Physiotherapy and Occupational Therapy Journal

POTJ

Indexing information: *NLM catalogue & locator plus, USA, Index Copernicus, Poland. EBSCO Publishing's Electronic Databases, USA, Academic Search Complete*, USA, *Academic Search Research & Development, USA, ProQuest, USA, Genamics JournalSeek, OCLC World Cat.*

Corresponding address
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I
Delhi - 110 091 (India)
Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205
E-mail: redflowerppl@vsnl.net
Website: www.rfppl.org

The Physiotherapy and Occupational Therapy Journal's (ISSN 0974 – 5777, Registered with Registrar of Newspapers for India: DELENG/2007/22242) on topics pertaining to physical therapy and rehabilitation. Coverage includes geriatric therapy, pain management techniques, cardiac, orthopaedic and pulmonary rehabilitation, working with stroke patients, occupational therapy techniques and much more. The editorial contents comprise research papers, treatment notes and clinical observations, case histories, professional opinion and memoirs and comments on professional issues. The Editorial Board's mission is to publish significant research which has important implications for physiotherapy and occupational therapy. Our vision is for the journal to be the pre-eminent international publication of the science and practice of physiotherapy and occupational therapy.

Readership: Physiotherapist, Occupational therapists, medical engineers, epidemiologists, family physicians, occupational health nurses etc.

Subscription Information

India

Individual (1 year): Rs.1000

Life Subscription (Valid for 10 Years): Rs.5000

Institutional (1 year): Rs.7000

Rest of the World

Individual (1 year) USD100

Insitutional (1 year) USD360

Payment methods

Bank draft / cashier s order / check / cheque / demand draft / money order should be in the name of **Red Flower Publication Pvt. Ltd.** payable at **Delhi**.

International Bank transfer / bank wire / electronic funds transfer / money remittance / money wire / telegraphic transfer / telex

1. **Complete Bank Account No.** 604320110000467
2. **Beneficiary Name (As per Bank Pass Book):** Red Flower Publication Pvt. Ltd.
3. **Address:** 41/48, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091(India)
4. **Bank & Branch Name:** Bank of India; Mayur Vihar
5. **Bank Address & Phone Number:** 13/14, Sri Balaji Shop,Pocket II, Mayur Vihar Phase- I, New Delhi - 110091 (India); Tel: 22750372, 22753401. **Email:** mayurvihar.newdelhi@bankofindia.co.in
6. **MICR Code:** 110013045
7. **Branch Code:** 6043
8. **IFSC Code:** BKID0006043 (used for RTGS and NEFT transactions)
9. **Swift Code:** BKIDINBBDOS
10. **Beneficiary Contact No. & E-mail ID:** 91-11-22754205, 45796900, E-mail: redflowerppl@vsnl.net

Online You can now renew online using our RFPPL renewal website. Visit www.rfppl.com and enter the required information and than you will be able to pay online.

Send all Orders to: **Red Flower Publication Pvt. Ltd.,** 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091(India). Phone: 91-11-22754205, 45796900, Fax: 91-11-22754205, E-mail: redflowerppl@vsnl.net, Website: www.rfppl.org.

Physiotherapy and
Occupational Therapy Journal

POTJ

April - June 2014
Volume 7, Number 2

Contents

Revised Rates for 2014 (Institutional)

Title	Freequency	Rate (Rs): India	Rate ($):ROW
Dermatology International	2	2500	280
Gastroenterology International	2	3500	360
Indian Journal of Agriculture Business	2	4500	300
Indian Journal of Anatomy	2	3200	260
Indian Journal of Ancient Medicine and Yoga	4	6600	330
Indian Journal of Anesthesia and Analgesia	2	4000	600
Indian Journal of Anthropology	2	8000	500
Indian Journal of Applied Physics	2	3500	400
Indian Journal of Biology	2	1500	170
Indian Journal of Cancer Education and Research	2	4500	500
Indian Journal of Communicable Diseases	2	1000	58
Indian Journal of Dental Education	4	3200	288
Indian Journal of Forensic Medicine and Pathology	4	12500	576
Indian Journal of Forensic Odontology	4	3200	288
Indian Journal of Genetics and Molecular Research	2	5000	262
Indian Journal of Law and Human Behavior	2	5000	500
Indian Journal of Library and Information Science	3	7500	600
Indian Journal of Maternal-Fetal & Neonatal Medicine	2	4500	400
Indian Journal of Mathematics and Statistics	2	3000	200
Indian Journal of Medical & Health Sciences	2	1800	120
Indian Journal of Obstetrics and Gynecology	2	2000	200
Indian Journal of Pathology: Research and Practice	2	3000	915
Indian Journal of Plant and Soil	2	5000	1700
Indian Journal of Preventive Medicine	2	3200	270
Indian Journal of Reproductive Science and Medicine	4	3000	180
Indian Journal of Scientific Computing and Engineering	2	3300	280
Indian Journal of Surgical Nursing	3	1800	70
Indian Journal of Trauma & Emergency Pediatrics	4	6500	302
International Journal of Agricultural & Forest Meteorology	2	8000	800
International Journal of Food, Nutrition & Dietetics	2	3200	900
International Journal of History	2	6000	500
International Journal of Neurology and Neurosurgery	2	7500	276
International Journal of Political Science	2	5000	400
International Journal of Practical Nursing	3	1500	70
International Physiology	2	4000	240
Journal of Animal Feed Science and Technology	2	3500	280
Journal of Cardiovascular Medicine and Surgery	2	5500	238
Journal of Orthopaedic Education	2	2500	190
Journal of Pharmaceutical and Medicinal Chemistry	2	3000	350
Journal of Psychiatric Nursing	3	1800	70
Journal of Social Welfare and Management	4	6600	276
Meat Science International	2	5000	500
Microbiology and Related Research	2	3800	150
New Indian Journal of Surgery	4	6500	360
Ophthalmology and Allied Sciences	2	3000	150
Otolaryngology International	2	2000	300
Pediatric Education and Research	4	3200	150
Physiotherapy and Occupational Therapy Journal	4	7000	360
Urology, Nephrology and Andrology International	2	2200	350

Terms of Supply:

1. Advance payment required by Demand Draft payable to Red Flower Publicaion Pvt. Ltd. payable at Delhi.
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 10% discount.
4. Claim must be made within six months from issue date.

Order from

Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India), Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205. E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com, Website: www.rfppl.org

Original Article

Physiotherapy and Occupational Therapy Journal
Volume 7 Number 2, April - June 2014

Prevalence of Balance Deficits in Chronic Obstructive Pulmonary Disease

Singh Pallavi*, Mitra Shambhovi, Kumar Lokender***, Sharma M. Divya******

Abstract

Background: Although primary path physiology of COPD is pulmonary but extra pulmonary manifestation like skeletal muscles dysfunction, physical capacity etc. are studied. Preliminary Evidence shows deficit in postural control in COPD. We aimed at finding out prevalence of balance deficits in chronic Obstructive pulmonary disease (COPD), little is known regarding the disordered subcomponents underlying control of balance. **Objective:** To find out the prevalence of balance deficit in patients with Chronic Obstructive Pulmonary disease. **Participants :** 100 subjects (96 male and 4 female) with COPD participated in this study. **Methods:** A observational study design was used. Subjects aged between 40-60 years were recruited for study. Balance was evaluating using the Berg Balance Scale; Timed Up and Go Test and Sit and Reach Test. Socioeconomic status was assessed by Kuppuswamy Scale. **Results:** According to Berg Balance Scale 67% had medium fall risk and 33% had low fall risk. As per Timed Up and Go Test 65% had high risk of falls. Berg Balance Scores and Timed Up and Go Test had a significant correlation (p= .000 ;p ≤ 0.05). Berg Balance Scores and Timed Up and Go Test score had significant correlation with FEV_1(r=0.195,p=0.051); (r=0.218,p=0.029). **Conclusion:** In conclusion , this study showed that a majority of Chronic Obstructive pulmonary Disease patients have balance issues.

Keywords: Chronic obstructive pulmonary disease; Berg balance scale; Timed up and go test; Sit and reach test; Kuppuswamy scale.

Introduction

Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases.[1]

Author Affilation: *Research Student, **Asstt. Professor & Research Internal Guide, MPT Cardiopulmonary, ISIC Institute of Rehabilitation Sciences, Vasant Kunj, ***Research Co Guide, Chest Physician, Sri Aurobindo Marg, Near Qutub Minar, Delhi, ****Research External Guide & In charge Physiotherapist, Vardhman Mahavir Medical College, Safdarjung, New Delhi-110029, India.

Reprint Request: Pallavi Singh, Research Student, ISIC Institute of Rehabilitation Sciences, Vasant Kunj, New Delhi-110070, India.

E-mail: pallavi.singh257@gmail.com

The prevalence rates of COPD in males varied from 2.12% to 9.4% in studies conducted in north India. The respective ranges for females are 4.3% and male is 7.0% in Delhi. The median values of these prevalence rates are 5% for males and 2.7% for females. The prevalence rate New Delhi is 8.1% for males and 4.6 % for females.[26] Thus, COPD is more common among males than females.]26,27,28,29,30]

The ability to maintain balance is critical for mobility, avoidance of falls and functional independence in daily living. Balance impairment has been associated with an increased risk of falls and emerging evidence suggest that balance may effected in COPD. The primary path physiology of COPD is pulmonary but extra pulmonary manifestation of the disease is also well studied.

Thus this study aims to find out prevalence of balance deficits in COPD patients aged between 40-60 years.

Methods

Participants

An observational design was used. All COPD patients were included who met the following: COPD diagnosed as GOLD's criteria, Age between 40-60 years, independent ambulation and independent in activity of daily living. Patients with any diagnosed musculoskeletal; neurological; psychiatric and cognitive problems, severe visual and hearing deficit and pulmonary disorder other than COPD were excluded.

Data Collection Procedure

The study was reviewed; discussed and approved by Research committee and Institutional ethical committee of LRS Institute of Tuberculosis and Respiratory diseases. Subjects were recruited from LRS Institute of Tuberculosis and Respiratory disease, from September 2012 onwards. After obtaining written consent from patients, Berg Balance Scale, Timed Up and Go Test and Sit and Reach Test was performed .

Measures

Berg Balance Scale (BBS)

The BBS was developed as a performance-oriented measure of balance in elderly individuals.[14] The BBS consists of 14 items that are scored on a scale of 0 to 4. A score of 0 is given if the participant is unable to do the task, and a score of 4 is given if the participant is able to complete the task based on the criterion that has been assigned to it.[24] The maximum total score on the test is 56. The items include simple mobility tasks (e.g. transfers, standing unsupported, sit-to-stand) and more difficult tasks (e.g., tandem standing, turning 360°, single-leg stance). Some task are rated according to the quality of the performance of the task; where as the time taken to complete the task is measured for other tasks.[24]

Timed Up and Go Test

The TUG measures the time it takes a subject to stand up from an armchair, walk a distance of 3m, turn, walk back to the chair, and sit down.[26,24]

Sit and Reach Test

The sit and reach (SR) test is a ûeld test used to measure hamstring and low back flexibility.[49]

Kuppuswamy Scale

Kuppuswamy's socioeconomic status scale has been in use as an important aid to measure Socioeconomic status of families in urban communities. The original 1976 version has been Updated by Mishra and Singh in 2003 and Kumar *et al* in 2007. The last update was done and published in public domain in 2007. The latest update; and may be applicable in the studies ongoing in 2012.

Statistical Analysis

Data Analysis

Statistical analyses were performed using SPSS (Statistical Package for Social Sciences; version 17.0 for Windows). Descriptive statistical methods were used to analyses the data. To determine correlation between two measures Spearman's correlation were used. Level of significance was set at $p < 0.05$.

Results

100 subjects participated in study. Out of 100, 96 were male and 4 were female with mean age 53 + 6.07 and 57.75 +2.8 respectively. (Table-1)

Smoking History

The smoking years of the sample is 19.95+8.20 years. Mean smoking years of male

Table 1: Demographic Detail of Subjects

Sl. No.	Demographic details	Male	Female
1-	Gender	96	4
2-	Age (yrs)	53±6.07	57.75±2.87
3-	Smoking history (yrs)	19.80±8.10	28.75±4.78

Table 2: GOLD Stages

Gold stage	Male	Female
Stage I (Mild)	0	0
Stage II (Moderate)	71	4
Stage III (Severe)	22	0
Stage IV (Very severe)	3	0

was 19.80+8.10 and that of female was 28.78+4.78. (Table-1)

GOLD Criteria

In this study 75% of the sample was in GOLD stage II (moderate); 22% in stage III (severe) and 3% in stage IV (very severe). (Table-2)

Berg Balance Scale

In this study 33% of COPD patients had low fall risk and 67% had medium fall risk. (Fig 1)

Fig 1: Berg Balance Scale

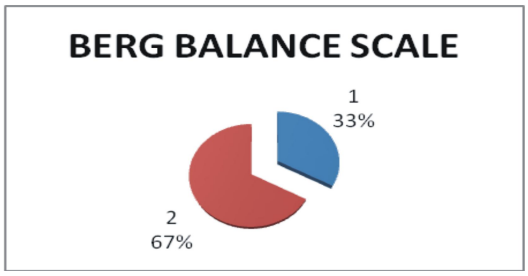


Fig 2: Timed up and Go Test

Fig 3: Sit and Reach Test

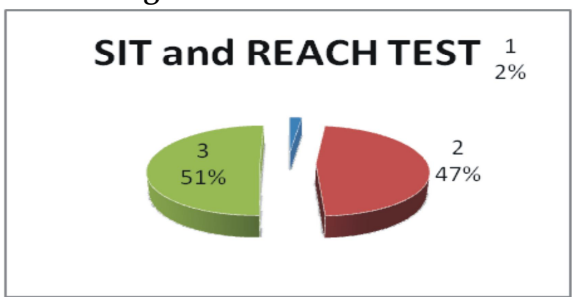
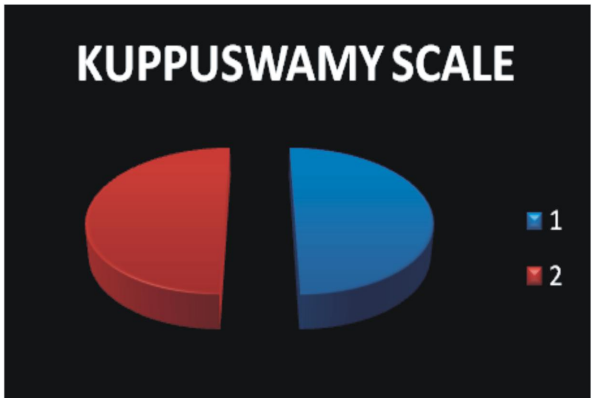


Fig 4



Timed Up and Go Test

The score of 62 % of COPD patients were more than 14 second, 3% are equal to 14 second indicate high risk of fall and 35% are less than 14 second. (Fig 2)

Sit and Reach Test

In this study 45% of COPD patients had poor flexibility, 51% had below average flexibility and 2% have average flexibility. (Fig 3)

Kuppuswamy's Socioeconomic Status

Out of 100 subjects 50% were in upper middle group and 50% were in lower middle

Table 3: Correlation of BBS

		TUGT	FEV_1%	FEV_1/FVC %	KPSWM	BMI
Berg Balance Scale	Spearman's Correlation (r)	0.457	0.195	1.25	0.061	0.004
	Significant 2-tailed Significance (p-value)	0.000	0.051	0.215	0.550	0.971

Table 4: Correlation of Timed Up and Go Test

		BBS	FEV_1 %	FEV_1 /FVC %	KPS WM	BMI
Timed Up And Go Test	Correlation (r)	0.457	0.218	0.286	0.041	0.070
	Sig. 2-tailed (p) value	0.000*	0.029*	0.004*	0.683**	0.487**

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is not significant

group.(Fig. 4)

Correlation of Berg Balance Scale with TUGT; FEV_1; FEV_1/FVC; KPSWM and BMI

Correlation of Berg Balance Scale with Timed Up and Go Test showed significant correlation (p=.000;r=.457). Correlation of BBS with FEV_1 was significant (p=.051;r=.195). Correlation with FEV_1/ FVC ; Kuppuswamy scale and with Body Mass Index were (p=.215 ;r=-1.25);(p=.550; r= -.061) and (p=.971 ; r=-.004) not significant. (Table 3)

Correlation of Timed Up and Go Test with BBS; FEV_1; FEV_1/FVC; KPSWM and BMI

Correlation of Timed Up and Go Test with Berg Balance Scale was (r=.457; p=.000) significant. Correlation of Timed Up and Go Test with FEV_1 was (p=.029; r=-.218) significant. Correlation of TUGT with FEV_1/ FVC was significant (p=.004; r=-.286). Correlation of Timed Up and Go Test with Kuppuswamy Scale and Body Mass Index were not significant (p=.683; r= -.041) and (p= .487; r=-.070). (Table 4)

Correlation of Kuppuswamy Scale TUGT with BBS;FEV_1;FEV_1/FVC;KPSWM and BMI

Correlation of Kuppuswamy Scale with Berg Balance Scale and Timed Up and Go Test (p=.550; r= -.061); (p=.683; r=-.041) which were not significant. Correlation of Kuppuswamy Scale with Body Mass Index (p=.045*; r=-.201) was significant. (Table 5)

Discussion

This study aimed at finding out the

Table 5: Correlation of Kuppuswamy Scale

		BBS	TUGT	BMI
Kuppuswamy scale	Spearman's Correlation (r)	0.061	0.041	0.201
	Significant 2-tailed Significance (p-value)	0550**	0.683**	0.045*

prevalence of balance deficit in COPD. The primary patho physiology of COPD is pulmonary but research has shown extra pulmonary manifestation of the disease also. Most commonly studied extra pulmonary manifestation of the disease.

A review article done by Marla Beauchamp concluded deficits in postural control in COPD as an impairment. The studies included in article had used clinical measures like Berg Balance Scale, Timed Up and Go Test to evaluate balance deficits in COPD.[29] In our study Berg Balance Scale scores showed that 67% of the COPD patients had moderate risk of fall and 33% had low fall risk. The results of our study is in tandem with previous studies in which scores Berg Balance Scale were reduced in COPD as compared to age matched control.[22,39] In a study done by Marla Beuchamp in 2009, Berg Balance Sore were in poor in COPD as compared to age matched controls. The study had included 39 COPD patients with a mean age of 71 years. In contrast to this study our study had included COPD patients in a age group between 40-60years to negate the effect of natural aging on balance and shown balance deficits in terms of predicted fall risk.

In our study Timed Up and Go Test showed 65% of the population took more than or equal to14 seconds to complete the test. This 65% of COPD patients are at high risk of falls .

The results of our study is similar to that obtained by Marla and Colleagues.[26]

The scores of Berg Balance Scale and Timed up and go test showed a significant positive correlation (r=0.457, p=0.000). This results paves up the evidence of existence of balance deficits in COPD.

FEV_1 denotes the amount of air exhaled in the one second . GOLD uses $FEV_{1\%}$ to classify severity of obstruction COPD is classified on basis of FEV_1 %. The scores of Berg Balance Scale and Timed Up and Go Test have showed significant correlation with FEV_1 (r=-0.195, p=0.051), (r= -0.218, p= 0.029) respectively which implies that with severity of obstruction balance deficits increase in COPD. These results imply severity of obstruction as one of the factors to influence balance in COPD.

The finding of our study strengthens the existing preliminary evidence of balance deficits, deficits in postural control and increased incidence of falls in COPD. These studies possible mechanisms for balance deficits COPD may be reduced peripheral muscle strength, slower reaction time in response to perturbation and reduced physical activity level.[37]

In our study we evaluated the effect of nutritional status on balance deficits. Nutritional status was evaluated by Body Mass Index and Socioeconomic status of the COPD patients.

Body Mass Index showed non significant correlation with Berg Balance Scale (r=-0.004, p= 0.971) and Timed Up and Go Test scores. (r= -0.070 , p=0.487) This reason may be that Body Mass Index does not delineate measurements of fat free mass.[14]

In COPD there is evidence of atrophy of peripheral muscles. Body Mass Index was not sensitive to evaluate the reduction in muscles mass ,thus could not judge the influence of nutritional status on balance deficits.

Secondly our study population was equally divided into upper and middle class group as per Kuppuswamy Scale which might not have major differences in the socioeconomic status.

This might be the reason that correlation of Kuppuswamy scale with Berg Balance Scale (r=-0.061, p=0.550) and Timed Up and Go Test (r=-0.041, p=0.683) did not show significant correlation.

Thus our study strengthen the evidence on presence of balance deficit in COPD population using clinical measures like Berg Balance Scale and Timed Up and Go Test.

Limitations of the Study

1. Age and gender matched healthy controls was not included.
2. Diagnostic tools like posturography, force plate analysis was not used to

assess balance.

3. Prospective study was not done to evaluate the occurrence of falls in the population.
4 Study population was equally divided in lower and upper middle socio economic status.

Future Research

1. Prospective study can be done to evaluate the number of falls in COPD.
2. Effect of balance training can be evaluated in Balance Deficit in COPD.

Clinical Relevance

Our study showed a prevalence of balance deficits in COPD which many a times goes undiagnosed as a part of traditional pulmonary rehabilitation. Thus the component of balance should be evaluated and be a part of rehabilitation program of COPD patients.

Conclusion

In conclusion, this study showed that a majority of Chronic Obstructive pulmonary Disease patients suffer from balance problem.

References

1. Jan Zeilinski, Klaus F Chris Van Weel . Global Strategy for the Diagnosis;Management, and Prevention of Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med.* 2007; 176: 527-528.
2. Harry R Gosker, Emiel FM Wouters, Ger J van der Vusse, and Annemie MWJ Schols. Skeletal muscle dysfunction in chronic obstructive pulmonary disease. A statement of the American Thoracic Society and European Respiratory Society. *Am J Respir Crit Care Med.* 1999; 159: S1-40.
3. Eisner MD, Yelin EH, Trupin L, Blanc PD. The influence of chronic respiratory conditions on health status and work disability. *Am J Public Health.* 2002; 92(9): 1506-1513.
4. Emil FM Wouters, MD, PhD, FCCP; Eva C Creutzberg, PhD; Annemie MWJ Schols. Systemic Effects in COPD. 2002.
5. (GOLD) . From the Global Strategy for the Diagnosis, Management and Prevention of COPD. 2011. Accessed 02/21/2012, 2012.
6. Maltais F, LeBlanc P, Jobin J, Casaburi R. Peripheral muscle dysfunction in chronic obstructive pulmonary disease. *Clin Chest Med.* 2000; 21: 665-677.
7. Wouters EF. Chronic obstructive pulmonary disease. 5: systemic effects of COPD. *Thorax*. 2002; 57(12): 1067-1070.
8. Eisner MD, Blanc PD, Yelin EH, *et al*. COPD as a systemic disease: impact on physical functional limitations. *Am J Med.* 2008; 121(9): 789-796.
9. Peter J Barnes . COPD and Asthma: Effects Beyond the Respiratory System . National Research Institute of Tuberculosis and Lung Disease, Iran. ISSN: 1735-0344. *Tanaffos.* 2012; 11(3): 9.
10. Denis EO Donell; Robert B Banett. Pathophysiology of Dyspnea in Chronic Obstructive Pulmonary Disease. *Am Thorac Soc.* 2007; 4(2): 145-168.
11. Burgel PR, Nesme –Meyer P, Chanez P, Caillaud D, Carre P, Perez T, Roche N. Cough and sputum production are associated with frequent exacerbations and hospitalizations inCOPD subjects. *Chest.* 2009; 135(4): 975-82.
12. Mahler DA. Mechanisms and measurement of dyspnea in chronic obstructive pulmonary disease. *American Thoracic Society.* 2006; 3(3): 234.
13. M Orozco-Lev. Structure and function of the respiratory muscles in patients with COPD: impairment or adaptation? *ERJ.* 2003; 22(46suppl): 41s-51s.
14. Dvaid K, McKenzie, Jane E, Simon C. Respiratory muscle function and activation inchronic obstructive pulmonary disease. *Thorax*. 2000; 55: 704-716 doi:10.1136.
15. Jan Sundquist and Sven-Erik Johansson. The influence of socioeconomic status,ethnicity and lifestyle on body mass index in a longitudinal study. *International Journal of Epidemiology.* 1998; 27: 57-63.

16. Chaout A, Naeiie, Weitzenblum E . Pulmonary hypertension in COPD. *Eur Respir J*. 2008; 32(5): 1371-85.
17. A Shujaat. Pulmonary hypertension and chronic cor pulmonale in COPD. *Int J Chron Obstruct Pulmon Dis*. 2007; 2(3): 273–282.
18. Eisner MD, Iribarren C, Blanc PD, *et al*. Development of disability in chronic obstructive pulmonary disease: beyond lung function. *Thorax*. 2011; 66(2): 108-114.
19. Troosters T, Casaburi R, Gosselink R, Decramer M. Pulmonary rehabilitation in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2005; 172(1): 19-38.
20. Lacasse Y, Martin S, Lasserson TJ, Goldstein RS. Meta-analysis of respiratory rehabilitation in chronic obstructive pulmonary disease. A Cochrane systematic review. *Eura Medicophys.* 2007; 43(4): 475-485.
21. Eisner MD, Iribarren C, Blanc PD, *et al*. Development of disability in chronic obstructive pulmonary disease: beyond lung function. *Thorax*. 2011; 66(2): 108-114.
22. Smith MD, Chang AT, Seale HE, Walsh JR, Hodges PW. Balance is impaired in people with chronic obstructive pulmonary disease. *Gait Posture*. 2010; 31(4): 456-460.
23. Butcher SJ, Meshke JM, Sheppard MS. Reductions in functional balance, coordination,and mobility measures among patients with stable chronic obstructive pulmonary disease. *J Cardiopulm Rehabil*. 2004; 24(4): 274-280.
24. Mancini M, Horak FB. The relevance of clinical balance assessment tools to differentiate balance deficits. *Eur J Phys Rehabil Med*. 2010; 46(2): 239-248.
25. Maki BE. Postural control in older adult. *Clinical Giriatric Medicine*. 1996; 12(4): 635-58.
27. Marchetti Mary, Whitney Susan. Postural control in older adult with cognitive dysfunction. *Physical Therapy Review*. 2006; 11(3): 161.
28. Maria K Beauchamp, D Brooks Roger .Deficit in postural control in COPD. *Multidisciplinary Respiratory Medicine*. 2010; 5(6): 417-421.
29. Shumway-Cook A, Woollacott M. Motor Control Translating Research into Clinical Practice, 3rd ed. Philadelphia: Lippincott Williams and Wilkins; 2007.
30. Deshpande N, Metter EJ, Lauretani F, Bandinelli S, Guralnik J, Ferrucci L. Activity restriction induced by fear of falling and objective and subjective measures of physical function: a prospective cohort study. *J Am Geriatr Soc*. 2008; 56(4): 615-620.
31. Guideline for the prevention of falls in older persons.American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopedic Surgeons Panel on Falls Prevention. *J Am Geriatric Soc*. 2001; 49: 664-672.
32. Gillespie LD, Robertson MC, Gillespie WJ, *et al*. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2009; 2: CD007146.
33. Steffen TM, Hacker TA and Mollinger L. Age- and Gender-Related Test Performance in Community-Dwelling Elderly People: Six-Minute Walk Test, Berg Balance Scale, Timed Up & Go Test, and Gait Speeds. *Physical Therapy*. 2002; 82: 128-137.
34. Sibley KM, Straus SE, Inness EL, Salbach NM, Jaglal SB. Balance assessment practices and use of standardized balance measures among Ontario physical therapists. *Phys Ther*. 2011; 91(11): 1583-1591.
35. Bueno-Cavanillas A, Padilla-Ruiz F, Jimenez-Moleon, Peinado-Alonso CA, Gálvez-Vargas R. Risk factors in falls among the elderly according to extrinsic and intrinsic precipitating causes. *Eur J Epidemiol*. 2000; 16: 849-859.
36. KJR Murthy and JG Shashtry. Economic burden of chronic obstructive pulmonary disease.
37. Celli BR, Mac Nee. Standards for the diagnosis and treatment of patients with COPD: a summary of the ATS/ERS position paper. *Eur Respir J*. 2006; 27(1): 242.
38. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. *Updated*. 2005; 3(1): 2006.
39. Lopez AD, Shibuya K, Rao C, *et al*. Chronic obstructive pulmonary disease: current burden and future projections. *Eur Respir J*. 2006; 27(2): 397-412.
40. Ailsa J McKaya, PA Maheshb, Julia Z Fordhama, Azeem Majeed C. Prevalence of

COPD in India: a systematic review. *Prim Care Respir J.* ***2012****;* 21(3): 313-21.

41. SK Jindal, AN Aggarwal and D Gupta. A Review of Population Studies from India to Estimate National Burden of Chronic Obstructive Pulmonary Disease and Its Association with Smoking. *Indian J Chest Dis Allied Sci.* 2001; 43: 139-1471.
42. G Baltaci, V Tunay, A Belser. Compraion of three different sit and reach test for measurements of flexibility in female university students. *Sports Medicine.* 2003; 37: 59-69.
43. Riddle DL and Stratford PW. Interpreting Validity Indexes for Diagnostic tests:An illustration using the Berg Balance test. *Physical Therapy*. 1999; 79: 939-948.
44. Janusz Bromboszcz (AEF), Tomasz W³och. Tests of the functional performance of patients with COPD: A proposal for the application of the Expanded Timed 'Get Up and Go Test'. *Medical Rehabilitation.* 2010; 14(1): 22-34.
45. Butcher SJ, Meshke JM, Sheppard S. Reductions in Functional Balance, Coordination, and Mobility Measures Among Patients With Stable Chronic Obstructive Pulmonary Disease. *Journal of Cardiopulmonary Medical Rehabilitation.* 2010; 14(1): 22-34. *Journal of cardiopulmonary Rehabilitation.* 2004; 24: 274–80.
46. `G Baltaci, N Un, V Tunay, A Besler, S Gerçeker. Comparison of three different sit and reach tests for measurement of hamstring flexibility in female university students. *Br J Sports Med.* 2003; 37: 59-61 .
47. Neeta Kumar, Neeru Gupta, Jugal Kishore. Kuppuswamy's socioeconomic scale: Updating income ranges for the year 2012. *Indian Journal of Public Health.* 2012; 56: 103-104.
48. Ailsa J McKaya, PA Maheshb, Julia Z Fordhama, Azeem Majeed C. Prevalence of COPD in India: a systematic review. *Prim Care Respir J.* ***2012***; 21(3): 313-21.
49. SK Jindal, AN Aggarwal and D Gupta. A Review of Population Studies from India to Estimate National Burden of Chronic Obstructive Pulmonary Disease and Its Association with Smoking. *Indian J Chest Dis Allied Sci.* 2001; 43: 139-1471.
50. G Baltaci, V Tunay, A Belser. Compraion of three different sit and reach test for measurements of flexibility in female university students. *Sports Medicine*. 2003; 37: 59-69.
51. Steffen TM, Hacker TA and Mollinger L. Age- and Gender-Related Test Performance in Community-Dwelling Elderly People: Six-Minute Walk Test,Berg Balance Scale, Timed Up & Go Test, and Gait Speeds. *Physical Therapy.* 2002; 82: 128-137.
52. Riddle DL and Stratford PW. Interpreting Validity Indexes for Diagnostic tests: An illustration using the Berg Balance test. *Physical Therapy.* 1999; 79: 939-948.
53. Janusz Bromboszcz (AEF), Tomasz W³och. Tests of the functional performance of patients with COPD: A proposal for the application of the Expanded Timed 'Get Up and Go Test'. *Medical Rehabilitation*. 2010; 14(1): 22-34.
54. Butcher SJ, Meshke JM, Sheppard S. Reductions in Functional Balance, Coordination, and Mobility Measures Among Patients With Stable Chronic Obstructive Pulmonary Disease. *Journal of Cardiopulmonary Medical Rehabilitation.* 2010; 14(1): 22-34. 2004; 24: 274–80.
55. G Baltaci, N Un, V Tunay, A Besler, S Gerçeker. Comparison of three different sit and reach tests for measurement of hamstring flexibility in female university students. *Br J Sports Med.* 2003; **37**: 59-61.
56. Neeta Kumar, Neeru Gupta, Jugal Kishore. Kuppuswamy's socioeconomic scale: Updating income ranges for the year 2012. *Indian Journal Public Health.* 2012; 56: 103-104.

Original Article

Physiotherapy and Occupational Therapy Journal
Volume 7 Number 2, April - June 2014

The Six Minute Walk Test as a Tool to Evaluate Functional Progress in Persons with Respiratory Disability

S.K. Prasad*, Divya M. Sharma**

Abstract

Chronic obstructive pulmonary disease is a widely prevalent disorder and the most common cause for respiratory impairments and disability. It is expected to rise at the fifth position as a cause of disability adjusted life year by the year 2020. Patients of COPD suffer from chronic breathlessness which limits their activities and functional capacity. The Six minute walk test is a valid and simple tool to evaluate the functional limitation and monitor progress. The aim of our study was to assess the functional progress in COPD patients undergoing a six week exercise program using the 6 MWT as a tool. 45 subjects with a history of smoking and a diagnosis of stable COPD were made to undergo a six weeks exercise program and the 6 MWT was performed before and after six weeks. The variables evaluated were the walk distance and dyspnoea ratings. There was a statistically significant increment in both the parameters after six weeks. The mean increment for walk distance was 31 meters and the dyspnoea rating improved by 0.5 and 0.7 for the baseline and completion values. These increments over a short period are positive indicators of clinical progress and signify potential scope for enhancement in the functional capacity of these eternally breathless patients.

Keywords: Chronic obstructive pulmonary disease (COPD); Respiratory disability; Functional capacity; Six minute walk test (6MWT); Six minute walk distance (6MWD); Rating of perceived exertion (RPE); Therapeutic exercises.

Introduction

Respiratory impairment refers to an alteration in lung structure or function that results in decrease or limited functional ability and is usually manifested by dyspnoea on exertion. Out of the many respiratory diseases that cause impairment chronic obstructive pulmonary disease leads the cause. The impairment ratings for persons with respiratory impairment and disability are described using the framework set forth by the American thoracic society (ATS). Chronic obstructive pulmonary disease (COPD) is a common and costly medical condition. Among adults of working age about five percent report having COPD. COPD is the fourth leading cause of death in the world[1], representing an important public health challenge that is both preventable and treatable.

COPD is a major cause of chronic morbidity and mortality throughout the world. Many persons suffer from this condition for years and die prematurely from it or its complications. World over the incidence of COPD is projected to increase in the coming years as the exposure to risk factors is increasing and also the global population is aging.[2]

The important causative factors in the etiology of COPD are smoking, air pollution and recurrent infections. These patient suffer from a chronic airflow obstruction which is also diagnostic of the disease. This is progressive in nature and not completely reversible. Chronic airflow limitation results from a combination of airway inflammation

Author Affilation: *Director, NCDS, Indira Gandhi National Open University, New Delhi, **In-charge Physiotherapy, Safdarjung Hospital and Vardhman Mahavir Medical College, New Delhi, India.

Reprint Request: Divya M. Sharma, Safdarjung Hospital and Vardhman Mahavir Medical College, New Delhi, India.

E-mail: divyamsharma21@yahoo.co.uk

increase in mucous production and repeated infections in persons who are genetically predisposed.

The symptoms of a COPD patient include cough, sputum, wheezing, and progressive dyspnoea or breathlessness. The specific form that COPD takes can range along a spectrum.[3] At one end of the spectrum people get chronic bronchitis with narrow inflamed airways filled with mucous accompanied by a chronic p cough. At the other end of the spectrum people get emphysema, which indicates the destruction of small respiratory units (alveoli and respiratory bronchioles) and the formation of large, useless airspaces in the lungs. These are called bullae.

The most common symptom of COPD is breathlessness on exertion which leads to gradual decline in physical functioning acting through a vicious cycle. A practical quick and inexpensive method of measuring the physical function is to ambulate for a given distance as it indicates the capacity of a person to undertake physical activity.[4] The six minute walk test (6 MWT) is one of the most widely used functional walk test as it is simple, practical and just requires the ability to walk.[5] The role of six minute walk test is to evaluate the functional exercise capacity which is reflective of individuals capacity to perform the activities of daily living.[6] It is a clinical evaluation method which measures the performance through a sub-maximal effort.[7]

Historical Overview

Lipkin was the first person to introduce the 6MWT as a functional exercise test in 1986. Originally, it was developed by Balke in 1963 to evaluate the functional capacity.[8] It was a modified derivation of the 12 minute walk test developed by Cooper to predict the maximum oxygen uptake.[9] Since some respiratory patients were unable to complete the 12 minute walk test due to exhaustion, the six minute walk test was developed. A recent review of functional walking tests concluded that "the 6MWT is easy to administer, better tolerated and more reflective of activities of daily living than other walk tests".[10]

Clinical Usefulness of the 6MWT

Six minutes walk test is a simple and practical test which requires only a measured feet hallway and no other exercise equipments or advanced training for technicians. Walking is an activity that is performed on a daily basis by all except the most severely impaired persons. The 6MWT measures the distance that a patient can quickly walk on a flat, hard surface in a period of six minutes. It can evaluate both the global and the integrated responses of all the systems involved during the exercise including the pulmonary and cardiovascular system, systemic circulation, peripheral circulation, blood, neuromuscular units and muscle metabolism. It does not provide the specific information on the function of each of the different organs and systems involved in exercise or the mechanism of exercise limitation as is the case with maximal cardiopulmonary exercise testing.

The self paced 6MWT assesses the sub-maximal level of functional capacity. Most patients do not achieve maximal exercise capacity during the 6MWT, instead they choose their own intensity of the exercise and are allowed to stop and rest during the test. However, since most activities of daily living are performed at a sub-maximal level of exertion, the 6MWT may better reflect on the functional exercise level of daily physical activities.

The strongest indication for six minute walk test is for measuring the response to therapeutic interventions in patients with the moderate to severe heart or lung disease. The 6MWT is also used as an one time measure of functional status of patients as well as predictor of morbidity and mortality. Studies have found a good correlation between formal cardiopulmonary exercise testing and 6MWT. A significant correlation of $r = 0.73$ was reported between 6MWT and severe lung disease.[11,12] In fact in issues pertinent to

quality of life parameters, the 6MWT is more relevant and correlates better with quality of life than does the peak oxygen uptake.[13] Also the questionnaire indices of functional status in COPD have a larger short term variability that is 22 to 33% than does the six minute walk test.[14,15,16] If we compare the 6MWT with the shuttle walking test it scores somewhat lower in the peak oxygen uptake correlations with the activities of daily living but the shuttle test has a definite disadvantage as it carries more potential for cardiovascular problems and has less validation than the 6MWT.

The main contraindications to the 6MWT are angina and myocardial infarction one month prior to testing. Its relative contraindications are a resting heart rate over 120, systolic BP more than 180 mm Hg and diastolic BP more than 100 mm Hg. The criterion for immediate termination of the test includes chest pain, intolerable dyspnoea, leg cramps, staggering, diaphoresis and pale appearance. If the test is stopped for any of these reasons the patient is made to sit or lie supine depending on the severity of the event and an assessment of the cause is made.

An interesting study was made by Turner *et al* in 2004.[17] They investigated the cardiorespiratory and dyspnoea responses to incremental and self paced exercise test in patients with COPD. The pattern of responses in heart rate and dyspnoea seen during 6MWT suggests that the patients with COPD tend to titrate exertion against dyspnoea to achieve a peak tolerable intensity. This strategy is not possible in incremental shuttle walking or cycle ergometry.

The submaximal nature and self paced aspect of the 6MWT makes it a very safe evaluation tool. Because it is relatively low intensity, it allows the assessment of many persons who would otherwise be limited by their symptoms during an evaluation of their functional status or exercise capacity. This is true in various disease states in which the 6MWT is indicated and especially true in elderly persons where physical limitation can prevent more strenuous evaluations of physical capacity. In two very large studies, thousands of patients were subjected to six minute walk test without any complications or complaints of limiting symptoms. Finally, should the complication arise, because the test is self paced the patients can stop the test at any time they feel necessary.[10]

From investigator to investigator there were slight differences in the protocols in the evolution stage. Some used a straight track (out and back type), others used a continuous circular, oval or rectangular track. The distance between the start and the end point varied between 20, 30 or 50 meters. The six minutes walk distance ranges between 400 meters to 700 meters for healthy adults. In case of patients an improvement of more than 70 meters walk was clinically important.[18]

Material and Methods

The primary objective of the study was to evaluate the difference in the distance walked by the patients before and after completing an exercise therapy program of six weeks. The secondary aim of the study was to evaluate the variance in the dyspnoea ratings before and after six weeks. For studying both the above parameters six minute walk test was used as a tool.

Design

A pre and post intervention study.

Setting

The study was conducted in the physiotherapy OPD department of Safdarjung Hospital and V. M. Medical College. The selected patients for the study were referred from the department of respiratory medicine and critical care.

Participants

Seventy subjects with stable COPD were screened for the study and enrolled after the

process of evaluating, the inclusion and the exclusion criteria. There were 25 dropouts and 45 participants completed the study over a period of six weeks.

Intervention

The patients underwent an exercise therapy program for six weeks which constituted of warm-ups, endurance, strengthening, postural and breathing exercise. All the exercises were active range of motion exercises except for strength training for which half Kg weights were used for both the lower and upper extremity. The patients were taught the exercises on a individualized training basis and in the presence of a caretaker. They were supervised in the OPD for twice a week and they followed through the program at home on a twice daily basis.

Procedure of the Test

The six minute walk test was conducted on the patients before starting the exercise therapy program and at the end of six weeks that is at the completion of the exercise therapy program. The test was performed keeping the safety issues in mind. Emergency equipments, oxygen, sublingual nitroglycerine, nebulizer, telephone and the physician were all present in the testing area. The test was performed indoors along a 30 meter long, flat, straight enclosed corridor inside the ward. The length of the corridor was marked and the distal end of the walk way and the starting point which marks the beginning and end of each lap (30 x 2 = 60 meters) was marked on the floor using a bright red colored tape. All the patients were instructed to wear light comfortable clothing and since the test was performed in the forenoon OPD time, they were also requested to have a standardized light breakfast. Before starting the test a warm up period was allowed to practice the walk and they were all demonstrated by the therapist by walking a lap herself. The patients were made to understand and rate their baseline dyspnoea using the modified Borg's scale. The timer was set to six minutes and the patients were instructed to walk starting from the red line. Standardized phrases were used to encourage the patients. After the completion of six minutes post walk dyspnoea ratings were noted along with the number of laps which were ticked on a sheet of paper.The total distance covered was noted. After completion of the test patients were thanked and offered water.

Outcome Measures

The primary outcome measure was the six minute walk distance which was measured in meters and the secondary outcome measure was the dyspnoea on exertion ratings which were measured using the modified Borg's scale. The modified Borg's scale is a visual analogue scale and the patient is asked to rate the difficulty of his/her breathing. The scale has a base of 0 which indicates no difficulty at all and a apex of 10 which signifies maximum difficulty in breathing.

Results

Our present study had 45 patients ranging from 42 years to 86 years. The percentile gender distribution was 73.34 males and 26.66 females. 81 percent of the patients belonged to lower socio economic group according to Kuppuswamy scale. All the persons were smokers and 86% reported bidi smoking and only 14% were cigarette smokers (Fig. 1).

Our results demonstrate an increment in the six minute walk distance over a period of six weeks. The means of the scores were 207 ± 60.41 meters at the baseline and 237.91 ± 69.76 meters after the completion of six weeks exercise program (Fig. 2).

Improvements were also noted in the scores of perceived exertion. The mean of modified Borg's scale score for the pre six minute walk test was 3.71 ± 1.12 at the baseline and 3.36 ± 1.26 after six weeks ($p = 0.005$). For the post six minute walk test the scores were 6.42 ± 1.26 at the baseline and 6.05 ± 1.38 after six weeks ($p = 0.005$). This improvement of minus

Figure 1: Demographic Profile of the Patients

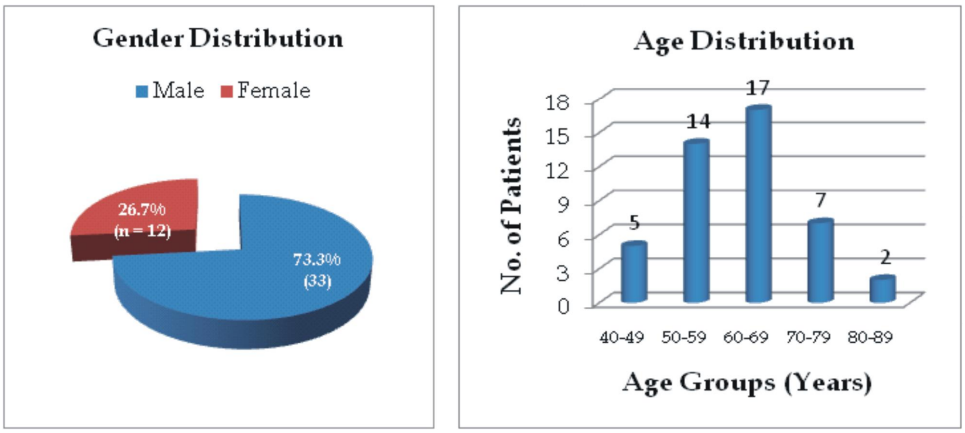


Figure 2: Comparison of Distance Walked (6-MWD)

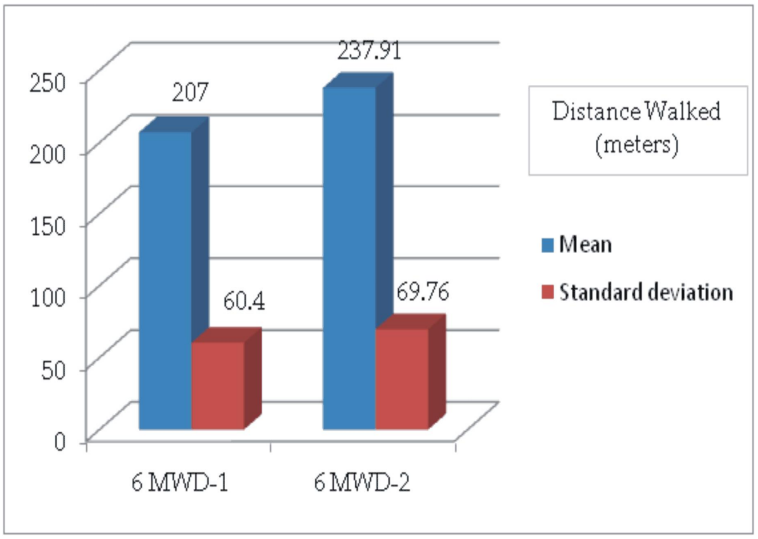
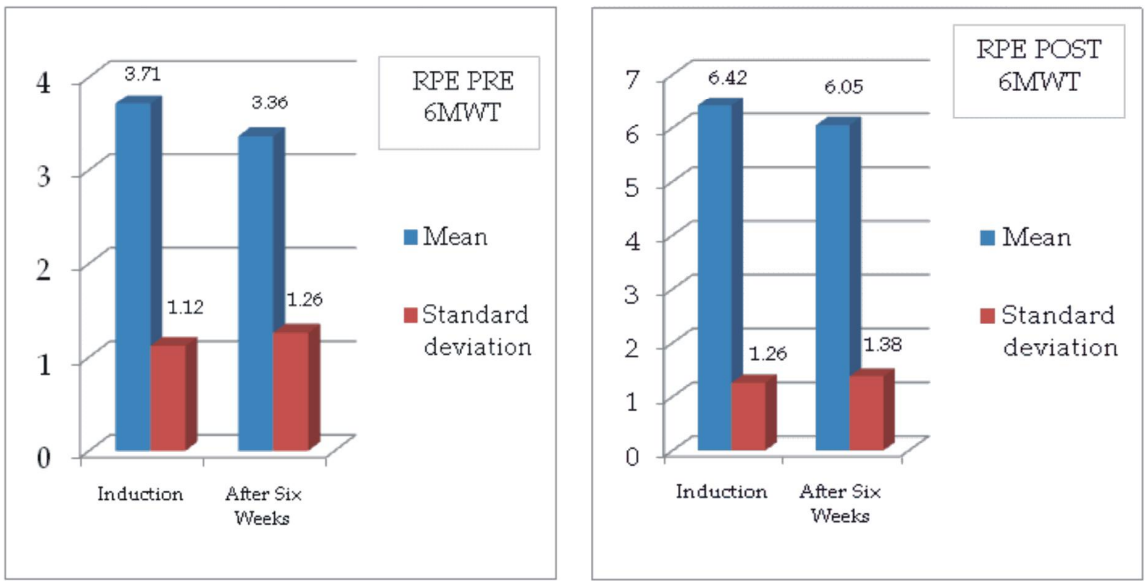


Figure 3: Comparison of Rating of Perceived Exertion Scores



0.35 in the pre six minute walk test values and minus 0.37 in the post six minute walk test values is statistically significant (Fig. 3).

Discussion

The results of our present study indicate that the exercise capacity and dyspnoea perception, both improve after a six week exercise program. This supports the experimental hypothesis. The 6MWT is a simple and useful measure of functional capacity which is reflected by its main measurements of distance walked and ratings of perceived exertion. 6MWT was performed using the guidelines issued by American Thoracic society in 2002. For the Six minute walk distance our results are comparable to Gold Stein *et al* (1994) who also demonstrated a significant improvement of 37.9 meters. Barakat *et al*[19] showed an improvement of 54 meters but their incorporated exercise program was for a duration of 14 weeks. Singh *et al* (2003) in their study of 40 stable subjects showed an improvement of 54 meters over a period of 4 weeks. A probable explanation could be the homogeneous profile of stable COPD while selection. In contrast, our subjects were referred from the department of respiratory medicine and had a few subjects who were sub acute in nature and were recently admitted for an exacerbation.

It is proposed that exercises improve the functional capacity in part by reducing the systemic oxidative stress, changing the ventilatory capacity and improving the respiratory pattern. Regular exercising is also associated with the phenomenon of desensitization to dyspnoea. Recently in a Korean study Sung Soon Lee *et al*[20] demonstrated a significant improvement of 48.8 meters ($p = 0.0017$) after 12 weeks of home-based program. For the dyspnoea indices our finding are comparable to Kirsten and Barakat *et al* who demonstrated a decline of 1.2. They proposed that the reduction in dyspnoea is due to reduced ventilatory requirements at an identical work rate and identical oxygen consumption.

Conclusion

The results obtained from our study suggest that there is a significant increment in the functional capacity and also an improvement in the dyspnoea ratings in the subjects who underwent a supervised six week exercise therapy program. The parameters were evaluated by utilizing the six minute walk test which worked out to be a simple, inexpensive and quick method to assess the extent of clinical improvement in functional capacity in the persons who underwent an individualised respiratory rehabilitation program. Its use in clinical settings and research themes is recommended from our side.

References

1. GOLD: Update 2013.
2. Loez AD, Shiburya K, Rao C. COPD: Current burden and future projections.
3. Harry R Gosker, Emiel FM Wouters, Ger J Vander Versse and Annemic MWJ Schols. Skeletal muscle dysfunction in COPD. A statement of the American Thoracic Society and European Thoracic Society. *Am J Respir Crit Care Med*. 1999; 159: S1-40.
4. Enright PL, Sherril DL. Reference equations for the six minute walk test in healthy adults. *Am J Crit Care Med*. 1998; 158: 1384-1387.
5. Shivranjini S, Vanamail P, Eason J, 6MWT in people with tuberculosis sequel. *Cardiopulm Phys Ther J*. 2010; 21(3): 5-10.
6. Pitta F, Troosters T, Spruit MA, Probst VS, Deramer M, Gosselink R. Characteristics of physical activities in daily life in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med*. 2005; 171: 972-977.
7. Evanirso S, Aquino, Flavio AG Mourao, Roberta KV, Souza, Braulio M, Gliçirio, Cristian C Coelho. Comparative analysis of the 6MWT in healthy children and adolescents. *Rev Bras Fisioster, Sao Carlos*. 2010; 14: 75-80.

8. Balke B. A simple field test for the assessment of physical fitness. *Rep Cir Aeromed Res Inst US*. 1963; 53: 1-8.
9. Cooper KH. A means of assessing maximal oxygen uptake: correlation between field and treadmill testing. *JAMA*. 1968; 203: 20-204.
10. ATS statement guidelines for the 6MWT. *Am J Respir and Crit Care Med*. 2002; 166: 111-117.
11. Butland RJA, Pang J, Gross ER, Woodcook AA, Geddes DM. Two, six and twelve minute walking tests in respiratory disease. *BMJ*. 1982; 284: 1607-1608.
12. Solway S, Brooks D, Lacasse Y, Thomas S. A qualitative systemic overview of the measurement properties of functional walk tests used in the cardiorespiratory domain. *Chest*. 2001; 119(1): 256-270.
13. Weisman IM, Zeballas RJ. An integrated approach to the interpretation of cardiopulmonary testing. *Clin Chest Med*. 1994; 15: 421-445.
14. Guyatt GH, Townsend M, Keller J, Singer J, Nogradi S. Measuring functional status in chronic lung disease. Conclusions from a random control trial. *Respir Med*. 1991; 85(Suppl B): 17-21.
15. Niederman MS, Clemente PH, Fein AM, Feinsilver SH, Robinson DA, Ilowite JS, Bernstein MG. Benefits of a multidisciplinary pulmonary rehabilitation program: improvements are independent of lung function. *Chest*. 1991; 99: 798-804.
16. Noseda A, Carpiaux J, Prigogine T, Schmerber J. Lung function, maximum and submaximum exercise testing in COPD patients. Reproducibility over a Long Interval. *Lung*. 1989; 167: 247-257.
17. Turner SE, Eastwood PR et al. Physiological responses to incremental and self paced exercises in COPD: A comparison of their tests. *Chest*. 2004; 126(3): 766-73.
18. Redelmeir DA, Vayoumi AM, Goldstein RS, Guyatt GH. Interpreting small differences in functional status. The six minute walk test in chronic lung disease patients. *Am J Respir Crit Care Med*. 1997; 155(4): 1278-1282.
19. Barakat S, Michel G, George P, Nicol V, Guy A. A out-patient pulmonary rehabilitation in patients with COPD. *Int J Chron Obstruct Pulmon Dis*. 2008; 15: 155-162.
20. Sung Soon Lee, Chang Wan Kim. Effects of home based pulmonary rehabilitation with a metronome guided walking pace in COPD. *J Korean Med Sci*. 2013; 28(5): 738-743.

BOOKS FOR SALE

CHILD INTELLIGENCE

By **Dr. Rajesh Shukla**

ISBN: 81-901846-1-X, Pb, vi+141 Pages

Price: Rs.150/-, US$50/-

Published by **World Informations Syndicate**

This century will be the century of the brain. Intelligence will define success of individuals; it remains the main ingredient of success. Developed and used properly, intelligence of an individual takes him to greater heights. Ask yourself, is your child intelligent! If yes, is he or she utilizing the capacity as well as he can? I believe majority of people, up to 80% may not be using their brain to best potential. Once a substantial part of life has passed, effective use of this human faculty cannot take one very far. So, parents need to know how does their child grow and how he becomes intelligent in due course of time. As the pressure for intelligence increases, the child is asked to perform in different aspects of life equally well. At times, it may be counter-productive. Facts about various facets of intelligence are given here. Other topics like emotional intelligence, delayed development, retardation, vaccines, advice to parents and attitude have also been discussed in a nutshell. The aim of this book is to help the child reach the best intellectual capacity. I think if the book turns even one individual into a user of his best intelligence potential, it is a success.

PEDIATRICS COMPANION

By Dr. Rajesh Shukla

ISBN: 81-901846-0-1, Hb, VIII+392 Pages

Price: Rs.250/-, US$50

Published by **World Informations Syndicate**

This book has been addressed to young doctors who take care of children, such as postgraduate students, junior doctors working in various capacities in Pediatrics and private practitioners. Standard Pediatric practices as well as diseases have been described in a nutshell. List of causes, differential diagnosis and tips for examination have been given to help examination-going students revise it quickly. Parent guidance techniques, vaccination and food have been included for private practitioners and family physicians that see a large child population in our country. Parents can have some understanding of how the doctors will try to manage a particular condition in a child systematically. A list of commonly used pediatric drugs and dosage is also given. Some views on controversies in Pediatrics have also been included. Few important techniques have been described which include procedures like endotracheal intubations, collecting blood samples and ventilation. I hope this book helps young doctors serve children better.

Order from

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.org, redflowerppl@vsnl.net

Review Article

Physiotherapy and Occupational Therapy Journal
Volume 7 Number 2, April - June 2014

Effect of Balance Training on Foam Platform in Geriatric Population

Sanjai Kumar*, Meenu Singh, Avikirna Pandey*** Shivanjali Shrivastava******

Abstract

Objective: The study was done to find out the "Effects of Balance Training on Foam Platform in Geriatric Population". **Methods**: The study was of control design, with 30 subjects, 15 subjects in each, according to the inclusion and exclusion criteria, from Old Age Home, Jai Physiotherapy and Dental Clinic, Residential Care Centre and Physiotherapy O.P.D. of CSS Hospital, Meerut. These subjects were than conveniently divided into 2 groups,(Group A and Group B), Group A consisting of 15 subjects (7 males and 8 females) received the balance training on foam platform, Group B also consisting of 15 subjects (6 males and 9 females) received same balance training on floor. Demographic details of subjects, sex, age, height, and weight was collected following Berg Balance Scale (BBS), Functional Reach Test (FRT). After assessing the initial balance scores, the balance training on foam platform for group A and same balance training on floor, were given for a period of four weeks for each subject in 3 days a week approximately for 30 minutes. Both the groups were assessed on the above mentioned balance scales after four weeks of exercises. The collected data was of mean and standard deviation and has been analyzed using SPSS software. The t-test was used to analyze the difference in the balance improvements in Group A and Group B. Intra group analysis between pre-intervention and post-intervention scores was also done for both the groups. **Results:** The results of my study showed that there is a significant improvements in balance control after receiving short term balance training program that specifically emphasize for experimental group i.e. Group (A). Several balance specific exercises à shifting their body weight from foot to foot, standing on one foot, and standing with the feet in a series of positions, including side by side, and heel to toe, while standing on foam pad. On comparing the BBS at day 30 of group A (mean = 55.26, SD = .96) and of Group B (mean = 52.26, SD = 2.91) and its corresponding P value (0.001) is significant. So, it showed that there is a significant improvement in Group A.

Keywords: Balance; Berg Balance Scale (BBS); Functional Reach Test (FRT); Foam Platform.

Introduction

According to WHO (World Health Organization) those, "aged 60-74 years as geriatric and those older as aged". The elderly are the fastest growing segment of our population. In the coming years, it will become essential for more health care professionals to develop clinical expertise in evaluating and treating the unique health concerns of this group.[1] The ability to maintain balance is essential to nearly all activities associated with daily living. The balance system enables us to sense where we are in space and to maintain our posture and equilibrium while we are still and while we are in movement.[2]

Geriatric people show a decline in ability to maintain balance when faced with the perturbations imposed by functional requirements such as dividing attention between task as is needed to keep balance when walking in a crowd.[3] Balance disturbances frequently cause elderly people to seek medical advice on admission to

Author Affilation: *Assistant Professor, Subharti College of Physiotherapy, Meerut, **Senior Consultant, Jai Physiotherapy and Dental Clinic, SF-06, Ansal Galleria, Ansal Town, Meerut, ***Assistant Professor, ****Assistant Professor, Subharti College of Physiotherapy, Meerut, Uttar Pradesh, India.

Reprint Request: Dr. Sanjai Kumar, Assistant Professor, Subharti College of Physiotherapy, Meerut, Uttar Pradesh, India.

E-mail: kumarsanjai40@yahoo.com

hospital and residential homes.[4] Many cases of the fall in the elderly is a result of inadequate control of balance. Falling has been associated with an increase in morbidity and mortality rate in elderly population.[5] One third of community residing adults aged 65 years and older suffer a fall each year.[6]

Falls are common and serious problem among older – causing, injury, mortality and declines in mobility.[7] A person who falls or almost falls could become fearful or anxious about subsequent falls and serious injury and associated potential consequences. It results in loss of confidence, restriction of activities, social isolation and increased dependence on others.[8] An older person with reduced physical activity after a past fall could subsequently become deconditioned and weak, develop increased joint stiffness and become less attentive on leads to more falls and further mobility restriction.[9]

Identification of significant risk factors is an important step towards fall prevention. Several studies have been performed among both home living and institutionalized population to define risk factors associated with fall. These risk factors have included both patient related or intrinsic factors and extrinsic factors. Intrinsic factors that increase the probability of an individual falling include components such as advanced age, specific disease, muscle weakness, gait disorders[9-11], Extrinsic factors are those environmental hazards that present the opportunity for the occurrence of a fall by an individual such as inadequate lighting or a slippery walking surface.[10-11]

Balance control is the manifestation of concerned interaction between the neuromusculoskeletal, visual, vestibular and proprioceptive information concerning body position, appropriate biomechanical alignment, sufficient muscle strength, and quick, coordinated muscle activation patterns. Impairment in any of these domains will reduce an individual's ability to balance the multiple links of the musculoskeletal system while standing or during ambulating.[12] As age increase the influence of these systems deteriorates, resulting in an increased susceptibility to falling.[14]

Efforts to reduce the risk and incidence of falls in older adults are plentiful as evidenced by intervention studies which have appeared in the literature with in the last 2 decades detailing various exercise interventions intended to reduce falls.[15-16] Exercise is effective in lowering falling risk in among elderly.[17-18]

Nelson and Amin reported that 10% - 25% of falls are associated by abnormalities in gait and balance. Thus balance training interventions have an important role in fall prevention. These interventions have emphasized a variety of exercise modes including resistance training[16] flexibility exercises[19] many of this interventions have focused too heavily on simple maneuvers that are easier to quantify but that may not address adequately the varied needs of different individuals.

Aims and Objectives

The study was done to find out the "Effects of Balance Training on Foam Platform in Geriatric Population".

However, because many different types of studies were studied, it was impossible to determine which type was most effective. Keeping this in mind this study was designed with the purpose of improving balance in geriatric population while using foam platform.

Berg Balance Scale[20-21] and the Functional Reach Test[22-23] are used to assess the outcome interventions. The reliability and validity of these scales have been established.

Berg Balance Scale: Berg Balance Scale is an objective measure of static and dynamic balance abilities, this ordinal scale evaluates patient performance on 14 tasks commonly performed in daily life.[18-19]

Functional Reach Test: Functional Reach Test

is defined as the maximal distance one can reach forward beyond arm length while maintaining a fixed base of support in the standing position.[20-21]

Foam Platform Exercise: These exercises improve balance in elderly. These exercises provide subtle changes in balance similar to the challenges experienced in everyday life and they allow the body to learn how to make appropriate responses to maintain balance while standing still.

Operational Definitions

Balance

Balance is a complex process involving the reception and integration of sensory inputs, and the planning and execution of movement, to achieve a goal requiring upright posture. It is the ability to control centre of gravity (COG) over the base of support in a given sensory environment.[24-25]

Hypothesis

Null Hypothesis: There will be no difference in balance in geriatric population after giving balance training on foam platform.

Alternative Hypothesis: There will be significant improvement in balance in geriatric population after giving balance training on foam platform.

Limitation of the Study: A small sample size was one of the major limitations of the study. Also, most the participants belonged to the same community and were leading an active lifestyle. Thus, results obtained cannot be generalized for all population types.

Inclusion Criteria

Age 60- 75 years.

Exclusion Criteria

a. Any Neurological disease – stroke, hemiplegia.
b. Any acute Musculoskeletal injury
c. Acute Congestive heart failure
d. Severe visual deficit.
e. Any cognitive impairment
f. Sensory impairment

Design

An experimental design study. Pre test and post test match subject design.

Instrument and special testing tools:

1. Foam pad – 16"x 9" x2"
2. Berg balance scale
3. Functional test
4. Standard measuring tape

Material Used

Chair of 46 cm. of seating height and a ball.

Protocol

A sample of convenience of 30 older adults took part in this study. These subjects were than conveniently divided into 2 groups, Group A consisting of 15 subjects received balance training on foam platform, Group B also consisting of 15 subjects received same balance training on floor. Demographic details of subjects, sex, age, height, and weight was collected following Berg Balance Scale (BBS) & Functional Reach Test (FRT). After assessing the initial balance scores, the balance training on foam platform for Group A and same balance training on floor for Group B, were given for a period of four weeks for each subject in 3 days a week approximately for 30 minutes. Both the groups were assessed on the above mentioned balance scales after four weeks of exercises.

Procedure

The subjects were invited to participate in the study. A detailed explanation of the procedure was given after which the subjects on informed consent. The subjects were assessed on the two balance scales. The Berg

Fig 3.1: The Subject is Practicing to Semi Tandem Position

Balance Scale (BBS) and the functional reach test (FRT). Subjects of Groups A received the balance training on foam platform, which consists of — Flexibility exercise (3 to 5 repetitions 30 sec. hold)

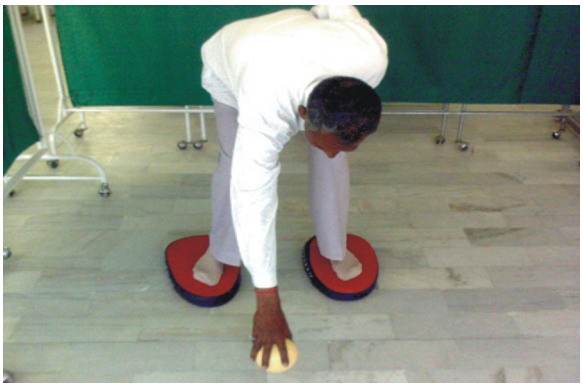
- Hamstring stretch
- Calves stretch
- Quadriceps stretch

The Balance exercises start with placing the feet in a series of positions that gradually reduce the base of support, holding the stance for 10-30 seconds.

- Semi tandem - Stand on foam with one foot in front of the other in semi tandem position.

Fig 3.2: The Subject is Practicing of Stepping in Different Direction

Fig 3.3: The Subject is Picking up an Object from the Floor



- Full tandem – Stand on foam with heel of one foot directly in front of the toes of the other foot.
- Standing up on toes on the foam pad.
- Standing on one foot on foam pad.

Gradually, additional exercise that to the following are introduced.

Add dynamic movements to perturb the center of gravity, such as:

- Leaning or stepping in different direction on foam pad.
- Reaching
- Picking up on object on from the floor on standing on foam pad.
- Five minutes of cool down and relaxation activities.

Breathing exercises for relaxation.

Fig 3.4: The Subject is Performing one of the 14 Items of Berg Balance Scale

Fig 3.5: The Subject is Performing one of the 14 Items of Berg Balance Scale

Subjects of Group B received the same balance training on floor.

Berg Balance Scale

Berg Balance Scale is an objective measure of static and dynamic balance abilities. The scale consists of 14 items that are scored from 0 to 4, where 0 indicates an inability to perform the task and 4 indicates that the tasks were performed correctly and independently. The maximum score of the test is 56. The items range from sitting to standing, standing unsupported, sitting with back unsupported on the floor or on the stool, transfers, standing unsupported eyes closed, standing unsupported with feet together, reaching forward with outstretched arm while standing, picking up an object from the floor in standing position, turning to look behind

Fig 3.6: The Subject is Performing Functional Reach Test

Table 5.1: Mean and SD of Age and Sex of Group A and Group B

	Age (mean ± SD)	No. of male / female	Height	Weight
Group A	68.0 ± 3.92	Male – 7 Female – 8	159.0 ± 7.9	63.8 ± 10.1
Group B	70.5 ± 4.17	Male – 6 Female – 9	159.3 ± 7.0	63.4 ± 6.9

over the left and right shoulders while standing, turning 360°, placing alternate foot on step or stool while standing unsupported with one foot in front and standing on one leg. Scores obtained during the assessment were used in data analysis.

Data Analysis

Statistics were performed using SPSS software. A student's t-test was used to analyze the difference in the balance improvements in Group A and Group B. Intra group analysis between pre-intervention and post – intervention scores was also done for both the groups. A significance level of $p < .05$ was fixed.

Results

The results of the data analysis of the two intervention group scores on the two balance measures.

The group receiving balance training on foam platform (Group A) consisted of 7 males and 8 females with a mean age of 68.6 + 3.92 years while the group B receiving balance training on floor consisted of 6 males and 9 females with a mean age of 78.0 + 4.17. Both

Fig 5.1: Illustrates Mean and S.D. of F.R.T. & B.B.S.

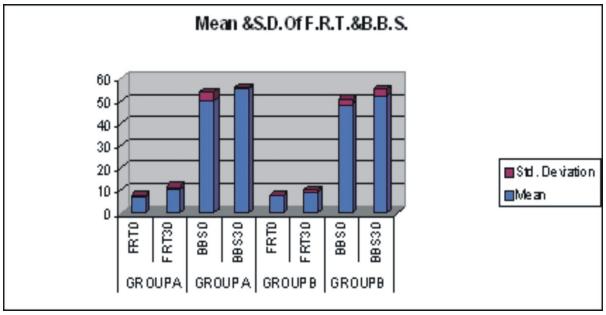
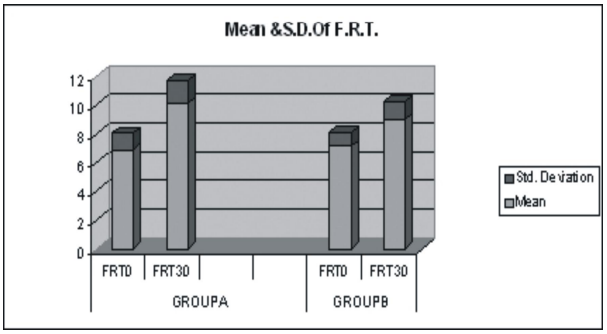


Table 5.2: Within Group Analysis for FRT

	FRT 0 (Mean ± SD , N= 15)	FRT 30 (Mean ± SD , N= 30)	T_0 test t	P
Group A	6.9 ± 1.2	10.2 ± 1.5	15.8	.000
Group B	7.13 + 1.0	9.0 + 1.3	5.5	.000

Fig 5.2: Illustrates Mean and S.D. of F.R.T.



the groups were matched in terms of age, height and weight.

A student's t-test was used to compare the performance of subjects of Group A and B on Functional Reach Test (FRT) and Berg Balance Scale (BBS) prior to the intervention programme

Table 5.1 is illustrates in Group A (mean age = 68.0, SD = 3.92) and in Group B (mean age = 70.5, SD = 7.17) and no. of male were 7 and female were 8 in Group A and in Group B no. of males were 6 and no. of females were 9.

The mean height of Group A was 159.0 + 7.9 and mean height of Group B was 159.3 +

Table 5.3: Within Group Analysis for Berg Balance Scale

	BBS 0 (Mean ± SD , N= 15)	BBS 30 (Mean ± SD , N= 30)	T_0 test t	P
Group A	49.9 ± 3.9	55.2 ± 1.0	6.6	.000
Group B	48.4 + 2.6	52.2 + 2.9	6.6	.000

Fig 5.3: Illustrates Mean and S.D. of B.B.S.

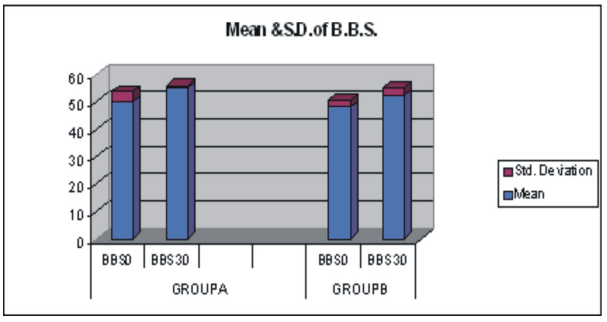


Table 5.4: Between Group Analysis for FRT and BBS

	Group A (Mean ± SD , N= 15)	Group B (Mean ± SD , N= 15)	T_0 test t	P
FRT 0	6.93 ± 1.16	7.13 ± .99	.50	.02
FRT 30	10.2 + 1.52	9.0 + 1.25	2.3	.61
BBS 0	49.9 ± 3.91	48.4 ± 2.64	1.25	.21
BBS 30	55.26 + .96	52.26 + 2.91	3.78	.001

7.0 and mean weight of Group A was 63.8 + 10.1 and mean weight of Group B was 63.4 + 6.9.

This shows that both Groups were matched in terms of age, sex, height and weight.

Table 5.2 illustrates that in experimental Group A Functional Reach Test (FRT) at day 0 was 6.9 + 1.2 and FRT at day 30 was 10.2 + 1.5 with a t value of 15.8 and p = .000

In the control Group B, FRT at day 0 was 7.13 + 1 and FRT at day 30 was 9 + 1.3 with a t value of 5.5 and p = .000. So both in Group A and Group B, FRT there is significant improvement.

Table 5.3 illustrates that in experimental group A Berg Balance Scale (BBS) at day 0 was 49.9 + 3.9 and BBS at day 30 was 55.2 + 1 with a t value of 6.6 and p = .000

In the control group BBS at day 0 was 48.4 + 2.6 and day 30 was 52.2 + 2.9 with a t value of 6.6 and p = .000

So, both in Group A and Group B, BBS, there is significant improvement.

Table 5.4 illustrates that on comparing the FRT at day 30 of Group A (mean = 10.2, SD = 1.52) and Group B (mean = 9.0, SD = 1.25) and its corresponding P value (.61) is significant. So, it shows that there is significant improvement in group A.

On comparing the BBS at day 30 of Group A (mean = 55.26, SD = .96) and of Group B (mean = 52.26, SD = 2.91) and its corresponding P value (0.001) is significant. So, it shows that there is significant improvement in group A.

*P < 0.05 , P < 0.001 Significant.By applying student 't' test, at 5% and 1% level of significance, A significant difference was observed for FRT 30 and BBS 30 between the

two Groups i.e. $P < 0.05$, $P < 0.001$.

Discussion

This chapter deals with the discussion of the results, future research and its clinical implication.

The study has proved to improve balance while giving balance training on foam platform in geriatric.

As age increases there is deterioration of the physiologic systems controlling balance resulting in an increased susceptibility to falling.

Efforts to reduce the risk and incidence of falls in older adults are plentiful, as evidenced by intervention studies which have appeared in the literature within the last 2 decades detailing various exercise interventions intended to reduce falls.

The obvious importance of being able to improve balance has resulted in a number of balance intervention studies. Which initially focused on task specific exercises and every day activities such as getting in an out of a chair, or stepping up and from one level to another (Harada *et al*, 1995, Judge, 2003; Lord *et al*, 2003, Nelson *et al*, 2004, Nitz and Choy, 2004, Steadman *et al*, 2003). These studies demonstrated that balance could be improved greatly, especially in rehabilitation and nursing home environments. Researchers than began to examine the effects of task specific exercise in combination to strength training (Binder *et al*, 2002; Harada *et al*, 1995, Shaw and snow, 1998). They found that not only did the combination of the two exercises improve balance, but strength training along also improved balance (Barrett and Smerdely, 2002, Becker *et al*, 2003, Brill *et al*, 1998).

The findings of my study show that significant improvements in balance control can be realized following this short term balance training program that specifically emphasises. Several balance specific exercises à shifting their body weight from foot to foot, standing on one foot, and standing with the feet in a series of positions, including side by side, and heel to toe, while standing on foam pad.

These exercises provide subtle changes in balance similar to the challenges experienced in every day life and they allow the body to learn how to make appropriate response to maintain balance while standing still.

As a result of intervention program, limits of stability improved. This could have resulted in more efficient movement in the improved functional ability to balance.

James, W. Bellew has shown effect of balance training (Medial – lateral and anterior posterior movement and bilateral partial squats (while standing on semi compressible foam roller devices in older women. He observed significant increase in balance trained Groups.

Based on the findings of the FICSIT study and others, the specific inclusion of balance activities is warranted in exercise interventions with goals of improving balance. However, many programs reported in the literature are of significantly greater duration and frequent and require more specialized equipment, staff and facilities than the program reported in this study. Because of these traits, many balance programs may not be available to those who benefit from such activities.

The need for a simplistic, concise, short term balance training program that provide improvement in control of balance in elderly while at same time minimizing frequency, duration and expense.

This balance training program is short term, could be performed independently and requires no expensive equipment. This program provides a simple effective and enjoyable opportunity for elderly to participate in exercises that are promising in terms of preventing falls and keeping elderly more active for a longer period of time.

Clinical Implications

These data suggest that the balance training on foam platform is more effective in

improving balance in geriatric population as compared to the balance training on floor. This helps us to choose a better balance training program in geriatric population above 60 years in order to improve balance significantly even in a short time duration.

The ultimate effect of this study is to improve balance with the aim of reducing injurious falls in elderly population.

Future Research

This study was conducted for a short period only. Future research involving a longer time period and comparing the effects of the two intervention programs is possible. Also the research can be oriented towards finding out the reduction in falls following balance training in either group. This can be done by maintaining a follow up for few months to years. This study uses only a small sample of subjects. The relevance of this study can be increased by taking a larger sample of subjects.

Conclusion

This study thus concludes that although both balance training on floor and balance training on foam platform show significant improvement. On balance outcome scales, the subjects who participated in the balance training on foam platform showed a significantly improvement in balance as compared to Group B. Thus, concluding that balance training on foam platform is superior to balance training on floor.

References

1. Bloem BR, Valkenburg VV, Slabbekoom M, Willemsen. The multiple tasks test development and normal strategies. *Gait Posture.* 2; 14: 191-202.
2. Worlfson L, Whipple R, Berby CA, Amerman P, Murphy T, Topin JN and Nashnor L. A dynamic posturography study of balance in healthy elderly. *Neurology*. 1992; 42: 2069-2075.
3. John D Lloyd, CPE, Clifford M Gross. Biomechanical assessment and stress test of dynamic postural sway to preduct falls in healthy elderly.
4. Community based exercise programs To improve balance and prevent falls in older adults (By Bichael E Rogers).
5. American Geriatrics society , Brithsh Geriatrics Society and American Academy of Orthopady.
6. Kevin M Means, MD, Patricid S O' Sollivan. Psychosocial effects on an exercise program in older persons who fall.
7. Bio mechanical assessment and stress test of bynemn postural sway to predict falls in healthy elderly. Part 1 Review of hristophe by John D Llyd CPE,
8. Effects of a short term dynamic balance training. Programme balance in healthy older woman.
9. Duncan PW, Weiner DK, Chandler J, Studenskl S. Funcational reach: A new clinical measures of balance.
10. Gardner MM, Robertson MG, Compbell AJ. Exercise in preventing falls and fall related injuries in older people: A review of hristophe controlled trials. *BR J Sports Med.* 2000; 34: 7-17.
11. Komogata S, Netwton K. The effectiveness of Tai Chai on improving balance in older adults: An evidence review. *J Geriatricf Phy Ther*. 2003; 26(2): 9-16.
12. *The Journal on Active Aging*. September. October 2003.
13. Judge Jo, Lindsey C, Underwood M, Winsemi US. D balance improvement in older women. Effects of exercise training. *Phys Ther*. 1993; 73: 254-265.
14. Nashnor L. Evaluation of postural stability , movements and control . In hassaon S (ed.) clinical exercise physiology, Christopher, CV. Mosby; 1994.
15. Daray A umphred alaxandira, VA, American Physical Therapy association, 1990. IV edition.
16. Tinetti *et al*. 1988 simpson and forester 193. Fiatarone et al 1999.
17. Light KE. Information processing for motor performance in aging adults. *Phys Ther*. 1990; 70: 820-826.
18. Martin Kessler. Neurologic Intervention or physical therapist Assistants.

19. Brown AP. Reducing falls in elderly people: A review of exercise intervention. *Physiother Therpay Pract.* 1999; 15: 59-68.
20. Nevitt MC. Fall in the elderly; risk factors and prevention. In: Masdue JC, Sudar Sky L, Wolfson L, eds. Gait disorders of aging. Falls and hristopher strategic. Philadelphia: Lippincott Ravan; 1997, 13-35.
21. Robbin's AS, Rubenstein LZ, Josephson KR *et al*. Predict of falls among elderly people results of two hristophe based studies. *Arch Internmed.* 1989; 149: 1628-1633.
22. Rubenstein LZ, Josephon KR of Robbins AS. Falls in the nursing home. *Ann Intern Med*. 1994; 121: 442-45.
23. Tinetti, ME, Williams TF, Mayruski, R. Falls risk index for elderly patients based on number of chronic disabilities. *Am J Med.* 1986; 80: 429-434.
24. Fleming BE, Pendergast Dr. Physical condition activity pattern and environment as factors in falls by adult care facility residents . *Arch Phys Med Rehabil.* 1993; 574: 627-636.
25. Amminaj RG, Kelsey JL, Neutt MC. Metmodologi tissues in the study of frequent and recurred health problems. Falls in the elderly. *Ann. Epidemical.* 1990; 1: 49-56.
26. Lord SR, Castell S, Corcuran J, Dayhaw J, Matters, B Sh A hristop P. The effect of group exercise on physical functioning and falls in trial older people living an retirement villages. A randomized, controlled trial. *J Am Geriater Soc*. 2003; 51: 1685-1692.
27. Linman MR. Comparison of two short term balance training programs for community dwelling older adults. *J Geriatric Phystherapy.* 2002; 25(3): 10-15.

Review Article

Physiotherapy and Occupational Therapy Journal
Volume 7 Number 2, April - June 2014

Effectiveness of Deep Friction Massage and Isometric Exercises in "Osteoarthritic Knee"

Avikirna Pandey*, Mukesh Kumar, R.K. Meena***, Sanjai Kumar******

Abstract

Objective: To compare the effect of isometric exercises and deep friction massage on osteoarthritis knee. **Methods:** Total number of participants were 40 (both male and female) . Equal number of participants were randomly assigned into two groups i.e. A and B. According to the Inclusion and Exclusion criteria and carried out at CSSH (Meerut) in department of physiotherapy. Ultrasonic modality was given to patients in both the groups. Group A was given Isometric Exercises while Group B was given Deep Friction Massage.

The study design was of pre and post test comparative design with Group A and B. **Results:** To find out the effect of six days of treatment on both the group. **Conclusions:** We conclude from our study that though improvement comes from both the techniques but Isometric Exercises provide better results then to Deep Friction Massage.

Keywords: Osteoarthritis; Deep friction massage; Isometric Exercises.

Introduction

Osteoarthritis is a non inflammatory degenerative disorder of joints characterized by progressive deterioration of the articular cartilage and formation of new bone (osteophytes). It is primary when the etiology is unknown and secondary when it follows some known cause – e.g. trauma, infection, rheumatoid arthritis, etc. It is more common in weight bearing joints such as hip and knee. The concept of "wear" and "tear" is generally attributed as a cause of osteoarthritis.[1]

Osteoarthritis (degenerative joint disease, osteoathrosis) is characterized by thinning and destruction of the hyline cartilage of joints, followed by remodelling of underlying bony surface. It is essentially non-inflammatory. Repeated heavy occupational stress on joints may increase the prevalence of osteoarthritis. Some of osteoarthritis is genetically related. The medial compartment of the knee transmits a higher proportion of weight than the lateral compartment. As the cartilage begins to degenerate, stress of weight bearing frequently leads to narrowing of medial compartment. This may ultimately leads to genu varum, similar to bow legs where the knees curve outward.[2]

Osteoarthritis is often regarded as a progressive process associated with getting older. It should be regarded as the end result of abnormal mechanical, inflammatory, metabolic, physiological or pathological factors. The incidence of the disease is higher in the elderly. Radiological symptoms may be present only in some 15% of those with radiological change, but after the age of 60 over 80% of the population will have some radiological symptoms of osteoarthritic changes.[3]

Osteoarthritis (OA) is the most common joint disorder in a large number of people older than 65 years. Knee OA is more commonly associated with disability than OA of any other joint. Prevalence increase with

Author Affilation: *Assistant Professor, **Vice Principal, ***Principal, ****Assistant Professor, Subharti College of Physiotherapy, Meerut, Uttar Pradesh, India.

Reprint Request: Dr. Avikirna Pandey, Assistant Professor, Subharti College of Physiotherapy, Meerut, Uttar Pradesh, India.

E-mail: dravipandey@yahoo.com

age, and radiographic abnormalities are present in more than 30% of persons older than 65 years, with approximately 40% of these persons being symptomatic.[4]

Van Saase *et al (*1989) reported that knee pain is one of the most commonly reported muscuskeletal disorders which estimates that it will affect 30-40% of population by age of 65 years. It has been demonstrated that physiotherapy intervention is effective in reducing pain and improving activity in people with anterior knee pain. Manual therapy techniques including mobilization, stretching soft tissue massage are also used in the treatment in OA knee (Cyriax 1977).[5]

The femorotibial joint are the target sites for osteoarthritis of the knee joint isolated patellofemoral osteoarthritis is relatively rare. The incidence of symptomatic isolated patellofemoral osteoarthritis in patients older than 55 years has been estimated to be 8% of women and 2% of men. Eight % have pain and difficulty during cslimbing and descending stairs. Patellofemoral joint lesions have been found to be lateral in 89% of all of patellofemoral osteoarthritis.[1]

Osteoarthritis is one of the most common cause of pain and disability in the western world and it effect upto 80% of people over the age of 65 (Brandt 2000). Despite numerous research studies, the exact pathways and triggers involved in OA are still the cause of some debate. OA is some time known as "degenerative joint disease". Both men and women are affected but the joint distribution pattern is different.[6]

Need of Study

Osteoarthritis knee is a common problem in both male and female population.

The effective treatment protocol is still lacking, this study is intended to find out an effective treatment for treating osteoarthritis knee.

Hypothesis

Experimental Hypothesis (H1): ultrasound with isometric exercise (VMO) with deep friction massage techniques will have different effect on improvement in patients with osteoarthritis of knee.

Null hypothesis (H0): ultrasound with isometric exercise (VMO) with deep friction massage will have similar effect on improvement on patients with osteoarthritis knee.

Aims and Objectives

To study the effect of ultrasound with isometric exercises (VMO) on subject with osteoarthritis knee.

To study the effect of ultrasound with deep friction massage on subject with osteoarthritis knee.

To compare the effect of both treatment techniques.

Purpose and Significance of Study

To find out an effective treatment which will help osteoarthritis of knee.

To improve functionally in clinical sittings.

Materials and Methodology

1. Number of Subjects

The total number of participants were N= 40 (both male and female).

2. Sample Selection

Type of sampling = random

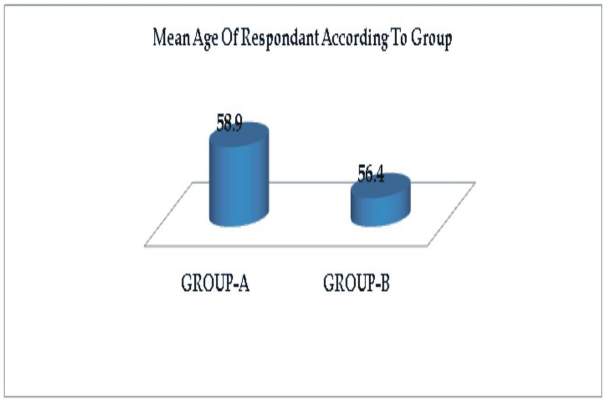
The subject diagnosed as osteoarthritis knee by orthopaedician who showed a sign and symptoms requested to participate in the study.

The purpose of study was explained to the subject.

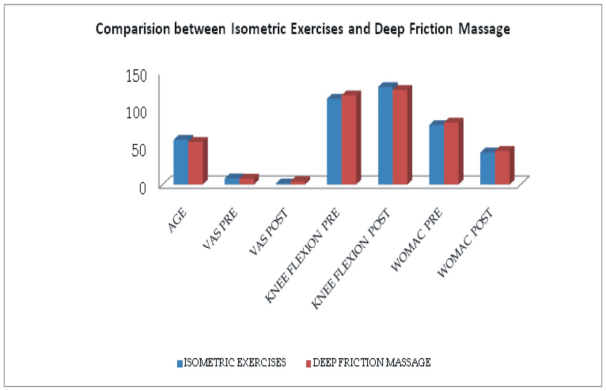
An informed consent was taken from each subject.

All the patients were assessed using a similar

Groups	No. Of Patients	Mean Age	Std.Dev.
Group-A	20	58.87	7.9
Group-B	20	56.40	9.4



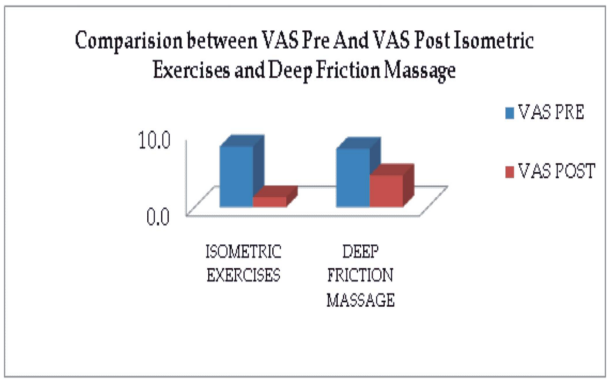
	Isometric Exercises		Deep Frictionmassage	
	Mean	Std. Dev	Mean	Std. Dev
Age	58.87	7.855	56.40	9.364
Vaspre	8.00	0.845	7.73	0.884
Vas Post	1.33	0.816	4.20	1.265
Knee Flexion Pre	113.87	9.899	118.40	8.322
Knee Flexion Post	129.33	7.471	125.60	7.453
Womac Pre	78.40	7.424	81.60	8.822
Womac Post		4.209	44.53	6.567

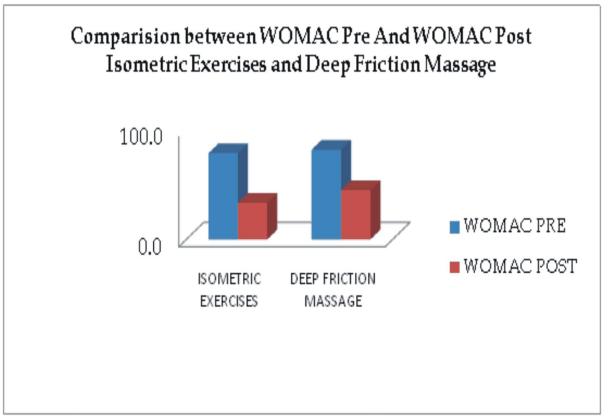


assessment performa and assigned randomly to either of the group.

3. *Group Division*

Group A = ultrasound with isometric exercises.





Group B = ultrasound with deep friction massage.

4. *Place of Study*

Physiotherapy O.P.D. of Chattrapati shivaji subharti hospital and Subharti College Of Physiotherapy, Meerut (U.P).

5. *Study Design*

Pre test and post test comparative design with group A and B.

6. *Selection Criteria*

A) *Inclusion Criteria*

Age above 39 years.

Presence of sign and symptoms of

Isometric Exercises			Deep Friction Massage	Independent T- Test	
VAS Pre (Mean ±SD,N=20)		8.00±0.8	7.73±0.9	0.845	0.405
Vas Post (Mean±Sd,N=20)		1.33±0.8	4.20±1.3	-7.374	0.000
Paired	T	31.623	16.412		
T Test	P(Sig)	0.048	0.001		

osteoarthritic knee.

Pain in knee which increase on palpitation.

Presence of crepitus.

Body enlargement.

B) Exclusion Criteria

No pathology around knee joint.

Age not below 39 years.

Absence of bony enlargement.

Fracture around knee joint.

Instruments and Tools Used in the Study

Examination Table: for examination and treatment of the patients.

Universal Goniometer (Half Circle): for measuring ROM of joints.

Pillow: for positioning the patients.

Ultrasound: Model COMBINED, 2200, 1&3 MHz.

Pen and paper.

The WOMAC (Western Ontario and McMaster Universities) Index of osteoarthritis.

Procedure

Patients of all groups were assessed for following parameters before starting the treatment.

Range of motion using half circle Goniometer.

The purpose of study should be explained to all the patients and informed consent was taken from each subject.

Pain measured by visual analogue scale.

All the patients were assessed by using similar assessment Performa and assigned randomly to either of the group i.e Group A and Group B.

Ultrasound

Position of Patients: Patient was lying on the affected side with side flexion and other extremity did not overlap. A pillow is used under the head of the patient to prevent head sacking. Patient should be in comfortable and relaxed position.

Position of Therapist: Standing on the affected side of the patient.

Technique: The skin surface to be treated should be inspected; inflammatory skin condition should be avoided. The couplent should be applied to the skin surface (ultrasound gel). The treatment head of UST is moved continuously over the surface while even pressure is maintained. The emitting surface must be kept parallel to the skin surface. The rate of movement must be slow. The pattern of movement can be a series of overlapping parallel stroke, circles of figure of eight.

Isometric Exercise

Position of Patient: Patient in supine lying position with a small towel rolled under the knee with knee in 15^0 of Flexion.

Position of Therapist: Standing on the affected side of the patient.

Technique: The patient is asked to press his affected knee on to the rolled towel and hold it for 10-15 count (10-15 sec). This should be repeated for 20 counts.

Deep Friction Massage

Position of Patient: Patient side lying on the affected side with slight flexion and top leg flexed from the knee and extended from the hip, so that both lower extremities does not overlap. Pillow is used under the head of the patient to prevent head sacking. Patient should be in comfortable and relaxed position.

Position of Therapist: Standing on affected side of the patient.

Technique

The Index and the ring finger are held together and overlapped with middle finger and pulps these fingers are used for deep

transverse friction massage. The musculo tendinous junction of VMO is located for deep transverse friction massage.

Protocol

Group A patients should be given ultrasound with isometric exercise (VMO) for 6 repetitions [for 5 sets] X 6 weeks.

Group B patients should be given ultrasound with deep friction massage for 6 week.

Both group patients were given ultrasound 1 MHz for 8 min. At 1.5 watts/cm^2, pulsed mode for 6 weeks.

Patient attended physiotherapy session for 6 days a week for 6 weeks.

Data Analysis

All the analysis were obtained using SPSS version13.0 (for window vista). Demographic data of the patients including age and gender were summarized. The dependent variable for the statistical analysis was knee ROM, pain, and WOMAC. A base line data was taken at the beginning of the study (pre test values) and after the completion of the treatment protocol reading was taken for the same parameters (post test values) to analyse the difference between the two treatment groups, independent test was used. A level of 0.05 was used to determine the statistical significance.

The mean age ofgroup A (isometric VMO) was 58.87 with the standard deviation of 7.855.The mean age of group B (deep friction massage) was 56.40 with the standard deviation of 9.364.

Discussion

In this study isometric exercise and deep transverse friction massage were applied in patient with OA knee. As an outcome pain, ROM and WOMAC were taken. Detailed statistical analysis shows improvement in both the groups. Over all isometric exercise technique group has showed more improvement. WOMAC has improved better in isometric exercise technique group with p=0.000, pain has improved better with isometric exercise technique with p=0.000, and ROM has improved similar in both the groups with p=0.000

Conclusion

We consider our positive results Isometric (VMO) was helped by our setting in general practice and adequate selection of patients by diagnostic groups. We found Isometric (VMO) to be most effective treatment for knee OA. It should also be noted that the measure of dispersion from deep friction massage were consistent than it was Isometric (VMO). So on summary we conclude through the improvement shows that both the technique has a differential outcome Isometric (VMO) provide better result than to deep friction massage.

Limitation of Study

The study was done on a very small sample.

The study is a short time study.

The study is done on a limited part of the body.

Suggestion for Further Study (Future Research)

Effectiveness of ultrasound with isometric exercise and deep friction massage can be tried in various other muscle groups.

Effectiveness of ultrasound with isometric exercise and deep friction massage in long-term period can be tried.

Effectiveness of ultrasound with isometric exercise and deep friction massage with other types of modalities can be tried.

References

1. Dr. John z Serbely *et al*. Ultrasound in the management of osteoarthritis: part 1. *J Can*

Chiropr Association. 2008; 52(1): 30-37.

2. Paul A Van den Dolder *et al.* Six sessions of manual therapy increases knee flexion and improved activity in people with anterior knee pain: a randomized controlled trial. *Aus I Phys*. 2006; (52): 261-264.
3. LT Michael T, Kelly MS. Non surgical management of knee osteoarthritis. *JAAPA.* 2006; 19(1).
4. Chad D Market *et al*. Non thermal us and exercise in skeletal muscle regeneration. *Arch Phys Med rehabilitation*. 2005; 86: 1304-1309.
5. *Australian Journal of Physiotherapy.* 2006; 52.
6. Robert top *et al*. The effects of dynamic vs isometric resistance training on pain and functioning among adults with OA knee. *Arch Phys Med Rehabilitation.* 2002; 83: 1187-95.
7. Gail D deyle, Stephen C Allison. physical therapy management for OA knee. *Physical Therapy.* 2005; 85(12).
8. Jayant Joshi, Prakash Kotwal. Essential of orthopaedics and applied physiotherapy 2004: arthritis-chapter 12 : pp292 under textbook of rehabilitation : 2002 (2):pp 390
9. Julie Haynes, RGN and Paul Creamer MD, MRCP. Management of OA pain in community dwelling elderly. *Clinical Geriatric.* 2003; 2(4): 34-4.
10. Dstasinopoulos and M I Johnson. CYRIAX physiotherapy for tennis elbow/lateral epicondylitis. *BR J Sports Med.* 2004; 38: 675-677.
11. Gail D Deyle *et al*. Effectiveness of manual physical therapy and exercise in knee. 2000; 132(3): 173-181.
12. John Low and Read. Therapeutic ultrasound, chapter 6. Electrotherapy Explained. 2000: 17.
13. Bellamy N Buchannan ww *et al*. Validation study of WOMAC: A health status instrument for measuring clinical important patient relevant outcome to anti rheumatic drug therapy in patients with osteoarthritis knee or hip. *J Rheumaltol.* 1988; 15: 1833-1840.

Case Report

Physiotherapy and Occupational Therapy Journal
Volume 7 Number 2, April - June 2014

Physiotherapy Management of an Infant with Bilateral Congenital Talipesequinovarus

Swati S. Kadu*, Sunil Mhaske**

Abstract

Background: Clinicians are constantly seeking for the most ideal option in the management of Congenital Talipes Equino Varus (CTEV), especially among infants. **Objective:** This case report presents the outcome of a one year Physiotherapy management of an infant with Congenital TalipesEquinoVarus (CTEV). **Methods:** Management commenced 48 hours after birth. During the first three months, passive stretching and strapping techniques were employed. Subsequently, plaster of Paris cast was applied using the serial plastering approach. Stretching continued each time the cast was removed for replacement. **Results:** Follow up after one year showed that the child could walk with apparently normal gait and there was no residual deformity. **Conclusion:** There is need for more enlightenment on the importance of early referral of CTEV cases for Physiotherapy care.

Keywords: Physiotherapy; Talipesequinovarus; Passive stretching; Strapping.

Introduction

Congenital ClubFoot (CCF), otherwise known as Congenital TalipesEquinoVarus (CTEV) is one of the commonest deformities occurring at the region of the ankle, subtaloid and mid-tarsal joints.[1] Talipesequinovarus is a derivative from Latin: talus (ankle) and pes (foot); equinus (horse-like), that is, the heel in plantar flexion and varus-inverted and adducted.[2] Hence the deformity comprises of three elements visa-viz: Inversion (twisting inward) of the foot, adduction (inward deviation) of the forefoot relative to the hindfoot and equinus (plantar flexion).[3]

Historically, talipesequinovarus was recognized and documented since the time of the ancient Egyptians.[2,4] According to Strach[5], Smith and Waren in 1924 found that Pharaoh Siptah of the XIX dynasty was afflicted with clubfoot. Hippocrates introduced talipesequinovarus into the medical literature in 400 BC.[5,6]

The incidence of CCF varies widely with race and sex. World wide, it is estimated at 1 to 2 per 1,000 live births.[7,8] In the United States the incidence is about 2.29 per 1,000 live births, 1.6 per 1000 live births in Caucasians and 0.57 per 1,000 in Orientals.[9] All populations show a consistency of 2:1 male predominance, with about 50% of cases being bilateral.[4,6] In unilateral cases, right side affectation dominates.[10] A positive family history has been connected to high incidence.[6,11]

According to Strach[5], Hippocrates had suggested that the treatment of CTEV should start as soon as possible after birth with repeated manipulation and fixations by strong bandages which should be maintained for a long time to achieve over correction. This sage's teaching principles of treatment are as valid as they were over 2,300 years ago.[2] Presently management of CTEV is fraught with controversy hence there is no consensus

Author Affilation: *Assistant Professor, College of Physiotherapy, Padamshree Dr Vithalrao Vikhe Patil Medical College, Maharashtra, **Professor & Head, Paediatrics, Dept. of Paediatrics, Padmashree Dr. Vithalrao Vikhe Patil Medical College & Hospital, Near Govt. Milk Dairy, Vilad Ghat, Ahmednagar-414111, Maharashtra, India.

Reprint Request: Dr. Sunil Mhaske, **Professor & Head, Paediatrics, Dept. of Paediatrics, Padmashree Dr. Vithalrao Vikhe Patil Medical College & Hospital, Near Govt. Milk Dairy, Vilad Ghat, Ahmednagar-414111, Maharashtra, India.

E-mail: sunilmhaske1975@gmail.com

as to the best treatment for this deformity.[12] In Nigeria, most parents/guardians remain unconvinced on why they should allow surgical procedures for their child. Sometimes they prefer to wait until when the child is old enough before management can commence. In view of this, this study presents a case report of a 2-day old baby boy with congenital talipesequinovarus managed conservatively using physical therapy.

Case Report

A 2-day old baby boy (who weighed 3.2 kg at birth) with talipesequinovarus was referred by an orthopaedic surgeon to the Physiotherapy clinic. The baby was delivered at full term, by spontaneous vaginal delivery (SVD) in a missionary hospital.

On examination, the baby was found to have bilateral congenital talipesequinovarus. Both feet were noticed to turn inwards with the soles directed medially, giving a bow string appearance at both ankle regions. The right foot was observed to be more affected than the left. The characteristics features of CTEV, that is, a three dimensional deformity (inversion, adduction and equinus) with four components (C.A.V.E) were evident in both feet visa viz:

C - Cavus (increased longitudinal arch of the feet)

A - Adduction (tarsal bones directed towards the median plane)

V - Varus (inversion and adduction of the calcaneal bones

E - Equinus (increased plantar flexion of the ankles)

On passive movement, there was relative tightness of the tendoachilles on both ankles (the right more than the left); the talocrural, the subtaloid and the mid-tarsal joints were stiff. Every other part of the musculoskeletal system was clinically normal.

Physiotherapy Management

The goal of management of the baby consisted of short term and long term goals. The short term goal was to correct the deformity so that the ankles assume plantigrade position by the time the baby would be three months old. The long term goal was to maintain the corrected ankle in situ and follow up the maintained correction until the baby starts walking and if feasible further follow up to avoid relapse.

Means of Management

1. Rhythmic and repeated gentle manipulation.[13]
2. Strapping[14] and plaster of Paris (POP) cast.[13]
3. Education and instructions to the mother and/or parents.

Rhythmic and Repeated Gentle Manipulation

The right foot which was more affected was first attended to. Before commencing the procedure, the right knee was placed at 90° flexion to prevent damage to the lower end of tibial and fibular epiphyses, and the knee joint. Thereafter the soft tissues of the right foot were passively stretched as follows: the forefoot was uncurled so that it moved away from the ipsilateral heel (that is forefoot abduction). This manoeuvre was to correct adduction. Then the foot was turned such that the sole faced outward (that is eversion), in an attempt to correct the inverted foot. Finally, to correct the equinus (plantar flexion deformity), the heel was cupped with the right hand from the front of the foot and an upward pressure was applied to it bringing the forefoot upward. This brought the ankle into dorsiflexion. Each of the above manipulation lasted for about two minutes and the entire procedure was repeated four times.

The baby was allowed to rest for about 20 minutes while the mother breast fed him. Then the same manoeuvre and procedure were performed on the left.

To maintain the feet in the corrected position, strapping was commenced. Materials

needed for the strapping were: a 2.5 cm width adhesive zinc oxide plaster, cotton wool, tincture of benzoin compound (TBC), methylated spirit and a pair of scissors. Before strapping commenced, skin toileting was religiously observed as follows: the hands were washed with medicated soap and distilled water, then dried with sterilized towel. Finger nails were always cut and kept clean. One of the authors stabilized the baby's limb and the other carried out the procedure.

Cotton wool soaked in methylated spirit was used to clean the right lower limb from the lower 1/3 of the thigh to the toes to avoid sepsis. Thereafter tincture of benzoin compound (TBC) was applied to prevent skin excoriation and improve the adherence of the plaster so that hairs would not stick to the straps.

Scissors was used to cut the 2.5 cm width zinc oxide plaster into four strips of appropriate lengths. Strapping began by holding the manipulated right foot to over corrected position. The first strip was applied from the medial border of the midpoint of the right leg down under the ipsilateral heel then along the lateral border of the leg to the lower 1/3 of the thigh with knee flexed at 90°. This was to correct the heel varus deformity. The second strip was applied over the dorsum of the mid-foot from lateral to medial then under the sole back to the lateral border of the mid-foot then along the border of the leg over the lower 1/3 of the thigh with knee still at 90°. This was important to correct the varus and equinus deformities by eversion of the foot and abduction of the forefoot.

To bring the ankle into dorsiflexed position, the third strip was applied over the dorsum of the forefoot from lateral to medial, then along the plantar surface of the forefoot to the lateral border of the leg over the lower 1/3 of the thigh. The last strip was applied circumferentially around the leg at a point 2cm above the ankle joint. This was to correct the bow string appearance of the lower 1/3 of the leg, the ankle and the foot, and to increase eversion. The baby rested, then the left foot underwent the same process

At the end of the procedure the mother was asked to wait for 30 minutes while breastfeeding the baby. This was to observe for any compromise to circulation. For the first six weeks the baby was seen thrice a week and strapping applied twice per week. From the period the baby was 7 to 12 weeks, he was being seen two times in a week and the strapping was done once per week. At three months there was marked improvement, especially on the left foot.

By this period (that is when the baby was three months), the strapping was no more effective because he was kicking vigorously with the lower limbs. It was then replaced with a full leg plaster of Paris (POP) with the knees at 90° of flexion. The plaster was changed weekly for the first eight weeks of application and the knees and feet mobilized on each occasion. Thereafter it was applied and changed forth-nightly for another eight weeks. The plaster was finally removed when the baby was exactly seven months. At eight months and three weeks he started standing with support and good plantigrade position. At the thirteenth month the baby could walk with good heel strike. The child is now three years without any obvious residual deformity, he is in nursery school and doing very well.

Education and Instructions to the Mother

The mother was assured and reassured that with her co-operation, consistency and compliance to treatment the deformity would be corrected. She was made to understand that the correction should be gradual and that we would follow up the case beyond when the baby starts walking. She was taught how to mobilize the feet in the absence of strap. She was instructed anytime a fresh strapping or plaster was applied to observe at frequent intervals any unusual crying by the baby, swollen or bluish colouration of the toes and report to the accident and emergency unit of our hospital. She was also advised to endeavour as much as possible to prevent the strapping or plaster from being wet or soiled either by water or any other fluid such as urine

or faeces.

Precautions Taken during the Application of the Strapping and Plaster

Moderate pressure was used to apply the straps and later the plaster, in order to maintain and preserve circulation;

A layer of cotton wool (the rolled type in layers), enough to cover the malleoli was applied at medial and lateral malleoli of both ankles to avert pressure sore;

Where the strips of the straps were circumferentially applied, in between spaces were avoided to prevent window oedema;

The strips of the straps were smoothly applied and no wrinkles were permitted, to prevent skin excoriation.

Discussion

The choice of techniques for management of CTEV in infants has historically provoked much debate. Recently, there is a swing towards conservative management[15,16], possibly because the results of surgical procedures are unpredictable.[17] Also there is no consensus on what the standard or most appropriate conservative method should be.[18] Various conservative techniques such as Kite method[19], Ponseti technique[13] and the French method[14] have been tried and have shown to have varying degrees of success. However, when CTEV proves stubborn to conservative management, then surgical procedures become the option. Clinical decisions are usually impeded by a lack of adequate and convincing long-term reviews of treatment based on prospective assessment and unbiased comparisons of different techniques.

This case report showed the outcome of Physical therapy approach for the management of an infant who presented with CTEV. Management in this case report involved a combination of passive stretching and manipulation, strapping technique, Plaster of Paris casting and education of the guardian. Unlike the Ponseti technique and kite methods the researchers opted to commence treatment with Zinc oxide strapping similar to the use of adhesive taping technique of the French method. Although it is usually recommended that serial plaster casting be the first direction of conservative treatment after manipulation[17], the researchers argued that the use of zinc oxide strapping could also be as much effective up till the point when the child starts kicking. The outcome showed that after treatment and at follow up a year later the child showed no sign of the initial presenting pathology. Until recently, treatment consisted of forcible serial manipulations under anaesthesias followed by casting. More recently, authors[20,21,22] have advocated the use of serial casting with minimal force (not requiring anesthesia) and have emphasized its importance and potential for success of non-operative treatment. The case report presented employed this and shows that there can be remarkable success if serial POP casting is properly and timely applied. In this case report POP was applied when the application of adhesive tapping outlived it usefulness. Another major factor for the success of the method is the early commencement of treatments and subsequent cooperation from the guardian to bring the child for treatments. Thus, the importance of sufficient and persistent education is essential on the part of the physiotherapist. It has been reported[23] that one of the most common reasons for failure is that patients are not referred on time and this affects the outcome of the treatments.

Although there is no universally accepted method of assessing outcome in CTEV[24] the central aim of physical therapy is to restore the patient to the maximum functional ability in the use of the lower limb especially the foot. Early commencement of physical therapy, proper education and an individualized plan of treatment are essential aspect of this care. This is vital because at this stage there is an enormous potential for remodeling of the tissues through peripheral manipulative

therapy techniques if appropriately applied. This is also important as most guardians in Nigeria will not want their wards to undergo surgical procedures at a very early stage of development even when it is medically advisable.

Conclusion

This study presents a patient with Congenital TalipesEquinoVarus successfully managed by Physical Therapy approach. This case report indicates that management of Congenital TalipesEquinoVarus if commenced early after birth could help in achieving good recovery and reduce cost of treatment while ameliorating the psychological burden on both the caregiver and patient's parents.

References

1. Thomson A, Skinner A, Piercy J. Tidy's Physiotherapy. Diseases and disorders of bones and joints. Oxford: Butterworth-Heinemann; 2000, 91–93.
2. Nordin S, Aidura M, Razak S, Faisham WI. Controversy in congenital clubfoot: Literature Review. *Malaysian Journal of Medical Sciences*. 2002; 9(1): 34–40.
3. Adams JC, Hamblen DL. Outline of Orthopaedics. Edinburgh: Churchill Livingstone; 1990, 363–368.
4. Roye BD, Hyman J, Roye DP. Congenital idiopathic talipesequinovarus. *Paediatrics in Review*. 2004; 26(4): 124–127.
5. Stracha'EH. Clubfoot through the centuries. In: Rickham PP, editor. Progress in Pediatric Surgery,Vol 20. Berlin Heidelberg: Springer-Verlag; 1986.
6. Turco VG. Clubfoot. Edinburgh: Churchill Livingstone; 1981.
7. Cummings RJ, Lovell WW. Current concepts review: Operative treatment of congenital idiopathic clubfoot. *Journal of Bone and Joint Surgery*. 1988; 76A(7): 1108–1112.
8. DePuy J, Drennan JC. Correction of idiopathic: A comparison of result of early versus delayed posteromedial release. *Journal of Pediatric Orthopaedics*. 1989; 9: 44–48.
9. Turco VG, Spinella AJ. Current management of clubfoot in Institutional course lecture of the American Academy of Orthopedic Surgeons, Vol 31. St Louis: CV Mosby; 1982, 218–234.
10. Tachdjian MO. The Child Foot. Philadelphia: WB Saunders; 1985, 139–239.
11. Wynne-Davies R. Family studies and cause of congenital clubfoot. *Journal of Bone and Joint Surgery*. 1996; 46B: 445.
12. Kite JH. The Child Foot. New York: Crune Stratton Inc; 1964.
13. Ponseti IV. Treatment: Congenital clubfoot-Fundamentals of treatment. New York: Oxford University Press; 1996, 61–81.
14. Richards BS, Johnston CE, Wilson H. Non-operative clubfoot: Treatment using the French physical therapy method. *Journal of PaediatricOrthopaedics*. 2005; 25(1): 98–102.
15. Benjamin DR, Joshua H, David PR. Congenital idiopathic TalipesEquinovarus. *Paediatrics in Review*. 2004; 26(4): 124–130.
16. Siapkara A, Duncan R. Congenital talipesequinovarus:A review of current management. *Journal of Bone and Joint Surgery*. 2007; 89B(8): 995–999.
17. Andrei GZ, Vermesan S. Considerations in treating congenital clubfoot in children: A two year retrospective study. *Revistade Ortopediesitraumatologic - Asoris*. 2009; 3(15): 19–23.
18. Sud A, Tiwari A, Sharma D, Kapor S. Ponseti versus kite's method in the treatment of clubfoot-A prospective randomized study. *International Orthopaedics*. 2006; 32: 409–413.
19. Kite JH. Non-operative treatment of congenital clubfoot. *Clin Orthop*. 1972; 84: 29–38.
20. Dobbs BM, Rudzki JR, Purcell DB, Walton T, *et al*. Factors predictive ofoutcome after use of the Ponseti method for the treatment of idiopathic clubfoot. *Journal of Bone and Joint Surgery(American Volume)*. 2004; 86(1): 22–27.
21. Morcuende J, Doran LA, Dietz FR, Ponseti IV. Radical reduction in the rate of extensive corrective surgery for clubfoot using Ponseti method. *Journal of Paediatrics*. 2004; 13(2): 3.

22. Colburn M, Williams M. Evaluation of the treatment of idiopathic clubfoot using Ponsetic method. *Journal of Foot and Ankle Surgery*. 2003; 42(5): 259–267.
23. Herman Z. Barriers experienced by parents/ caregivers of children with clubfoot deformity attending specific clinics in Uganda. Uganda: University of Western Cape; 2006. Unpublished MSc Dissertation.
24. `Hart D. Evidence Note01. London: Chartered Society of Physiotherapy; 2009. Physiotherapy management of Positional talipesequinovarus.

Guidelines for Authors

Manuscripts must be prepared in accordance with "Uniform requirements for Manuscripts submitted to Biomedical Journal" developed by international committee of medical Journal Editors.

Types of Manuscripts and Limits

Original articles: Up to 3000 words excluding references and abstract and up to 10 references.

Original articles: Up to 2500 words excluding references and abstract and up to 10 references.

Case reports: Up to 1000 words excluding references and abstract and up to 10 references.

Online Submission of the Manuscripts

Articles can also be submitted online from http://www.rfppl.com (currently send your articles through e-mail attachments)

I) First Page File: Prepare the title page, covering letter, acknowledgement, etc. using a word processor program. All information which can reveal your identity should be here. use text/rtf/doc/PDF files. Do not zip the files.

2) Article file: The main text of the article, beginning from Abstract till References (including tables) should be in this file. Do not include any information (such as acknowledgement, your name in page headers, etc.) in this file. Use text/rtf/doc/PDF files. Do not zip the files. Limit the file size to 400 kb. Do not incorporate images in the file. If file size is large, graphs can be submitted as images separately without incorporating them in the article file to reduce the size of the file.

3) Images: Submit good quality color images. Each image should be less than 100 kb in size. Size of the image can be reduced by decreasing the actual height and width of the images (keep up to 400 pixels or 3 inches). All image formats (jpeg, tiff, gif, bmp, png, eps etc.) are acceptable; jpeg is most suitable.

Legends: Legends for the figures/images should be included at the end of the article file.

If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks from submission. Hard copies of the images (3 sets), for articles submitted online, should be sent to the journal office at the time of submission of a revised manuscript. Editorial office: **Red Flower Publication Pvt. Ltd., 48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi – 110 091, India, Phone: 91-11-22754205, 45796900, Fax: 91-11-22754205, E-mail: redflowerppl@vsnl.net.**

Preparation of the Manuscript

The text of observational and experimental articles should be divided into sections with the headings: Introduction, Methods, Results, Discussion, References, Tables, Figures, Figure legends, and Acknowledgment. Do not make subheadings in these sections.

Title Page

The title page should carry

1) Type of manuscript (e.g. Original article, Review article, Case Report)
2) The title of the article, which should be concise, but informative;
3) Running title or short title not more than 50 characters;
4) The name by which each contributor is known (Last name, First name and initials of middle name), with his or her highest academic degree(s) and institutional affiliation;
5) The name of the department(s) and institution(s) to which the work should be attributed;
6) The name, address, phone numbers, facsimile numbers and e-mail address of the contributor responsible for correspondence about the manuscript;
7) The total number of pages, total number of photographs and word counts separately for abstract and for the text (excluding the references and abstract);
8) Source(s) of support in the form of grants, equipment, drugs, or all of these;
9) Acknowledgement, if any; and
l0) If the manuscript was presented as part at a meeting, the organization, place, and exact date on which it was read.

Abstract Page

The second page should carry the full title of the manuscript and an abstract (of no more than 150 words for case reports, brief reports and 250 words for original articles). The abstract should be structured and state the Context (Background), Aims, Settings and Design, Methods and Material, Statistical analysis used, Results and Conclusions. Below the abstract should provide 3 to 10 keywords.

Introduction

State the background of the study and purpose of thestudy and summarize the rationale for the study or observation.

Methods

The methods section should include only information that was available at the time the plan or protocol for the study was written such as study approach, design, type of sample, sample size, sampling technique, setting of the study, description of data collection tools and

methods; all information obtained during the conduct of the study belongs in the Results section.

Reports of randomized clinical trials should be based on the CONSORT Statement (http://www. consort-statement. org). When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 2000 (available at http://www.wma.net/e/policy/l 7-c_e.html).

Results

Present your results in logical sequence in the text, tables, and illustrations, giving the main or most important findings first. Do not repeat in the text all the data in the tables or illustrations; emphasize or summarize only important observations. Extra or supplementary materials and technical details can be placed in an appendix where it will be accessible but will not interrupt the flow of the text; alternatively, it can be published only in the electronic version of the journal.

Discussion

Include summary of key findings (primary outcome measures, secondary outcome measures, results as they relate to a prior hypothesis); Strengths and limitations of the study (study question, study design, data collection, analysis and interpretation); Interpretation and implications in the context of the totality of evidence (is there a systematic review to refer to, if not, could one be reasonably done here and now?, what this study adds to the available evidence, effects on patient care and health policy, possible mechanisms); Controversies raised by this study; and Future research directions (for this particular research collaboration, underlying mechanisms, clinical research). Do not repeat in detail data or other material given in the Introduction or the Results section.

References

List references in alphabetical order. Each listed reference should be cited in text (not in alphabetic order), and each text citation should be listed in the References section. Identify references in text, tables, and legends by Arabic numerals in square bracket (e.g. [10]). Please refer to ICMJE Guidelines (http://www.nlm.nih.gov/bsd/uniform_requirements.html) for more examples.

Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006;35:540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003;61:347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997;195 Suppl 2:3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000;71:1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

More information about other reference types is available at www.nlm.nih.gov/bsd/uniform_requirements.html, but observes some minor deviations (no full stop after journal title, no issue or date after volume, etc).

Tables

Tables should be self-explanatory and should not duplicate textual material.

Tables with more than 10 columns and 25 rows are not acceptable.

Number tables, in Arabic numerals, consecutively in the order of their first citation in the text and supply a brief title for each.

Explain in footnotes all non-standard abbreviations that are used in each table.

For footnotes use the following symbols, in this sequence: *, ¶, †, ‡‡,

Illustrations (Figures)

Graphics files are welcome if supplied as Tiff, EPS, or PowerPoint files of minimum 1200x1600 pixel size. The minimum line weight for line art is 0.5 point for optimal printing.

When possible, please place symbol legends below the figure instead of to the side.

Original color figures can be printed in color at the editor's and publisher's discretion provided the author agrees to pay

Type or print out legends (maximum 40 words, excluding the credit line) for illustrations using double spacing, with Arabic numerals corresponding to the illustrations.

Sending a revised manuscript

While submitting a revised manuscript, contributors are requested to include, along with single copy of the final revised manuscript, a photocopy of the revised manuscript with the changes underlined in red and copy of the comments with the point to point clarification to each comment. The manuscript number should be written on each of these documents. If the manuscript is submitted online, the contributors' form and copyright transfer form has to be submitted in original with the signatures of all the contributors within two weeks of submission. Hard copies of images should be sent to the office of the journal. There is no need to send printed manuscript for articles submitted online.

Reprints

Journal provides no free printed reprints, however a author copy is sent to the main author and additional copies are available on payment (ask to the journal office).

Copyrights

The whole of the literary matter in the journal is copyright and cannot be reproduced without the written permission.

Declaration

A declaration should be submitted stating that the manuscript represents valid work and that neither this manuscript nor one with substantially similar content under the present authorship has been published or is being considered for publication elsewhere and the authorship of this article will not be contested by any one whose name (s) is/are not listed here, and that the order of authorship as placed in the manuscript is final and accepted by the co-authors. Declarations should be signed by all the authors in the order in which they are mentioned in the original manuscript. Matters appearing in the Journal are covered by copyright but no objection will be made to their reproduction provided permission is obtained from the Editor prior to publication and due acknowledgment of the source is made.

Abbreviations

Standard abbreviations should be used and be spelt out when first used in the text. Abbreviations should not be used in the title or abstract.

Checklist

- Manuscript Title
- Covering letter: Signed by all contributors
- Previous publication/ presentations mentioned Source of funding mentioned
- Conflicts of interest disclosed

Authors

- Middle name initials provided.
- Author for correspondence, with e-mail address provided.
- Number of contributors restricted as per the instructions
- Identity not revealed in paper except title page (e.g. name of the institute in Methods, citing previous study as 'our study')

Presentation and Format

- Double spacing
- Margins 2.5 cm from all four sides
- Title page contains all the desired information. Running title provided (not more than 50 characters)
- Abstract page contains the full title of the manuscript
- Abstract provided: Structured abstract provided for an original article.
- Key words provided (three or more)
- Introduction of 75-100 words

- Headings in title case (not ALL CAPITALS). References cited in square brackets
- References according to the journal's instructions

Language and grammar

- Uniformly American English
- Abbreviations spelt out in full for the first time. Numerals from 1 to l0 spelt out
- Numerals at the beginning of the sentence spelt out

Tables and figures

- No repetition of data in tables and graphs and in text.
- Actual numbers from which graphs drawn, provided.
- Figures necessary and of good quality (color)
- Table and figure numbers in Arabic letters (not Roman).
- Labels pasted on back of the photographs (no names written)
- Figure legends provided (not more than 40 words)
- Patients' privacy maintained, (if not permission taken)
- Credit note for borrowed figures/tables provided
- Manuscript provided on a CDROM (with double spacing)

Submitting the Manuscript

- Is the journal editor's contact information current?
- Is a cover letter included with the manuscript? Does the letter

1. Include the author's postal address, e-mail address, telephone number, and fax number for future correspondence?
2. State that the manuscript is original, not previously published, and not under concurrent consideration elsewhere?
3. Inform the journal editor of the existence of any similar published manuscripts written by the author?
4. Mention any supplemental material you are submitting for the online version of your article?

Contributors' Form (to be modified as applicable and one signed copy attached with the manuscript)

Physiotherapy and Occupational Therapy Journal

Library Recommendation Form

If you would like to recommend this journal to your library, simply complete the form below and return it to us. Please type or print the information clearly. We will forward a sample copy to your library, along with this recommendation card.

Please send a sample copy to:

Name of Librarian

Library

Address of Library

Recommended by:

Your Name/ Title

Department

Address

Dear Librarian,

I would like to recommend that your library subscribe to the **Physiotherapy and Occupational Therapy Journal**. I believe the major future uses of the journal for your library would be:

1. As useful information for members of my specialty.
2. As an excellent research aid.
3. As an invaluable student resource.
4. **I have a personal subscription and understand and appreciate the value an institutional subscription would mean to our staff.**
5. Other

Should the journal you're reading right now be a part of your University or institution's library? To have a free sample sent to your librarian, simply fill out and mail this today!

Stock Manager

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II, Mayur Vihar, Phase-I

Delhi - 110 091 (India)

Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.com, redflowerppl@vsnl.net

Website: www.rfppl.org

Call for Reviewers

The Physiotherapy and Occupational Therapy Journal's topics pertaining to physical therapy and rehabilitation. Coverage includes geriatric therapy, pain management techniques, cardiac, orthopaedic and pulmonary rehabilitation, working with stroke patients, occupational therapy techniques and much more. The editorial contents comprise research papers, treatment notes and clinical observations, case histories, professional opinion and memoirs and comments on professional issues. The Editorial Board's mission is to publish significant research which has important implications for physiotherapy and occupational therapy. Our vision is for the journal to be the pre-eminent international publication of the science and practice of physiotherapy and occupational therapy.

Indexing and Abstracting information: NLM catalogue & locator plus, USA, Index Copernicus, Poland. EBSCO Publishing's Electronic Databases, USA, Academic Search Complete, USA, Academic Search Research & Development, USA, ProQuest, USA, Genamics JournalSeek, OCLC World Cat.

One must have at least five years of experience in the field after completion of the education in that field and at least five original research papers in journal(s).

Please note that the acceptance of your application will be at the sole discretion of the editors.

Please provide your complete information and affiliation in brief through e-mail or you can register your self on our website www.rfppl.org.

For more information, please contact:

Publication–in-charge

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II

Mayur Vihar Phase-I

Delhi – 110 091

India

Phone: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com

Website: www.rfppl.org

Subscription Form

I want to renew/subscribe to international class journal **"Physiotherapy and Occupational Therapy Journal"** of Red Flower Publication Pvt. Ltd.

Subscription Rates:
• India: Institutional: Rs.7000, Individual: Rs.1000, Life membership (10 years only for individulas) Rs.5000.
• All other countries: $360

Name and complete address (in capitals):

Payment detail:
Demand Draft No.
Date of DD
Amount paid Rs./USD

1. Advance payment required by Demand Draft payable to Red Flower Publicaion Pvt. Ltd. payable at Delhi.
2. Cancellation not allowed except for duplicate payment.
3. Agents allowed 10% discount.
4. Claim must be made within six months from issue date.

Mail all orders to
Red Flower Publication Pvt. Ltd.
48/41-42, DSIDC, Pocket-II, Mayur Vihar Phase-I, Delhi - 110 091 (India)
Tel: 91-11-22754205, 45796900, Fax: 91-11-22754205
E-mail: redflowerppl@vsnl.net, redflowerppl@gmail.com
Website: www.rfppl.org

Instructions to Authors

Submission to the journal must comply with the Guidelines for Authors.

Non-compliant submission will be returned to the author for correction.

To access the online submission system and for the most up-to-date version of the Guide for Authors please visit:

http://www.rfppl.org

Technical problems or general questions on publishing with ***POTJ*** are supported by Red Flower Publication Pvt. Ltd's Author Support team (http://ww.rfppl.org)

Alternatively, please contact the Journal's Editorial Office for further assistance.

A Lal

Publication -in-Charge

Physiotherapy and Occupational Therapy Journal

Red Flower Publication Pvt. Ltd.

48/41-42, DSIDC, Pocket-II

Mayur Vihar Phase-I

Delhi – 110 091

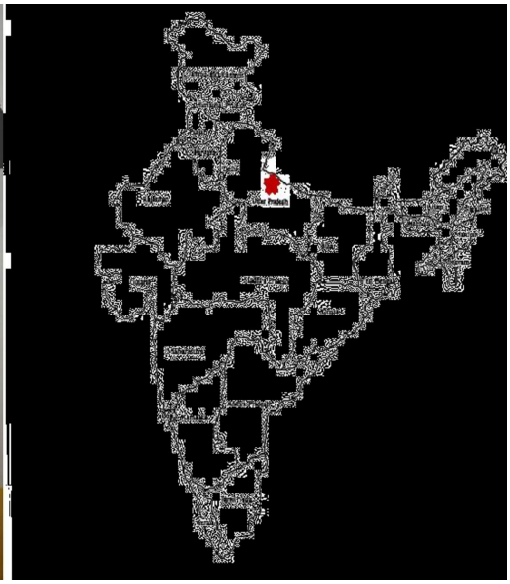
India

Phone: 91-11-22754205, 45796900, Fax: 91-11-22754205

E-mail: redflowerppl@gmail.com, redflowerppl@vsnl.net

Website: www.rfppl.org

Advertisement



HELP THESE INDIAN CHILDREN TO BUILD THEIR OWN FUTURE!

Over 250 children in Belsar village in India, in the backwards rural District of Gonda in Uttar Pradesh (see map) will be without a school building by the end of this school year… unless we help them to pay for building materials for a new school building. Parents who are masons, carpenters and others are committed to give their free time to help and construct the building. World Without Obstacles – a registered NGO – with support of friends and family enabled this initiative.

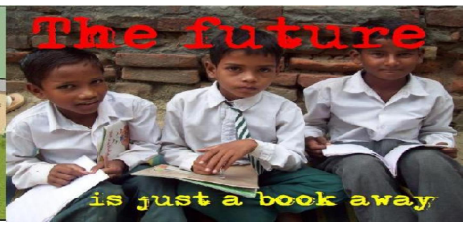
For many years WWO already works together with a small primary school called Gurukul Children Academy. The school is financially independent from the NGO in its day-to-day operations. WWO helps to increase quality of education and health of children and their families. We already designed a future vision together with an architect and the school Principal. During school hours the new building will be used to educate 300 children and after hours WWO will give health info-sessions and vocational skill trainings to adults from the village. The multi-functional building will also be used as a regional office and accommodation for volunteers of the NGO. This will allow WWO to reach out to even more people in Belsar and Gonda District.

In total we need about INR 52 lakh to realise the complete multi-functional school building with 10 class rooms. One class room on average costs around INR 4 lakh. Phase 1 was partly financed via a global online crowd funding campaign. To allow the children continuity of education in the next school year we need to complete construction

of phase 1 before monsoon. This includes the foundation, five class rooms, an office and a staircase. Phase 2 concerns the sanitation facilities for which we hope to receive a contribution from government funds.

Your support is much appreciated!

For more information: www.worldwithoutobstacles.org



Introducing a new sister concerned company of ***Red Flower Publication Pvt. Ltd.***

RF Library Services Pvt. Ltd.

RF Library Services Pvt. Ltd. is a global market leader in managing professional information. We develop and deliver innovative services that enable the use of knowledge to its full extent. As the only information Services Company to be globally and we play a key role in today's complex information marketplace. Founded in 1985 as a registered company under sub-section (2) of section 7 of the Companies Act, 2013 and rule 8 of the Companies (Incorporation) Rules, 2014, the business draws on more than a decade of experience within the information industry. With this knowledge, we service the needs of thousands of customers from over 30 countries. We are a division of Red Flower Publication Pvt. Ltd.

Where we are based

RF Library Services Pvt. Ltd headquarters is in Delhi, India, and has a representative office in Cochin. Visit "Our Offices" page to locate your nearest regional office.

RF Library Services Pvt. Ltd.
D-223/216, Laxmi Chambers, Laxmi Nagar,
Near Laxmi Nagar Metro Station,
Delhi-110092(India)
Tel: 011-22756995, Fax: 011-22756995
E-mail: rflibraryservices@vsnl.net, rflibraryservices@@gmail.com
Wesite: www.rf-libraryservices.com

Branch Office

RF Library Services Pvt. Ltd.
3rd Floor, City Point Building, Jose Junction
Chinmayananda Road, South Ernakulam
Cochin - 682016, Kerala (India)
Tel: 0484-2373399, Mob: 8606486058
E-mail: rfpkochi@gmail.com, www.rf-libraryservices.com