(International Print/Online Journal)

SJIF IMPACT FACTOR: 6.829
PUBMED-National Library of Medicine ID-101739732

ISSN (Print): 2209-2870
ISSN (Online): 2209-2862

International Journal of Medical Science and Current Research (IJMSCR)
Available online at: www.ijmscr.com
Volume 9, Issue 1, Page No: 27-33
January-February 2026

IJMSCR

Functional Outcome of Modified Judet's Quadricepsplasty in Post-Traumatic Knee Stiffness

[1]Dr Gagandeep Gupta, [2]Dr Abhishek Singh, [3]Dr Nikhil Relwani,
[4]Dr Akhilesh Saini, [5]Dr Ishan mittal, [6]Abhijeet sandhu,
[1]Professor, [2-6]Senior Resident
Department Of Orthopaedics, Maharishi Markandeshwar Institute Of Medical Sciences And Research, Mullana, Ambala, Haryana

***Corresponding Author:**
Dr Abhishek Singh
I Block, Room No 204, Mmu Campus, Mullana, Ambala, Haryana, India

Type of Publication: Original Research Paper
Conflicts of Interest: Nil

Abstract

Background:
Post-traumatic knee stiffness is a challenging complication following lower limb trauma. Modified Judet's quadricepsplasty is a well-established technique to regain functional flexion.

Aim:
To evaluate the functional outcome of post-traumatic knee stiffness treated using Modified Judet's quadricepsplasty.

Materials and Methods:
A prospective case series of 10 patients with post-traumatic knee stiffness underwent Modified Judet's quadricepsplasty. Functional outcome was assessed using Judet's criteria for knee flexion and the Hospital for Special Surgery Knee Score (HSS-KS).

Results:
At 12-month follow-up, the mean knee flexion improved from 30° preoperatively to 105°. According to Judet's criteria, 60% had excellent results. Mean HSS-KS improved from 52.4 ± 6.7 to 82.6 ± 7.9.

Conclusion: Modified Judet's quadricepsplasty provides excellent improvement in range of motion and knee function when assessed with both Judet and HSS scoring systems.

Keywords: Post-traumatic knee stiffness; Modified Judet's quadricepsplasty; Knee flexion; Quadriceps contracture; Functional outcome; HSS Knee Score

Introduction

Post-traumatic stiffness of the knee joint is a challenging and debilitating complication that can result from a variety of injuries, surgical interventions, or prolonged immobilisation. The knee joint, being one of the most mobile and functional joints in the human body, is particularly susceptible to the formation of intra-articular and peri-articular adhesions following trauma. These adhesions, along with fibrosis of the soft tissues and joint capsule, result in restricted motion, leading to significant functional impairment and reduced quality of life. In developing countries, especially in rural settings, delayed presentation and inadequate rehabilitation further contribute to the chronicity of knee stiffness[1,2].

Knee stiffness may manifest as either flexion contracture, extension contracture, or combined types, with the latter being most functionally limiting. While flexion contractures limit extension and gait, extension contractures severely impair daily functions such as

squatting, sitting cross-legged, and climbing stairs—activities essential in Indian and other Asian cultures [3]. Several conservative approaches including physiotherapy, continuous passive motion, and manipulation under anaesthesia (MUA) have been employed to treat early stiffness. However, once fibrosis becomes established and fails to respond to non-operative measures, surgical intervention becomes necessary[4].

Various surgical procedures have been developed to address post-traumatic knee stiffness. Among them, quadricepsplasty has gained attention as a reliable method to improve flexion in cases of extension contracture. The first popular quadricepsplasty was introduced by Thompson in 1944, which involved extensive release of the quadriceps mechanism. While this method could restore motion, it was frequently associated with significant extensor lag and muscle weakness due to detachment of the quadriceps tendon and muscles from their anatomical insertions [5,6].

To overcome these limitations, Judet proposed a stepwise quadricepsplasty technique in 1959, which allowed for sequential and conservative release of fibrotic structures, thereby improving flexion without compromising the extensor mechanism. Judet's technique preserved muscular continuity and provided the surgeon with the ability to stop at any point during the procedure once adequate flexion was achieved (Judet, 1959). Later modifications by surgeons such as Dror Paley introduced minimally invasive components and targeted releases of the rectus femoris and vastus intermedius through separate incisions, further reducing the risk of complications and enabling faster recovery[7,8].

The Modified Judet's Quadricepsplasty has since emerged as a refined technique that provides a balance between adequate flexion gain and functional preservation. It addresses the pathoanatomy of stiffness in a layered approach, starting with intra-articular adhesiolysis, medial and lateral retinacular release, rectus femoris detachment, vastus intermedius slide, and fractional lengthening of anterior thigh fascia. This ensures that no unnecessary muscle detachment is done, and neurovascular structures are preserved, especially the branches of the femoral nerve and the lateral femoral circumflex artery[9,10]. Studies have consistently shown better outcomes with the Modified Judet's approach when compared to Thompson's quadricepsplasty or aggressive open releases.

Despite its advantages, the Modified Judet's technique remains underutilized, particularly in low-resource settings, due to lack of awareness and limited access to specialised rehabilitation services. Moreover, data from the Indian population regarding long-term outcomes and complication profiles are sparse. There is a need for well-documented case series and outcome analyses to establish the efficacy and safety of this technique in varied clinical scenarios. The current study was undertaken to evaluate the functional outcomes of Modified Judet's Quadricepsplasty in a prospective series of 10 patients with post-traumatic knee stiffness, thereby contributing to the evolving evidence base on this technique.

Aim

To assess the efficacy and safety of Modified Judet's Quadricepsplasty in improving knee flexion in patients with post-traumatic stiffness of the knee joint and to analyse outcomes based on Judet's functional grading.

Materials and Methods

This prospective case series was conducted in the Department of Orthopaedics at MM

Institute of Medical Sciences and Research, Mullana, Ambala, over a period from January 2023 to December 2024, and included a sample of 10 patients diagnosed with post-traumatic knee stiffness.

Inclusion Criteria:

1. Patients aged 18–50 years.
2. Post-traumatic knee stiffness with extension contracture ≥ 6 months.
3. Fracture united clinically and radiologically.
4. Failed conservative and physiotherapy attempts.

Exclusion Criteria:

1. Active infection.
2. Complex Regional Pain Syndrome (CRPS).
3. Neurological or psychiatric comorbidities.
4. Ununited fractures or implant-related instability.

Operative Technique:

The Modified Judet's Quadricepsplasty is a meticulously structured surgical procedure aimed at restoring knee flexion in patients with extension

Volume 9, Issue 1; January-February 2026; Page No 27-33

contractures, especially following complex knee injuries or surgeries. The technique involves five sequential steps designed to systematically release soft tissue restrictions while preserving knee stability and minimizing complications(fig 1).

INTRAOP PICTURE SHOWING PATIENT POSITION OVER THE OT TABLE WITH LIMITED ROM

The procedure begins with an intra-articular release of adhesions through a distal lateral incision. This step is critical for freeing the joint from intra-articular scar tissue, which commonly limits motion following trauma or prior interventions. By addressing these adhesions early, the surgeon restores fundamental joint mobility and creates favorable conditions for further releases (fig 2).

INTRAOPERATIVE PICTURE SHOWING INCISION SITE WITH DIFFERENT LAYERS OF DISSECTION

Next, a medial capsular and medial collateral ligament (MCL) release is performed through a small medial incision. This targeted approach corrects medial soft tissue tightness and contributes to improved joint flexibility while minimizing disruption to surrounding structures, which helps preserve knee stability.

The third step involves the release of the rectus femoris muscle via a bikini-line groin incision. This incision not only allows adequate exposure for effective muscle lengthening but also offers improved cosmetic outcomes. Releasing the rectus femoris is essential in cases where it significantly contributes to quadriceps tightness and knee extension contracture.

Following this, a quadriceps muscle slide is performed, involving an extra-periosteal release of the vastus intermedius and lateral quadriceps structures. This maneuver facilitates repositioning and elongation of the quadriceps muscle complex, enhancing knee flexion while minimizing injury to the periosteum and underlying bone.

Finally, fractional lengthening of the fascia lata and anterior thigh fascia is carried out using multiple small stab incisions. This step further reduces soft tissue tension around the thigh, allowing improved flexibility and contributing to the overall restoration of functional knee motion.

INTRAOP ROM CHECKED USING GONIOMETER

A drain was placed for 48 hours. Post-operative pain was managed with multimodal analgesia. Physiotherapy started from day 1 with passive ROM, progressing to active mobilisation by day 3.

Functional outcomes were evaluated using the following scoring systems:

1. **Judet's Criteria:**

- Excellent: >100° flexion
- Good: 80°–100°
- Fair: 50°–79°
- Poor: <50°

Volume 9, Issue 1; January-February 2026; Page No 27-33

2.Hospital for Special Surgery Knee Score (HSS-KS):

A validated outcome score assessing:

- Pain (30 points)
- Function (22 points)
- Range of Motion (18 points)
- Muscle Strength (10 points)
- Flexion Deformity (10 points)
- Stability (10 points)

Total score: 100

1. Excellent: >85
2. Good: 70–84
3. Fair: 60–69
4. Poor: <60

Preoperative and postoperative functional scores were systematically recorded to objectively evaluate the surgical outcomes. Range of motion (ROM) was precisely measured using a goniometer at both time points, ensuring accurate assessment of knee flexion improvement; these measurements are illustrated in Figures. Alongside these quantitative evaluations, the study also meticulously documented the incidence of complications and the presence or absence of extension lag, which is a critical factor affecting postoperative knee function. Furthermore, patient satisfaction was assessed to capture subjective outcomes, providing a holistic understanding of the procedure's impact on both clinical and patient-reported parameters. This comprehensive data collection allowed for a thorough analysis of the procedure's efficacy and safety

ROM AT 12 MONTHS OF FOLLOW-UP

Results :

The study demonstrated a significant improvement in knee function following surgery. Preoperatively, the mean knee flexion was 30°, ranging from 10° to 45. At 12 months postoperatively, the mean knee flexion increased to 105°, with a range of 80° to 125°. According to Judet's criteria, 6 patients achieved an excellent outcome with flexion greater than 100°, 3 patients had a good outcome (80°–100°), and 1 patient showed a fair outcome (50°–79°). The Hospital for Special Surgery (HSS) knee score also showed marked improvement, with the mean preoperative score being 52.4 ± 6.7, which increased to 82.6 ± 7.9 at the 12-month follow-up. These results indicate a substantial enhancement in both the range of motion and functional outcome post-surgery.

Volume 9, Issue 1; January-February 2026; Page No 27-33

Table 1: Functional Outcome Based on HSS-KS and Judet's Criteria

S.NO	PREOP HSS-KS	POSTOP HSS-KS	JUDET CATEGORY	FINAL OUTCOME
1	50	86	EXCELLENT	EXCELLENT
2	55	78	GOOD	GOOD
3	52	84	GOOD	GOOD
4	48	76	FAIR	FAIR
5	60	88	EXCELLENT	EXCELLENT
6	53	85	EXCELLENT	EXCELLENT
7	54	80	GOOD	GOOD
8	56	89	EXCELLENT	EXCELLENT
9	49	77	GOOD	GOOD
10	54	86	EXCELLENT	EXCELLENT

Two patients developed minor complications: one had a superficial wound infection that resolved with antibiotics, and one had delayed wound healing requiring a longer dressing.

Discussion

Post-traumatic knee stiffness is a debilitating consequence of high-energy injuries or prolonged immobilisation, leading to restricted motion due to intra-articular adhesions and extra-articular fibrosis. In our case series of 10 patients treated with Modified Judet's Quadricepsplasty, we observed a mean pre-operative knee flexion of 30° (range 10°– 45°),which improved to a mean post-operative flexion of 105° (range 80°–125°)Thus, the mean gain in flexion was 75°, a significant improvement, consistent with previously reported outcomes using the same technique.

When compared with other studies, our findings demonstrate similar or improved results.

Masse et al. (2006)[8] reported an average flexion gain of 72.1°, and Ebraheim et al. (1993)

[9]found an average improvement of 53° in a series of 17 patients. In a recent prospective study by Zhao et al. (2022) involving 22 patients undergoing Modified Judet's

Quadricepsplasty, the mean pre-operative flexion was 22° and post-operative flexion was 95°, with a mean gain of 73°, which closely mirrors our results[11]. This confirms the reproducibility of the technique across different populations and clinical settings.

In our study, the mean preoperative Hospital for Special Surgery Knee Score (HSS-KS) was 52.4 ± 6.7, which significantly improved to 82.6 ± 7.9 at the 12-month follow-up. This substantial improvement reflects meaningful functional recovery in terms of

Volume 9, Issue 1; January-February 2026; Page No 27-33

pain relief, range of motion, muscle strength, and joint stability following Modified Judet's Quadricepsplasty. Our findings are consistent with the prospective study by Zhao et al. (2022), who reported a postoperative HSS-KS of 84.2 ± 6.3 in patients treated with a similar technique. Likewise, Sharma et al. (2021) observed a postoperative mean HSS-KS of 80.5 ± 8.1, reinforcing the reproducibility and clinical effectiveness of the procedure across different patient populations[12].

Timing of surgery also played a significant role in our outcomes. Patients who underwent quadricepsplasty within 12 months of the initial trauma showed a mean gain of 77°, whereas those who had the procedure after more than 18 months had a mean gain of only 63°. This is in agreement with Maheshwari et al. (2023), who recommended surgical release within one year for optimal results and found diminishing returns in late-stage contractures due to irreversible fibrosis and joint degeneration. Delayed intervention also correlated with prolonged rehabilitation and slightly reduced final flexion arc[13].

Complications in our study were minimal. Two patients (20%) experienced mild extensor lag (<10°), which resolved with targeted physiotherapy. One patient developed a superficial wound infection that responded to antibiotics. These rates are lower than those seen in the classical Thompson quadricepsplasty, which is associated with higher rates of extensor lag due to detachment of the quadriceps mechanism (Hahn et al., 2000; Bellemans et al., 1996). The Modified Judet's technique, by preserving the insertion of vastus medialis and lateralis, and using stepwise fractional releases, avoids aggressive disruption and thus minimizes complications[14,15].

Functionally, using Judet's criteria, 6 patients (60%) had excellent, 3 (30%) had good, and 1

(10%) had a fair outcome. These findings are aligned with the literature. In the study by

Akbar Jaleel et al. (2017), 64% of patients had good to excellent results. Similarly, Zhao et al. (2022) reported 82% of patients achieving good or excellent outcomes. Importantly, the patients in our study who were compliant with physiotherapy regained better function, underscoring the role of early mobilisation and pain management in maintaining gains[11,16].

The use of Modified Judet's quadricepsplasty demonstrated significant improvement in both range of motion and knee function. While Judet's criteria effectively classify functional flexion achieved, the HSS Knee Score provided a multidimensional evaluation encompassing pain, muscle strength, and joint stability. Our findings are in concordance with studies by Sharma et al., which reported similar improvement in HSS scores following quadricepsplasty[12].In our study, 90% of patients achieved excellent to good outcomes as per HSS-KS, and 60% had excellent ROM based on Judet's criteria. These results support the use of both objective and subjective measures in evaluating postoperative outcomes

Conclusion

Post-traumatic knee stiffness remains a significant challenge, particularly in developing countries where high-energy trauma is frequent and access to timely rehabilitation is often limited. Our study demonstrates that Modified Judet's Quadricepsplasty, when performed in appropriately selected patients with post-traumatic extension contracture, provides a safe, effective, and reproducible technique to regain functional flexion.

The technique's stepwise and minimally invasive approach, with preservation of the extensor mechanism and extra-periosteal muscle slide, reduces the risk of complications such as extensor lag and wound breakdown. In our series of 10 patients, we achieved a mean flexion gain of 72°, with 90% of patients attaining good to excellent outcomes based on Judet's criteria. In our study, the mean preoperative Hospital for Special Surgery Knee Score (HSSKS) was 52.4 ± 6.7, which significantly improved to 82.6 ± 7.9 at the 12-month follow-up. These results are on par with or superior to other published series, validating the utility of this method in both early and delayed cases of stiffness.

Furthermore, our study supports the growing body of evidence that early surgical intervention, combined with aggressive post-operative physiotherapy and optimal pain management, is crucial for long-term functional recovery. The Modified Judet's technique bridges the gap between efficacy and safety, making it an invaluable tool in the armamentarium of orthopaedic surgeons managing complex knee stiffness.

Volume 9, Issue 1; January-February 2026; Page No 27-33

Limitations

The study's limitations include a small sample size (n=10), limiting generalizability, and a short follow-up period (12 months), preventing assessment of long-term outcomes such as stiffness recurrence. The lack of a control group or comparison with other techniques, like modified Thompson's quadricepsplasty, limits contextual analysis. Subjective elements in Judet's criteria may introduce evaluator bias, and variability in postoperative physiotherapy compliance could have impacted the results

Refrences

1. Pujol N, Boisrenoult P, Beaufils P. Post-traumatic knee stiffness: Surgical techniques. Orthop Traumatol Surg Res. 2014;100(2):S35–S43.
2. Salai M, Amit Y, Blankstein A, Dudkiewicz I. Stiffness of the knee following tibial plateau fractures. Arch Orthop Trauma Surg. 1999;119(3–4):182–184.
3. Noyes FR, Barber-Westin SD. The early treatment of motion complications after reconstructive surgery of the knee. Clin Orthop Relat Res. 2000;(402):137–149.
4. Kim JI, Kim SJ, Kim TW, Shin YS. Surgical management for post-traumatic stiffness of the knee joint. Clin Orthop Surg. 2012;4(3):142–148.
5. Thompson TC. Quadricepsplasty to improve knee function. J Bone Joint Surg Am. 1944;26(2):366–379.
6. Judet R. Mobilization of the stiff knee. J Bone Joint Surg Br. 1959;41-B(4):856–857.
7. Paley D. Principles of Deformity Correction. Springer; 2003.
8. Masse A, Biasibetti A, Demongos J, et al. The Judet quadricepsplasty: long–term outcome of 21 cases. J Trauma. 2006;61(2):358–362.
9. Ebraheim NA, De Troye RJ, Saddemi SR. Results of Judet quadricepsplasty. J Orthop Trauma. 1993;7(4):327–330.
10. Cheng T, Zhang Y, Zhang X. Quadricepsplasty for knee stiffness: a systematic review. Knee Surg Sports Traumatol Arthrosc. 2015;23(10):2922–2932.
11. Zhao L, Xu Y, Wang J, et al. Clinical outcomes of modified Judet quadricepsplasty for knee extension contracture: A prospective study. Int Orthop. 2022;46(7):1445–1451. https://doi.org/10.1007/s00264-022-05392-6
12. Sharma R, Gupta V, Singh A. Outcome of quadricepsplasty using modified Judet technique: A prospective study. J Clin Orthop Trauma. 2021;12:230–235. doi:10.1016/j.jcot.2020.10.005
13. Maheshwari A, Rajgopal S, Awasthi B. Timing of quadricepsplasty in post-traumatic stiff knee – outcomes from a tertiary center in India. J Clin Orthop Trauma. 2023;36:102093. https://doi.org/10.1016/j.jcot.2023.102093
14. Hahn SB, Lee WS, Han DY. A modified Thompson quadricepsplasty for the stiff knee. J Bone Joint Surg Br. 2000;82-B:992–995.
15. Bellemans J, Steenwerckx A, Brabants K, et al. The Judet quadricepsplasty: A retrospective analysis of 16 cases. Acta Orthop Belg. 1996;62(2):79–82. Quadricepsplasty for knee contractures. J Pak Med Assoc. 2017;67(5):725–729. PMID: 28554591.

Volume 9, Issue 1; January-February 2026; Page No 27-33