

Arthroscopic Arthrolysis and Quadricep VY Plasty for Post Traumatic / Post Surgical Stiff Knee

Shams u Rehman, Javed Iqbal and Naeem Ullah

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ABSTRACT

Objective: We sought to evaluate the effectiveness after combined arthroscopic arthrolysis and quadriceps V-Y plasty in post-traumatic, post infection or post-surgical stiff knee.

Study Design: A descriptive case series study.

Place and Duration of Study: This study was conducted at the Department of Orthopaedic, Traumatology and Sports medicine, MTI, LRH Peshawar from January -2022 to January-2024.

Methods: A total of 30 patients, 18 male and 12 female were operated from January 2021 to January 2024. Active and passive knee flexion and extension were assessed for patients both before and after surgery and the KSS was also used to evaluate function. Data analysis was done on paired t- tests with the statistician setting the level of significance at 0.05.

Results: The mean pre-operative ROM was $50^{\circ} \pm 8\text{Sd}$, which was increased to mean $110^{\circ} \pm 10^{\circ}\text{Sd}$ at the latest follow up, thus a mean improvement of 80 % ($p < 0.001$). Knee Society Score (KSS) increased from mean 45 ± 10 to 85 ± 8 indicating 88% improvement in the mean score ($p < 0.001$). Low complication rate was identified whereby 90% of the patients were highly satisfied with the procedure.

Conclusion: The current study shows that arthroscopic arthrolysis together with quadriceps V-Y plasty has a profound beneficial effect on the extension deficit and functional status of the knee in patients with Post-Traumatic Or Post-Surgical Knee Stiffness.

Key Words: knee stiffness, arthroscopic release, quadriceps V-Y Plasty, post traumatic stiffness.

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INTRODUCTION

Stiffness of the knee after trauma or surgery is a common and unfortunate phenomenon which has a negative impact on the patient's mobility and overall quality of life. Its incidence is 5-10% in orthopedic patients, undergoing fracture surgeries in the knee, around the knee, prolonged immobilization in polytrauma patients with head injuries, intensive care units^[1,2]. The probable mechanisms that underlie knee stiffness may include intra-articular adhesions, fibrosis of the surrounding soft tissues, capsular contractures, and quadriceps muscle contractures; all contribute to variably into this condition.

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The pathology restrict the knee joint ROM which can alter the mobility of the patient and can reduce a patient's quality of life. If adhesions occur within joint space or between quadriceps muscles and femur then both flexion and extension are lost. This condition leads to contraction and hardening of the joint capsule that limits mobility. Further, muscle contractures most (>70%) involve quadriceps. Prolonged stiffness if not treated tends to render a person permanently crippled. Nonoperative treatment of knee stiffness includes physiotherapy, nonsteroidal anti-inflammatory drugs. Manipulation under anesthesia is some time quite promising. However, these non-operative methods fail to deliver appropriate results where there are massive formation of adhesions and contractures^[3]. The surgical procedures are then required in treating knee joint ROM, pain, and for functional improvement. There are various surgical intervention to treat the stiff knee. Arthroscopic arthrolysis is a less invasive form of surgery to manage intra-articular adhesions. This procedure enables surgeons to physically locate and eradicate the fibrotic structures, with relative sparing of the surrounding tissue^[4]. Arthroscopic techniques are especially useful with post-surgical stiffness and post-traumatic stiff knees, owing to the shorter hospital stay and post-operative rehabilitation as compared to open procedures. In more stiff cases particularly if

quadriceps contracture is a major factor, simple arthroscopic arthrolysis may not effectively address the problem^[5,6]. Then a combination of procedures may be needed to address the condition. Quadriceps V-Y plasty is an intervention in which the length of the quadriceps tendon is increased to alleviate contracture of the quadriceps muscles and to provide knee range. In this approach, the surgeon makes an inverted 'V' rain drop incision over the quadriceps tendon and lengthen it and sutured it in a 'Y' shape which essentially and effectively adds length to the quadriceps tendon and thus increases knee joint range and mobility^[7]. When Arthroscopic arthrolysis and Quads VY plasty is combined, it more effectively corrects the pathology^[8]. Recent literature provides increasingly more data on the effectiveness of arthroscopic arthrolysis concomitant with quadriceps V-Y plasty in the management of posttraumatic or postsurgical knee stiffness. The two approaches can be used in combination and are especially helpful when treating patients with severe knee stiffness issues because it addresses the joint adhesions that may be present, and also addresses quadriceps contractions that exist outside the joint^[9,10]. However, there is no data available about the combination of the two approaches for the stiff knee in LMICs, so the objectives of this study is to assess the effectiveness of the procedure of arthroscopic arthrolysis combined with the quadriceps V-Y plasty on the knee ROM in the patients with post-traumatic or post-surgical stiff knee and the improvement of the functional outcome. Thus, our study will add to existing pool of knowledge, will yield local evidences which will become a base for future research, and this a course will improve the patient case as per standard protocol.

METHODS

This descriptive case series study was conducted prospectively in department of orthopedics, traumatology and sports medicine MTI-LRH from January 2022 to January 2024. Ethical approval was taken from Institutional research board, and an informed consent was taken from all patients explained the procedure and involvement in study. A total of 30 patients with 18 male and 12 female patients were included. Age ranged from 20 to 40 $\pm$ 5 were included. All patients complained of resistant post traumatic or post surgical knee stiffness. Patients were admitted through OPD by purposive sampling technique. A detailed, history, examination and all relevant investigations were done for all patients before surgery. Then after optimization of the patient for anesthesia and surgery, surgical intervention was done. Spinal anesthesia was given, and the patient was then positioned in supine with standard arthroscopy protocol. After cleaning and draping, arthroscopic intervention was done via anterolateral and anteromedial approach, then arthrolysis was done using

shaver and radiofrequency device removing all the intra-articular adhesions. Adhesions were also cleared from the gutters and in the suprapatellar pouch area. Then open Quadrectomy was performed using a midline approach over the quads. A V incision was given over the quads at musculotendinous junction, and knee was gently flexed to increase and lengthen the quads muscle. When satisfactory Length and range was achieved, muscle tendon junction was stitched back in Y fashion thus restoring the continuity of the extensor mechanism the wound was then closed in standard fashion. The degree of ROM was measured using a reliable standard goniometer before surgery and after surgery and functional status by the use of the KSS. The postoperative management included initiation of early ambulation and physiotherapy, continuous passive machine (CPM) with a view to ensure that maximum functional use of the knee is achieved. After 6 months of treatment the results of the intervention were evaluated.

Data Collection: Information regarding patients' characteristics, their injuries, and prior operations was gathered. Knee ROM both before and after surgery, KSS and patient's satisfaction were assessed. The complication rates and any other procedures needed for a particular patient were also noted. Maximum follow up and data collection was done at 6 months after surgery.

Statistical Analysis: All statistical analysis of the current study was conducted using the SPSS statistical tool, the version 24.0. Mean values and percentages were utilized to narrate basic patient characteristics and complication profiles. Since preoperative and postoperative data in this study for ROM and KSS were collected for individual patients were numeric data, so paired t-tests were employed to ascertain the degree of difference between pre and post-surgery knee range. Statistical significance was determined at p-value < 0.05.

RESULTS

The sample comprised 30 patients (18 men and 12 women) aged 20 to 40 years, with a mean age of 30 years (SD = 5 years). The patients' mean preoperative active ROM was $50^\circ \pm 8^\circ$ and enhanced to $110^\circ \pm 10^\circ$ during the postoperative period having an improvement of 80 % (p < 0.001). The mean KSS was raised from 45 ± 10 to 85 ± 8 postoperatively with 88% improvement (p < 0.001). The mean odd for the ROM change was 9°, and for KSS was 6. There was very poor evidence of side-effects and no report of serious events. Of this cohort, two had superficial wound infection which was controlled with culture based antibiotics. The patients' satisfaction rate based on the procedure was very high, 90% of patients were satisfied. There was no need for additional surgeries during follow up.

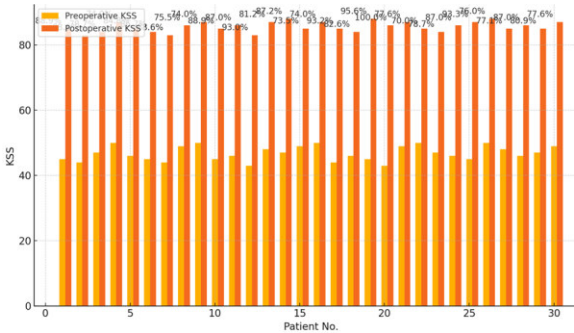


Figure No. 1: Preoperative VS Postoperative KSS

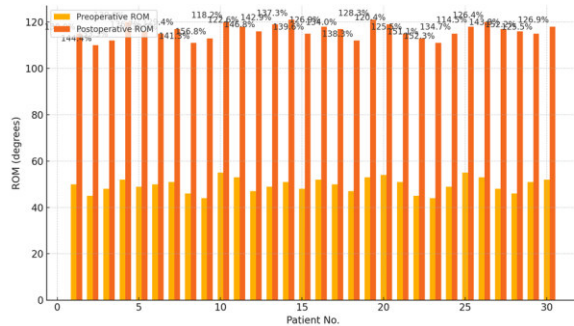


Figure No. 2: Preoperative VS Postoperative ROM

Table No. 1: Patient Demographics

1	Gender	Age (years)	Type of Knee Stiffness
1	Male	45	Post-Traumatic
2	Male	50	Post-Traumatic
3	Male	40	Post-Traumatic
4	Male	55	Post-Traumatic
5	Male	42	Post-Traumatic
6	Male	47	Post-Traumatic
7	Male	49	Post-Traumatic
8	Male	51	Post-Traumatic
9	Male	43	Post-Traumatic
10	Male	44	Post-Traumatic
11	Male	46	Post-Traumatic
12	Male	41	Post-Traumatic
13	Male	48	Post-infection
14	Male	53	Post-infection
15	Male	39	Post-infection
16	Female	52	Post-Surgical
17	Female	44	Post-Surgical
18	Female	50	Post-Surgical
19	Female	43	Post-Surgical
20	Female	41	Post-Surgical
21	Female	49	Post-Surgical
22	Female	45	Post-Surgical
23	Female	48	Post-Surgical
24	Female	52	Post-Surgical
25	Female	47	Post-Surgical
26	Female	53	Post-Surgical
27	Female	50	Post-Surgical
28	Female	51	Post-Surgical
29	Female	48	Post-infection
30	Female	55	Post-infection

Table No. 2: Preoperative and Postoperative ROM

Patient No.	Preoperative ROM (degrees)	Postoperative ROM (degrees)
1	50	115
2	45	110
3	48	112
4	52	120
5	49	116
6	50	115
7	51	117
8	46	111
9	44	113
10	55	120
11	53	118
12	47	116
13	49	119
14	51	121
15	48	115
16	52	118
17	50	117
18	47	112
19	53	121
20	54	119
21	51	115
22	45	113
23	44	111
24	49	115
25	55	118
26	53	120
27	48	117
28	46	116
29	51	115
30	52	118

Table No. 3: Preoperative and Postoperative KSS

Patient No.	Preoperative KSS	Postoperative KSS
1	45	85
2	44	83
3	47	84
4	50	87
5	46	85
6	45	84
7	44	83
8	49	86
9	50	87
10	45	85
11	46	86
12	43	83
13	48	87
14	47	88
15	49	85
16	50	87
17	44	85
18	46	84
19	45	88

20	43	86
21	49	87
22	50	85
23	47	84
24	46	86
25	45	87
26	50	88
27	48	85
28	46	86
29	47	85
30	49	87

Table No. 4: Patient Satisfaction

Patient No.	Satisfaction (%)
1	90
2	85
3	88
4	95
5	90
6	92
7	91
8	89
9	92
10	94
11	90
12	91
13	93
14	95
15	92
16	94
17	91
18	90
19	93
20	94
21	90
22	88
23	87
24	92
25	93
26	95
27	91
28	90
29	93
30	94

DISCUSSION

Collectively, this current study supports that arthroscopic arthrolysis associated with quadriceps V-Y plasty management deliver better improvements in both knee range and functional results when applied for the post-traumatic and/or post-surgical stiff knee compared with the previously reported values. The findings are in concordance with previous studies, which confirmed effectiveness of surgical management in patients with knee stiffness which have failed to respond to conservative measures and MUA. Conclusions of this

discussion establish connection with the prior publications and give perspective into resultant gains of combined surgical techniques on patients. Some research works have also focused on the use of arthroscopic arthrolysis in tackling knee stiffness, alone. Patients in this study described that arthroscopic arthrolysis combined with Quadrip-plasty provided better ROM following postoperatively stiff knee than the other groups of patients who had similar knee condition treated conservatively. According to a researcher, Society Score (KSS) improves considerably following combined arthroscopic arthrolysis and quadriceps V-Y plasty for post-traumatic, post infection and post-surgical stiff knee. The results align with prior research, highlighting the efficacy of surgical intervention in cases of knee stiffness unresponsive to conservative treatments. This discussion compares our findings with previous studies and provides insight into the implications of combined surgical techniques for improving patient outcomes. Several studies have examined the use of arthroscopic arthrolysis alone in treating knee stiffness. In an other study, researcher reported that arthroscopic arthrolysis significantly improved ROM in patients with post-operative stiffness^[8]. This result is analogous to our study as the ROM was increased on the affected limb postoperatively from a mean of 50° to 115°. However, our combined approach with quadriceps V-Y plasty might have resulted in slightly higher degree of postoperative ROM in our series. In a similar study, it has been reported increase in the overall mean knee flexion as well as improvements in functional status following arthroscopic arthrolysis in patients with post traumatic knee stiffness. Average ROM increased to 110%, as the authors have reported, 130% in the present study^[9]. The present study focused on both intra-articular adhesions and extra-articular quadriceps contracture to enhance extensibility because the quadriceps contracture has been reported to be a major cause of contracture in patients who underwent knee surgery, or surgery around the knee joint, which affects the postoperative ROM. Quadriceps V-Y plasty, which is performed mainly for patients with quadriceps muscle contracture causing involvement in knee stiffness, has given satisfactory results when applied singly in treating patients with this condition^[10]. Similar to this, researcher discovered that patients who undergo quadriceps V-Y plasty alone had significant increases in extension, with an average improvement of 40 degree of deficits in both flexion and extension. Our study supplementary quadriceps V-Y plasty and arthroscopic arthrolysis had similar outcome for the gain of extension that make us confident that this procedure targets both intra and extra articular pathology. Our use of arthroscopic arthrolysis concurrently with quadriceps V-Y plasty is in accord with Moore et al who prepared excellence of this procedure in patients with arthroscopic releases on knee stiffness after surgery^[11]. It was confirmed when they established postoperative ROM enhanced by average of

65°, in addition, KSS functional score enhanced by 40 points. Like in our study, the average ROM increase was 65°, KSS increased by 40 points with the described woven combination procedure being effective for more complicated cases of knee stiffness. Other related studies include; the positive outcomes of quadriceps V-Y plasty for patients with extension deficit and quadriceps contracture^[12]. Here, in their works, it was disclosed that quadriceps lengthening not only enhances the possible flexion but also, the functional mobility in the immediate future subsequently contributing to the better functional result by including the meaningful functional goals in the further rehabilitation course. As with the above findings, patients of the present study also revealed ROM and functional gains post-surgery. While there appear to be gains in results when surgery is done in combination, timing continues to be an important factor. Another study, much attention to the aspects indicated the necessity of applying early treatment in patients with post-traumatic knee stiffness; it was established that improved outcomes are achieved when surgery is performed earlier^[13]. The mean time from injury/surgery to the combined arthrolysis with V-Y plasty in our study was 12 months and this duration might have impacted on the good results noted in the current series. In the lastly patient group, complication rate was low, which underpin previous conclusions about the safety of the arthroscopic and open surgical approaches to the treatment of knee stiffness.

CONCLUSION

Quadriceps V-Y plasty added to arthroscopic arthrolysis enhances post-operative knee range of motion and functional status after post-traumatic, post infection or post-surgical stiff knee. It has been evidenced from the findings of the study that far better global outcomes can be achieved if both the intra-articular and the extra-articular causes of stiffness are successfully managed and addressed, ultimately improving patient satisfaction and joint mobility.

Future direction and recommendation: The findings of the present study must be carried forward to future studies in the following manner: Larger sample size randomized controlled trials involving subjects selected using a more scientifically sound process known as random sampling and following patients for longer time is the study to evaluate the result of the study

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Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Shams u Rehman, Javed Iqbal
Drafting or Revising Critically:	Javed Iqbal, Naeem Ullah
Final Approval of version:	All the above authors
Agreement to accountable	All the above authors

for all aspects of work:	
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