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**Dr. Ronak V Shah**  
3rd Year Resident,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Dr. Aditya K Agrawal**  
Associate Professor,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Dr. Harshil V Shah**  
3rd Year Resident,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Dr. Sudhir K Rawat**  
Assistant Professor,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Dr. Dhruv Sharma**  
Associate Professor,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Dr. Paresh P Golwala**  
Professor and Head,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

**Corresponding Author:**  
**Dr. Aditya K Agrawal**  
Associate Professor,  
Department of Orthopaedics,  
Dhiraj Hospital, SBKS MIRC,  
Sumandeep Vidyapeeth  
University, Waghodia,  
Vadodara, Gujarat, India

## Quadricepsplasty: A modality for stiff knee

**Dr. Ronak V Shah, Dr. Aditya K Agrawal, Dr. Harshil V Shah, Dr. Sudhir K Rawat, Dr. Dhruv Sharma and Dr. Paresh P Golwala**

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### Abstract

Stiffness of the knee after trauma and/or surgery for femoral fractures is one of the most common complications and is difficult to treat. Stiffness in extension is more common and can be reduced by vigorous physiotherapy. If it does not improve by physiotherapy, then Quadricepsplasty is indicated. Quadricepsplasty is the surgical procedure required to release the quadriceps muscle in order to improve the range of knee flexion. This procedure is indicated mainly for stiffness of the knee in extension. Thompson and Judet type of Quadricepsplasty are the most common surgical procedures described to treat knee stiffness, the former being more popular. We evaluated our results after Thompson's Quadricepsplasty and physiotherapy. The patient regained satisfactory functional range of motion after Thompson's Quadricepsplasty.

**Keywords:** Thompson's quadricepsplasty, Judet's Quadricepsplasty, knee fixed in full extension

### Introduction

We operated a case of 32 year old male patient came to us with left side stiff knee fixed in extension, since last four year with history of RTA and open wound over anterior surface of left lower thigh, wound dehiscence scar of size 5-6 cm was present over the same region. Extension contracture or stiff knee is a complication of fracture femur, particularly in the supracondylar area. Adequate knee flexion may not be possible, if we don't do the proper physiotherapy and rehabilitation postoperatively. After a fracture in the femoral supracondylar region, some difficulty always remains in regaining a full range of motion. In most of our cases stiffness is due to the Periarticular and intramuscular adhesions which prevent free gliding of the muscle fibres one upon another. If stiff knee is severe and not possible by conservative treatment by exercises the knee movement can be increased by Judet's Quadricepsplasty or Thompson's Quadricepsplasty. The pathological abnormalities that limit knee flexion include <sup>[1, 2]</sup>. a. Intra articular adhesions to complete arthro fibrosis. b. Capsular contracture. c. Quadriceps muscle contracture and adhesions to bone. d. Fascial contractures and e. MCL contracture

The treatment of knee extension contracture must therefore vary from simple arthroscopy to lyse adhesions to more extensive Quadricepsplasty. Quadricepsplasty can be divided into distal and proximal types. Distal Quadricepsplasty, such as the Thompson or V-Y types and Proximal Quadricepsplasty is the Judet <sup>[3, 4]</sup>.

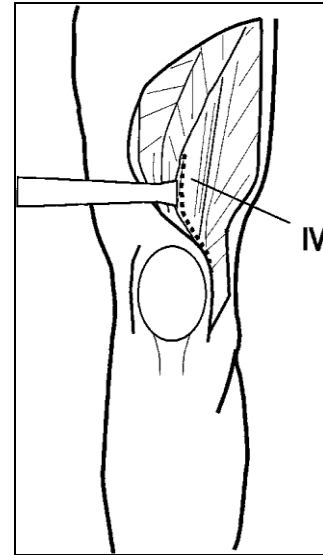
### Mechanism of stiffness

1. Lower third of thigh and Suprapatellar pouch, due to fibrosis of Vastus Intermedius.
2. Retro patellar, due to adhesions from patella to femur.
3. Para condylar, due to adhesions of the Aponeurotic expansions of the vasti to the sides of the femoral condyles.
4. Inside the knee joint, due to adhesions between the femoral and tibial articular surfaces, or to contracture of the posterior cruciate ligament.

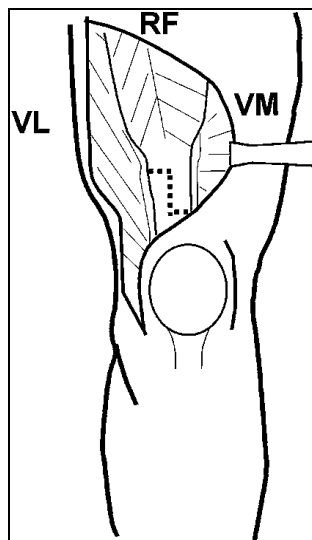
### Materials and Methods

This study was conducted at Dhiraj hospital in Orthopaedics department in a 32 year old male patient who developed stiff knee post trauma.

In our study we used Thompson Quadricepsplasty on our patient. We used Judet's criteria to assess the result and outcome in our patient. Surgical procedure:- THOMPSON: Midline longitudinal skin incision was made over left knee extending from distal third of the thigh to the tibial tuberosity. Medial parapatellar incision was used for release of adhesions on the medial side with arthrolysis and synovectomy of the knee joint. (Fig. 1). Vastus lateralis and vastus medialis were isolated from rectus femoris and released close to its patellar insertion (Fig.2). Vastus medialis was released from rectus femoris by stripping with a finger (Fig.2). Rectus femoris was freed from vastus intermedius on the anterior surface of the femur and upper pole of the patella (Fig. 3 and Fig. 4). Additional pie crusting incisions were made over the tendinous and fibrous strands of quadriceps muscle. The procedures were carried out using a tourniquet, and the wound was closed over suction drainage. The tourniquet was released, and the appearance of the skin flap was checked, while the knee was immobilised in flexion with an elastic bandage in a figure-of-eight. Above knee slab was given on ventral surface of knee in 120 degree flexion. Routine prophylactic antibiotics were administered.



**Fig 1:** Vastus lateralis and vastus medialis were isolated from rectus femoris and released close to its patellar insertion



**Fig 2:** Vastus medialis was released from rectus femoris by stripping with a finger

Post operative management: The knee was immobilised in flexion (at an angle of  $10^\circ$  less than the maximum achieved) for three hours (Fig. 5), then released and full extension allowed for three hours. This pattern of periodic passive movement and quadriceps strengthening exercises was

continued for four weeks. At first, patient was checked hourly for neurovascular status and requirement for pain relief. Further flexion and quadriceps strengthening exercises were encouraged from four weeks to six months after the operation, and the patient was revised at two-weekly intervals.



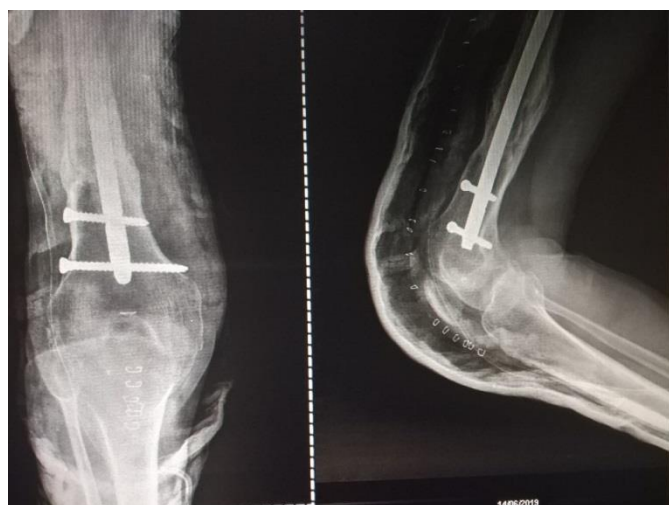


**Fig 3, 4, 5, 6:** Intraoperative and post-operative images of right knee Thompson Quadricepsplasty.

Post-operative care: It is mandatory to do aseptic dressing from day 1. Plaster is removed. The passive knee movement is continued through the whole range obtained at operation was done 3 times a day. We used CPM machine for exercises from the 3rd postoperative day. We remove suture on post-operative day 12. During discharge the patients were instructed to do exercises in the knee regularly and also to built quadriceps by active physiotherapy.



**Fig 6:** Pre-operative radiograph showing femur interlocking nail in situ with united femur shaft fracture



**Fig 7:** Immediate post-operative radiograph showing more than 90° knee flexion after Quadricepsplasty with implant in situ and no fracture of patella or tibia.

## Discussion

Quadricepsplasty is the recommended procedure for release of severe knee extension contracture. JUDET: The incision is marked for the full length of the thigh from the rough line of the greater trochanter to the lateral aspect of the patellar tendon. During surgical intervention we must give emphasis to these following steps. Step-1 (Intra articular release): Under tourniquet, only the distal part of the incision is made to release the parapatellar adhesions from the lateral side. Step-2: MCL and Medial capsular release Medial capsule is cut from a short medial incision; artholysis is performed. Deep part of MCL is elevated off the tibia distally. Step-3 (Rectus femoris release): With a small bikini line inguinal incision of approximately 3 to 4 cm is made, the rectus is identified and is transected. Step-4(Quadriceps muscle slide): This incision is extended proximally to the greater trochanter. The tourniquet must be removed. The quadriceps is elevated off the femur along the intramuscular septum. The perforating vessels are ligated or cauterized. Vastus lateralis fascia is cut laterally. Step-5: Fractional lengthening of Fasia lata and anterior Fasia of Thigh. Finally we must release the fascia lata. It should not be separated from the skin to avoid skin necrosis. Transverse incisions at multiple levels can be made across the fascia lata and anterior thigh fascia. At this point, the knee should be able to be flexed fully with the skin, subluxing medially. No attempt should be made to close the knee capsule. The post traumatic knee stiffness can impose a severe handicap and disability that can threaten the occupational and leisure activities of the patient. Knee flexion of less than 70 hampers the normal gait of the patient and produces limp. The pathological alterations that cause a block to knee flexion are fibrosis and shortening of the medial and lateral parapatellar retinaculum, adhesions between the deep surface of the patella and femoral condyle, fibrosis of the Vastus Intermedius with adherence to the rectus femoris muscle and to the front of femur; and actual shortening of the rectus femoris [4, 5]. Additionally fracture callus and adhesion of the skin to underlying muscles particularly in open fractures treated with external fixators at pin and scar site should also be considered in the causes of limitation of flexion.

## Conclusion

Thompsons Quadricepsplasty followed by a strict and rigorous postoperative physiotherapy protocol successfully increases the range of knee flexion.



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