Original Research Article **Physiotherapy**

International Journal of Pharma and Bio Sciences

ISSN 0975-6299

COMPARE THE EFFECT OF 10 METER WALK TEST IN CONVENTIONAL BELOW KNEE PROSTHESIS VERSUS MODULAR BELOW KNEE PROSTHESIS ON UNILATERAL TRANSTIBIAL AMPUTEE PATIENTS

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ABSTRACT

Our study is to compare the effect of 10 meter walk test on unilateral Transtibial amputees those who are using conventional and modular patellar tendon bearing (PTB) prosthesis with stump exercises. The effect of 10 meter walk test as an outcome measure to assess the time duration to walk the 10 meter distance by the unilateral transtibial amputees on the day of first PTB prosthesis fitting (1st day), at the end of 4th week and at the end of 8th week respectively and to compare the 10 meter walk test time in between conventional PTB prosthesis with stump exercises and modular PTB prosthesis with stump exercises. A sample of 120 persons with below knee amputees who were trained to wear prosthesis were studied with a comparative follow up study design with purposive sampling technique. Patients who were admitted at KIMS & RI, Bangalore, KSHMA & RI Mangalore, (N=150) who underwent unilateral transtibial, transfemoral and other amputations between Dec 2009 – Dec 2015. To find out the time duration to walk`10 meter distance by 10 meter walk test on the day of first prosthetic fitting(1st day), at the end of 4th week and at the end of 8th week (peri and post prosthetic fitting) by unilateral transtibial amputees who wear conventional and modular PTB prosthesis along with stump exercises. *6* years of comparative follow up study reveals that the outcome measures of peri and post-prosthetic fitting 10 meter walking distance time by 10 meter walk test while using conventional PTB prosthesis with stump exercises and modular PTB prosthesis with stump exercises on unilateral transtibial amputees. The unilateral transtibial amputees who trained with modular prosthesis along with stump exercises group patients 10 meter walking distance time(9.14 sec) are reduced as compared to the unilateral transtibial amputees who are trained with conventional PTB prosthesis along with stump exercises(13.84 sec). The mean difference of 10 meter walking distance time was 4.7 seconds (P<0.001). There is no significant difference seen in both the groups while giving stump exercises alone. The unilateral transtibial amputees who were trained with modular PTB prosthesis along with stump exercises group patient's 10 meter walking distance time has reduced (P<0.001).

KEYWORDS: **Amputation, 10 Meter walk test, PTB prosthesis. Stump exercises**

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INTRODUCTION

Lower-limb amputation is prevalent, with approximately 1,027,000 people in the United States. The number of people with lower-limb amputations is expected to double by the year 2050, unilateral transtibial amputees are primarily due to dysvascular disease and diabetes.[1,2] Foot ulcer infections are one of the major challenges in patients with diabetes mellitus which is associated with significant morbidity, disability and impairment in a diabetic patient's life. 20% of diabetes-related hospital admissions are often leads to lower extremity amputation unless prompt treatment strategies are ensured.[3,4]. According to the Indian Census 2013, there were 21 million people with disabilities in India, who constituted 2.13 % of the total population. The prevalence rates of amputees by state each; Gujarat, Karnataka, Tamilnadu and Kerala are around 15,000 each. As per the guidelines and gazette notification issued by Ministry of Social Justice and Empowerment on June 13, 2014, Permanent Physical Impairment (PPI) for various levels of amputation is as follows: below-knee amputation, 70%; through-knee amputation, 75%; above-knee amputation, 85%; below-elbow amputation, 70%; above-elbow amputation, 85%; through-hip amputation, 90%; through-shoulder amputation, 90%; and through-ankle amputation, 55%.Amputation is a triple offence that results in loss of function, body image, and sensation.[5] Amputation should be considered as a treatment but not necessarily a tragedy. Due to amputation the patient becomes physically, socially and psychologically impaired.[6] Amputation of the lower limb can result in a permanent impairment and disability in all age group.[7] The amputees experience the following four themes: 'lost in the dark woods', 'emotional collapse', 'difficulty in passing through the shadow' and 'ignition a gleam of hope'.[8] The loss of a body part primarily can cause physical, psychological and social disturbance, the majority of previous researches in this area focused on the effective rehabilitation program.[9] People with amputations will receive a new prosthetic limb once every 2 years throughout their lifetime, and will see their prosthetist between 4 and 9 times per year.[10,11] Proper prescription of prosthetic device and potential rehabilitation increases the quality of life for subjects with amputations. Advances in prosthetic technology, includes specialized gel and silicone liners to improve the interface with the residual limb.[12] As a general rule applicable to both upper and lower extremities, the more distal the level of amputation, better are the results with regard to overall function and efficiency of walking.[13,14,15] Further patients who have a lower extremity amputation, can be maintained at a transtibial level will have more efficient gait and better function compared to those who have a transfemoral amputation. Therefore an adequate soft tissue envelope with proper skeletal length is important to maintain optimal physiotherapy outcomes.[16] Below knee amputation affects almost all the aspects of amputee patient's life style. Walking ability is very important functional outcome which is measured through the 10 meter walk test to understand the wellbeing of the patient. According to world health organization, the ability to change body position and the ability to walk are the key components of mobility.[17] Performance walk test used in rehabilitation with a prosthetic device include measures of fixed walking distance such as 10 meter walk test have shown as the best objective performance oriented test to have excellent measurement properties to measure the future function of the amputees. The 10-Meter Walk Test has principally been used to test individuals with lower-extremity amputation.[18] The time taken to walk a distance of 10 m at the usual pace from a standing start was recorded, measurements were collected from two trials of self-selected walking speed. Support for concurrent validity of data for the 10-Meter Walk Test among a sample of 53 subjects with either a TT or TF lower-limb amputation has been reported. Rossier and Wade (2001) also have demonstrated intra rater reliability of data for the 10-Meter Walk Test using correlation (r=.93) and Bland-Altman plots. Rehabilitation immediately after the below knee amputation is provided in a variety of ways by the physical therapists that could be considered as a continuum of an intensive inpatient rehabilitation service on a specialized unit using prosthetic devices. Transtibial amputees with an adequate fit of the prosthesis socket are more likely to function better in daily life than those with fitting problems of their prosthetic sockets. To determine the right range of movement after fitting the first prosthesis, it's necessary to know when the stump volume has stabilized. Fluctuations in stump volume may hinder an adequate prosthetic fit. Therefore, accurate measurement of the stump volume is important in prosthetic care. A study was therefore planned to compare the 10 meter walk test result while using the conventional and modular patellar tendon bearing prosthesis with stump exercises.

MATERIALS AND METHODS

The study was a hospital / rehabilitation center based comparative follow up study from the day of prosthetic fitting to 8 weeks. Institutional Ethical clearance and permission was provided by NITTE. Permission for sample collection was permitted by the Principal and heads of surgery department and orthopedic department. Sample for the study comprised of 150 amputee patients out of which the 120 adult (male and female) amputees aged between 40 years to 55 years who underwent unilateral below knee amputation due to diabetes and peripheral vascular disease between December 2009 to December 2015 were selected on purposive sampling method. Samples of the study comprised of unilateral transtibial amputees at Kempegowda Institute of Medical Sciences Bangalore and Kshema Hospital Mangalore. The study was conducted and the individual subject data (10 meter walking distance time) were collected from the 1st day of 1st prosthetic fitting to 8 weeks of post prosthetic limb fitting. The study samples were selected based on inclusion and exclusion criteria with written consent from the individual patient. The 120 adult amputee patients were divided in to two groups having 60 samples in each group, group A patients were given conventional patellar tendon bearing (PTB) prosthesis with intensive stump exercises and group B patients were given modular PTB prosthesis with intensive stump exercises respectively. The samples are selected based on the sample selection formula. According to Suresh et al – "Evaluation of effectiveness of Balance training in Conventional prosthesis versus Ultra modern prosthesis in unilateral transtibial amputee by using Flemingo Balance test". Consider the values of Post intervention.

1. Conventional 35.00 ± 6.39
2. Modular 26.70 ± 2.95

Thus with 95% confidence as well as 95% power and with minimum expected time difference in both groups to walk 10 meter of 4 seconds minimum number of subjects to be included in study were :

n = Sample size
α = Level of Significance
β = Power of test
SD_1 = Standard Deviation of first group
SD_2 = Standard Deviation of second group
D^2 = Degree of precision required by researcher

$$n = \frac{(SD_1^2 + SD_2^2) \times (Z_1 - \alpha/2 + Z_{1-\beta})^2}{D^2}$$

$$= \frac{((6.39)^2 + (2.95)^2) \times (1.96 + 1.645)^2}{4^2}$$

$$= \frac{(40.8321 + 8.7025) \times (3.605)^2}{16}$$

$$= \frac{(49.5346 + 12.9990)}{16}$$

$$= \frac{62.5306}{16}$$

$$= 39$$

Since the study was of Before – After type 10% extra due to drop out were decided to study. Thus in Conventional group minimum 41 subjects and in Modular group minimum 41 subjects were planned to study. In this study all the 120 male and female unilateral below-knee amputees underwent 30 minutes of intensive physiotherapy exercises (starting with isometric stump exercises progressed to resisted exercises of the hip extensor, hip abductor, knee extensor muscle groups bilaterally and for the ankle plantar flexors on the sound side limb.) from the day of surgery, on the day of first prosthesis fitting to till 8 weeks post prosthetic fitting. All the subjects were given physiotherapy treatment for 5 visits per week for 8 weeks. All the patients were explained about the use of prosthesis, type of prosthesis and its weight bearing status according to the surgical procedure. The main criterion for selection of each subject with ideal stump, would be at least two months post-surgery to assure that the surgical wounds were well healed and non-tender. Residual limb length as measured from the medial tibial plateau to the distal tip of the tibia was required to range from 12 to 20 cm (4.7 in-7.9 in) to provide adequate muscle bulk for intensive physiotherapy for stump along with other joints and muscles on the amputated limb and sound side limb. All the subjects were required to be available for complete evaluation about one hour every two weeks over an eight-week period from the time of prosthesis fitting. The main goal of the intensive rehabilitation program for people with a lower extremity amputation is to assist them in returning to and maintaining normal living activities with prosthetic devices which in turn helps to increase the walking speed for 10 meters walk test.

Inclusion Criteria

Gender of subjects: Male/ Female, Etiology of amputation (trauma/ PVD/DM), Level of amputation (unilateral transtibial amputees), All subjects immediately after the prosthetic fitting with ideal stump, Patients who don't have phantom limb pain and other associated problems, Patients who don't have cardio respiratory and renal problems(MI,Congestive Cardiac Failiure,and Partial or complete renal failure).

Exclusion Criteria

Level of amputation other than unilateral transtibial amputees, Patients without ideal stump, Patients with cardio respiratory and renal problems, Patients with major associated psychological problems, Patients who didn't want to participate in the study after being explained about the nature and purpose of the study, Patients with associated physical disabilities other than amputation were excluded (PPRP, Hemiplegia, Parkinson diseases).The BK Amputee patients having well healed surgical wound with good and snuggy prosthetic fitting includes the subjects those who had proper prosthetic socket were participated in the 10meter walk test to assess the time taken for 10 meter walk test. For this study the subjects were taken (Central Ethical committee clearance was issued by NITTE university dated 29/05/2009 reference :

NU/CEC/01/2009) from the day of surgery, first day of first prosthetic fitting and 8 weeks of post prosthetic fitting treatment sessions. Informed consent was taken from each and every patient. The data of first day of first prosthetic fitting, at the end of 4th week and at the end of 8 weeks 10 meter walking distance time mean average of two trials were recorded with the help of Stop watch while using conventional and modular prosthesis in unilateral transtibial amputees. Conventional prosthesis also known as exoskeletal limb, the outer visible skin is the main structural element and such limbs are hollow attached with socket and joint. In this the weight bearing of the stump takes place at the boundary of the socket mainly 60% of the weight borne to patellar tendon and 40% of the weight borne to supracondylar region of the socket. In the last decade the design, material and prescription of the prosthesis have changed dramatically leading to modular prosthesis. Modular prosthesis also known as endoskeletal limb, this type of prosthesis now most widely used for lower extremity amputee. It has a central structural tube to which the socket and joints are attached, and this is usually covered with shaped foam to match the contour of the contralateral limb as closely as possible. The advantage of this prosthesis allows comfortable weight bearing. After amputation, gait speed usually declines and the energy cost of walking speed increases. Although regaining the strength on the amputated side and the sound side limb musculature have been emphasized for increased function. Increased function would have been emphasized by traditional rehabilitation programs which in turn increases the muscle strength and coordination to facilitate successful prosthetic gait. The gait speed would have been calculated with the help of 10 meter walk test, this test has principally been used to test individual with lower extremity amputation. The Level walking was conducted on a 10-m walkway. The time taken to walk a distance of 10 m at the usual pace from a standing start was recorded, in this study measurements were collected from two trials of a self-selected walking speed to calculate their mean and standard deviation for the outcome.

RESULT

Following are the statistical analysis

The principal investigator described 10 Meter walking distance time at the post-operative prosthesis fitting day 1 including stump exercises, post-operative prosthesis fitting with stump exercises at the end of 4th week and 8th week respectively, Data of each group are evaluated using means and SDs for all variables in the study. The researcher used parametric and non-parametric tests based on the outcome measure. Un-paired 't' test to compare the age groups. Mann Whitney 'U' test used to compare the differences between two independent groups. Friedman test was used to detect differences in treatments across multiple test attempts. Wilcoxon signed rank test was used to evaluate the differences between two treatments.

Table 1
Age group between Conventional and Modular below knee prosthesis

Group	N	Minimum	Maximum	Mean	Std. Deviation
Conventional below knee Prosthesis	60	40.00	55.00	47.1	4.2
Modular below knee Prosthesis	60	40.00	55.00	47.9	4.5

Unpaired t = 0.946, p = 0.346
Table 1 shows the age group of conventional and modular below knee prosthesis. The mean+SD of conventional below knee prosthesis group was 47.1, 4.2. The mean+SD of Modular below knee prosthesis was 47.9, 4.5. The unpaired t = 0.946 and the p = 0.346.

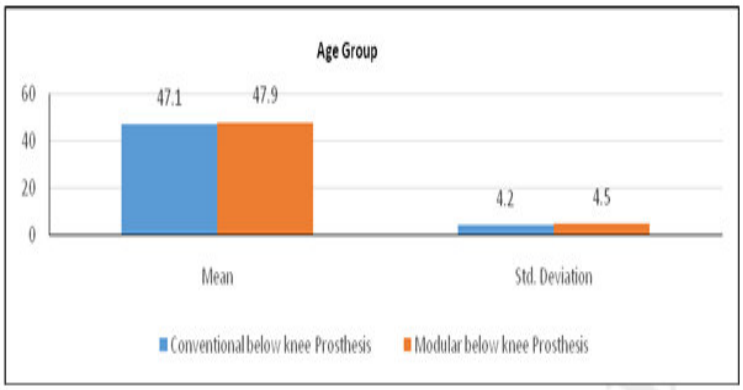

Figure 1
Comparison of age group between conventional and Modular Below knee prosthesis in unilateral transtibial amputees

Table 2
Age group distribution between Conventional and Modular below knee prosthesis

		Group		Total
		Conventional below knee Prosthesis	Modular below knee Prosthesis	
Age Group	40-45yrs	25	18	43
		41.7%	30.0%	35.8%
	>45-50yrs	17	21	38
		28.3%	35.0%	31.7%
	>50-55yrs	18	21	39
		30.0%	35.0%	32.5%
Total		60	60	120
		100.0%	100.0%	100.0%

Chi-square = 1.791, p = 0.408
Table 2 shows the age group distribution among Conventional and Modular below knee prosthesis. They were 25(41.7%) Conventional below prosthesis users and 18(30.0%) Modular below knee prosthesis in the age group of 40 to 45 years. They were 17(28.3%) Conventional below prosthesis users and 21(35.0%) Modular below knee prosthesis in the age group of >45 to 50 years. They were 18(30.0%) Conventional below prosthesis users and 21(35.0%) Modular below knee prosthesis in the age group of >50 to 55 years. The Chi-square value = 1.791 and the p = 0.408.

Table 3
Side distribution between Conventional and Modular below knee prosthesis

		Group		Total
		Conventional below knee Prosthesis	Modular below knee Prosthesis	
Side	Right side	31	31	62
		51.7%	51.7%	51.7%
	Left side	29	29	58
		48.3%	48.3%	48.3%
Total		60	60	120
		100.0%	100.0%	100.0%

Chi-square = 0.000, p = 1.000
Table 3 shows the side distribution in each group. There were total 120 right and left side unilateral below knee amputees. In right side there were 31(51.7%) Conventional below knee prosthesis users and 31(51.7%) Modular below knee prosthesis users. In left side there were 29(48.3%) Conventional below knee prosthesis users and 29(48.3%) Modular below knee prosthesis users. The chi-square value = 0.000 and p=1.000.

Table 4
Gender distribution between Conventional and Modular below knee prosthesis

		Group		Total
		Conventional below knee Prosthesis	Modular below knee Prosthesis	
Sex	Male	53	51	104
		88.3%	85.0%	86.7%
	Female	7	9	16
		11.7%	15.0%	13.3%
Total		60	60	120
		100.0%	100.0%	100.0%

Chi-square = 0.288, p = 0.591
Table 4 shows the gender distribution in each group. There were total 120 male and female unilateral below knee amputees. In male gender there were 53(88.3%) Conventional below knee prosthesis users and 51(85.0%) Modular below knee prosthesis users. In female gender there were 7(11.7%) Conventional below knee prosthesis users and 9(15.0%) Modular below knee prosthesis users. The chi-square value = 0.288 and p=0.591.

Table 5
Un-paired 't' test for measuring 10mts walking distance time between conventional PTB prosthesis and modular PTB prosthesis.

Group		10mts walking distance time on Day 1	10mts walking distance time at the end of 4weeks	10mts walking distance time at the end of 8 weeks
Conventional below knee Prosthesis	N	60	60	60
	Minimum	37.00	31.00	22.00
	Maximum	42.00	36.00	28.00
	Mean	39.6500	33.2833	25.8167
	Median	39.0000	33.0000	26.0000
	Std.Deviation	1.69571	1.61656	1.69237
Modular below knee Prosthesis	N	60	60	60
	Minimum	22.00	16.00	13.00
	Maximum	26.00	20.00	18.00
	Mean	23.7500	17.7000	14.6167
	Median	24.0000	18.0000	14.5000
	Std.Deviation	1.37317	1.04638	1.24997
Unpaired 't' test value		56.445	62.684	41.235
p value		<0.001	<0.001	<0.001

Table 5 shows the 10 meter walking distance time in each group, the mean and standard deviation of conventional below knee prosthesis with stump exercises on day 1, 39.65, 1.69. at the end of 4th week,33.28, 1.62 and at the end of 8th week 25.82, 1.69. Likewise, the mean and standard deviation of Modular below knee prosthesis with stump exercises on day 1, 23.75, 1.37. at the end of 4th week,17.70, 1.05 and at the end of 8th week 14.62, 1.25 respectively. The unpaired 't' test value on day 1,56.445, at the end of 4th week 62.684, and at the end of 8th week 41.235 respectively. The P value <0.001

Repeated measures ANOVA
Conventional below knee Prosthesis: F = 1219.2, p<0.001
Tukey Kramer multiple comparison test (Post-hoc test):
Walking time on Day 1 v/s Walking time at the end of 1 month: p< 0.001
Walking time at the end of 1 month v/s Walking time at the end of 2 months: p<0.001
Walking time on Day 1 v/s Walking time at the end of 2 months: p<0.001

Modular below knee Prosthesis: F = 1186.8, p<0.001
Tukey Kramer multiple comparison test (Post-hoc test):
Walking time on Day 1 v/s Walking time at the end of 1 month: p< 0.001
Walking time at the end of 1 month v/s Walking time at the end of 2 months: p<0.001
Walking time on Day 1 v/s Walking time at the end of 2 months: p<0.001

Right side v/s Left side
Conventional below knee Prosthesis
Walking time on Day 1: Unpaired 't' test value = 1.091, p=0.280
Walking time at the end of 1 month: Unpaired 't' test value = 0.670, p=0.505
Walking time at the end of 2 months: Unpaired 't' test value = 1.119, p=0.268

Modular below knee Prosthesis
Walking time on Day 1: Unpaired 't' test value = 0.608, p=0.545
Walking time at the end of 1 month: Unpaired 't' test value = 1.575, p=0.121
Walking time at the end of 2 months: Unpaired 't' test value = 2.101, p=0.04

Male v/s Female patients
Conventional below knee Prosthesis
Walking time on Day 1: Unpaired 't' test value = 0.578, p=0.566
Walking time at the end of 1 month: Unpaired 't' test value = 0.490, p=0.626
Walking time at the end of 2 months: Unpaired 't' test value = 0.405, p=0.687

Modular below knee Prosthesis
Walking time on Day 1: Unpaired 't' test value = 0.721, p=0.668
Walking time at the end of 1 month: Unpaired 't' test value = 0.932, p=0.355
Walking time at the end of 2 months: Unpaired 't' test value = 1.597, p=0.116

Age wise comparison
Conventional below knee Prosthesis
Walking time on Day 1: One-way ANOVA test F value = 2.895, p=0.043
By Tukey test significant difference in 45- <50yrs [39.1±1.7 sec] and ≥55yrs [42.0±0.0sec] (p=0.030)

Walking time at the end of 1 month: One-way ANOVA test F value = 1.534, p=0.216
Walking time at the end of 2 months: One-way ANOVA test F value = 1.086, p=0.363

Modular below knee Prosthesis
Walking time on Day 1: One-way ANOVA test F value = 0.059, p=0.981
Walking time at the end of 1 month: One-way ANOVA test F value = 0.619, p=0.606
Walking time at the end of 2 months: One-way ANOVA test F value = 0.493, p=0.689

DISCUSSION

To compare the effect of 10 meter walking distance time on unilateral Transtibial amputees those who are using conventional and modular patellar tendon bearing (PTB) prosthesis with stump exercises, the main outcome measure of the present study concludes that the time duration taken to cover the 10 meter distance by unilateral transtibial amputees those who are using the conventional PTB prosthesis on day 1,39.65 sec at the end of 8th week it was 25.81 sec the difference between 1st day and 8th week was 13.84 seconds. Likewise for the modular prosthesis on day 1, 23.75 sec at the end of 8th week it was reduced to 14.61 seconds the difference between 1st day and 8th week was 9.14 seconds. The amputees those who used the conventional prosthesis with stump exercises samples took 13.84 seconds, were as the patients those who were used the modular prosthesis with stump exercises samples took 9.14 seconds, the difference between the conventional and modular prosthesis were 4.7 seconds. The time taken to cover the 10 meter distance between conventional and modular prosthesis has clinically significant difference, likewise the Suresh et al in the year 2014 also found the 10 meters walking distance time for conventional and modular PTB prosthesis with the P valve of P=0.000** One of the principal goals of rehabilitation program for subjects with unilateral transtibial amputees is to assist and maintain their normal living activities with PTB prosthetic device. According to the World Health Organization, the ability to change body position and the ability to walk are key components of mobility. In general the patient mobility depends on the types of PTB prosthesis would be given, further it should allow the safe household ambulation, set of transfers, level walking and turns. There are several performance walk tests are used in rehabilitation with a prosthetic device include measures of fixed walking time, such as the 2-Minute Walk Test[19] and measures of fixed walking distance, such as the Timed “Up & Go” Test [20] the 10-Meter Walk Test(Datta D 1996)[18] and gradations of a 100-m walk(Hatfield AG 2002).[21] Studies have shown that the main objective performance-oriented tests have excellent measurement properties and are able to predict future function of the amputees. The walk tests provide essential information about ambulation with prosthetic devices during the rehabilitation and follow-up of individuals who have had a lower-limb amputation. The 10-Meter Walk Test has principally been used to test individuals with lower-extremity amputation (Van Herk IEH 1998).[22] The time taken to walk a distance of 10 m at the usual pace from a standing start was recorded. Support for concurrent validity of data for the 10-Meter Walk Test among a sample of 53 people with either a TT or TF lower-limb amputation has been reported. Rossier and Wade (Rossier P 2001).[23] Also have demonstrated intrarater reliability of data for the 10-Meter Walk Test using correlation (r=.93). In the present study attempt has been made to analyse the changes in unilateral transtibial amputee patients walking speed with the help of 10 meter walk test while using the conventional and modular PTB prosthesis along with stump exercises and the researcher found that the subjects those who are used the modular PTB prosthesis showed the statistical improvement in their walking speed and ability because of its advancements in preparing the socket, adequate socket fit and its light weightiness are more likely to function better in daily life than their fitting problems of their prosthetic socket.[24,25] After amputation, gait speed usually declines and the energy cost of walking speed increases. A Correct prosthetic prescription derived for functional benefits of prosthesis and the prosthetic user.[19] Many factors influence the gait of individuals who have had a dysvascular amputation. Burgess EM et al 1982[26] concluded that the traditional rehabilitation programs emphasized the increased muscle strength and coordination to facilitate successful prosthetic gait. The gait analysis of lower limb amputee patients depends on the muscle power of the hip extensor, abductor and knee extensor muscle groups bilaterally, and the ankle plantar flexors on the sound side may result in greater ambulation ability. Renstrom et al 1983[27] found a significant correlation (P<.01) between knee extensor and flexor strength and step length, as well as a relationship between strength and maximal walking speed, in a group of individuals with below-knee amputations. Winter and Arendt Nielsen et al[28] found that the increase in knee flexion during initial stance progressively faster the gait speed. In the present study researcher also found statistically significant improvement in the subjects gait speed of those who are used the modular PTB prosthesis with stump exercises, further the researcher concluded that the post-operative rehabilitation include the intensive stump exercises of the quadriceps, hamstrings, hip abductors, hip adductors, hip flexors and hip extensors of the residual limb reduces the stump edema, promote the stump healing, prevent stump contracture, complications of bed rest and increases the stump muscle strength which in turn helps the subject to get out of the bed. Human locomotion is the dynamic process for transferring the body weight from one place to another without loss of equilibrium. Prosthesis is an integral part to share load for locomotion. Power et al studied on the gait and indicated that the sound limb takes more load than amputated limb in unilateral transtibial amputees.[29] Authors in previous study concluded that the static weight bearing, Increased gait speed in young transtibial amputees using PTB prosthesis with SACH foot than elderly amputee (P<0.0001).[30] The results showed that stride length of young amputee was 36% greater than elderly and a statistical significant difference was found (P<0.006) and similar findings were indicated by Elbel et al.1991, Murray et al,1969 and Winter et al.[31,32,33] In this

study the researcher had more male patients aged between 40 to 55 years(P=0.408), having right sided (P=1.000) unilateral transtibial amputees wearing the PTB prosthesis with SACH foot showed the statistically significant difference in their gait speed 10 METERS WALK TEST (P<.001) while using the modular PTB Prosthesis. Further the author concluded that the young subjects walking ability showed greater improvement in modular PTB prosthesis then the conventional PTB prosthesis (P<.001).

STUDY LIMITATIONS

The study population was small. The long term follow up of the new system (modular prosthesis) may further prove its potential as an alternative prosthetic limb. Further the non-availability of the female samples and drop outs of female samples limits the study.

CONCLUSION

It is suggested that the below knee amputees walking ability can be evaluated ideally by 10 meter walk test, it is the major intervention for the overall management of amputees. The study has emphasized the role of orthopedic surgeon, physiotherapist and prosthetist and orthotist as a part of the team in managing the cases. Further attempts may be made to evaluate patients with long term clinical follow up.

CONFLICT OF INTEREST

Conflict of interest declared None.

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