

Review Article

Patellofemoral Pain Syndrome and Its Effect on the Walking of Affected Subjects: Update Review

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Abstract

Background: Patellofemoral pain syndrome (PFPS) is complication in the knee joint that can affect the gait of affected subjects. Various studies have been done in this field. The purpose of this study is to update the review article in the effect of PFPS on gait parameters.

Method: This update review includes articles published between 1990 and 2018. Our search has been done in PubMed, Google scholar, Science direct and ISI web of knowledge databases. Finally, 20 studies entered this review.

Results: Subjects with PFPS show changes in walking parameters such as speed, cadence, step length and some other parameters in comparison with normal people.

Conclusion: It can be concluded that some gait parameters in PFPS subjects change, and this change can be a mechanism for the reduction of patella femoral joint reaction force and pain.

Keywords: Gait; Walking; Gait parameters; Patellofemoral pain syndrome; PFPS

Methods

Search strategy

Introduction

Patellofemoral pain syndrome (PFPS) is one of the disorders that are related to the knee joint which includes 10 to 25 percent of knee injuries [1,2]. The incidence of this complication is estimated to be between 7% and 15% in young adults in military [3]. Studies have also shown that the PFPS is more common in women than in men [4-11].

Patellofemoral pain syndrome can cause changes in the gait of affected people [12,13]. Some of these changes have been reported on some studies, such as a decrease in velocity, cadence and knee extensor moment [14-19].

Other studies also show that the Patellofemoral pain syndrome causes the affected subjects to have other changes in walking, such as: increase hip adduction, delayed peak rear foot eversion, significant reduction of the knee flexion angle and step length [5,14-25].

There have been some papers that published relating to gait on the PFPS but a comprehensive study in gait of subjects with PFPS is needed. To help in this direction, it was thought useful to review studies which have evaluated gait in the individual with PFPS. We conducted this study with the aim of updating the review article on the impact of PFPS on the gait.

We searched Science Direct, Google scholar; PubMed and ISI web of knowledge from 1990 to 2018, by using the keywords include gait parameters, gait variability, walking and Patellofemoral pain syndrome. Finally, 20 articles were selected from final evaluation.

Inclusion criteria	Exclusion criteria		
Patellafemoral pain syndrome	Other pathological condition		
Kinetic parameters in PFPS in gait	Subjects have other functional limitation or disable		
Kinematic parameters in PFPS in gait	Gait parameters in knee osteoarthritis subjects		
Spatiotemporal parameters in PFPS in gait	Gait parameters in chondromallishia subjects		
Compared PFPS and healthy subjects in gait parameters	Knee pain with other reasons		

Table 1: Inclusion and exclusion criteria utilized to select articles.

Inclusion and exclusion criteria

Table 1 utilized Inclusion and exclusion criteria to select articles. This update review contains those articles that investigation the gait of people with PFPS. Studies which involved other groups were excluded.

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Studies that included other knee disorders were excluded from this study. Also, only studies in English were included in this study.

Results

According to a literature review published in 2016, most of this articles that evaluated the effects of PFPS on kinematic parameters reported that the speed of patients with PFPS, cadence and their flexion angles was lower than that of healthy subjects. We also from the data onto this review article in spatial parameters conclude that PFPS subjects usually have a shorter step length. Also, the most important results from the kinetic parameters mentioned in the study by Arazpour et al. [26] included increase contralateral pelvic drop and hip adduction reduce knee extensor moment and delayed peak rear foot eversion during gait (Tables 2 and 3).

Variable	Study	P value	Mean (SD)	Mean (SD)	Mean diff (95% CI)	Significant change
	Paoloni et al. [17]	p=0.5	1.15 ± 0.16	1.1 ± 0.15	-0.05 (-0.20 to 0.10)	-
	Levinger and Gilleard [16]	P=0.22	1.36 ± 0.10	1.41 ± 0.07	0.05 (-0.02 to 0.12)	-
	Powers et al. [18]	P=0.004	1.465 ± 0.18	1.29 ± 0.002	-0.175 (-0.27 to -0.08)	Ļ
velocity (m/s)	Powers et al. [30]	P<0.001)	1.16	0.94	-0.22	Ļ
	Barton et al. [15]	p=0.073	1.45 ± 0.16	1.37 ± 0.13 m/s	-0.08 (-0.17 to 0.01)	-
	Nadeau et al. [21]	p=0.84	1.3 ± 0.2	1.2 ± -0.17 to 0.20	-0.1 (-0.39 to 0.19)	-
Cadence (steps/min)	Salsich et al. [19]		96.9	0.74	-96.16	
	Powers et al. [18]	P=0.31	121.7 ± 9.1	117.3 ± 12.3	-4.4 (-13.82 to 5.02)	-
	Powers et al. [30]	P<0.001	125.2	114.1	-11.1	Ļ
	Nadeau et al. [21]	P=0.63	103.7 ± 6.9	101.3 ± 8.3	-2.4 (-13.53 to 8.73)	-
Stride length (m)	Powers et al. [18]	p>0.05m	1.43 ± 0.14	1.32 ± 0.11	-0.11 (-0.21 to -0.01)	-
	Powers et al. [30]	P<.001	1.38	1.22	0.16	Ļ
	Nadeau et al. [21]	p=0.97	1.4 ± 0.1	1.5 ± 0.2	0.1 (-0.13 to -0.33)	-
Knee flexion	Nadeau et al. [21]	P<0.01	21.8 ± 4.6	13.14 ± 4.0	-8.66 (-14.95 to -2.37)	Ļ
	Goto et al. [2]	P=0.987	58.28 ± 11.95	58.22 ± 7.81	-0.06 (-7.90 to 7.78)	-
	Goto et al. [2]	P=0.320	0.78 ± 11.66	-3.13 ± 8.53	-3.91 (-11.85 to -4.03)	-
Knee Internal rotation	Noehren et al. [32]	P=0.39	1.9	0.01	1.89	-
	Paoloni et al. [31]		17.8° ± 2.6	20.0° ± 3.5	2.2 (-0.03 to 4.43)	î
	Barton et al. [15]					
Hip adduction angle	Bolgla et al. [5]	– p=0.046				
	Noehren and Davis [33]	_				
		P=0.877	7.7 ± 3.2	7.6 ± 3.3	-0.1 (-2.05 to 1.85	-
	Noehren and Davis [33]	P=0.15	2.6°	1.0°	-1.6	-
		p>0.05	11.8° ± 3.9°	8.7° ± 5.2°	-3.1 (-6.04 to -0.16)	-
		0.007	8.1	12.1	4	1
Hip internal rotation	Paoloni et al. [31]	p=0.002	5.2° ± 3.3	9.8° ± 4.2	4.6 (1.87 to 7.33)	
	Barton et al. [15]					1
	Souza and Powers [22]	1				
	Bolgla et al. [5]	p=0.024	11.8 (6.9)	7.0 (6.6)	-4.8 (-8.83 to -0.77)	Ļ
	Noehren et al. [32]	P=0.001	1.2° ± 3.8°	7.6° ± 7.0°	6.4 (2.82 to 9.98)	1

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		P=0.67	1.0°	2.1°	1.1	-
		P=0.47	3	4.5	1.5	-
Knee external rotation moment	Paoloni et al. [17]	P=0.007	0.042 ± 0.02	0.071 ± 0.02	0.029 (0.01 to 0.05)	1
knee abductor moment Paoloni et al. [17]		P=0.01	0.398 ± 0.13	0.555 ± 0.13	0.157 (0.03 to 0.29)	1
Hip abductor moment	Paoloni et al. [17]	P=0.001	0.508 ± 0.17 (LR)	0.898 ± 0.24	0.39 (0.18 to 0.60)	↑ (
		P=0.002	0.450 ± 0.18 (TS)	0.842 ± 0.26	0.392 (0.17 to 0.62)	↑ (
	Noehren et al. [32]	P=0.896	-1.3	-1.3		-
Ground reaction force	Paoloni et al. [17]	P=0.01	56.7 ± 9.1	40.7 ± 15.6	-0.16 (-28.76 to -3.24)	Ļ
	Levinger and Gilleard [20] (P=0.03)		0.66 ± 0.14	0.52 ± 0.17	-0.14 (-0.26 to -0.02)	Ļ
	Powers et al. [18]	P=0.01	141.4 ± 10.7	129.5 ± 10.2	-11.9 (-20.68 to -3.12)	Ļ
Rear foot eversion Paoloni et al. [31]		P=0.27	-9.4° ± 5.3	-11.2° ± 4.0	-1.8 (-5.19 to 1.59)	-

Table 2: Summary of gait characteristics for control and PFPS group [*An up arrow (\uparrow) indicates a significant increase in intervention group than control, a down arrow (\downarrow) indicates a significant decrease in intervention group than control, and a hyphen (-) indicates no change compared to baseline or between group. LR: Loading Response, TS: Terminal Stance

Authors	Study design	Sample size	Outcome measures	Results		
Controlled	Controlled	12 PFPS	Patellofemoral kinematics	This study finding that patients with PFPS have an abnorma		
	laboratory study	13 H	(lateral patellar displacement)	lateral patellar displacement		
Scholtos and Salsish [28]	Controlled	20 pfps	There were no group differences in angle of peak kne			
Scholles and Saisich [26] Lab	Study	16 H	Knee liexion	during the usual condition (P=0.484)		
Holdon et al [20]		8 pfps	Knoo volguo diaplocoment	The finding of this study demonstrated that knee valgus		
68 H		compared to healthy subjects				
Goto et al. [2] C	Case-control	14 PFP	Hip flexion/adduction/internal rotation	They found that there is no significant difference between kinematic parameters in patients with patella femoral pain		
		14 H	Knee flexion/abduction/internal rotation	syndrome compared to healthy subjects (p>0.05)		

Table 3: New studies investigating the effects of patella femoral pain syndrome on gait parameters.

Discussion

In general, according to our findings from this study, we can say that subjects with PFPS have a slower walk than healthy people. It seems that these people reduce their speeds to reduce patella femoral joint loading and quadriceps muscle activity. They also have a shorter step length than healthy people [15,17,18,21,30]. Also, the results of the studies showed that people with Patella femoral pain syndrome have fewer cadences than normal people that contributing to the reduce knee moment [18,19,21,30]. There is a direct relationship between walking speed and step length, and when Walking speed in people with PFPS is reduced, so the length of the step decreases. Reducing this parameter in these individuals can be to reduce patella femoral joint stress [18,24,30].

Based on the data available in this review, we found that individuals with PFPS are likely to reduce the loading and their symptoms, so they have less knee joint flexion and knee extensor moment during gait [17-19,21]. The findings of this study also show that knee abductor and external rotator moments increased and knee internal rotation decrease with PFPS during gait and this change a reason for the greater tibia external rotation among individuals with PFPS [19,25]. There are contradictions in the results of studies regarding some parameters such as hip rotation that these differences in the results of these studies may be due to differences in methodology and the criteria for entering the patients in the investigation [15,22,31-33]. Also, based on the results of this review, it can be stated that this patients have a lower ground reaction force than healthy people and this can be related to a cause such as reduced velocity employed by the PFPS subjects and may be characterized by altered neuromata control due to knee pathologies [17,18,20].

Conclusion

In general, it can be concluded in conclusion that PFPS can cause changes in the walking of affected subjects, and some gait parameters in these individuals are different from healthy subjects. Also it can be noted that some of which changes during walking may be a compensatory mechanism to reduce pain and patella femoral joint reaction force in affected individuals.

Declaration of Interest

The authors report no declarations of interest.

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