Impact of Chronic Osteoarthritis of Knee Joint on Postural Stability and Functional Mobility in Women

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ABSTRACT

Background: *Earlier studies have demonstrated that static postural control is worse in patients with knee osteoarthritis (OA), whereas little information is available about the dynamic balance and impact of OA on functional mobility.* ***Purposes:*** *The primary purpose of this study was to investigate whether balance as assessed by static postural control under different test conditions and dynamic standing are impaired in subjects with knee OA. Secondary purpose was to investigate whether functional mobility is impaired in subjects with knee OA compared with age, gender and body mass index (BMI) matched control group. Finally, investigate the correlation between pain, physical function and postural stability, functional mobility.* ***Methods:*** *Thirty female subjects with knee OA and 30 normal control females participated in this study, modified clinical test of sensory interaction on balance (mCTSIB) ,limit of stability (LOS), step up/over (SUO) and sit to stand (STS) tests were assessed by Balance Master System.* ***Results:*** *Compared with age, gender and BMI control group, the patients with knee OA had statistical significant greater sway under different test conditions except under firm condition with eye opened (P=0.29). There were statistical significant reductions in directional control, movement velocity and increase in reaction time (P=0.0001). Regarding variables of SUO there were statistical significant increases in exerted force and time required to get up and over stair. In addition there were statistical significant differences in weight transfer, sway velocity and rising index (P= 0.033, 0.018 and 0.027) respectively. Finally negative correlation (r=-.479) was found only between pain and ability of patients to progress toward target.* ***Conclusion:*** *The results of the present study suggested that older women with knee OA present worse performance in functional mobility and require a longer period of time and exert more force and less directional control during balance tests when compared with age, gender and BMI matched controls.*
Key words: *Balance, postural sway, dynamic standing, functional mobility, knee, osteoarthritis.*

INTRODUCTION

Knee osteoarthritis (OA) is one of the most prevalent musculoskeletal complaints worldwide[12]. It is a major cause of impairment and disability among the elderly[8], and poses a significant economic burden on the community[23]. Individuals with knee OA suffer progressive loss of function, displaying increasing dependency in walking, stair climbing and other lower extremity tasks[8]. Balance is an integral component of these and many other activities of daily living. Understanding the impact of knee OA on balance may allow possible mechanisms of disability in this patient population to be elucidated, and may permit more effective management of patients with the disease[12]. Knee OA may result in changes that affect not only intracapsular tissues but also periarticular tissues, such as ligaments, capsule, tendons and muscle[20]. Subjects with knee OA are known to have impaired proprioception compared with age matched controls[19], and histology of ligaments from OA knees shows marked reduction in the number of mechanoreceptors. Knee OA is also associated with 50-60% reduction in maximum quadriceps torque, possibly resulting from disuse atrophy and arthrogenic inhibition[13].

Balance is a complex function involving numerous neuromuscular processes[18]. Control of balance is dependent upon sensory input from the vestibular, visual and somatosensory systems. Central processing of this information results in coordinated neuromuscular responses that ensure the centre of mass remains within the base of support in situations when balance is disturbed. Effective control of balance thus relies not only on accurate sensory input but also on a timely response of strong muscles.

Normal ageing is associated with a decline in the integrity of these physiological systems that contribute to the control of balance[24]. In the elderly, impairments of balance have serious health implications. Poor balance is associated with an increased risk of falling[7], and fall-related injuries have significant individual and societal costs. Balance impairments are also associated with poorer mobility measures in the elderly population[2,7].

When OA affects weight-bearing joints, mainly the knee, it leads to a marked decline of muscle function and consequently to a reduction balance and especially of the ability to perform sit-to-stand tasks, to gait alterations, functional limitation, and loss of independence[6]. Therefore, OA is considered to be an intrinsic risk factor for the occurrence of fall.

Limited researches have evaluated the impact of knee OA on dynamic balance and functional mobility most of previous studies utilized force platforms and sway- meter to measure postural sway and simple clinical tests like step test and time up and go test to evaluate dynamic balance in OA patients[12]. The use of sway meter to assess postural sway generates multiple outcome variables. As such, the risk of finding a significant difference between groups, due to chance alone and not because of true deficits in balance is increased and must be recognized[12]. Few studies to date have utilized balance master system to assess balance in individuals with knee OA. Additionally, the effect of knee OA on functional, dynamic tests of balance remains unknown.

The primary purpose of this study was to investigate whether balance as assessed by static postural control under different test conditions and dynamic standing are impaired in subjects with knee OA. Secondary purpose was to investigate whether functional mobility is impaired in subjects with knee OA compared with age, gender body mass index (BMI) matched control group. Finally, to investigate the correlation between pain, physical function and postural stability, functional mobility.

MATERIAL AND METHODS

Subjects

This was cross-sectional study of a sample composed of sixty female subjects; 30 pateints with knee OA and 30 controls. All volunteers were recruited from orthopedic clinic in university hospital. Patients and controls were comparable with respect to age, gender, and BMI. The inclusion criteria were: age >50 years clinical and radiological diagnosis of bilateral knee based on the criteria of the American Association of Rheumatism[12]. Participants with OA were included if they had knee pain on most days of the previous month with average pain >3 cm on a 10-cm visual analogue scale (VAS), demonstrated osteophytes on X-ray, and experienced pain and/or difficulty when getting up from sitting or climbing stairs. All participants were independent in activities of daily living. Those taking non-steroidal anti-inflammatory drugs had been on a stable dosage over the previous fortnight. Exclusion criteria included formal consultation of a physiotherapist for treatment of the knee (previous 12 months), knee surgery (previous 12 months), past history of lower limb joint replacement, or intra-articular steroid injection (previous 6 months), systemic arthritic condition, or severe medical condition precluding safe testing. Control participants were excluded if they reported any lower limb or displayed abnormality on physical examination of the knee. For all participants exclusive criteria also included the presence of neurological diseases.

Knee pain and disability

Valid and reliable Arabic version of Western Ontario and MacMaster Universities Osteoarthritis Index (WOMAC) evaluated knee pain and disability in OA group[9].

Instruments

Sensory impairment (postural sway as measured by modified clinical test of sensory interaction on balance (mCTSIB) test) motor impairment (dynamic standing as measured by limit of stability (LOS) test) and functional mobility as measured by step up /over and sit to stand (SUO and STS)) Were evaluated using Balance Master System (Neurocom System, Neurocom International Inc., Clackamas, OR.USA). This instrument has 18" x 60" dual force plate to measure the vertical forces exerted by the patient's feet connected to microcomputer which are capable of detecting the center of gravity (CG) sway during different tasks[1,3]. The equipment provides quantitative and objective data through balance that reproduces the activity of daily living (ADL$_S$)[1,3].

Procedure

All the measurements were done while patient were barefoot to eliminate the effects of shoe use[17]. Before performing the balance tests, the patient's age and basic anthropometric data were registered. The balance tests took place in a discrete room free from external distractions. Starting the assessment, the researcher positioned the patient’s feet following the appropriate alignments on the force platform for the medial malleolus and the outside border of the heel. All patients started with the assessment of static balance, which was followed by the dynamic balance test. For each condition of the static balance test and before the dynamic balance test, one training trial was allowed before data collection.

1- ***mCTSIB***

This test measure center of pressure (COP) sway velocity for 4 progressively more difficult sensory conditions including three consecutive trials lasting duration of 10 s: (1) standing with eyes open on a firm surface, (2) standing with eyes closed on a firm surface, (3) standing with eyes open on a foam surface, (4) standing with eyes closed on a foam surface. The test sequence of the conditions was identical for all patients. Patients were instructed to stand upright as steady as possible with the arms by their sides. In the conditions 'eyes open', the patients were requested to keep the eyes open and look straight ahead. In the conditions 'eyes closed' they were blindfolded and asked to stand upright as steady as possible with eyes closed. The relative absence of sway was a measure for static stability (center of gravity (COG) sway velocity).

2- ***LOS***

This test quantified several movement characteristics associated with the subject's ability to voluntary sway towards various locations in space, and briefly maintain stability at those positions. The LOS test measured the patient's volitional (intentional) control of the COG. A limit of stability is the maximum distance a person can lean in a given direction (measured as angular distance from vertical) without losing balance, stepping, or reaching. Performing the dynamic standing balance task, the location of the patient's COG was displayed on the computer screen as a cursor providing continuous visual feedback. Cursor control occurred by weight-shifting. The patient had to move the cursor (their projection of their centre of gravity) as close as possible to eight targets (their limits of stability). The eight targets were arranged in an ellipse, separated by an angle of 45° (forward forward-right, right, backward-right, backward, backward left, left, and forward-left). They started at the midline and held the cursor at the target as long as the target remained highlighted. After eight seconds, the cursor disappeared and the patient returned to the midline. The same procedure was repeated clockwise for all the targets. Therefore, the patients were instructed to "move as quickly and accurately as possible" to each of the eight targets, without displacing the feet, bending the trunk or moving the arms. Patients were instructed to move like a 'piece of wood', to emphasize a neutral hip position performing the LOS. When a patient lost the correct posture, the test leader stopped the test. Five component variables were assessed reaction time (RT), movement velocity (MV) in addition accuracy was indicated by (1) whether or not the subject reached the target (maximal excursion (MXE)), (2) whether the target was reached on the initial attempt (endpoint excursion (EPE)), and (3) whether or not progress towards the target was smooth and consistent (directional control (DCL)). The scores from all 8 targets were compiled into composite scores. In this study composite score data were used to represent over all performance for RT, MV and DCL.

3- ***SUO***

The patient steps up onto a curb with one foot, lifting the body through an erect position over the curb, swings the other foot over the curb and then lowers the body to lend the swing leg on the force plate. The measured parameters are rising index (force to rise), movement time, and impact index (impact force).

4- ***STS***

The last test is STS the individuals sat on a bench with the arms resting by sides. They were requested to stand up as quickly as possible without the help of the upper limbs or any other physical aid. A familiarization trail and consisting of three repetitions of the task was performed. The measured parameters are weight transfer time, rising index (force exerted to rise), and sway velocity.

STS and SUO are significantly correlated with the Performance Oriented Mobility Assessment Scale and with functional measures of gait[1].

Statistical Analysis

Data were collected on special forms then varied and coded. After checking normality, all data were expressed as mean and standard deviation for all continuous data. Independent t- test was used to compare the difference between the groups.

For those variables that were significantly different between groups, potential independent predictors were evaluated within the OA participants. Selected predictors include severity of pain and disability. Correlation between these predictors and the balance, functional mobility variables were determined using the person (r) coefficient. Confidence interval 95% was assigned so P value < 0.05 was considered. Data were analyzed using statistical package for social sciences (SPSS) version 10.1.

RESULTS

Sixty female subjects were recruited to the study 30 patients with knee OA and 30 controls. Patients and controls were comparable with respect to age, sex, and BMI. The characteristics of subjects were shown in table (1) the mean age of all subjects was (55.70±3.71) year (P=0.5353) the mean BMI (29.42±0.37) Kg/cm^2 (P=0.0578) the period of complain was about 9 years. There was no significant difference in the average age, BMI and duration of knee pain.

Table (1): Presenting characteristics of all subjects.

Groups	Number	Sex	Age(yrs) (Mean± SD)	BMI (Mean± SD)	Duration of complain
Normal	30	female	55.40 ± 3.23	28.731±2.57	
Osteoarthritis (OA)	30	female	56.00± 4.16	30.117±2.96	9 years

Table (2): WOMAC scores for subjects with knee OA.

WOMAC scores	Median	Total range	Maximum
Pain	12	7-15	20
stiffness	6	4-8	8
Physical function	45	37-62	68

Table (3): Independent t- test for mCTSIB, LOS, SUO an d STS tests, for Normal and OA groups.

Measurements		Mean ±SD		t-value	P- value	Level of significant
		Normal	OA			
mCTSIB test	Firm EO	0.27±0.15	0.31± 0.14	1.06	0.2921	NS
	Firm EC	0.32± 0.12	0.44± 0.18	3.06	0.0033	**
	Foam EO	0.61±0.14	0.83± 0.23	4.49	0.0001	***
	Foam EC	0.85± 0.41	1.3± 0.46	4.17	0.0001	***
LOS test	RT	0.67±0.15	1.11±0.25	8.41	0.0001	***
	MV	5.06±1.13	3.91±0.41	5.25	0.0001	***
	DCL	74.75±7.22	61.12±8.15	6.86	0.0001	***
SUO test	Impact index left	43.1±11.75	51.64±14.6	2.49	0.0153	*
	Impact index right	45.3±9.8	51.64±14.56	1.98	0.0525	NS
	Lift up index left	1.54±0.25	2.28±1.014	3.89	0.0003	***
	Lift up index right	1.47±0.07	1.80±0.28	6.27	0.0001	***
	Movement time left	31.1±5.58	37.82±8.14	3.73	0.0004	***
	Movement time Right	39.93±4.87	36.78±8.07	1.83	0.0727	NS
STS test	Weight transfer time	0.42±0.21	0.569±0.30	2.19	0.0325	*
	Sway velocity °/S	3.27±1.36	4.14±1.45	2.42	0.0187	*
	Rising index (% body weight)	20.53±5.82	16.98±6.33	2.27	0.0273	*

SD: Standard deviation NS: non significant *: significant **: very significant
***: extremely significant EO :eye open EC: eye closed

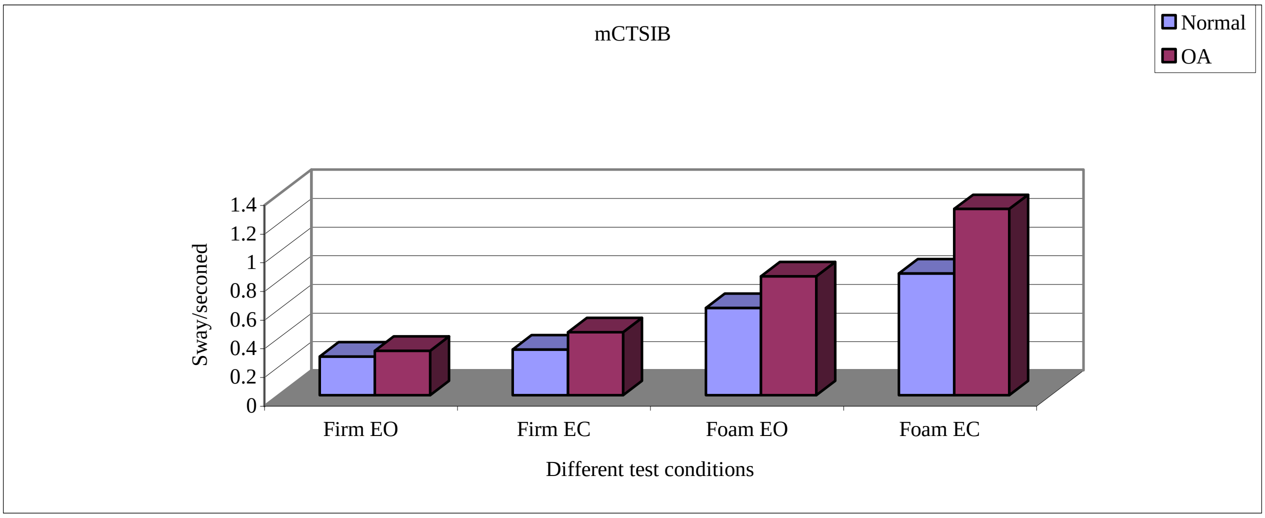
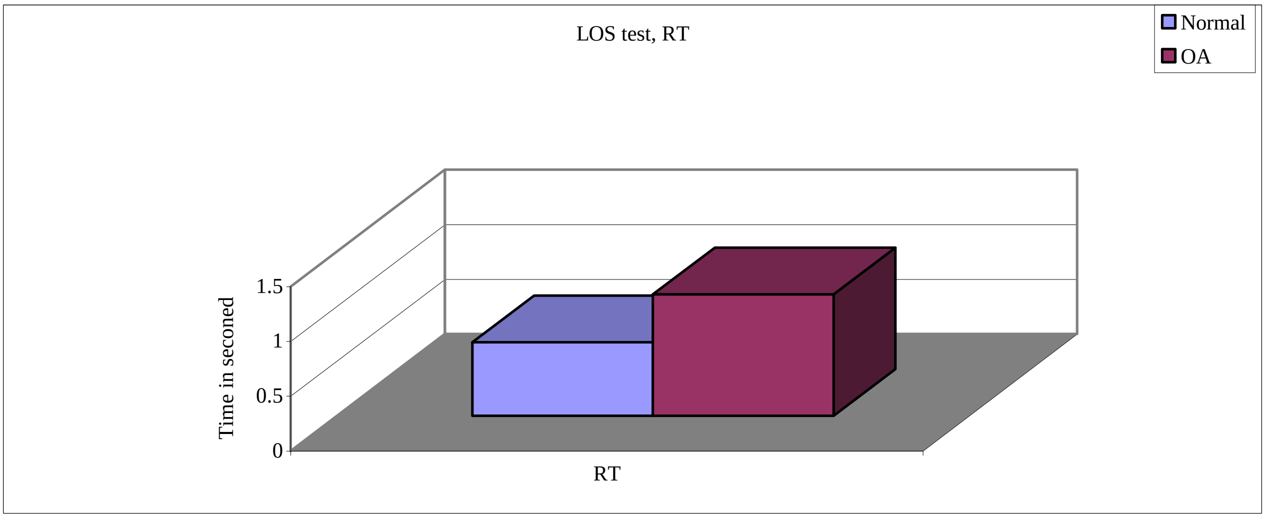


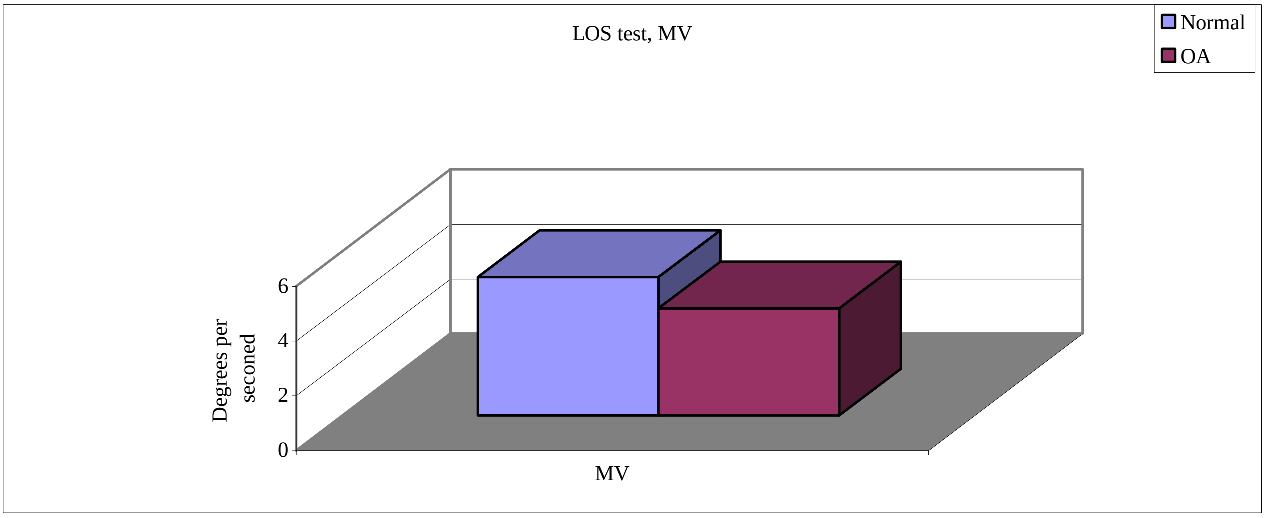
Fig. (1): Mean total body sway in normal and OA participants across all four testing conditions.

The mean and standard deviation of body sway in the OA and control participants are presented for each of the four testing conditions in figure (1). The results revealed significant difference between normal and OA patients except under firm condition with eye opened (P=0.29) as shown in table 3.



a

Fig. (2a,b,c):



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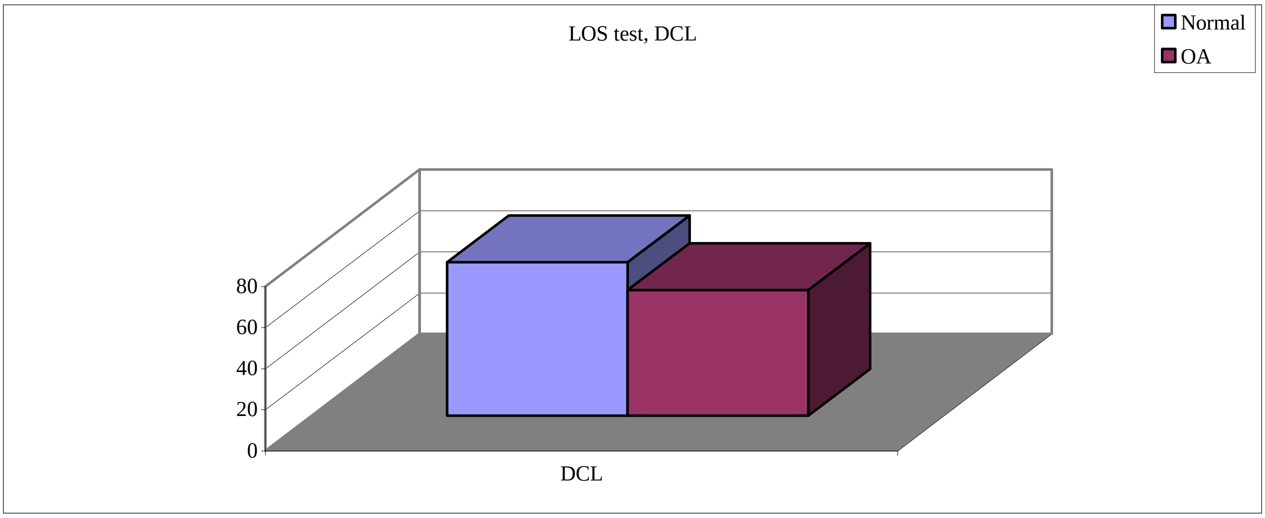

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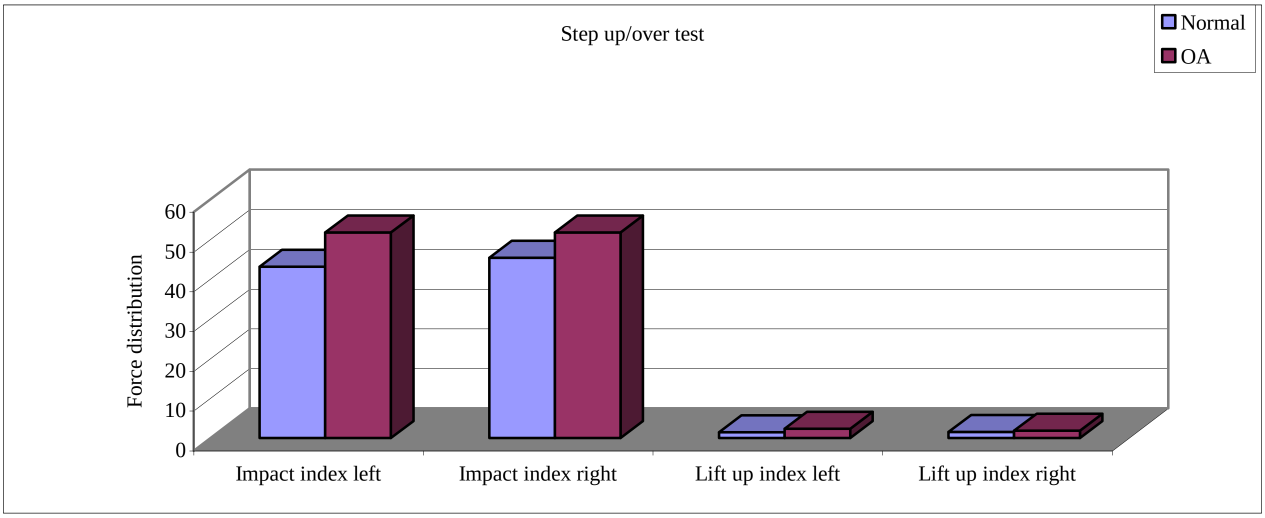
Fig. (2a,b,c): Mean and standard deviation of LOS test (RT, MV and DCL) of normal and OA participants.

The mean results of LOS were represented in table 3 and figure 2 (a, b and c) compared with controls. Amongst the variables of LOS test, there were statistical significant reductions in direction control, movement velocity and increase in reaction time (P=.0001).



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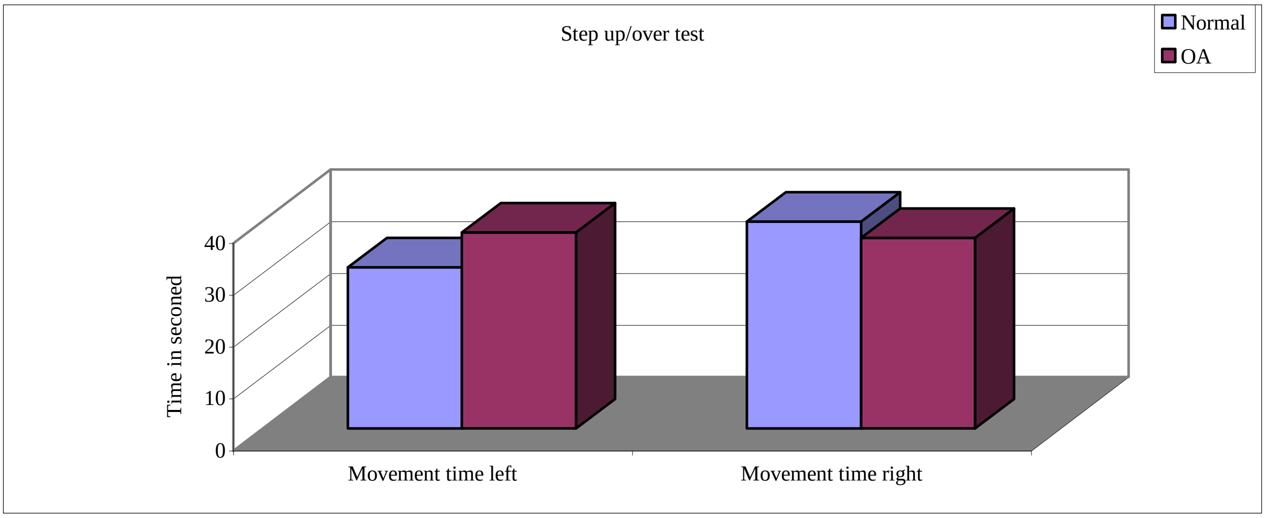
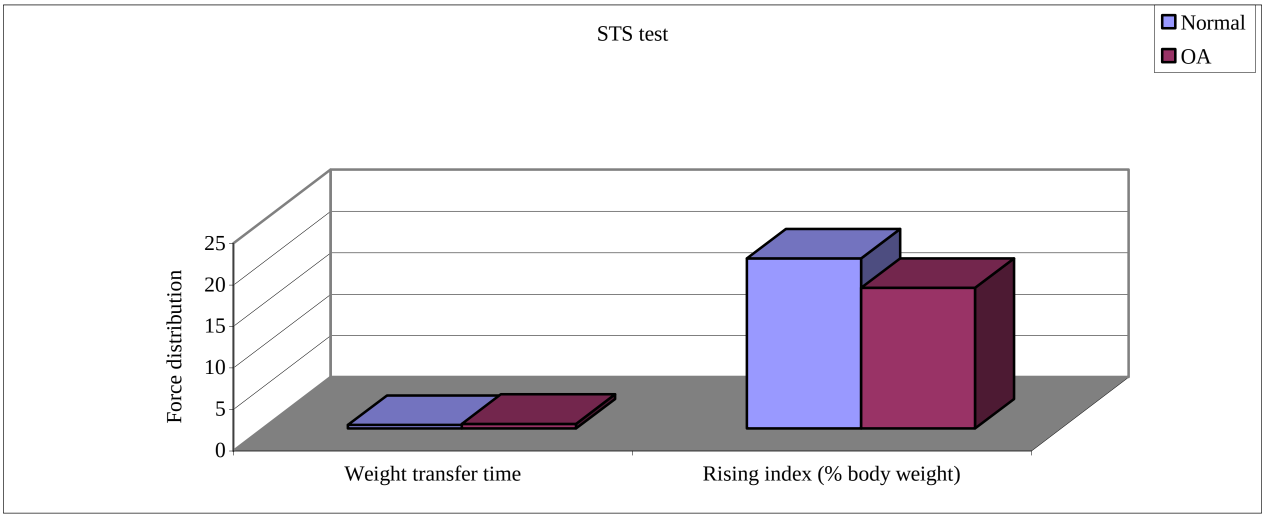


b

Fig. (3a,b): Mean and standard of different parameters of step up/over test in normal and OA participants.

Amongst the variables of SUO test, there were statistical significant differences between two groups except in variables related to impact index and movement time right (P=0.051, 0.073) respectively. As shown in table 3 and figures 3(a and b).



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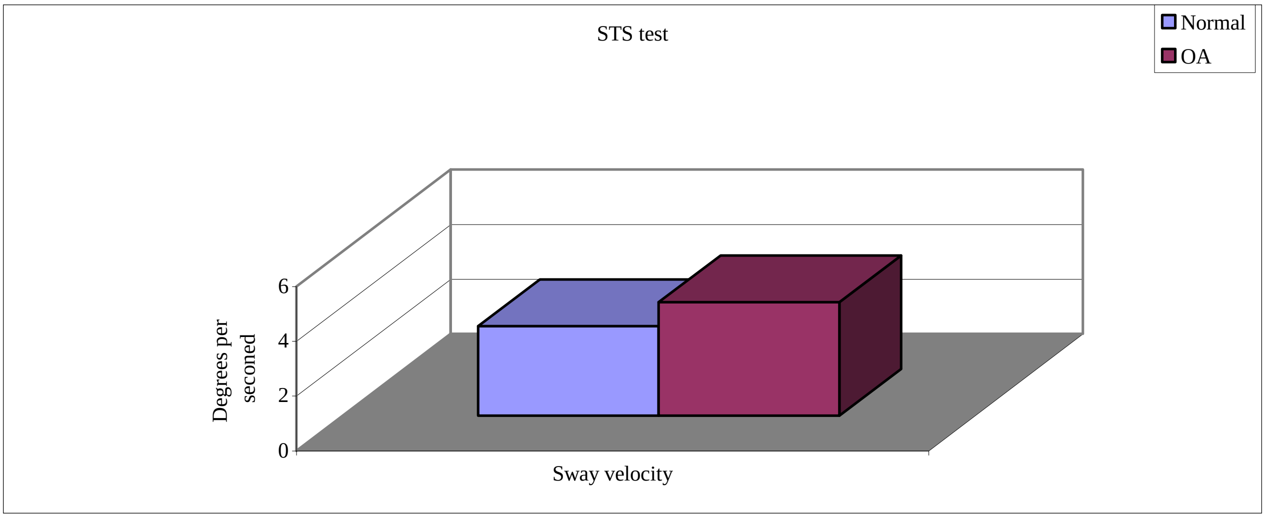

b

Fig. (4a,b): Mean and standard of different parameters of sit to stand test in normal and OA participants.

The results of STS test revealed significant differences between groups regarding to all variables of the test weight transfer, sway velocity and rising index (P=0.033, 0.018 and 0.027) respectively as shown in table 3 and figure 4 (a and b).

Table (4): Person correlation between pain and postural stability in patients with OA.

	Pain	mCTSIB test				LOS test		
		Fi EO	Fi EC	Fo EO	Fo EC	RT	MV	DL
Pain	1.000	.058	-.144	-.282	-.044	-.055	.236	-.479**
mCTSIB								
-Firm EO		1.000	-.288	-.054	-.027			
-Firm EC			1.000	.047	.202			
-Foam EO				1.000	-.341			
-Foam EC					1.000			
LOS								
-RT						1.000	.408*	-.013
-MVL							1.000	.633**
-DCL								1.000

**Correlation is significant at the 0.05 level (2-tailed) *Correlation is significant at the 0.01 level (2-tailed).

Table (5): Person correlation between pain and functional mobility in patients with OA.

	Pain	STS test			SUO test					
		Rising index	Weight transfer	Sway velocity	Impact index L	Impact index R	Lift index L	Lift index R	Mov, time L	Mov, time R
Pain	1.000	-.050	-.010	-.038	.055	.192	.100	-.065	-.008	-.039
STS										
Rising index		1.000	.488**	-.694**						
Weight transfer			1.000	-.485**						
Sway velocity				1.000						
SUO										
Impact index L					1.000	-.027	.284	-.346	.042	.288
Impact index R						1.000	.016	.351	-.464**	.127
Lift up L							1.000	-.850**	-.485**	.453*
Lift up R								1.000	.013	-.150
Mov, time L									1.000	-.388*
Mov, time R										1.000

**Correlation is significant at the 0.05 level (2-tailed). *Correlation is significant at the 0.01 level (2-tailed).
Mov., = Movement L = Left R = Right

Table (6): Person correlation between physical function and postural stability in patients with OA.

	Physical function	mCTSIB				LOS		
		Firm EO	Firm EC	Foam EO	Foam EC	RT	MV	DL
Physical function	1.000	-.144	-.107	-.291	.122	-.036	.143	-.126
mCTSIB								
-Firm EO		1.000	.026	.072	.029			
-Firm EC			1.000	.047	.202			
-Foam EO				1.000	-.341			
-Foam EC					1.000			
LOS								
-RT						1.000	.408*	-.013
-MVL							1.000	-.633**
-DCL								1.000

**Correlation is significant at the 0.05 level (2-tailed). *Correlation is significant at the 0.01 level (2-tailed).

Table (7): Person correlation between physical function and functional mobility in patients with OA.

	Physical function	STS			SUO					
		Rising index	Weight transfer	Sway velocity	Impact index L	Impact index R	Lift index L	Lift index R	Mov, time L	Mov, time R
Physical function	1.000	-.181	-.042	.266	.018	.111	-.248	.279	-.054	-.223
STS										
Rising index		1.000	-.694**	.488**						
Weight transfer			1.000	-.485**						
Sway velocity				1.000						
SUO										
Impact index L					1.000	-.027	.284	-.346*	.042	.288
Impact index R						1.000	.016	.351	-.464**	.127
Lift up L							1.000	-.850**	-.485**	.453*
Lift up R								1.000	.013	-.150
Mov, time L									1.000	-.388*
Mov, time R										1.000

**Correlation is significant at the 0.05 level (2-tailed). *Correlation is significant at the 0.01 level (2-tailed).
Mov., = Movement L = Left R = Right

Predictors of balance deficits in OA group

Little was seen to predict the observed balance deficits within the OA group. Whilst increased severity of pain was associated with decreased the ability of patients to progress towards the target (DCL) (r=-.479), no other correlation between pain and balance was evident. No significant correlation was observed between disability scores and selected balance and functional mobility variables (tables 4, 5, 6 and 7).

DISCUSSION

Sixty female subjects were recruited to the study 30 patients with knee OA and 30 controls. The main purpose of this study was to investigate the impact of knee OA on balance (static and dynamic) and functional mobility.

There were no statistically significant differences (P>0.05) between two groups regarding demographic variables. The severity of OA was not evaluated radiographically since other studies have established that there is no correlation between radiographic and clinical findings[22]. This is the first study to assess the four parameters or tests in the same patients with OA and in matched controls and seek an explanatory correlation between these and other factors such as pain and physical function.

The main finding of this study were that subjects with knee OA, compared with age, gender and BMI matched controls sway more in different test conditions with eye opened and closed except under firm surface with eye opened (P=0.29). Diminishing visual feedback with eyes closed consistently results in decreased postural stability in comparison with eye-open condition[5]. The results of this study are consistent with these finding.

Regarding LOS test, there were statistical significant reductions in direction control, movement velocity and increase in reaction time (P=.0001). In OA special, loss of balance has been associated with decreased functional ability and increased incidence of fall. In postural stability measurements, one main factor of interest is the magnitude of postural sway, which is the amount of movement of COP. Studies, showed that balance is lost when COP displacement falls out side the limit of stability, which is defined by the optimal COP position within the base of support. It has been reported that ageing is associated with increased COP displacement during standing and that older adults with a history of falls show increased COP displacement in the anteroposterior direction[7]. It has been also postulated that reduced balance ability in older individuals may be associated with smaller base of support and hence an increased chance for COP to fall outside the safety limits. This effect might become more crucial for elderly in more challenging postural tasks requiring a smaller base of support, such as single-leg stance compared with bipedal stance[7].

In addition limitation in patient's LOS may correlate to risk for fall or instability during weight shifting activities such as leaning forward or take objects from a shelf, leaning back for hair washing ……..etc[11].

Statistically significant difference was observed between the two groups for all parameters of SUO test except for impact index right (P=0.052) and movement time right (P=0.073). These results revealed that participants with knee OA exert more force to lift or to rise the body through an erect position over the curb and to make the appropriate eccentric control (impact index) as well as patients needs greater time to move. This reflects a reduced ability to maintain standing balance whilst performing a potentially stabilizing activity. These finding may high lights and focus on the imbalance deficit evident on SUO test which may impacts functionally on individuals with knee OA.

In addition statistical significant difference was observed between two groups for all parameters of STS test, weight transfer time (P=0.0325), sway velocity (P=0.0187) and rising index (P=0.0273), the group with knee OA was slower in transferring COG during the STS movement (P=0.0325). Slowing the movement is necessary to control the CG and maintain a better postural stability. In addition, the control of COG is important to the movement, given the fact that if COG is moved forward excessively or not enough, fall forward or back to seat could occur, respectively[21].

The speed of STS movement influences the vertical component of COG. Faster movements lead to greater oscillation of this center. Pain due to knee OA might lead individuals to transfer from a sitting to a standing position in more cautious manner, increasing the time to do the task. This suggests that there might be an understanding dysfunction which can result in decline in physical functioning and increase the risk of falling[1].

Deficits in lower limb proprioception and muscle strength are associated with knee OA[14] and this may be postulated as a cause of impaired balance. However, studies of balance in this population are yet to establish a relation ship between these parameters[6], rending this hypothesis open question.

The sensation of proprioception can be defined as the conscious or unconscious perception of the position of the extremities in space and being a ware of the movement and position of the joints. In patients with knee OA, there is a prominent loss in proprioception compared with control subjects of the same age and gender[4].

It has been demonstrated that impaired proprioception adds to functional insufficiency by generating impairment in walking rhythm, shortening step distance, and a decrease in walking speed and total walking time[4].

Pain associated with knee OA may play a role in balance impairment and sway increase. Hassan et al.,[11] found that knee pain is a significant predictor of sway in individuals with knee OA. Moreover, there is evidence of a direct association between severity of knee pain and postural sway[10], possibly, pain might generate a reflex inhibition of knee muscles which yields an ineffective and imprecise response related to postural control[11] further more, knee pain could result in lower weight bearing by affected joint, preventing the ability of a person with knee OA to maintain the center of mass inside the base of support[15] whilst hassan and colleagues found pain to be significant predictor of sway in their osteoarthritic sample, pain score in the present study were generally not correlated with observed defects. This may be due to the moderate levels of pain experienced by participants in the present study in contrast to those of hassan and colleagues, these results are similar to finding of Hinman et al and Bennell and Hinman[2,12].

Other studies, have demonstrated significant relationships between pain severity and balance deficits[6,12,16] were all conducted in people with underlying knee pathology. As such, it is difficult to differentiate the specific effects of pain itself from other effects of the OA process. Pain in combination with other abnormalities such as muscle weakness or impaired proprioception may produce measurable reductions in balance[2] it is possible that muscle weakness or poor proprioception may be the major contributors to altered balance in patients with knee OA and that muscle strength and/or proprioceptive retraining may be more appropriate treatment[2].

The results of the present study suggested that older women with knee OA present worse performance in balance (static and dynamic) and functional mobility and require a longer period of time and exert more force and less directional control during balance tests when compared with age, gender and BMI matched controls.

Thus, it is important that proper strategies be implanted to assure an improved functional and balance performance of these patients which may result in higher level of confidence regarding the performance of daily tasks and reduce the risk of falls.

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المستخلص العربي

تأثير الالتهاب المزمن لمفصل الركبة على ثبات القوام والوظائف الحركية لدى السيدات

الخلفية : أوضحت الدراسات المبكرة سوء التحكم في القوام الثابت في مرضى الالتهاب المزمن لمفصل الركبة و لكن المعلومات المتاحة حول الاتزان إثناء الحركة و تأثير هذا المرض على الوظائف الحركية قليلة . الهدف من الدراسة تقييم ما إذا كان مرض الالتهاب المزمن لمفصل الركبة يمكن أن يؤثر على (1) التحكم في القوام الثابت تحت ظروف اختباريه مختلفة مع فتح العين أو غلقها (2) الوقوف المتحرك(3) الوظائف الحركية بالمقارنة بالمجموعة الضابطة و المتوافقة معها من حيث العمر، النوع و معدل كتلة الجسم (4) فحص العلاقة بين الاتزان (الثابت والحركي) ، ووظائف الحركة و بين الألم والوظائف الفيزيائية للمرضى . الطريقة : استخدم في هذه الدراسة 30 سيدة تعانين من الالتهاب المزمن للركبة و 30 سيدة طبيعية كمجموعة ضابطة و تم قياس (1) الاختبار العملي المعدل للتداخل الحسي على الاتزان (2) الحد الأقصى للثبات (3) صعود وهبوط الدرج (4) القيام من وضع الجلوس وذلك باستخدام جهاز الاتزان . النتائج : بمقارنة المجموعة اللاتي تعانين من الالتهاب المزمن لمفصل الركبة مع المجموعة الضابطة و المتوافقة معها من حيث العمر، النوع، و معدل كتلة الجسم أظهرت النتائج زيادة ذات دلالة إحصائية في الترنح تحت كل الظروف الاختبارية ماعدا حالة استخدام السطح الثابت مع فتح العين (P=0.29) كذلك كان هناك انخفاض ذو دلالة إحصائية في القدرة على التحكم في الاتجاه وسرعة الحركة وزيادة في وقت رد الفعل (P=0.0001) إما بالنسبة لصعود وهبوط الدرج كان هناك زيادة ذات دلالة إحصائية في القوة المستخدمة و الوقت اللازم لذلك بالإضافة إلى ذلك كان هناك اختلاف ذو دلالة إحصائية على انتقال الوزن ، سرعة الترنح ، ومعدل النهوض (P=0.033,0.018 and 0.027) على الترتيب و في النهاية وجد أن هناك علاقة سلبية (r=-0.479) بين الألم و قدرة المريض على الوصول للهدف . الخلاصة : اظهر مرضى الالتهاب المزمن لمفصل الركبة تحكم سيء في الاتزان (الثابت والمتحرك) واحتياجهم لمزيد من الوقت وبذلهم مزيد من الجهد مع قلة التحكم بالاتجاه أثناء القيام بالوظائف الحركية المختلفة .

الكلمات الدالة : الاتزان – ترنح القوام – الوقوف المتحرك – التهاب المفاصل – الركبة .