnose and treat various diseases and disorders. In the field of Physiotherapy, electronic media like force plate, computerised dynography and pulmonary function tests are being widely used for diagnosing different ailments e.g. posture and balance disorders, Gait abnormalities, obstructive and restrictive pulmonary conditions etc and its subsequent treatment [1].

Telerehabilitation is an emerging method of delivering rehabilitation services that uses technology to serve clients, clinicians, and systems by minimizing the barriers of distance, time and cost. More specifically, "telerehabilitation can be defined as the application of telecommunication, remote sensing and operation technologies, and computing technologies to assist with the provision of medical rehabilitation services at a distance"[2]. Much attention has been paid to the efficacy of telerehabilitation in efforts to decrease time and cost in the delivery of rehabilitation services. Some studies have also compared telerehabilitation services to in-person interventions to discover whether these approaches are "as good as" traditional rehabilitation approaches. However, telerehabilitation may in fact provide new opportunities that are more effective by increasing accessibility and creating the least restrictive environment [3].

Telerehabilitation was first documented in 1959, when interactive video was used at the Nebraska Psychiatric Institute in the delivery

of mental health services. Over the past 50 years, technologists and clinicians have investigated the use of bridging the gap between individuals with specialized medical needs living in remote areas and the source of specialty care [3].

Osteoarthritis can be defined as a group of overlapping distinct diseases, which may have different aetiologies but with similar biologic, morphologic and clinical outcomes. The articular cartilage degenerates with the development of fibrillation and fissures and full thickness loss of the joint surface [4]. It is estimated that by 2030, the proportion of people with OA will have risen from 20% to 30% in those aged 60 years or over [5]. Increasing life expectancy, decreasing physical activity and increasing body weight are all considered as underlying factors. OA is the most common form of arthritis and is associated with a considerable cost to the individual and to society. A World Health Organisation report identified OA as the 8<sup>th</sup> leading cause of non-fatal burden in the world in 2000, accounting for 2.6% of total years lost due to disability [6].

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People residing in rural areas of India are more susceptible to suffer from osteoarthritis of the knee, spine and hip since agriculture is their main occupation. Along with long hours of working in the fields, the domestic tasks of lifting heavy weights, squatting for long hours while cooking and milking cows further makes them prone to develop OA.

Once diagnosed with OA, the patients find it difficult to go to a specialized health care delivery unit because of the long travel hours. Furthermore loss of their daily income accentuates this problem. Thus this study was aimed to take into consideration these factors by providing telerehabilitation to the patients and assessing its effectiveness when compared to a five-week progressive home exercise program.

## Methods

One hundred and twelve patients (n = 44 males; 68 females) with osteoarthritis of the knee with mean age 51.35 year, BMI 29.6, were randomly assigned to the study. The main inclusion criterion was a diagnosis of osteoarthritis of the knee based on fulfilments of one of the following clinical criteria developed by Altman et al. [7]. 1) knee pain, age 38 years or younger, and bony enlargement; 2) knee pain, age 39 years or older, morning stiffness for more than 30 minutes, and bony enlargement; 3) knee pain, crepitus on active motion, morning stiffness for more than 30 minutes, and bony enlargement; or 4) knee pain, crepitus on active motion, morning stiffness for more than 30 minutes, and the age 38 years or older. Altman et al. [7] found these criteria to be 89% sensitive and 88% specific for osteoarthritis. Patients were excluded if they could not attend the required number of visits, had received a cortisone injection to the knee joint within the previous 30 days or had a surgical procedure on either lower extremity in the past 6 months [7]. All patients were instructed to continue taking any medications that had been initiated 30 days or more prior to enrolment in this study. All patients were asked to give written informed consent to be enrolled in the study. All the physiotherapists involved in the study were post graduates with minimum experience of five years in orthopaedic physiotherapy. After randomly allocating the patients via envelope method, physiotherapist A performed the pre evaluation of the patients in both groups. Physiotherapist B demonstrated the initial exercises to all the patients in a uniform manner by answering their queries and clearing their doubts. Physiotherapist C conducted the videoconferencing session for progression of exercises, supervision of exercise completion, additional demonstration, and consultation every week for 5 weeks for group A and was also involved in the telephonic consultation for the same parameters in group B. Both the groups were instructed to perform the exercises at home on daily basis. The exercises given to both the groups were as described by Chamberlain et al. which included flexibility, strength, endurance and active range of motion activities [8]. For videoconferencing in group A, the assessors used the Logitech camera (2 megapixel) and the Skype software with broad band internet facility of 6 mbps. The patients then engaged in a 30-min group therapy session, occurring once per week for 5 weeks, all administered by the same therapist C. For queries individual patients adjusted the camera for the therapist to consult them regarding each exercise [9].

For group B in addition to the telephonic consultation, exercise hand outs were provided for reference. The patients were made aware of the side effects and contraindications (swelling, increase joint pain) of excessive exercise and were instructed to report the same through telephone or during videoconferencing session. Both groups were evaluated for functional outcome using the WOMAC index at the end of 6 weeks. Western Ontario MacMaster (WOMAC) Osteoarthritis Index is a self administered scale consisting of 3 sections with 24

items total (5 Pain, 2 Stiffness, & 17 Physical Function (PF)). The Psychometric Properties for all three dimensions show no statistically significant difference between tests and retest scores [10]. A literature review reports estimates of test-retest reliability for the WOMAC pain sub-scale to vary between 0.77 and 0.86 [11]. Interclass correlation coefficients for the individual subscales were, Pain = 0.74; Stiffness = 0.58; PF = 0.96 [12]

## Statistical Analysis and Results

Physical function as measured by WOMAC index showed significant difference between pre and post values in both group A and B. The percentage of difference for pain, stiffness, and physical function for group A were 53.7%, 58.94% and 50.05% respectively. On other hand for group B the percentage of differences was 31.81%, 47.78 % and 26.73 % respectively (Table 1).

## Discussion

The goal of the present study was to compare the use of telerehabilitation (TR) via videoconferencing to a well-designed progressive home exercise program with weekly telephone consultation to reduce pain and improve function in patients with OA of the knee. Both the videoconferencing group (group A) and telephone consultation group (group B) experienced clinically and statistically significant improvement in self perception of pain, stiffness and functional ability.

The difference between the groups is likely to be attributed to the additional effects of visual feedback and supervision of the exercises that group A received from the physiotherapist through the telerehabilitation session every week, while group B were performing their exercises unsupervised at home with weekly telephone consultation to address questions or concerns. Also videoconferencing was less expensive, requires no extensive travel time, and provides access to premium quality care otherwise not available in a rural set up [13].

WOMAC score in present study for TRH participants averaged 54.02%; average subscale improvement were for pain, stiffness and functional disability. Most important, these changes can be compared with those in the telephone consultation group who experienced an average improvement of 35.44% for the above said parameters. These results are in agreement with systematic reviews which have concluded that exercise therapy (e.g., strengthening, stretching and functional exercises) compared with no treatment is effective for patients with knee OA [14]. A reduction of pain may result from improvement of muscle strength and this coincides with the results of O'Reilly et al. [15] and Balint and Szebenyi [16] who concluded that improved quadriceps strength is associated with less knee pain and less disability.

Hence the results of this investigation suggest that telerehabilitation using videoconferencing may be more effective than home-based

Outcome measures	Telerehabilitation Group ( a)			Telephone consultation Group (b)		
	Pre	Post	% Improvement	Pre	Post	% Improvement
WOMAC index Pain	11.4	5.35	53.07	12.1	8.25	31.81
WOMAC index Stiffness	4.75	1.95	58.94	5.65	2.95	47.78
WOMAC index Physical function	44.75	22.35	50.05	47.5	34.8	26.73

Table 1: Statistical analysis and results.

exercises supported with telephone consultation to decrease pain and stiffness and increase function for individuals with OA of the knee. Telerehabilitation is a promising service delivery model to improve access to physiotherapists for individuals in rural communities suffering from OA. Additionally, patients expressed satisfy action with their TR experience and the clinical skills of the physiotherapists during the TR sessions. A major strength of Internet-based videoconferencing is the ability to provide telehealth services to individuals in their natural environments. Additionally, voice and picture quality were adequate for telehealth purposes.

On the positive side, it is worth noting that patients could continue with their daily tasks without any loss of wages and still find an improvement in their condition. In addition physiotherapists may have improved in their communication and dialoguing with patients because they had to explain the procedures very clearly. This study demonstrates the potential to use telerehabilitation to improve access and reduce costs associated with receiving care for OA for patients living in rural communities.

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