



THE ROLES OF THE QUADRICEPSPLASTY IN TREATMENTS OF POST- TRAUMATIC STIFF KNEE (USING JUDET PROCEDURE)

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Abstract:

Background; The lack of knee flexion is an increasingly recognized complication especially after trauma. This is a significant challenge for both surgeon and patients. In 1956, Judet proposed a quadricepsplasty technique that allowed for a graded release without the disruption of the vastus medialis, vastus lateralis, or rectus femoris.

Aim of the study; The aim of this study is to evaluate the beneficial outcome of the Judet quadricepsplasty in improving the range of movement of knee joint in those patients complaining from post-traumatic stiffness.

Methods; This research is done for evaluating the clinical outcomes of 15 patients who underwent a Judet's quadricepsplasty. They were 12 men and 3 women. The definitive flexion gain was classified according to Judet's criteria; excellent, if flexion was greater than (100°); good, from (80° to 99°), fair result are from (50° to 79°); and poor flexion degree is less than (50°).

Results; Patients were operated on average 19.40 months \pm 17.63 months (range, 6-72 months) after first initial surgery. Average follow-up period was 6.5months \pm 3.6months (range, 3-15 months). According to Judet criteria, 7 patients (47%) achieved excellent, 5 patients (33%) good, 2 patients (13%) fair, with zero poor results; but 1 patient ended with extension lag. Final average flexion arc improvement was 97.67 degrees \pm 18.6 degrees with a range between 60-120 degrees. Our complications included one case of extension lag and one case of small area of skin necrosis.

Conclusions; Even though it was proposed in 1956, the Judet procedure seems to give a reproducible amount of good results today and still holds its leading role in the treatment of extraarticular knee stiffness.

Keywords: knee joint , quadricepsplasty, post-traumatic stiffness.

INTRODUCTION

There are some joints, such as the wrist, ankle and tarsus, in which stiffness is compatible with excellent function, and even the effects of an arthrodesis may be masked almost beyond recognition. In the knee joint, however, any serious limitation of movement is a very considerable handicap, the effects of which can neither be disguised nor overcome. The patient is debarred from a considerable range of occupations and recreations; he may have to change both his job and his hobbies, and he is constantly being embarrassed by all the people who fall over his outstretched leg in cars, theatres, cinemas and the like, many of whom in their ignorance do not hesitate

to upbraid him for a clumsy and inconsiderate fellow. ¹ Traumatic causes of stiff knee include fractures of bone, inflammation of tendons or bursae, damage to the cartilage of the knee capsule or iatrogenic causes. Injuries may be sudden or may develop slowly over time. ²The different forms of arthritis are the most common chronic diseases to affect the knee. Osteoarthritis results from wear and tear on the joint, while rheumatoid arthritis arises from a dysfunction of the body's immune system. Tumors and infections of the knee joint and surrounding areas may produce a stiff knee. ² Stiffness may follow either disease or trauma. When it is the result of infection or arthritis, attempts at restoring movement are not only



disappointing but dangerous, and if any surgery at all is called for because of pain, instability, progressive deformity or for stiffness. When it follows trauma, however, the outlook is almost completely reversed and the most gratifying results can be obtained, even in the stiffest and most unpromising knees, by the operation of quadricepsplasty. This is in fact one of the most rewarding operations in the orthopaedic surgeon's repertoire, but one gets the impression that it is also one of the most neglected, simply because its possibilities are not sufficiently appreciated. Stiffness of the knee joint is one of the most common complications that presented after trauma or after surgical intervention in the thigh or that around knee, which can be treated by many surgical intervention one of these is the **Quadricepsplasty**.³

Definitions:

Quadricepsplasty is corrective surgical procedure on the quadriceps femoris muscle and tendon to release adhesions and improve mobility, with the goal of improving the range of flexion of the knee.⁴

A stiff knee occurs when you have difficulty in moving the knee joint due to injury or inflammation of the joint. Anything that leads to restricted movement of the knee joint may be considered to cause stiffness of the knee.⁵

History:

This procedure, described first in the Journal of Orthopedic Surgery by Bennett in September, 1919, with two cases, and again in April, 1922, with six cases, has filled a long-felt want, particularly in industrial surgery. It does not seem to be as well-known and popular as it should be, however, and hence, with an experience of five cases. All of old cases are treated by lengthening of the quadriceps tendon by anterior approach.⁶

In the English literature on quadricepsplasty since Hesketh (1963) and Nicoll (1963) evaluated the Thompson quadricepsplasty. Extension contracture of the knee may also be due to intra-articular causes, mainly adhesions. In their efforts to relieve extension contractures of either aetiology, Judet, and Lagrange (1956), using as a basis a technique devised by Payr (1914), initiated a new technique of quadricepsplasty which has been used with some success in Montreal at the McGill teaching hospitals.⁷

In 1956, Judet proposed a quadricepsplasty technique that allowed for a graded release without the disruption of the vastus medialis obliquus, vastus lateralis, or rectus femoris.⁸

PATIENTS AND METHODS

This prospective study was conducted during the period from the beginning of February 2011 till the 15th of August 2012, in Basrah University Department Of Orthopaedics. During this period fifteen patients suffering from post-traumatic stiffness in the knee joints were included in the study.

The total number of patients were (15) patients, (12) male and (3) female, with mean age of the patients was 35.60 years, range from (18-52) years. All patients were evaluated by a detailed history according to special questionnaire prepared for this purpose which include the pain (either in the knee, hip joint & also back), limitation of daily activities (Affecting the ability to stand, to go up & down stairs, squat & dress), limping, deformity, instability, muscle atrophy & secondary osteoarthritis.

Detail information was taken about the causes, duration of the stiffness and the type of the treatment for the previous problems including the history of osteomyelitis. We ask the patients about their past medical history; diabetes, rheumatological diseases, and smoking.

The ranges of the flexion is measured when stationary arm of the goniometer was placed parallel to the long axis of the femur along a line extending from the greater trochanter to the lateral femoral condyle, and the movable arm was placed parallel to the long axis of the fibula, between the head of the fibula and the lateral malleolus, and also measured the thigh muscle girth (all of the patients are presented with muscle wasting).

We explain for the patient that the quadricepsplasty is a major operation and the patients should accept a very slow return of active quadriceps extension. Most patients can expect improvement in range of motion of the knee after quadricepsplasty but should expect severe quadriceps weakness for many months.

All patients were send for hematological, biochemical investigation, and radiological examination for evaluating the state of the joint and femoral bone.

Two units of blood usually prepared prior to surgery. Same surgeon performed the procedure, and we used the Judet's procedure for all of them.

Operative Technique:

The patient in supine position, and before starting the operation, we give the patients the first dose of antibiotics (Ceftriaxone vial 1gm intravenously) with induction of anesthesia. The procedures were carried without using a tourniquet, by direct lateral incision of the affected side and then by subvastus approach, the vastus lateralis was divided from the linea aspera; we exposed the femoral bone



and release of the medial, lateral retinacula and release of the adhesions in the suprapatellar gutter and between the patella and femoral condyles. Release of the vastus intermedius, extending from the superior pole of the patella to the upper thigh thus identifying the vastus intermedius, which was then lifted off the anterior and lateral surfaces of the femur extraperiosteally.

Flex the joint gradually (before removing the matel if present), till reach a maximum degree of flexion and if flexion degree did not reach (120°), multiple small radial incision done in the quadriceps muscle near the musculotendinous junction for getting a good flexion degree.

Measure the flexion degree and removed the implant , after completing the procedure, a good homeostasis should be perform & put two suction drain. The fascia and skin are closed in flexion position, and a compressive wrap with an elastic bandage is applied from the toe to the thigh to decrease swelling. The extremity is immobilized in a splint in about 50 degrees less than the maximal flexion obtained at operation by anterior slab.

Post operative measures:

We keep all of the patients in a suitable dose of antibiotics (Ceftriaxone vial of 1gm and Amikacin vial 500mg twice daily) for three days and analgesia. The drains usually removed after 2days and the dressing is usually changes in 3rd postoperative day then the patients are discharged on oral antibiotics with suitable analgesia (for one week).

After two weeks we remove the stitches and start passive and active exercises for the quadriceps and hamstrings, which are of critical importance to the success of this procedure. The knee is kept in extension during night and is exercised during the day with active and active-assisted exercises, active straight leg raising, isometric quadriceps exercises, resistance exercises, and bicycling. Galvanic and thermal therapies are advised for all the patients from the third week postoperatively and continue for one month.

All of the patients completed follow up for at least three months (range 6.5moths±3.61months) with frequent visit to hospital every two to three weeks for all the patients. Measure the degree of the flexion and advise the patients for physiotherapy specially

quadriceps load bearing exercise for those patients who achieved more than (90°) of flexion.

Gentle manipulation with the patient under anesthesia after three months was required for patients that did not get more than (90°) of flexion (which performed for two of our patients).

Complications.

One patient had a small area of skin necrosis at sit of incision which treated conservatively and another patient ended with extension lag (20degrees) which also treated conservatively by splint.

We classify the patients in to two groups according to the flexion degee that measured preoperatively, group 1 (preoperative flexion<30°) which include 10 patients and group 2 (preoperative flexion>30°) which include 5 patients.

The ranges of the flexion are measured as final results by using the goniometer and the final results were assessed and according to the Judet's criteria; the definitive flexion gain was classified as excellent, good, fair, or poor. Excellent when >100 degrees, good when >80 <99 degrees, fair when >50 degrees <79 degrees, and poor when <50 degrees.⁸

We asked all of patients for the satisfaction from this operation , were the patient got a very good , good, fair, or got worse after the operation .

Statistical Analysis

IBM SPSS Statistics Version 20.0 was used to test study's result. Chi square and independent t-test was used to compare the results of various parameters among the studied groups. Some values expressed as Mean±SD. P value of <0.05 was considered to be statistically significant and P value of <0.001 was considered to be statistically highly significant

RESULTS

The total number of patients were 15 (12) males and (3) females with mean age 35.60years (minimum 18 years and maximum 51years). Ten patients (70%) were presented with long duration of stiffness.

Table-1 show the summary of the study data that include serial number for each patient, age in years , gender ,side, and if the patients complain from open or multiple injuries previously . Also it include the first types of the treatments , durations of these treatments and if the patients suffer from osteomyelitis and the second surgical interventions for each.

Case	Age Y	Sex	Side R/L	Open #	Multiple injury	First treatment	Duration	OM	Second treatment
1	32	m	L	*		External fixation	4 mth.	*	Long plate



2	50	f	R			POP	5mn		
3	49	m	L			External fixation	3 y.		
4	37	m	R	*		External fixation	1y		
5	27	f	L			Loge plat	6y		
6	18	m	R			POP	4 mth.	*	
7	25	m	L			POP	5 mth.		
8	51	f	L			POP	6mn		
9	42	m	R			External fixation	3 mth	*	Plate
10	38	m	L			L-plate	2y		
11	48	m	R	*	*	External fixation	9 mth	*	Long plate
12	42	m	L			L-plate	2 y		
13	24	m	L			L-plate	2.5 y		
14	18	m	L			L-plate	1.8 y		
15	33	m	L			External fixation	1 y		Plate

The total sample of the study was (15) patients, were 12 males (80%) and 3 females(20%) as shown in the table-2 and figure-9:

Male	12	80%
Female	3	20%

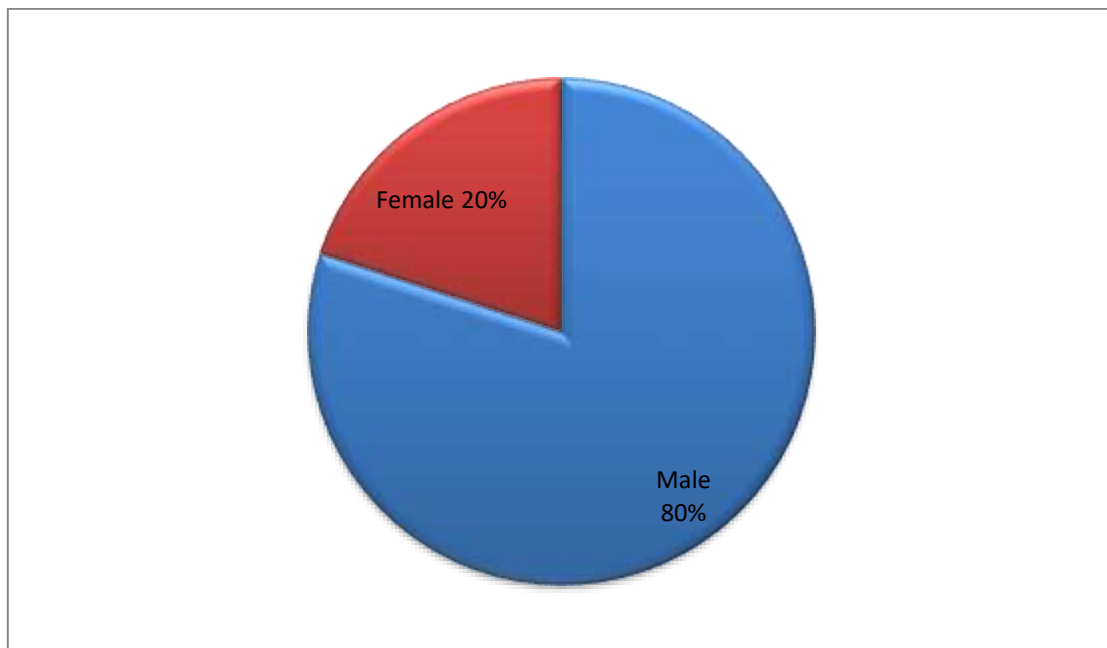


Figure-9: The percentage of the patient's gender.

The first line of the treatment was (5) patients with internal fixation , (6) patients with external fixation , and non-surgical treatments in (4) patients which includes two with history of trauma to the knee joints and presented with

fracture in patella and treated conservatively with POP for months, one patient was presented with osteomyelitis and septic arthritis also treated conservatively with POP and the other one patient had a history of trauma to his knee joint and haemoarthrosis treated with aspiration and POP, as shown in the table-3 and figure 10:

Table-3 ;Types and percentage of the first treatments		
Type of the treatment	No.	Percentage
Internal fixation	5	34%
External fixation	6	40%
Non surgical	4	26%
Total	15	100%

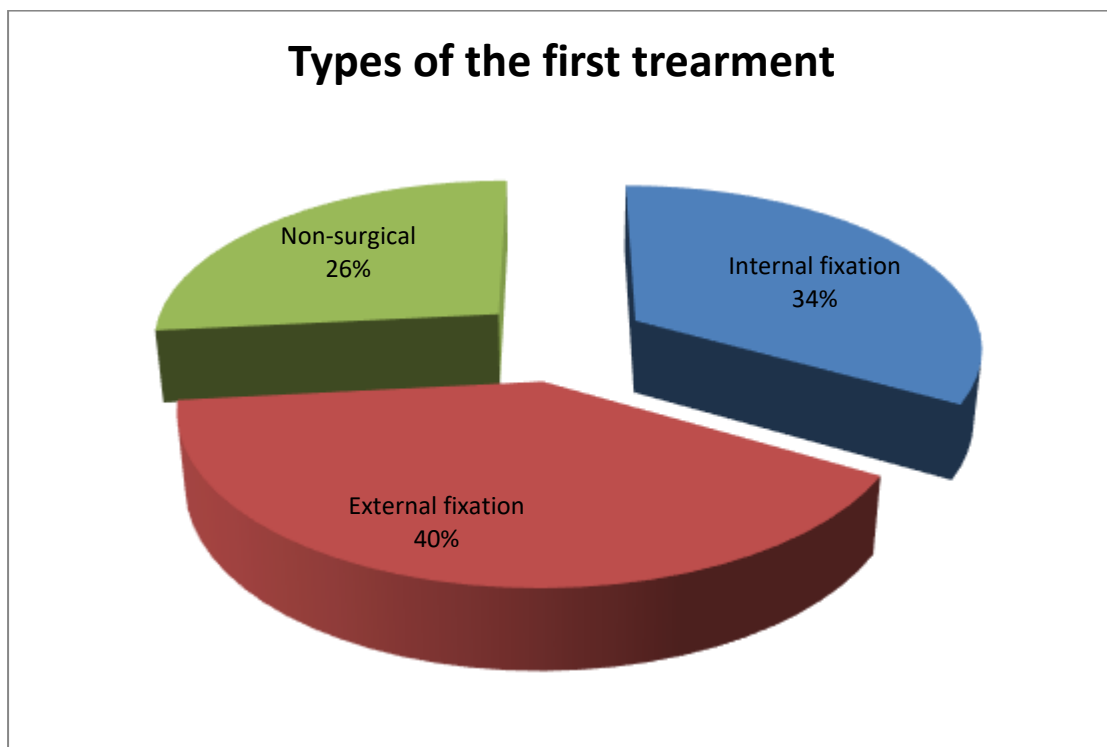


Figure-10: Distributions of the percentage of the first treatments.

Four patients (27% had a previous history of osteomyelitis, those patients with osteomyelitis were treated by serial surgical clearance which induced more muscular adhesion and wasting and more stiffness of the knee as shown in the next table and figure-11 :

Table-4 ; Frequency and Percentage of osteomyelitis		
	Frequency	Percent
osteomyelitis	4	27%
Total number of patients	15	73%

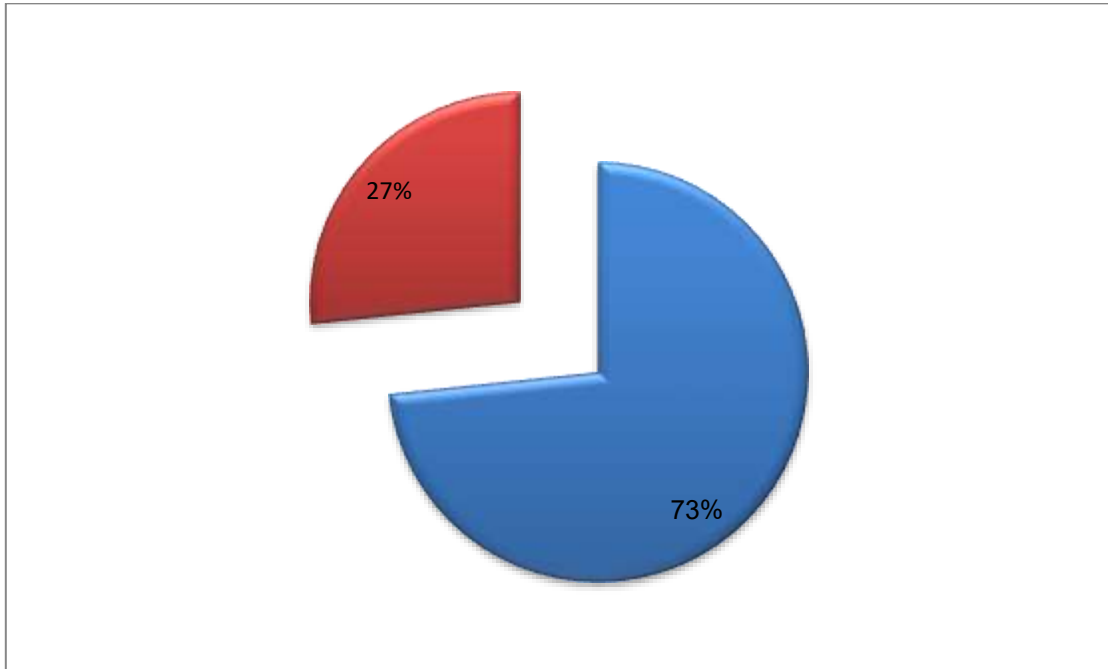


Figure-11: Incidence of osteomyelitis.

The interval between primary trauma and surgery till quadricepsplasty were divided into four groups according to the patient history, the mean duration 19.40 months±17.638 months as shown in table 5 and figure-12:

Table-5 ; Duration of the stiffness in months		
Duration(months)	No.	Total
5-10	1	7%
15-20	3	20%
20-25	4	27%
>25	7	46%
	15	100%

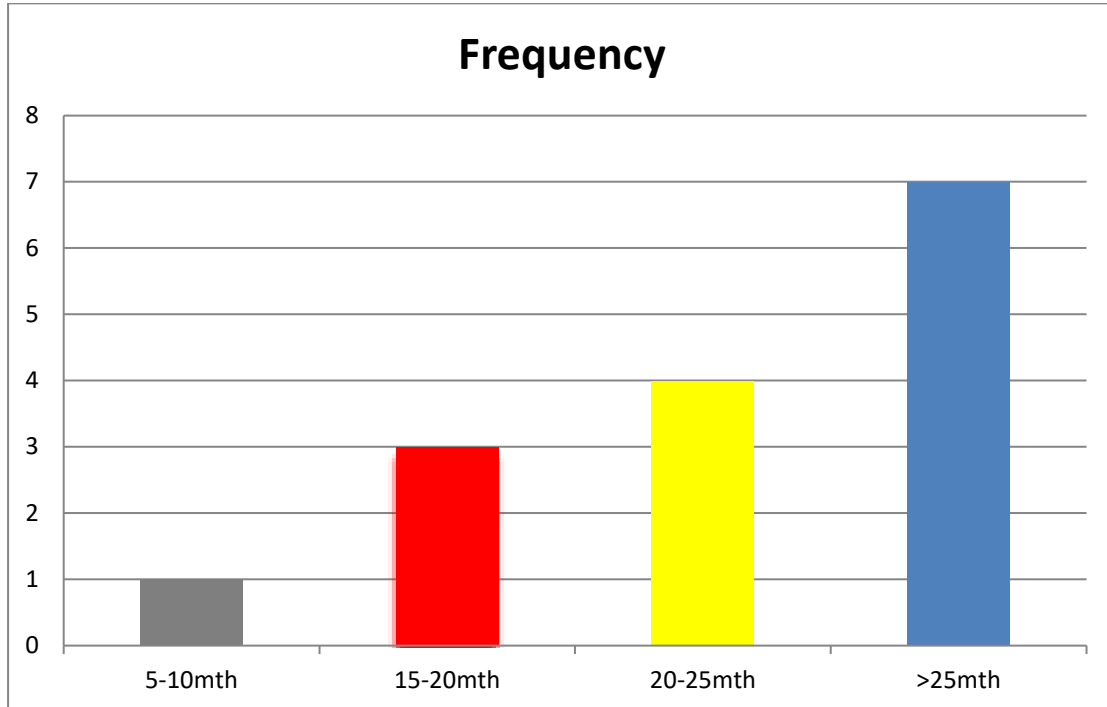


Figure-12: Elapsed time from injury to quadricepsplasty.

One patient (7%) had a previous history of multiple injuries which includes compound comminuted fracture of the femoral, ipsilateral tibial bones and chest trauma as shown in table 6:

	Frequency	Percent
N0 multiple injury	14	93%
Multiple injury	1	7%
Total	15	100%

The average preoperative flexion was 28 ± 10.488 degrees (ranging from 10–50 degrees), and the average follow up was $6.5 \text{ months} \pm 3.61$ months (range, 3-15 months). The average of the flexion gain are 97.67 ± 18.6 degrees (range 60-120 degrees).

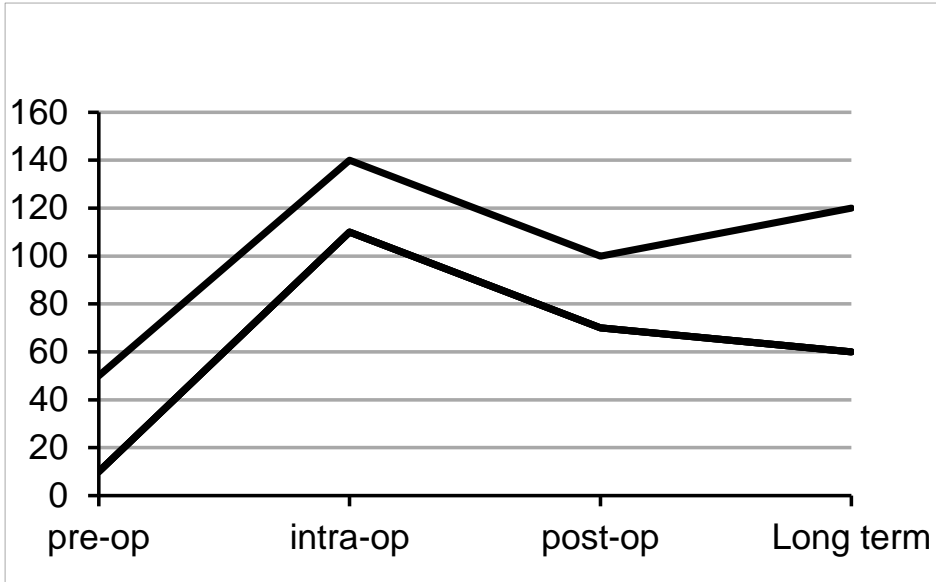
Statistical analysis of the significance in this study was shown that the preoperative flexion was significantly lower than that measured at all the other observations ($p = 0.001$) which is highly significant study; while the postoperative flexion was significantly lower than intra-operative flexion ($p = 0.005$).

The final results according to the Judet's criteria are presented in the table-7:

Case	Follow-up (mth)	Pre-operative ROM	ROM during surgery	Post-operative ROM	Final gain in flexion	Final result
1	4	10 (0-10)	110	60 (0-60)	50	Fair



2	15	35 (0-35)	120	100 (0-100)	65	Good
3	10	25 (0-25)	140	120 (0-120)	95	Excellent



4	10	25 (0-25)	120	110 (0-110)	85	Excellent
5	10	45 (0-45)	130	120 (0-120)	75	Excellent
6	8	15 (0-15)	110	90 (0-90)	75	Good
7	6	25 (0-25)	110	80 (0-80)	55	Good
8	10	20 (0-20)	120	110 (0-100)	90	Excellent
9	5	30 (0-30)	110	75 (0-75)	45	Fair
10	3	30 (0-30)	110	90 (0-90)	60	Good
11	4	30 (0-30)	120	90	Extension lag	
12	3	50 (0-50)	140	110 (0-110)	60	Excellent
13	6	30 (0-30)	130	120 (0-120)	90	Excellent
14	4	20 (0-20)	130	80 (0-80)	40	Good
15	3	25 (0-10)	120	110 (0-80)	85	Excellent

The average flexion preoperative, the average flexion degree that achieved intra-operative and definitive flexion gain after more than 3months follow up show that the ranges of the movements are decreased immediately after surgery but with the programs of the physiotherapy it increased gradually in most of the patients as shown in figure-13:



Figure-13: The range of the flexion pre-operative, intra operative and definitive flexion gain .

7 patients (47%) were got excellent result ,5 patients (33%) were got good result, while 2 patients (13%) were got fair result, and 1 patient (7%) were ended with extension lag as shown in table-8 :

Table-8 : Final results of the study .			
		Frequency	Percentage
Judet's criteria	Excellent	7	47%
	Good	5	33%
	Fair	2	13%
	Extension lag	1	7%
	Total	15	100%

The number and the percentage of group 1 (preoperative flexion<30°) and group 2 (preoperative flexion>30°) from the total number of patients are shown in table-9:

Table-9 ; Frequency and Percentage of group 1 & 2		
	Frequency	Percent
Group 1	11	73%
Group 2	4	27%
Total	15	100%

Incidence of Patients Outcome According to Judet's Criteria regarding preoperative flexion Arch of <30° (Group 1) and 30° and More (Group 2) are shown in table-10:

Table-10: Incidence of Patients Outcome According to Judet's Criteria in (Group 1) and (Group 2):		
Judet's Criteria	No. (%)	
	Group 2 (Flexion >30)	Group 1 (Flexion <30)
Excellent	2 (50)	5 (50)
Good	2 (50)	3 (30)
Fair		2 (2)

The number of the patients in group 1 and group 2 are (15) patients but if we classified those patients according to the Judet's criteria we must exclude one patient because this patient ended with extension lag and it will not be included in this criteria as shown in previous table and figure-14:

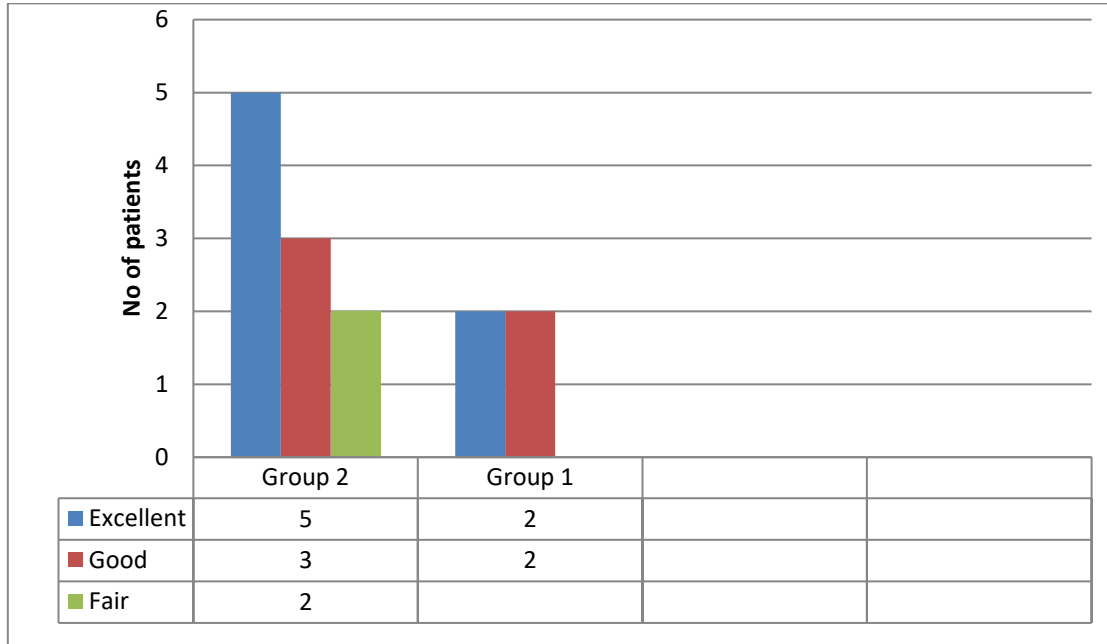


Figure-14 : Number percentage of the patients in each group.

The patients were complained from previous history of osteomyelitis were got a fair result in two patients; one patient got a good result and one patient ended with extension lag. So there is a strong relationship between the history of osteomyelitis and the final results of the quadricepsplasty.

The definitive flexion gain was reversibly correlated with the preoperative flexion, with the preoperative interval and directly correlated with the length of the follow-up.

Two complications arose related to the Judet procedure one patient ended with extension lag and another one got small area of skin necrosis was treated conservatively.

The long term range of the movements in all patients is shown in figure-15:

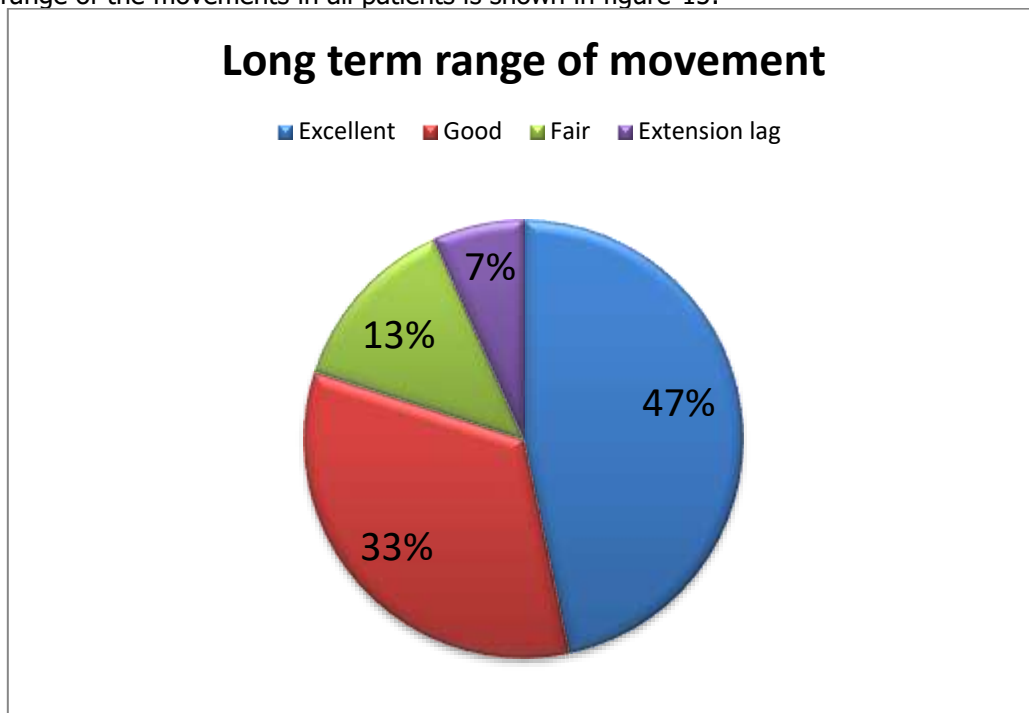


Figure-15: Long term movements



Finally, as a subjective study for all of our patients satisfaction about the outcome in the degrees of flexion gain after history of stiffness we classify the patients to worse , fair, good, and very good as clearly shown in figure -16:

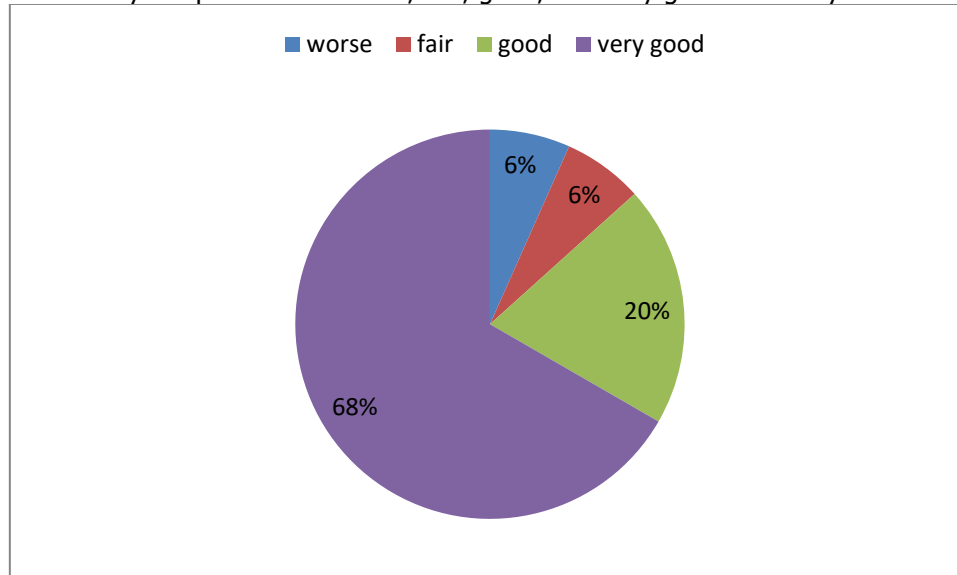


Figure -16; Patients satisfaction.

DISCUSSION

Stiff knee is a serious complication after fracture of the distal femur or other injuries around the knee joints. An extension contracture results from scarring of the extensor mechanism of the knee . The components limiting flexion of the knee have been including adhesions from the deep surface of the patella to the femoral condyles , fibrosis and shortening of the lateral expansions of the vasti and their adherence to the femoral condyles , fibrosis of vastus intermedius, and shortening of rectus femoris.

The total number of the patients in the study was (15) patients, (12) male and (3) female, all of them were complaining from post-traumatic stiffness in the knee joint during eighteen months time, which is relatively small sample for study, but in comparison with other studies about the same subject it is accepted . A study done by S. B. Hahn et al., in 2000 , their total sample size was (20) patients³ .

In other studies done by A. Masse et al., in (2006) for (21) patients⁸ , and another study done by J. Bellemans et al., in 1996 for (16) patients¹⁵.while the study that done by Ali AM et al., in (2003) done for (10) patients.²¹

The ages of our patients are between 18-51 years ,the mean age 35.60 years; when compaired with study done by Mohammad H et al., in (2010), the age of patients ranged between 17 years and 65 years, with an average of 30.52 years, most patients

were between 20 years and 29 years.²⁰ which are very close to our findings.

Another study done study done by S. B. Hahn et al., in 1997, The mean age of the patients was 37 years (18 to 64)³ also its very close to our patients .

Another study done by A. Masse et al., in (2006), the average age was 29.57 years (range, 18–42 years)⁸ which are accepted with our patients.

All of these finding reveals that this age groups are more vulnerable for trauma and more incidance of stiffness.

The mean interval between the initial operation and quadricepsplasty was 19.40 months±17.638 months (3 to 72 months) for our patients, while the interval period in a study done by S. B. Hahn et al., in 2000, the mean interval between the initial operation and quadricepsplasty was 28 months (14 to 60 months).³ these results are very close to our findings.

Another study done by A. Masse et al., in (2006), the average preoperative interval was 35.5 months (range, 10–88 months).⁸ Which was longer than that of our patients.

Another study done by Mohammad H et al., in (2010), the patients were operated on average 6.9 months ± 3.6 months (range, 4–24 months) after first initial surgery.²⁰ Which was shorter than that of our patients .



While the study that was done by H. Daoud et al., in (1982), the patients were operated on long period of interval (6months-21 years) ⁷ which are commensurated with our study.

Four patients (27%) in our study had previous history of osteomyelitis which affect significantly the final result of flexion gain in those patients. In a study done by A. Masse, A et al., in (2006) for (21) patients found that three patients (14%) had osteomyelitis.⁸ which was relatively higher in our patients .

Another studies done by Mohammad H et al., in (2010) for (40) patients and a study done by H. Daoud, T. O'farrell, R. L. Cruess, all of the patients had no history of osteomyelitis.^{7, 20}

The range of movement preoperatively for our patients was (10-50°) and the mean 28degrees ± 10.488 degrees , when compared with a study done by S. B. Hahn et al., in 2000, the mean flexion contracture was 7.0° (0 to 30) with active flexion to 50.0° (5 to 80). The mean range of movement was thus 43.0° (5 to 80). ³ Which was higher than that of our patients .

Another study done by Mohammad H et al., in (2010), the preoperative flexion were (0- 90°) with average of flexion (30.75 ± 28.54°). ²⁰ Which was higher than that of our patients .

Another study done by A. Masse, A et al., in (2006), the range of the flexion was (5-50°) preoperatively. ⁸ these results are very close to our findings.

We recorded two complications with our patients ; one patient with extesion lag and other with small arer of skin necrosis treated coservativly with daily dressing and antibiotics. While the study done by S. B. Hahn et al., in 1997, one patient had a deep infection which resolved after wound care and intravenous antibiotics.³

In a study done by A. Masse, A et al., in (2006), the complications includes five complications related to the Judet procedure they were deep sepsis (2 cases), intraoperative rupture of the quadriceps tendon (1 case), skin necrosis (1 case), and fracture of the lateral femoral condyle (1 case). ⁸ Which was worse than that of our patients.

Another study done by Mohammad H et al., in (2010), the complications occure in this study included two cases (5%) of superficial infection and one case (2.5%) with patellar fracture. ²⁰

However, the results of Ali AM et al., in (2003) included two patients had postoperative complications, one patiente suffer from hematoma and develope infection, and a minimal extension lag (10 degrees) developed in one patient. ²¹

In this prospective study the included patients are with a minimum of a 3 months and maximum (15) months of follow-up, the mean range of follow up was 6.5±3.61 months, due to difficulty in following up our patients we found that our follow up was short if compared with other studies. A study done by S. B. Hahn et al., in 1997 , the patients were followed for a mean duration of 35 months (24 to 52) ³ which was logner than that of our study.

Another study done by A. Masse et al., in (2006), the average follow-up was 101.0 months (range, 21–204 months). ⁸ which was logner than that of our study.

Another study done by Mohammad H et al., in (2010), the average follow-up was 17.5 months (range, 12–24 months). ²⁰ which was logner than that of our study duration.

Another study done by H. Daoud et al., all patients are followed up for (24months)⁷ which was logner than that of our study duration

In our study the final results of the patients according to the Judet's criteria were (47%) with excellent range (>100°)flexion , (33%) with good results (80-99°) , (13%) with fair reslts (50-79°) and (7%) have extension lag

In a study done by A. Masse et al., in (2006) for (21) patients they found excellent results in eight cases (38.10%), were good in nine (42.86%), and fair in four (19.05%) with zero poor results ⁸ , and these results are commensurated with our study.

Another study done by Mohammad H et al., in (2010) for (40) patients they found 9 patients (22.5%) achieved excellent, 27 patients (67.5%) good , 2 patients (5%) fair , and 2 patients (5%) poor results ²⁰ . When the results of this study are compared with our results, a highly percentage of good results are found but aslo (5%) of the patients ended with poor outcome.

However, the results of Ali AM et al., in (2003) study are (20%) were excellent , (70%) were good and (10%) with fair reslts ²¹ .

Another study done by H. Daoud et al., ended with (85%) of the patients with good or excellent and (4%) with poor results.⁷

Finally if we compaire our reasults with that of other studies for those who performed Judet's quadricepsplasty we can say that the main factors that affect the end reasults of flexion gain are previous history of osteomyelitis, duration of elapsed time between the primary injuries and quadricepsplasty , duration of the physiotherapy and follow up.

CONCLUSIONS



- 1- The results of this study showed that Judet quadricepsplasty successfully increases flexion range with less impairment of quadriceps function.
- 2- Familiarity with this technique might lower the surgeon's threshold for considering quadricepsplasty in patients with severe knee ankylosis after severe femoral fractures and in particular after a prolonged period of external fixation or other causes of stiffness.
- 3- The Judet technique of quadricepsplasty offers the advantages of a controlled, sequential release of the components limiting knee flexion and a reduced potential for iatrogenic quadriceps rupture or extension lag.
- 4- Patients with history of multiple injuries, long period of stiffness, severe soft tissue scar, or specially those with previous history of osteomyelitis are more probably not to achieve an excellent results or end with other complications like extension lag.
- 5- The definitive flexion gain did not correlate with either patient age or sex whereas it was reversibly correlated with the preoperative flexion, with the preoperative interval and directly correlated with the length of the follow-up.
- 6- Our research has shown that, even if first procedure of Judet's quadricepsplasty is performed in 1956, the Judet procedure still gives a reproducible amount of good results.
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RECOMMENDATIONS:

- 1- Quadricepsplasty is a major procedure with demanding rehabilitation regiment which should be considered when attempting to correct knees extension contractures. An earlier intervention would produce a better outcome especially in more severe cases.
- 2- The postoperative management after quadricepsplasty is very important if the flexion is to be maintained without loss of active extension.
- 3- Vigorous passive exercises with an elastic bandage and strengthening exercises of the quadriceps must be performed intensively for four weeks after the operation, and continued less intensively for at least six months.

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