The Effect of A Suggested Aquatic and functional exercises - Based program on Rehabilitation of Anterior Crutiate Ligament (ACL) after Endoscopic Surgical intervention among football players

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Introduction:-

Players usually face many sport injuries during training or official and friendly competition. Sport injuries represent the main obstacle to the advanced level of sport and hinder development progress of sports training and therefore it is impossible to achieve athletic goals . (4:12)

Rehabilitation is an important variable after surgical intervention. The success of the surgery in this case is (25%), while the remaining percentage represents (75%). It is the responsibility of rehabilitation staff and the injured himself, so the return of injured part to its functionality and efficiency is affected by rehabilitation level. (11 : 274)

This was confirmed by the study of Fahd Eid Mohammed (2005), entitled "The influence of exercise rehabilitation program for knee after surgical intervention on injured anterior cruciate ligament ". The results reached an improvement in leg muscle strength and range of motion of injured knee circumference . (2)

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This was also asserted by the study of Gamal Moheb Ahmed (2009) entitled "physical rehabilitation to the knee joint after surgical intervention for the treatment of the (ACL) injury and cartilage in the knee" . The results have reached improvement in muscle strength and balance of injured joint. (1)

Majima et., al (2002) had a study entitled " Rehabilitation after the re- installation of crutiate ligament ". The results found that rehabilitation after surgical intervention directly led to a rapid restoration of muscle power. (10)

The anterior cruciate ligament injury is the most serious injury that threatens the future of sport due to the importance of the anterior cruciate ligament in maintaining the anterior stability of the joint. This means that it prevents sliding tibia on to the femur as well as it prevents increasing the extension. (1: 3)

Through the work of researchers in the field of rehabilitation and sports injuries and through studying scientific research and previous studies, the researchers put rehabilitation programs for injured interior cruciate ligament of the knee joint, but the researchers within the limits of their knowledge did not find program depends on the water and functional exercises mainly as one of the current methods of rehabilitation after surgical intervention. The present researchers noted that all rehabilitation programs take about (18-24) weeks. So the present researchers developed program using water exercise, weightlifting exercises and functional exercise. The program takes about (16) weeks to rehabilitate the injured interior cruciate ligament after surgical intervention.

Study objectives:-

The present study aimed at exploring the effect of the proposed Program on injured knee pain, the degree of leakage, thigh and leg circumference, balance, muscle strength for muscles working on injured knee.

Study Methodology:-

The present researchers utilized the experimental method. They used one experimental group with post, pre, and follow up assessment. It's suitable to the nature of the goals and hypotheses of the study.

Participants:

The Sample of the study was four patient football players (ages ranged from 18 to 24 years old) with the anterior cruciate ligament cut , from Egypt Insurance company club . They were treated surgically by laparoscope, and over seasons (2014-2015).

Table (1)

Mean, Standard Median, skews and Standard deviation for the variables of (Age – Length - weight)(n =4)

Variables	Measurement unit	Mean	Median	Standard deviation	skews
Age	Year	20	19	2.82	1.064
Training age	year	8.5	7	3.78	1.163
Length	C.m	172.75	174	5.73	0.655
Weight	k.g	73.75	75.5	8.42	0.624

Table (1) refers to skews values of the variables of the study may be confined between (± 3) which shows the homogeneity of the sample in those variables .

Devices used:-

Device Alrstameter to measure the total length of the body, Medical Libra device for measuring weight , determine the circumference of thigh and leg muscles and knee leakage, (Vas) Measure to the degree of pain , Jinometer device to measure the range of motion , Isokainatic to measure balance and muscle strength of muscles working on knee.

Instruments used:

Participants utilized a pool, a football stadium , a fitness facility , mattresses foam , conveyor Belt , stable wheel , rope rubber , cones , hoops , dishes , barriers , ladder agility , altermpaulin device , balance disk, medical balls, and football.

The Basic experiment of the study:

The experiment has been individually applied on The respondents thorough period between 6/12/2014 till 13/09/2015, depending on the time of the injury and arthroscopic surgery . The measurements for the whole sample were conducted under the same conditions, taking into account the following same conditions: Measurements for the entire sample by the same method .Taking into account the measurement procedure in the same order , sequence and on the same device.

Pre - measurements:

Pre - measurements were conducted upon the whole sample with an average of three weeks from the date of surgical intervention.

The Pre - measurements were conducted for each case : - The measurement for the level of relieve of pain, (attachment 1/1). (5: 77) , The measurement of the affected knee and thigh circumference , leg infected knee, (attachment 1/2) (5: 72) , The measurement for the range of motion of the knee joint(Gynometer) , (attachment 1/3) (6:55) , The measurement for balance of the body(Isokainatic) , (attachment 1/4) (7) , and The measurement for the muscle strength of the muscles working on the knee joint (Isokainatic),(attachment 1/5) (9: 133).

Follow –up measurements:

Follow –up measurements have been conducted after the first, second and third stage in the same order of pre - measurements to follow-up and assess progress of the program.

Post - measurements:

Post - measurements have been conducted in the same order of pre and follow-up measurements of the infected and healthy knee .

Time Module Time within the proposed program:

Module lasted from (60) to (75) minutes, and was divided into three parts:

- Warm-up: The duration was from (5) to (10) minutes, and included general training for the body as whole .
- The main part: The duration was from (45) to (50) minutes.
- The final part: The duration was from (10) to (15) minutes, and included a superficial massage for the muscles working on the injured knee.

The proposed program has been divided to four qualifying stages thorough (16) weeks:

Phase I: inflammation control and movement restoration: -the exercises were performed within a fitness facility for four weeks in every week consisted of four training modules which included stretching exercises, flexibility , balance, and strength .

Phase objectives: to get rid of the feeling of fear of using the injured part , to get rid of the pain and the tumor , to restore (60 %) of the normal range of movement as the good part , improve flexibility, Improving balance and improve muscle strength without resistance and without pain.

Standard necessary to transmit from the first to the second stage:-

- Measurements were administrated at the end of the first stage and compared to the pre – measurements .

Phase Two: Motion Restoration

A group of water exercises that took four weeks which consisted of fou training modules and include flexibility exercises, balance , (stable - dynamic) and strength exercises in the water.

Phase objectives: - to restore motion in the injured party as it is in the proper one and to develop muscle strength and endurance using gradual resistance exercises.

Standard necessary to transmit from the second to the Third Phase:-

Measurements were administrated at the end of the stage and compared to the pre – measurements and the first follow up measurement .

Phase three: the restoration of functions of injured part : -

The exercises were performed within a fitness facility and took four weeks in each week five training modules.

Phase objectives :to Restore movement , balance and muscle strength.

Standard necessary to transmit from the third to the fourth stage :

Measurements were administrated at the end of stage and compared to the pre – measurements and the first and second follow-up measurement .

Phase four: functional exercises and return to physical activity: -

Exercises were inside the football stadium and in the swimming pool, and took four weeks , in each week five training modules, from the first to the fourth were inside the stadium , but the fifth was in the swimming pool.

Phase objectives: - to restore motion in the injured party as it is in the proper one ,restore (muscle strength , balance and range of motion) and return to physical activity.

Standard necessary to transmit from the fourth stage to training and competition:

Measurements were administrated at the end of stage and compared with the pre – measurements and follow- up measurements comparing the injured part with the proper one.

A plan for functional exercises inside the stadium:-

It lasts for four weeks divided as follows:

- First week: simple endurance - Second week: average endurance - Third week: high endurance - Fourth week : average endurance.

Results:-

Data analysis revealed the following results as indicated in table (2).

Table (2)

Differences between the groups in the research variables (N=4)

variables	Source of differences	Sum of Quadrature	D.F	Average of Quadrature	value (f)	The level of significance
Get rid of the pain	Between gropes	13346.3	4	3336.5	80.01	*signify
	Inside gropes	625.7	15	41.7		
Infiltration of the knee	Between gropes	57.63	4	14.4	23.3	*signify
	Inside gropes	9.27	15	0.618		
Thigh circumference for injured leg	Between gropes	62.4	4	15.6	11.47	*signify
	Inside gropes	20.4	15	1.36		
Leg circumference for the injured one	Between gropes	63	4	23.7	11.3	*signify
	Inside gropes	31.5	15	2.1		
Thigh circumference for proper leg	Between gropes	23.5	4	5.8	16.1	*signify
	Inside gropes	5.4	15	0.36		
Leg circumference for the proper one	Between gropes	21.65	4	5.41	2.57	*Not signify
	Inside gropes	31.55	15	2.1		
Range of motion (extension) for injured leg	Between gropes	863.1	4	215.7	241.5	*signify
	Inside gropes	13.4	15	0.893		
Range of motion (flexion) for injured leg	Between gropes	6081.1	4	1520.27	123.26	*signify
	Inside gropes	185	15	12.333		
Balance for injured leg	Between gropes	27.4	4	6.8	75.5	*signify
	Inside gropes	1.4	15	0.9		
Balance for proper leg	Between gropes	10.5	4	2.6	260	*signify
	Inside gropes	0.2	15	0.01		
Balance of all the body	Between gropes	15.9	4	1.7	17	*signify
	Inside gropes	1.3	15	0.1		

Tabulated(f) at freedom degree (15,4) and level of incorporeal(0.05)=3.06

Table (2) continued
Differences between groups in research variables(n=4)

variables	Source of differences	Sum of Quadrature	F.d	Average of Quadrature	Value of (f)	Level of significance
Strength at speed (60) extension for injured leg	Between gropes	23028.6	4	5757.15	226	*signify
	Inside gropes	382	15	25.4		
Strength at speed (60) flexion for injured leg	Between gropes	14982.4	4	3745.6	58.1	*signify
	Inside gropes	967.7	15	64.5		
Strength at speed (60) extension for proper leg	Between gropes	5184.3	4	129.07	43.1	*signify
	Inside gropes	450.5	15	30.03		
Strength at speed (60) flexion for proper leg	Between gropes	5011.6	4	1252.9	26.8	*signify
	Inside gropes	699.4	15	46.6		
Strength at speed (180) extension for injured leg	Between gropes	44976.2	4	11244.05	430.9	*signify
	Inside gropes	391.4	15	26.09		
Strength at speed (180) extension for injured leg	Between gropes	3737	4	934.2	121.3	*signify
	Inside gropes	115.5	15	7.7		
Strength at speed (180) extension for proper leg	Between gropes	13849.15	4	3462.2	224.8	*signify
	Inside gropes	231.8	15	15.4		
Strength at speed (180) flexion for proper leg	Between gropes	20868.3	4	5217.7	106.7	*signify
	Inside gropes	734.1	15	48.9		

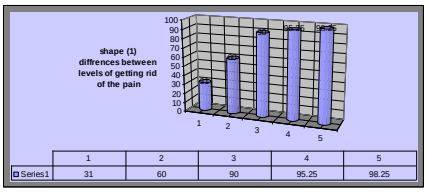
(f) at freedom degree (15,4) and level of incorporeal(0.05)=3.06 Tabulated

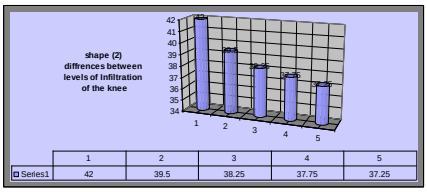
Table (2) shows significant differences at the level of incorporeal (0.05) between research measurements (pre-tests – follow up tests – post tests) in all research variables, so the researchers calculate less incorporeal different using (LSD) test in order to identify the direction of significance in favor of any measurements of the (tests – follow up tests – post test).

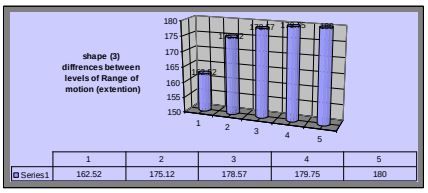
Table (3)

Differences between the groups in the research variables using the least significant difference test (LSD) (n = 4)

Variables	Groups	Averages	Pre – tests	Follow-up tests (1)	Follow-up tests (2)	Follow-up tests (3)	Post – tests	L.S.D
Get rid of the pain	Pre – tests	31		*29	*59	*64.25	*67.25	9.72
	Follow-up tests (1)	60			*30	*35.25	*38.25	
	Follow-up tests (2)	90				5.25	8.25	
	Follow-up (3)	95.25					3	
	Post – tests	98.25						
Infiltration of the knee	Pre – tests	42		*2.5	*3.75	*4.25	*4.75	1.18
	Follow-up tests (1)	39.5			*1.25	1.75	*2.25	
	Follow-up tests (2)	38.25				0.5	1	
	Follow-up (3)	37.75					0.5	
	Post – tests	37.25						
Range of motion (extension)	Pre – tests	162.52		*12.6	*16.05	*17.23	*17.48	1.42
	Follow-up tests (1)	175.12			*3.45	*4.63	*4.88	
	Follow-up tests (2)	178.57				1.18	*1.43	
	Follow-up (3)	179.75					0.25	
	Post – tests	180						
Range of motion (flexion)	Pre – tests	94.45		*37.67	*43.05	*45.05	*45.55	5.28
	Follow-up tests (1)	132.12			*5.38	*7.38	*7.88	
	Follow-up tests (2)	137.5				2	2.5	
	Follow-up (3)	139.5					0.5	
	Post – tests	140						







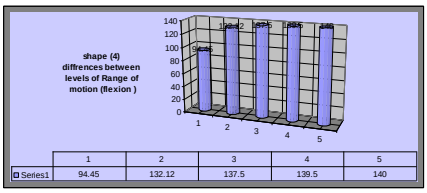
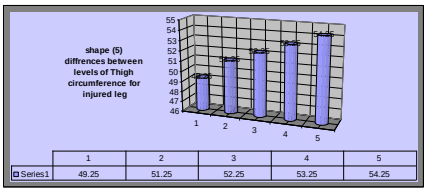
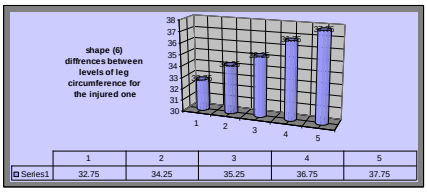
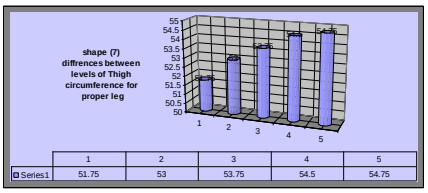


Table (3) continued
Differences between the groups in the research variables using the least significant difference test (LSD) (n = 4)

variables	groups	Pre – tests	Follow-up tests (1)	Follow-up tests (2)	Follow-up tests (2)	Follow-up (3)	Post – tests	L.S.D
Thigh circumference for injured leg	Pre –tests	49.25		*2	*3	*4	*5	1.75
	Follow-up tests (1)	51.25			1	*2	*4	
	Follow-up tests (2)	52.25				1	*2	
	Follow-up (3)	53.25					1	
	Post – tests	54.25						
Leg circumference for the injured one	Pre –tests	32.75		1.5	*2.5	*4	*5	2.18
	Follow-up tests (1)	34.25			1	*2.5	*3.5	
	Follow-up tests (2)	35.25				1.5	*2.5	
	Follow-up (3)	36.75					1	
	Post – tests	37.75						
Thigh circumference for proper leg	Pre –tests	51.75		*1.25	*2	*2.75	*3	0.903
	Follow-up tests (1)	53			0.75	*1.5	*1.75	
	Follow-up tests (2)	53.75				0.75	*1	
	Follow-up (3)	54.5					0.25	
	Post – tests	54.75						
Leg circumference for the proper one	Pre –tests	35.5		0.5	1	2.25	*2.75	2.41
	Follow-up tests (1)	36			0.5	1.75	2.25	
	Follow-up tests (2)	36.5				1.25	1.75	
	Follow-up (3)	37.75					0.5	
	Post – tests	38.25						







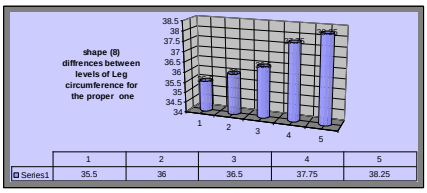
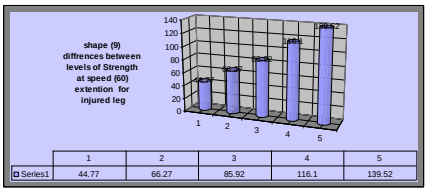
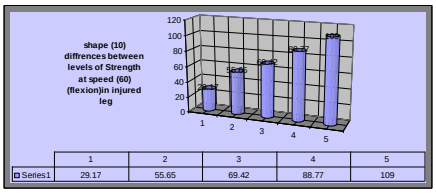


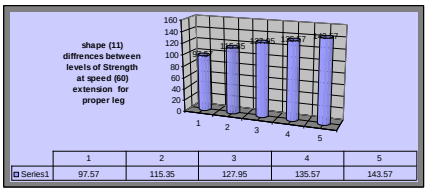
Table (3) continued

Differences between the groups in the research variables using the least significant difference test (LSD) (n = 4)

variables	groups	Averages	Pre – tests	Follow-up tests (1)	Follow-up tests (2)	Follow-up tests (3)	Post – tests	L.S.D
Strength at speed (60) extension for injured leg	Pre –tests	44.77		*21.5	*41.15	*71.33	*94.75	7.59
	Follow-up tests (1)	66.27			*19.65	*49.83	*73.25	
	Follow-up tests (2)	85.92				*30.18	*53.6	
	Follow-up (3)	116.1					*23.42	
	Post – tests	139.52						
Strength at speed (60) (flexion)in injured leg	Pre –tests	29.17		*26.48	*40.25	*59.6	*79.83	12.09
	Follow-up tests (1)	55.65			*13.77	*33.12	*53.35	
	Follow-up tests (2)	69.42				*19.35	*39.58	
	Follow-up (3)	88.77					*20.23	
	Post – tests	109						
Strength at speed (60) extension for proper leg	Pre –tests	97.57		*17.78	*30.38	*38	*46	9.88
	Follow-up tests (1)	115.35			*12.6	*20.22	*28.22	
	Follow-up tests (2)	127.95				7.62	*15.62	
	Follow-up (3)	135.57					8	
	Post – tests	143.57						
Strength at speed (60) flexion for proper leg	Pre –tests	64.85		*19.12	*26.77	*30.97	*48.55	10.28
	Follow-up tests (1)	83.97			7.65	*11.85	*29.43	
	Follow-up tests (2)	91.62				4.2	*21.78	
	Follow-up (3)	95.82					*17.58	
	Post – tests	113.4						







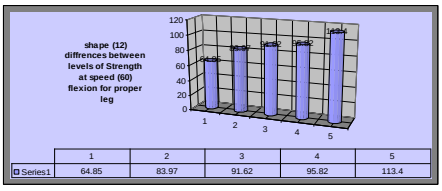
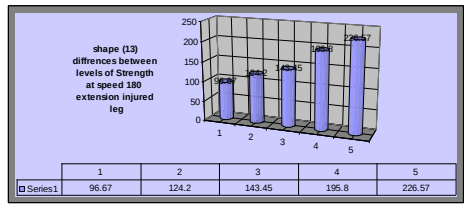
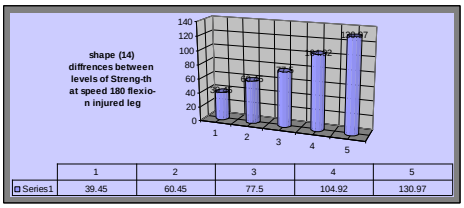
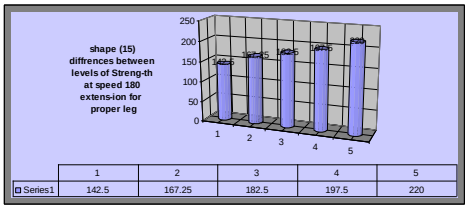


Table (3) continued
Differences between the groups in the research variables using the least significant difference test (LSD) (n = 4)

variables	Groups	Averages	Pre – tests	Follow-up tests (1)	Follow-up tests (2)	Follow-up tests (3)	Post – tests	L.S.D
Strength at speed 180 extension injured-leg	Pre –tests	96.67		*27.53	*46.78	*99.13	*129.9	7.69
	Follow-up tests (1)	124.2			*19.25	*71.6	*102.37	
	Follow-up tests (2)	143.45				*52.35	*83.12	
	Follow-up (3)	195.8					*31	
	Post – tests	226.57						
Strength at speed 180 flexion-n injured-leg	Pre –tests	39.45		*21	*38.05	*65.47	*91.52	4.17
	Follow-up tests (1)	60.45			*17.05	*44.47	*70.52	
	Follow-up tests (2)	77.5				*27.42	*53.47	
	Follow-up (3)	104.92					*26.05	
	Post – tests	130.97						
Strength at speed 180 extension for proper-leg	Pre –tests	142.5		*24.75	*40	*55	*77.5	5.90
	Follow-up tests (1)	167.25			*15.25	*30.25	*52.75	
	Follow-up tests (2)	182.5				*15	*37.5	
	Follow-up (3)	197.5					*22.5	
	Post – tests	220						
Strength at speed 180 flexion-n injured-leg	Pre –tests	96.7		*19.22	*28.12	*33.35	*39.2	10.5
	Follow-up tests (1)	115.92			8.9	*14.13	*19.98	
	Follow-up tests (2)	124.82				5.23	*11.08	
	Follow-up (3)	130.05					5.85	
	Post – tests	135.9						







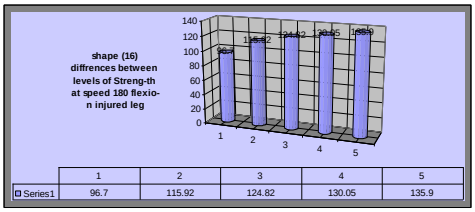
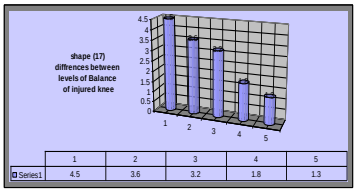
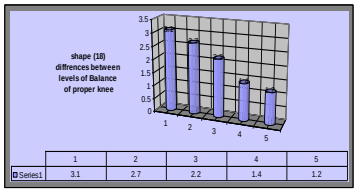


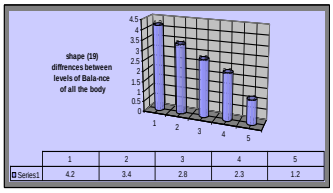
Table (3) continued
Differences between the groups in the research variables using the least significant difference test (LSD) (n = 4)

variables	groups	Means	Pre – tests	Follow-up tests (1)	Follow-up tests (2)	Follow-up tests (3)	Post – tests	L.S.D
Balance of injured -knee	Pre – tests	4.5		0.9	1.3	*2.7	*3.2	1.4
	Follow-up tests (1)	3.6			0.4	*1.8	*2.3	
	Follow-up tests (2)	3.2				1.4	*1.9	
	Follow-up (3)	1.8					0.5	
	Post – tests	1.3						
Balance of proper knee	Pre – tests	3.1		*0.4	*0.9	*1.7	*1.9	0.1
	Follow-up tests (1)	2.7			*0.5	*1.3	*1.5	
	Follow-up tests (2)	2.2				*0.8	*1	
	Follow-up (3)	1.4					*0.2	
	Post – tests	1.2						
Balance of all the body	Pre – tests	4.2		*0.8	*1.4	*1.9	*3	0.4
	Follow-up tests (1)	3.4			*0.6	*1.1	*2.2	
	Follow-up tests (2)	2.8				*0.5	*1.6	
	Follow-up (3)	2.3					*1.1	
	Post – tests	1.2						

As we noticed from the table (3), There are significant differences between pre – measurements and follow-up measurements in favor of follow-up measurements. The differences between follow-up measurements and Post –measurements in favor of Post –measurements, and the differences between the pre – measurements and Post – measurements in favor of Post –measurements.







Researchers indicated that differences between measurements (pre - follow-up – Post) measurements in research variables (pain - range of motion - the circumference of thigh and leg muscles – balance and muscle strength) happened due to administration of the proposed rehabilitation program, which has been applied to the sample, and this supports the results of Shirl (1994), Fahad Eid Mohammed (2005), and Gamal Moheb (2009), that rehabilitation exercises helped get rid of pain , leakage of infected knee, to return range of motion as close as possible to the proper knee, to be balanced as close as possible to the proper knee and to increase the circumference of the thigh muscles of the injured part , which mean increasing the strength of the muscle groups that contribute to increase the functional efficiency of the joint and return as close as natural condition. (12) , (2: 117) , (1: 112).

This is consistent with the results of the "Davis" (1992), the rehabilitative exercises helped to return range of motion of the injured part (295 : 9).

This is consistent with the results of Coopell (1991) " that muscle strength exercises for the anterior muscles that working on the knee joint

in general and posterior muscle in particular. As well as flexibility exercises for the same muscle groups lead to a significant balance in the muscle work for muscle groups working on the knee joint" (8:247).

The researchers believe that starting rehabilitation after surgical intervention affects positively on the injured joint rehabilitation . This is consistent with Berrutom Mitow and JGBD Johnson (1991). They found that the speed of the return of the injured and his functions and efficiency in less time possible stop on starting the rehabilitation process quickly (3: 175).

Table (4) continued
Percentage for rates of measurements improvement in all research variables (n =4)

variables	m pre	m follow up 1	m follow up 2	M follow up 3	m post	Percentage of improvements				
						Pre-post	follow up 3-post	follow up 2-follow up 3	follow up 1-follow up 2	Pre-follow up 1
Get rid of the pain	31	60	90	95.25	98.25	216 %	%3.1	%5.8	%50	%93.5
Infiltration of the knee	42	39.5	38.25	37.75	37.25	%11.3	%1.3	%1.3	%3.1	%5.9
Thigh circumference for injured leg	49.25	51.25	52.5	53.25	54.25	%8.12	%1.8	%1.4	%2.4	%4.0
Leg circumference for the injured one	32.75	34.25	35.25	36.75	37.75	%15.2	%2.7	%4.2	%2.1	%4.5
Thigh circumference for proper leg	51.75	53	53.75	54.5	54.75	5.7	%0.4	%1.3	%1.4	%2.4
Leg circumference for the proper one	35.5	36	36.5	37.75	38.25	%7.7	%1.3	%3.4	%1.3	%1.4
Range of motion (extension)	162.52	175.12	178.57	179.75	180	%10.7	%0.13	0.66	%1.9	%7.7
Range of motion (flexion)for injured knee	94.45	132.5	137.5	139.5	140	%90.5	%0.3	%1.4	%3.7	% .40

Table (4) continued
Percentage for rates of measurements improvement in all research variables (n =4)

variables	m pre	m follow up 1	m follow up 2	m follow up 3	m post	Percentage of improvements				
						Pre-post	Follow up 3-post	Follow up 2-follow up 3	Follow up1-follow up2	Pre follow up 1-
Balance of injured leg	4.5	3.6	3.2	1.8	1.3	%20	%11.11	%43.75	%27.77	%71.11
Balance of proper leg	3.1	2.7	2.2	1.4	1.2	%12.90	%18.51	%36.36	%14.28	%61.29
Balance of all the body	4.2	3.4	2.8	2.3	1.1	%19	%17.6	%17.8	%52.1	%73.8
Strength at speed (60) extension for injured leg	44.77	66.27	85.92	116.1	139.52	%48.02	%29.65	%35.12	%20.17	%211.6
Strength at speed (60) flexion for injured leg	29.17	55.65	69.42	88.77	109	%90.77	%24.74	%27.87	%22.78	%273.6
Strength at speed (60) extension for proper leg	97.57	115.35	127.95	135.57	143.57	%18.22	%10.92	%5.95	%5.90	%47.14
Strength at speed (60) flexion for proper leg	64.85	83.97	91.62	95.82	113.4	%29.4	%9.11	%4.58	%18.3	%74.8
Strength at speed (180) extension for injured leg	96.67	124.2	143.45	195.8	226.57	%28.47	%15.49	%36.49	%15.71	%134.3
Strength at speed (180) flexion for injured leg	39.45	60.45	77.5	104.92	130.97	%53.23	%28.20	%35.38	%24.82	%231.9
Strength at speed (180) extension for proper leg	142.5	167.25	182.5	197.5	220	%17.36	%9.11	%8.21	%11.39	%54.38
Strength at speed (180) flexion for proper leg	96.7	115.92	124.82	130.05	135.9	%19.87	%7.67	%4.19	%4.49	%40.53

The researchers attributed these differences .

between measurements (pre, follow up and post) and the increase of the percentage of improvement in the research variables (pain - leaching - thigh circumference and leg- range of motion-balance-muscle strength) to

the proposed rehabilitation program, which has been applied to the sample.

Conclusions:-

1- The program helped to get rid of the of pain.

2- The program helped to improve range of motion of the injured knee joint (extension and flexion)comparing with the proper knee.

3- The program helped to improve level of balance**.**

4- The program helped to improve muscle strength and comparing with the proper part**.**

5- water and functional exercise inside football stadium affected positively on the return of natural function of the injured part .

6- The program helped to improve muscle strength of the muscles working on the affected knee compared to the proper part.

7- water and functional exercises inside the football stadium, clearly helped to speed the return of normal basic functions of the injured part compared to the proper part.

Recommendations:-

- Using the proposed program of exercises in the rehabilitation of patients with cut at the anterior Crutiate ligament (ACL) .
- Focusing on the use of water exercise when designing rehabilitation programs as a means of assistance in the rehabilitation process.
- Paying Attention to functional exercises inside the stadium when designing rehabilitation programs.
- Using balance exercises at any proposed program of knee joint injuries .

- Using exercises of muscular strength for the muscles working on knee joint .
- Paying Attention to warming-up and developing flexibility and muscle strength because it is important in the prevention of injuries in general, and particularly knee injuries.
- Increasing the number of training units per week, and the use of other modern rehabilitation techniques.
- Doing more studies on knee joint injuries .
- Using devices of measurement because of its acurrent results.

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