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A Study to Compare Effectiveness of Strength Trainingalong with Treamill Walkingon Pain Free Walking Distanceand Quality of Life in Peripheral Arterial Occlusive Disorders

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Abstract

BACKGROUND & PURPOSE: PAD affects the lower extremities more commonly than the upper extremity vessels, and may lead to an recurrent fatigue, cramping sensation, or pain that is known as claudication intermittents. Although PAD has traditionally been perceived as a diseaseaffecting men, the prevalence of PAD appears to be equal among senior men and women. The patho-physiology of atherosclerosis involves complex interactions between cholesterol and vascular cells. The ultimate effect of these consequences may deteriorate the Quality of life in peripheral arterial disease patients. Obesity, hypertension, glucose intolerance, dyslipidemia may change the quality of life. Regular physical activity is the most effective treatment.Simplewalking regimens, leg exercises, and treadmill exercise programscanresult in decreased symptoms.

AIMS & OBJECTIVES: The aim of the study is to evaluate the effectiveness of strength training and treadmill walking on pain free walking & quality of life in subjects with peripheral arterial diseases. □ To assess the pain free walking distance by ACSM claudication scale □ To assess the quality of life by using VASCUQOL -6

METHODOLGY: 30 Peripheral arterial disease subjects were randomized into two groups. Group A received strengthtraining whereas group B treadmill training for a duration of 12 weeks. ACSM claudication scale & VASCUQOL-6 were used to asses pain free walking & quality of life before and after the treatment.

RESULTS: Between the group analysis of group, A and B revealed that there is a significant difference observed in between two groups by using ACSM claudication scale with a p value is 0.0097 onsidered very significant & p- value of VASCUQOL-6V is <0.0001 which is considered extremely significant

CONCLUSION: Both strength training & treadmill training play a prominent role on pain free walking distance & quality of life in subjects with peripheral arterial disease.

INTRODUCTION

Peripheral artery disease (PAD) is a progressive disorder characterized by stenosis or occlusion of large and medium-sized arteries, other than those that supply the heart (coronary artery disease, CAD) or the brain (cerebrovascular disease). PAD affects the lower extremities more commonly than the upper extremity vessels, and may lead to an recurrent fatigue, cramping sensation, or pain that is known as claudication intermittents (intermittent claudication), which is the most recognized symptomatic subset

of lower extremity PAD[1].

PAD affects over 200 million adults worldwide and the incidence of PAD increases to as high as20% in people over the age of 70[2]. Although PAD has traditionally been perceived as a diseaseaffecting men, the prevalence of PAD appears to be equal among senior men and women. Compared to non-smokers, smokers with PAD have shorter life spans and progress morefrequently to critical limb ischemia and amputation[3].

Classification[4] Rutherford classification

STAGE	CLINICAL PRESENTATION
Stage 0	asymptomatic
Stage 1	Mild claudication
Stage 2	Moderate claudication
Stage 3	Severe claudicayion
Stage 4	Rest pain
Stage 5	Minor ischemic ulceration
Stage 6	Severe ischemic ulcers or frank ganrene

Fontafine classification

Grades	symptoms
Stage I Stage II Mild claudication pain in limb	Asymptomatic, incomplete blood vessel obstruction
Stage IIA	Claudication at a distance > 200 m
Stage IIB	Claudication at a distance < 200 m
Stage III	Rest pain, mostly in the feet
Stage IV	Necrosis and/or gangrene of the limb

Risk factors include[5]:

- Diabetes
- Smoking
- Obesity (a body mass index over 30)
- High blood pressure
- High cholesterol
- Increasing age, especially after reaching 50 years of age
- A family history of peripheral artery disease, heart disease or stroke
- High levels of homocysteine, a protein component that helps build and maintain tissue

Typical signs and symptoms of the disease include[6]:

- Claudication—fatigue, heaviness, tiredness, cramping in the leg muscles (buttocks, thigh, or calf) that occurs during activity such as walking or climbing stairs. This pain or discomfort goes away

once the activity is stopped and during rest. Many people do not report this problem to their health care providers because they think it is a natural part of aging or due to some other cause.

- Pain in the legs and/or feet that disturbs sleep.
- Sores or wounds on toes, feet, or legs that heal slowly, poorly, or not at all.
- Color changes in the skin of the feet, including paleness or blueness.
- A lower temperature in one leg compared to the other leg.
- Poor nail growth and decreased hair growth on toes and legs.
- However, most people with P.A.D. do not experience symptoms.

PAD usually involves atherosclerotic disease in the abdominal aorta, iliac, and femoral arteries. The patho-physiology of atherosclerosis involves complex interactions between cholesterol and vascular cells. Atherosclerotic plaquebuilds up slowly on the inside of arteries. In the early stages of PAD, the arteries compensate forthe plaque buildup by dilating to preserve flow through the vessel. Eventually, the artery cannotdilate any further, and the atherosclerotic plaque starts to narrow the arterial flow lumen. The hemodynamic consequences of atherosclerosis depend on the degree of arterial narrowing. A50% decrease in vessel diameter corresponds to a 75% loss of cross-sectional area which isusually considered flow limiting. As the narrowing progresses or completely obstructs the artery,blood flow shifts to smaller arteries which parallel the diseased artery. Although this collateralflow preserves distal perfusion, the network of smaller vessels never carries as much blood flowas the main artery. This blood flow restriction represents the hallmark of PAD and its typicalsymptoms. The muscles of the lower extremity require increased blood flow during ambulationto meet the increased energy demand. Patients with PAD reach a point during walking at whichcollateral blood flow is maximized and cannot provide any more perfusion to the lower extremitymuscles. This supply-demand mismatch causes temporary ischemia of the muscles whichmanifests as pain, cramping, or fatigue and ultimately makes the patient with PAD slow down orstop walking. Lowering the energy demands of the muscle (by slowing or stopping) allows theblood supply to “catch up,” and the ischemic symptoms resolve. This cycle of blood flowrestriction increased energy demand, and temporary muscle ischemia describes thepathophysiology of claudication due to PAD.Patients with PAD usually have enough collateral blood flow that they only have symptomsduring activities that increase energy demand such as walking. Rarely, PAD becomeprogressively more severe, and the blood flow cannot meet the resting metabolic demands of thelower extremity. Poor perfusion to the nerves can result in ischemic rest pain which is oftendescribed as intractable, burning pain in the soles of the feet. Non-healing wounds and ischemiculcers represent tissue loss due to poor blood flow.

In the most severe cases, the toes or entire forefoot can become black and mummified as gangrene develops.[7]

Ankle-brachial index - the most common test for PAD, it is a test that compares the blood pressure in the ankle with the blood pressure in the arm. Ultrasound scan, angiography, and blood tests - may also be recommended to check levels of cholesterol, homocysteine, and C- reactive protein. Doppler and ultrasound (Duplex) imaging - a non-invasive method that visualizes the artery with sound waves and measures the blood flow in an artery to indicate the presence of a blockage. Computed tomographic angiography (CT) - another non-invasive test that images the arteries of a patient's abdomen, pelvis, and legs. This test is particularly useful in patients with pacemakers or stents. Magnetic Resonance Angiography (MRA) - gives similar information to that generated by a CT scan, but without the need for

X-rays. Angiography - this is normally reserved for use in conjunction with vascular treatment procedures. During an angiogram, a contrast agent is injected into the artery and X-rays are taken to show blood flow and to pinpoint any blockages that may be present. Undiagnosed or untreated PAD can be dangerous; it can lead to painful symptoms, loss of a leg, increased risk of coronary artery disease, and carotid atherosclerosis (a narrowing of the arteries that supply blood to the brain)[8].

Management strategies for PAD are focused to lower cardiovascular risk and improve walking ability. All patients with PAD, regardless of the presence or absence of symptoms, have an increased risk of stroke, myocardial infarction, and thrombosis compared to patients without arterial disease[9]. These cardiovascular events probably account for the shorterlife expectancy of patients with PAD. Therefore, all patients diagnosed with PAD should undertake lifestyle changes aimed at lowering their cardiovascular risk profile. Key targets for lifestyle changes include quitting smoking, lowering cholesterol, and controlling hypertension and diabetes.[10.11]

Antihypertensive drugs as well as statins tolower cholesterol levels. Cilostazol and pentoxifylline may be recommended for patients withintermittent claudication. The ACEinhibitor - ramipril - was shown to improve pain freewalking by 60 percent in a study published in JAMA. Exercise for intermittent claudication must take into account the fact that walking can bepainful. The program consists of alternating between activity and resting. Diet changes and adjustments- many individuals with PAD have elevated cholesterol levels. A diet low in saturated fat, trans fat, and cholesterol, as well as plenty of fruit and vegetables can help lower blood cholesterol levels[12].

Balloon angioplasty or stent placement provides a minimally invasive, percutaneous treatment option for patients with PAD symptoms that do not respond to exercise or medical therapy. These endovascular treatments achieve the best results when applied to focal occlusive lesions in the iliac and superficial femoral arteries. The technical success and durability of endovascular therapy decrease in patients with long-segment total occlusions and infrapopliteal arterial occlusive disease[13]. Since PAD does not usually represent a life or limb threatening condition, surgery should be reservedfor highly selected patients who have significant symptoms despite treatment with non-invasiveand endovascular therapy. Surgical options for PAD include bypass grafts to divert flow around the blockage or endarterectomy to segmentally remove the obstructive plaque.[14]

Peripheral arterial disease effects muscle mass, strength & endurance leads to change in the muscle metabolism. These changes may alter the bio mechanics of walking & decreased walking economy. Walking efficiency is reduced in patients with claudication in that walking patterns change to favor stability over speed. The ultimate effect of these consequences may deteriorate the Quality of life in peripheral arterial disease patients. Obesity, hypertension, glucose intolerance, dyslipidemia may change the quality of life[15].

VQ-6 is reliable and valid, and can be used to evaluate PAD treatment in clinical practice and in vascularregistries. Further research is necessary to determine the clinically important change over time. The VQ-6 demonstrated good internal consistency (alpha = 0.82) Cronbach's alpha coefficient calculations at baseline (n = 171)[16.]

Regular physical activity is the most effective treatment. Simplewalking regimens, leg exercises, and treadmill exercise programs canresult in decreased symptoms in just 4-8 weeks. Treatment options to improve walking ability vary depending on the patient's symptoms and disease severity. Exercise therapy involves walking until reaching pain tolerance, stopping for a brief rest, and walking again as

soon as the pain resolves[17]. Physical therapy treatment of claudication is dichotomized into two major goals: (1) improve walking ability and functional status by reducing claudication symptoms and preserving limb viability; and (2) reduce the risk of cardiovascular events by treatment of the underlying systemic atherosclerosis[18].Furtherresearch is required to know about the effects of exercise therapy dose, duration and long term effects The aim of this study was primarily to evaluate the effect of exercise training on pain free walking distance and quality of life in PAD subjects.

AIMS & OBJECTIVES

AIM: The aim of the study is to evaluate the effectiveness of strength training and treadmill walking on pain free walking & quality of life in subjects with peripheral arterial diseases.

OBJECTIVE: To assess the pain free walking distance by ACSM claudication scale To assess the quality of life by using VQOLQ-6

HYPOTHESIS

NULL HYPOTHESIS: It states that there is no significant difference observed in terms of pain free walking distance & quality of life by treadmill training & strength training programe in peripheral arterial disease subjects.

ALTERNATE HYPOTHESIS: It states that there is a significant difference observed in terms of pain free walking distance & quality of life by treadmill training & strength training programe in peripheral arterial disease subjects.

REVIEW OF LITERATURE

1. Alessandra de Souza Miranda1, Lausanne Barreto de Carvalho Cahú Rodrigues1, Sérgio Luiz Cahú Rodrigues1, Crivaldo Gomes Cardoso Júnior2, Maryela Oliveira Menacho3, Diego GiullianoDestro Christofaro3, Raphael Mendes Ritti-Dias1 conducted a study To analyze, the effects of walking and strength training on the walking capacity in patients with IC. Papers analyzing the effects of walking and strength training programs in patients with IC were browsed on the Medline, Lilacs, and Cochrane databases. Results of the study indicated Walking and strength training yielded increases in CD and TWD. However, walking training yielded greater increases than strength training. Walking and strength training improve walking capacity in patients with IC. However, greater improvements in TWD are obtained with walking training[19].
2. Michael H. Criqui, Victor Aboyans conducted a study to analyze data on the epidemiology ofperipheral artery disease (PAD).The PAD results were grouped into symptoms, diagnosis, prevalence, and incidence both in the United States and globally, risk factors, progression, coprevalence with other atherosclerotic disease, and association with incident cardiovascular morbidity and mortality. The most common symptom of PAD is intermittent claudication. Prevalence seems to be higher among men than women for more severe or symptomatic disease. The major risk factors for PAD are similar to those for coronary and cerebrovascular disease, with some differences in the relative importance of factors. Smoking is a particularly strong risk factor for PAD, as is diabetes mellitus. Result of the study is PAD is strongly associated with coronary and cerebrovascular diseases. After adjustment for known cardiovascular disease risk factors, PAD is associated with an increased risk of incident coronary and cerebrovascular disease morbidity and

mortality[20]

3. Rulon L. Hardman, MD, PhD1 Omid Jazaeri, MD1,2 J. Yi, MD2 M. Smith, MD1 Rajan Gupta, MD1 conducted a study to analyse Peripheral artery disease (PAD), secondary to atherosclerotic disease, is currently the leading cause of morbidity and mortality in the western world. While PAD is common, it is estimated that the majority of patients with PAD are undiagnosed and undertreated. The challenge to the treatment of PAD is to accurately diagnose the symptoms and determine treatment for each patient. Reproducible classification systems are also important in clinical trials and when comparing medical, surgical, and endovascular treatment. Result of the study indicated the various classification systems for PAD and advantages to each system[21].
4. Adriana Vera Artázcoz1, Juan Ruiz-García2, Eduardo Alegria-Barrero2, Ana C Ruiz Navarro2, Miguel Casares Santiago3, Marco A Blázquez2 and Miguel A San Martin2coducted a study to analysePeripheral arterial disease is a major cause of morbidity and mortality. Cardiovascular risk factors (diabetes,hypercholesterolemia, smoking, hypertension) are responsible for the development and progression of the disease .Progressive improvement of diagnostic techniques together with clinical tools has allowed a better diagnosis and earlier referral for revascularization techniques. Duplex ultrasound, computerized tomography angiography andmagnetic resonance angiography are widely used for the diagnosis of peripheral arterial disease. Digital subtractionangiography is used nowadays for revascularization procedures. Result of the study indicated the current status of thedifferent techniques used to diagnose peripheral arterial disease[22].
5. Lucía Cea-Soriano,1,2 F Gerry R Fowkes,3 Saga Johansson,4 Alaster M Allum,5Luis Alberto García Rodriguez6 Conducted a study to analyse time trends in symptomaticperipheral artery disease (PAD) incidence and prevalence, Cohort study using The Health ImprovementNetwork.Participants Individuals aged 50–89 years identifiedannually between 2000 and 2014. Participants withsymptomatic PAD were identified. Proportion of patients prescribed secondarypreventive therapy with acetylsalicylic acid (ASA),clopidogrel, an ACE inhibitor, an angiotensin receptor rblocker (ARB) and/or a statin.The result of the study is the incidence and prevalence of symptomatic PAD diagnosed in UK primary care are decreasing. A largeproportion of the population with PAD in clinical practicedoes not receive guideline-recommended secondaryprevention therapy[23].
6. RamezMorcos 1, BoshraLouka 2, Andrew Tseng 2, Sanjay Misra 3, Robert McBane 4,Heidi Esser 5 and Fadi Shamoun 2,conducted on the study to analyzePeripheral arterial disease (PAD) refers to partial or complete occlusion of one or morenon-coronary arteries that leads to compromised blood flow and ischemia. Numerous processesare involved in arterial stenosis, however, atherosclerosis remains the most common etiology.PAD constitutes a major health economic problem, and it is estimated that over 200 million peoplearound the world suffer from PAD, with at least 20% having some degree of claudication. The result of the study is to compare and contrast the guidelines on PAD published in 2005, 2011 and 2016 interms of new recommendations and level of evidence for practicing clinicians[24].
7. Mary M. McDermott, MD, Jack M. Guralnik, MD, PhD, Luigi Ferrucci, MD, PhD, Lu Tian, ScD, Kiang Liu, PhD, Yihua Liao, MS, David Green, MD, PhD, Robert Sufit, MD, Frederick Hoff, MD, Takashi Nishida, MD, Leena Sharma, MD, William H. Pearce, MD, Joseph R. Schneider, MD, PhD, and Michael H. Criqui, MD, MPH conducted a study to assess functional performance, calf muscle characteristics, peripheral nerve function, and quality of life in asymptomatic persons with peripheral arterial disease. PAD participants were categorized into leg symptom groups including intermittent

claudication and always asymptomatic. Calf muscle was measured with computed tomography. Result of the indicated that, the Persons with PAD who never experience exertional leg symptoms have poorer functional performance, poorer quality of life, and more adverse calf muscle characteristics compared with persons with intermittent claudication and a sedentary, asymptomatic, age-matched group of non-PAD persons[25].

8. Nicolas W Shammas conducted on the study to assess Peripheral arterial disease (PAD) is part of a global vascular problem of diffuse atherosclerosis. Aggressive risk factors modification is needed to reduce cardiac mortality in PAD patients. These include smoking cessation, reduction of blood pressure, aggressive low density lipoprotein lowering, losing weight, controlling diabetes and the use of oral antiplatelet drugs such as aspirin or clopidogrel. Result of the study is quitting smoking and exercise, cilostazol and statins have been shown to reduce claudication in patients with PAD. Patients with critical rest limb ischemia or severe progressive claudication need to be treated with revascularization to minimize the chance of limb loss, reduce symptoms, and improve quality of life[26].
9. Michael R. M. McGuigan,RogerBronks, Robert U. Newton,Matthew J. Sharman,John C. Graham,David V. Cody,and William J. Kraemer conducted a study to investigate the effects of a progressive resistance training program on myosin heavy chain isoform expression, fiber type, and capillarization in patients with symptomatic peripheral arterial disease. Patients were randomized to either a training group or a control group. The training sessions were completed 3 times/week, using 2 sets of various exercises, each performed for 8–15 repetitions. There were significant increases in 10 repetition maximum leg press and calf press strengths in the trained subjects. There were no significant changes in any of the measurements in the control group. Result of the study is progressive resistance training results in significant increases in muscle strength and alters skeletal muscle composition of subjects with peripheral arterial disease[27].
10. Parveen K. Garg, MD, MPH; Lu Tian, ScD; Michael H. Criqui, MD, MPH; Kiang Liu,PhD;LuigiFerrucci, MD, PhD; Jack M. Guralnik, MD, PhD; Jin Tan, MS; Mary M.McDermott, MDConducted on a study whether patients with lower-extremity peripheral arterial disease (PAD) who are more physically active during daily life have lower mortality rates than PAD patients who are less active.Participants were 460 men and women with PAD followed up for 57 months. Analyses were adjustedfor age, sex, race, body mass index, hypertension, smoking, comorbidities, total cholesterol, HDL cholesterol, leg symptoms, and ankle-brachial index. Result of the study is PAD patients with higher physical activity during daily life have reduced mortality and cardiovascular events compared with PAD patients with the lowest physical activity[28].
11. Katarzyna Kropielnicka ,1 WiolettaDziubek, et. al., conducted on a study to analyse a typical symptom of chronic lower-limb ischaemia is lower-limb pain, which occurs during walking forcing the patient to stop, intermittent claudication (IC). Exercise rehabilitation is the basic form of treatment for these patients.The aim of this study was to compare the effectiveness of three types of physical training programmes conducted over a 12-week period in patients with chronic lower-limb arterial insufficiency. Ninety-five people qualified for the 3-month supervisedmotor rehabilitation programme, conducted three times a week.Result of the study is Given both the force-velocity parameters and the covered distance, the training RES + NW gives the most beneficial changes compared to training TW alone and NW alone. All types of training increased walking distance, which is an important aspect of the everyday functioning of people with IC[29].

12. Anne Sofie F. Larsen1,4 , Anne Therese Reiersen2, Morten B. Jacobsen3,4, Nils-Einar Kløw4,5, JoakimNordanstig,Mark Morgan7 and JarlisWesche Conducted a study to analyse The VascuQoL-6 (VQ-6) health-related quality of life questionnaire, a short version of the disease-specific VascuQoL-25, was developed for clinical practice and use in vascular registries. The study purpose was to evaluate the validity and reliability of VQ-6. patients with intermittent claudication (IC) or critical limb ischemia (CLI) were included. All patients completed VQ-6 and Short Form-36 (SF-36), and were evaluated with ankle-brachial index (ABI) measurement pre- and post-exercise, a constant load treadmill test and clinical consultation at baseline and after 4 weeks. One hundred seventy-one patients with peripheral arterial disease (PAD) were included, 70 (41%) female. 147 (86%) of the patients suffered from IC. Result of the study is VQ-6 is reliable and valid, and can be used to evaluate PAD treatment[30].
13. ChaitsiKirit Jani1, Pukur I Thekdi2, Vijay Thakore conducted a study to compare the effect of upper body strength training exercise vs. treadmill walking on intermittent claudication In this study fifty four patients were enrolled in two groups through convenience sampling. Data were collected for 18 patients in Group A (upper body strength training) and 16 in group B (treadmill walking) for analysis. Independent t test was used for inter group comparison and ANOVA for intra group comparison of Ankle Brachial Index (ABI), Pain Free Walking Distance (PFWD), Maximum Walking Distance (MWD), Heart Rate (HR) and Walking Impairment Questionnaire (WIQ). Result of the study is Upper body strength training and treadmill walking both forms of exercise appears to be an effective for improving PFWD, HR and WIQ in intermittent claudication[31].
14. Hiatt WR ,Wolfel EE, Meier RH, Regensteiner JG. Conducted a studyIn patients with intermittent claudication, a supervised walking exercise programincreases peak exercise performance and community-based functional status. Patients withperipheral arterial disease also have muscle weakness in the affected extremity that may contribute to the walking impairment.The present study tested the hypothesis that a strength training program would be as effective as treadmill walking exercise and that combinations of strengthening and walking exercise would be more effective than either alone in improving exercise performance. Twenty-nine patients with disabling claudication were randomized to 12 weeks of supervised walking exercise on a treadmill, strength training, or a nonexercising control group. Result of the study is a supervised treadmill walking exercise program is an effective means toimprove exercise performance in patients with intermittent claudication, with continued improvement over 24 weeks of training. In contrast, 12 weeks of strength training was less effective than 12 weeks of supervised treadmill walking exercise[32].
15. Liu CJ ,Latham NK conducted a study to assess the effects of PRT on older people and identify adverse events. One hundred and twenty one trials with 6700 participants were included. In most trials, PRT was performed two to three times per week and at a high intensity. Functional limitation measures also showed improvements: e.g. there was a modest improvement in gait speed. PRT had a large positive effect on muscle strength. Participants with osteoarthritis reported a reduction in pain following PRT. Serious adverse events were rare, and no serious events were reported to be directly related to the exercise programme. Result of the study is that PRT is an effective intervention for improving physical functioning in older people, including improving strength and the performance of some simple and complex activities[33].
16. Preeti S. Christian conducted a study on Patients with PAD have a significant reduction in their physical activities like walking due to intermittent claudication. Intermittentclaudication is a major symptom of Peripheral arterial disease. It is cramping pain, aggravated by exercise and relieved by

rest. It is because of atherosclerosis, fatty deposits blocking blood flow through the arteries, which reduce blood flow to the muscles of leg. Treatments include stopping smoking, starting to physiotherapy, drugs and surgery. Result of the study is that physiotherapy can relieve intermittent claudication for many people. Exercise may be better than angioplasty. Some other types of surgeries are available which are more effective than exercise, but they carry more risks. Nowadays various modes of physiotherapy are available. It is advisable to start physiotherapy treatment with proper guidance[34].

17. Jeffrey W. Olin, DO,Christopher J. White, MD,Ehrin J. Armstrong, MD, MSC,DaniellaKadian-Dodov, MD,William R. Hiatt, MD conducted a study to analyzethe prevalence of peripheral artery disease (PAD) continues to increase worldwide. It is important to identify patientswith PAD because of the increased risk of myocardial infarction, stroke, and cardiovascular death and impaired quality oflife because of a profound limitation in exercise performance and the potential to develop critical limb ischemia. Result of the study is the management of PAD patients should include an exerciseprogram, guideline-based medical therapy to lower the cardiovascular risk, and, when revascularization is indicated,an "endovascular first" approach[35].
18. Debra Kohlman-Trigoboff, MS, ACNP-BCconucted a study on Peripheral arterial disease (PAD) is atherosclerosis of the arterial beds in the carotid, subclavian, aorta, visceral, and lower extremity arteries, exclusive of the coronary arteries. The presence of lower extremity PAD is a marker for systemic atherosclerotic disease in other vascular beds, such as the coronary, carotid, and renal arteries, and abdominal aorta. Result of the study is diagnosing PAD can lead to the early detection and treatment of other cardiovascular diseases[36].
19. P. Abdulhannan, D. A. Russell, and S. Homer-VanniasinkamIntroduction: Peripheral arterial disease (PAD) is a common vascular condition that affects both quality of life and life expectancy with an increased risk of cardiovascular events. Aggressive risk factorsmodification is needed to reduce cardiovascular-related mortality in PAD patients.There is a rapid expansion of endovascular technologies aiming to improve the effectiveness of this modality. The advances in the fields of gene therapy and therapeutic angiogenesis mean these are potential future treatments. Tissueengineering is a developing area and aims to produce grafts with similar patency and infection profiles to those of autologous material. Further elucidation of the pathophysiology of atherosclerosis is required to provide newtargets for pharmacotherapy[37].
20. J .C. TSAI 1, P. CHAN2, et al.,conducted A Study On The Effects Of Exercise Training On Walking Function And Perception Of Health Status In Elderly Patients With Peripheral Arterial Occlusive Disease. To Determine The Effects Of 12-Week Exercise Programme On Ambulatory Function, Freeliving Daily Physical Activity And Health- Related Quality Of Life In Disabled Older Patients[38.]

MATERIALS & METHODOLOGY

MATERIALS:

- Countdown timer (or stopwatch)
- A chair that can be easily moved along the walking course
- Adjustable weight cuffs
- Traffic cones
- Adjustable weight cuffs

- Motorized treadmill

SAMPLE SIZE: 30patients
RESEARCH DESIGN: Comparative study
SAMPLING TECHNIQUE: Simple randomized sampling
STUDYSETTING: HI TECH HOSPITALS, GUNTUR
STUDY DURATION:12 weeks

INCLUSION CRITERIA:

- Subjects with age group between 40-65years
- Subjects who are co-operative and comprehending
- Subjects with grade II of PAD (fontafine classification)

EXCLUSION CRITERIA:

- Patients with high intra cranial pressure
- Severe musculoskeletal and neurological problems
- Cardiac and Restrictive lung diseases
- Subjects who have undergone resistance exercises and aerobic exercises prior to study

ASSESMENT TOOLS:

- ACSM claudication pain rating scale
- VASCUQOL-6

PROCEDURE

Subjects were first evaluated and clinically diagnosed by surgery department through history and physical examination After taking proper assessment, which included the history of cardiovascular disease and its risk factors, any surgery, current medicine etc, subjects who were diagnosed as PAD with Intermittent claudication. Study procedure and effects were properly explained to all participants and informed consent was taken.

A total of 30 subjects with PAD are divided into two groups. Group A consists of lower limb strength training included total twelve weeks moderate intensity (60% of 1 RM) resisted exercises for large muscle groups of lower limb and ankle push ups three sets of 10 repetition in between two minutes rest of total 45 minutes duration for three days a week supervised by the physical therapist. The 1 RM was accurately tested by physical therapist initially and then after every two weeks for recalibrated intensity. Training session's starts and ends with five minutes of warm up and cool down phase.

Treadmill walking group BProtocol was started with five minutes of warm up then treadmill walking at a speed that produced claudication pain grade 3 into ACSM claudication scale within 5-10 minutes with 0% grade followed by the rest. This intermittent walking should repeat for 35 minutes and every session was followed the same protocol until patient could complete this with ease. After that every week speed was increased 0.3 km/m or grade by 1%. The session was ended by five minutes cool down period which included stretching of some major muscles.

Before & after the procedure subjects were assessed with simple walking test &VASCUQOL-6. Pain free walking distance is measured by asking the subject to walk on minimum 30 m long plain

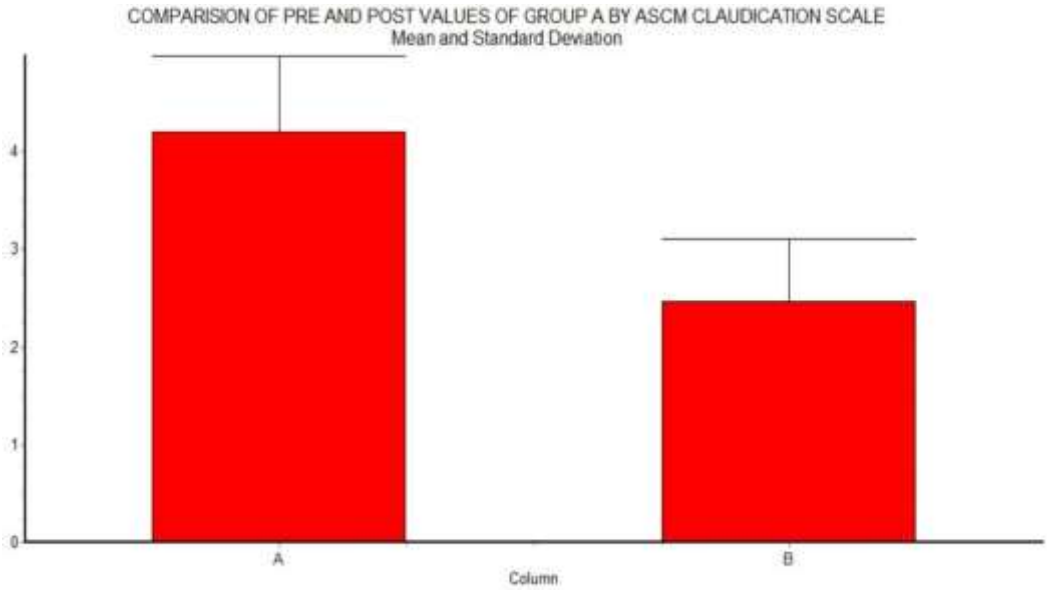
surface at a speed of approximately 100 m per min (equivalent to two steps per second). ACSM claudication pain rating scale was used to note the changes in severity of pain during the test.

DATA ANALYSIS & RESULTS

DATA ANALYSIS

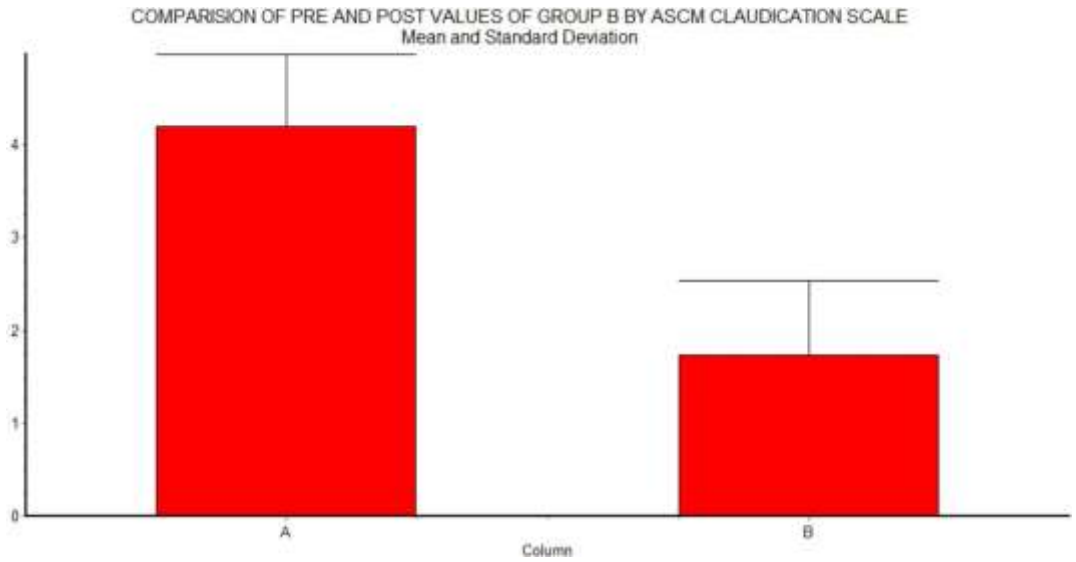
COMPARISON OF PRE & POST VALUES OF GROUP A (ACSM)

S.No	PRE TEST VALUES	POST TEST VALUES
1	5	3
2	3	2
3	4	3
4	5	3
5	5	3
6	3	2
7	4	2
8	5	1
9	5	3
10	4	3
11	3	3
12	4	2
13	4	3
14	5	2
15	4	2
Mean	4.2	2.46
Sd	0.77	0.63
P value	wo-tailed P value is < 0.0001, considered extremely significant. T value 6.681	



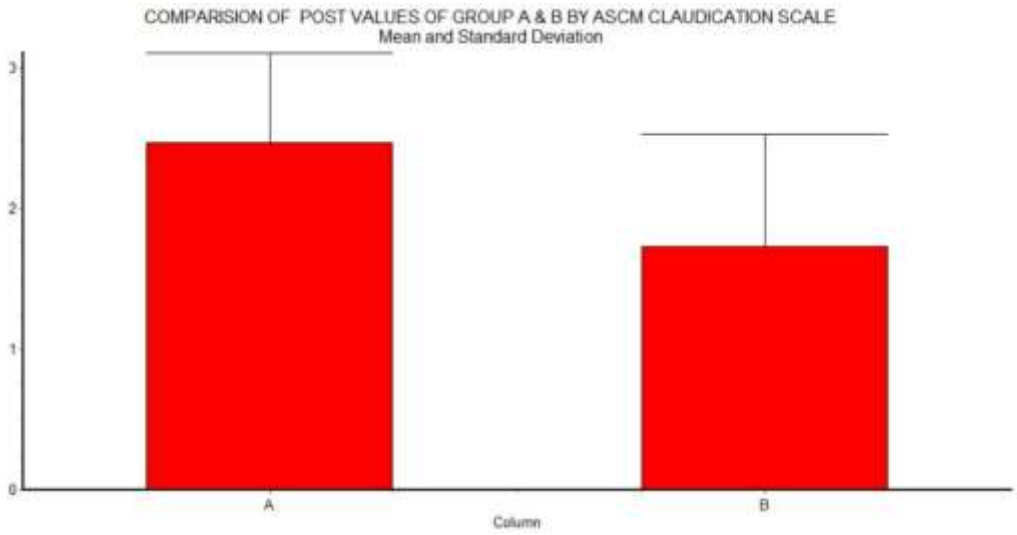
COMPARISON OF PRE & POST VALUES OF GROUP B (ACSM)

S.No	PRE TEST VALUES	POST TEST VALUES
1	3	1
2	3	2
3	4	2
4	5	1
5	5	3
6	5	1
7	4	1
8	5	1
9	5	3
10	4	3
11	3	1
12	4	2
13	4	1
14	5	2
15	4	2
MEAN	4.2	1.733
SD	0.77	0.79
P value	The two-tailed P value is < 0.0001, considered extremely significant t- value 8.586	



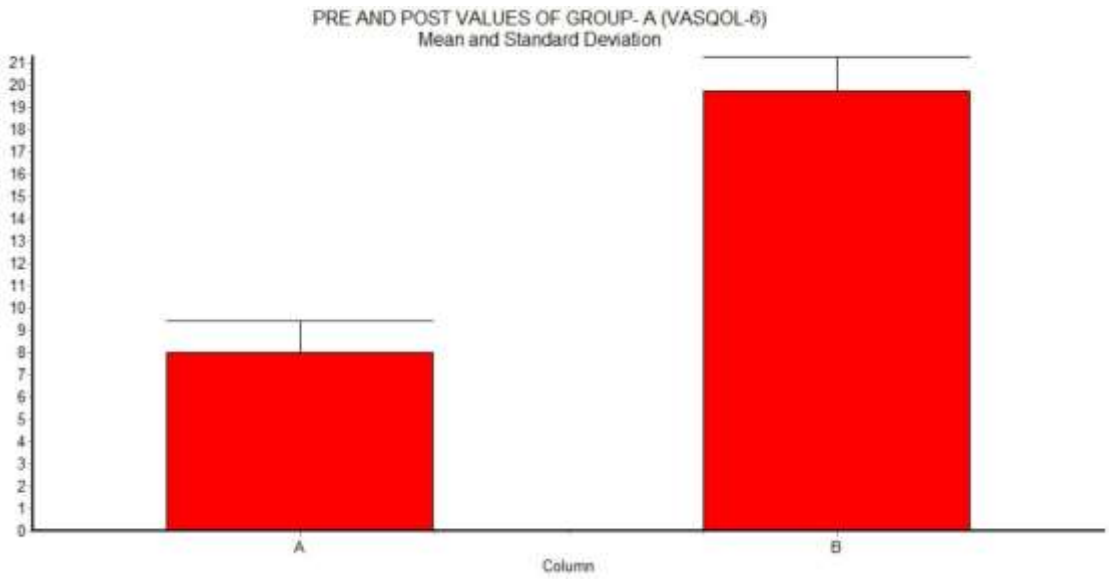
COMPARISON OF POST VALUES OF GROUP A AND B(ASCM)

S.No	POST TEST VALUES	POST TEST VALUES
1	3	1
2	2	2
3	3	2
4	3	1
5	3	3
6	2	1
7	2	1
8	1	1
9	3	3
10	3	3
11	3	1
12	2	2
13	3	1
14	2	2
15	2	2
MEAN	2.466	1.733
SD	0.63	0.79
P value	The two-tailed P value is 0.0097, considered significant. t-value 2.775	



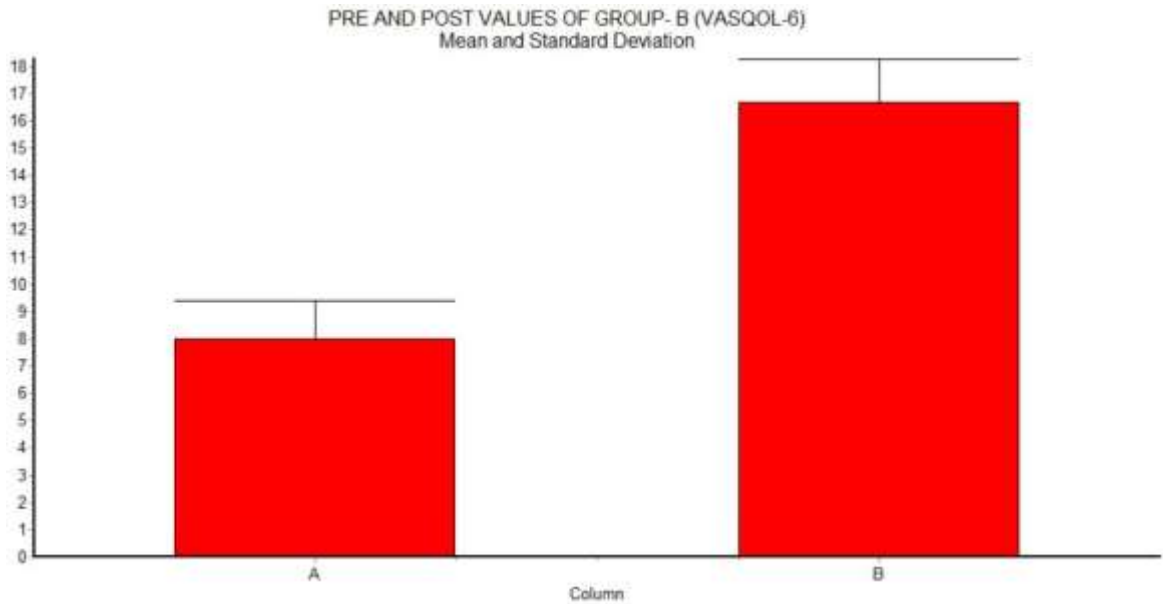
COMPARISON OF PRE AND POST VALUES OF GROUP A (VASCUQOL-6)

S.No	PRE TEST VALUES	POST TEST VALUES
1	8	18
2	8	20
3	9	18
4	7	19
5	7	21
6	8	18
7	6	20
8	9	19
9	7	22
10	10	21
11	8	19
12	7	23
13	9	20
14	6	18
15	11	20
MEAN	8	19.73
SD	1.414	1.534
P VALUE	o tailed p value is <0.0001, considered extremely significant. t-value21.782	



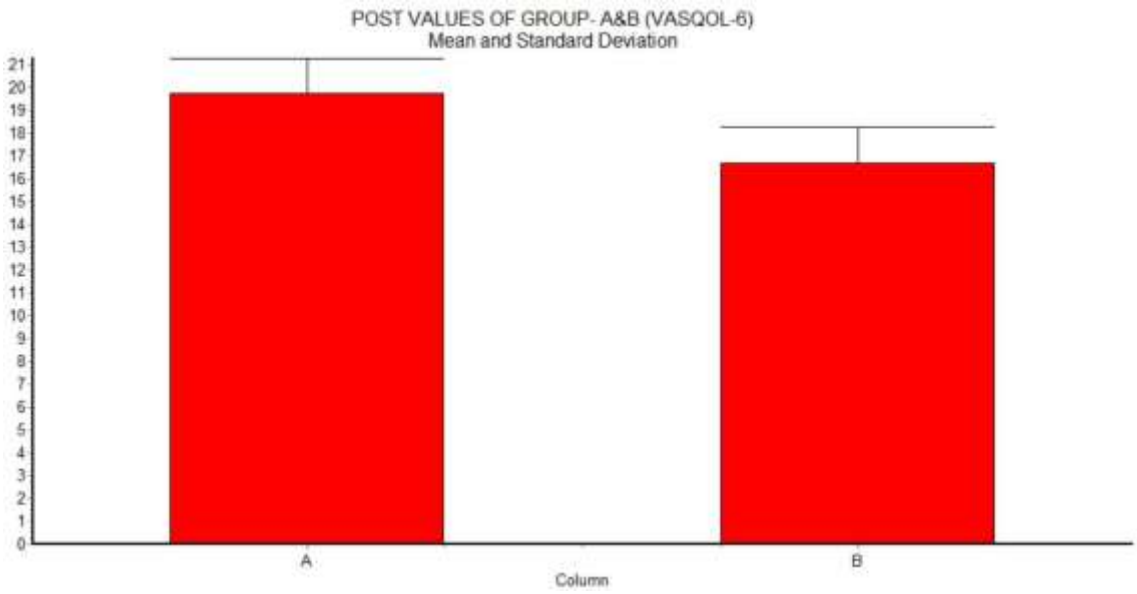
COMPARISON OF PRE AND POST VALUES OF GROUP-B(VASCUQOL- 6)

S. No	PRE TEST VALUES	POST TEST VALUES
1	6	15
2	10	17
3	9	15
4	7	16
5	7	19
6	8	18
7	8	15
8	9	16
9	7	19
10	11	15
11	8	15
12	7	18
13	8	16
14	6	17
15	8	19
MEAN	8	16.66
SD	1.414	1.589
P VALUE	o tailed p value is <0.0001, considered extremely significant. t-value 15.781	



COMPARISON OF POST VAUES OF GROUP A & B (VASCUQOL-6)

S. No	POST TEST VALUES	POST TEST VALUES
1	18	15
2	20	17
3	18	15
4	19	16
5	21	19
6	18	18
7	20	15
8	19	16
9	22	19
10	21	15
11	19	15
12	23	18
13	20	16
14	18	17
15	20	19
MEAN	19.73	16.66
SD	1.534	1.589
P VALUE	THE two tailed p value is <0.0001, considered extremely significant. t = 5.379	



RESULTS

Within group analysis of group, A treated with strength training revealed that there is a significant improvement within the group, by using ACSM claudication scale &VASCUQOL-6 as outcome

measure with a p value <0.0001 which is extremely significant.
Within group analysis of group B treated with aerobic training revealed that there is a significant improvement within the group by using ACSM claudication scale &VASCUQOL-6 outcome measure with a p value <0.0001 which is extremely significant.
Between the group analysis of group, A and B revealed that there is a significant difference observed in between two groups by using ACSM claudication scale with a p value is 0.0097 which is considered significant & p- value of VASCUQOL-6 < 0.0001 considered extremely significant.

DISCUSSION

Present study focused on beneficial aspects of physical therapy interventions in subjects with peripheral arterial diseases. 30 subjects with peripheral arterial diseases were randomized into two groups group A (15) & group B (15). Both groups were trained with same duration & assessment tools. The results are concluded that both groups showed significant improvement on pain free walking distance & quality of life in peripheral vascular diseases. Results of the study indicating that, treadmill training is beneficial to control pain symptoms & pain free walking distance in subjects with peripheral arterial diseases with a p- value 0.0097 which indicates the impact of treadmill walking.
Physical activity is still the first and most fundamental recommendation when treating individuals with PAD. Although in clinical practice this has not been standard practice[39], exercise Programs for PAD can increase the walking capacity of patients when compared to pretreatment values. Supervised exercise programs have been recommended as first-line therapy for treatment of claudication. Recent evidence demonstrates benefits of exercise training even among those patients with PAD who do not have claudication. Exercise programs combined with risk factor modification offer the possibility of altering the clinical trajectory of PAD.
The results of current research are compatible with the results obtained by Hiatt et al., whose results indicated the advantage of walking exercises over resistance exercises in improving the pain-free time. In the treadmill walking group, an increase of 74 - 58% in the maximum claudication time was observed after 12 weeks in comparison with the initial values. Moreover, VO2 max (maximal oxygen uptake) and the pain-free time also increased in a statistically significant way. In the group performing resistance exercises, the maximum walking time increased merely by 36 - 48%, while VO2 max and the pain-free time did not change in a statistically significant way[40].
Exercise training improves oxygen extraction and muscle carnitine metabolism in the leg. Following a program of exercise training, humans with heart failure will increase expression of vascular endothelial growth factor messenger RNA in skeletal muscle, and animal models reveal an increase in collateral development. Moreover, exercise increases levels of circulating endothelial progenitor cells, monocyte/macrophage-derived angiogenic cells, and reduces EPC apoptosis[41].
Cucato et al., conducted a study by using walking exercises and resistance training upon the walking distance. Their research involved a 12-week program of exercises with the intensity corresponding to levels 11–13 on Borg's scale. The improvement of walking parameters in both groups was similar. In the treadmill walking group, ICD measured in meters grew from 342 - 182 to 469 - 237, while ADC grew from 572 − 231 to 721 - 289 (p< 0.01). In the group performing resistance exercises, ICD grew from 358 } 224 to 504 } 276, while ACD grew from 618 - 282 to 775 - 334 (p< 0.01).Measurements were taken on a treadmill with a graded protocol [42].

The results of this research are not compatable with the resultsobtained by Ritti-Dias et al.,who compared the results of a 12-week program of resistance exercises and walking exercisesperformed twice a week. The walking distance was also measured withagradedprotocol on a treadmill.Theintensityof exercises was established on the level of 11–13 on Borg'sscale, which corresponded to level 3 on a 5-point scale used inour research. Ritti-Dias observed a significant improvementofICDandACDmeasured on the treadmill in both groups ofparticipants.The results obtained in both groups did not differin a statistically significant way. Measured in meters, ICDin the treadmill walking group grew from 342 - 182 to 469 - 237, while ACD grew from 572 - 231 to 721 - 287 ($p<$ 0.05).The pain-free distance and ACD in the group performingresistance exercises grew, respectively, from 335 - 224 to 504 - 276 and from 618 - 282 to 775 - 334 ($p<$ 0.05). The onlydifference observed by Ritti-Dias et al. was a lower level ofpain experienced by patients during the walking exercisescompared with those performing resistance exercises[43].

Following a program of exercise training, walking economy has been improved in PAD patients and in patients with other chronic diseases, as evidenced by a decrease in oxygen consumption at submaximal workloads. Strengthtraining & treadmill walking in peripheral arterial disease subjects had shown significant improvement on pain free walking distance & quality of life in peripheral arterial diseases. Treadmill training improved aerobic fitness, and endurance to walk without pain, whereas resistance training significantly improved muscular strength.

CONCLUSION

Strengthtraining& treadmill walking in peripheral arterial disease subjects had shown significant improvement on pain free walking distance & quality of life in peripheral arterial diseases. Treadmill training increases aerobic fitness, and endurance to walk without pain, whereas resistance training significantly improved self-esteem, muscular strength. Both strength training and treadmill training are useful to improve pain free walking distance & quality of life in subjects with peripheral arterial disease.

SUMMARY

It is a randomized controlled trail done on 30 patients with peripheral arterial disease were grouped into 2 of 15 in each. Group A subjects were given strength training and subjects in Group B were given treadmill walking. Group A were given treatment of total twelve weeks moderate intensity, and Group B subjects were given treatment fortreadmill walking at a speed that produced IC pain grade 3 into ACSM claudication scale within 5-10 minutes with 0% grade followed by the rest. This intermittent walking should repeat for 35 minutes and every session was followed the same protocol until patient could complete this with.started with five minutes of warm up then cool down period about 10 minutes in both groups. The outcome parameters recorded before and after the 12 weeks of study period.Results suggested that both the groups showed improvementin strength training and treadmill training are useful to improve pain free walking distance & quality of life in subjects with peripheral arterial disease.

LIMITATIONS AND RECOMENDATIONS

LIMITATIONS :

- Sample size.
- Short duration of study.

- Lack of followup after study.
- If there would be ample of time the study will be effective.

RECOMMENDATIONS:

- large sample size.
- longer duration of study.

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