



ISSN: 2395-1958
IJOS 2019; 5(1): 468-471
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www.orthopaper.com
Received: 01-11-2018
Accepted: 04-12-2018

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Functional results of judet's quadricepsplasty in the management of fixed flexion deformity of knee

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DOI: <https://doi.org/10.22271/ortho.2019.v5.i1i.81>

Abstract

Introduction: Prevalence of Fixed flexion deformity (FFD) of the Knee is more prevalent in Indian scenario due to prolonged immobilisation following indigenous method of treatment of fractures around knee. Quadricepsplasty has been described by Thompson and Judet to improve flexion in severely deformed knees. Judet's technique has potential advantages because it is less damaging to the quadriceps mechanism and addresses the problem of external fixator pin site tethering on the lateral side of the thigh.

Methodology: This is a prospective study conducted in Omanthurar Multispecialty Hospital from 2013-2018. Patients presenting with FFD of any reason due to post op immobilisation or conservative management of the fractures around the knee are included in the study while patients with previous history of surgery to improve flexion deformity were excluded. All the patients were evaluated clinically to measure the available range of movement preoperative and Judets Quadricepsplasty was carried out in a standard fashion and intraoperative flexion range achieved is recorded and their function results at final follow-up is categorised based on Judet's criteria.

Results: We included 32 patients into the study and the M: F ratio 1.42:1 with male preponderance. Etiology of the FFD being 18 patients due to indigenous management fractures around knee while 9 were due to external fixator for compound injuries and 5 due to post op immobilisation. Mean preoperative flexion was 33° while intraop immediate mean flexion achieved was 112° and flexion at final follow-up was 108°. One case of superficial infection settled with antibiotics and one case required manipulation under anaesthesia to regain flexion which was lost in the initial follow-up since the patient was not adherent to the postop protocol. Mean follow up of the patients under study was 2.6 yrs (Range 2-5 yrs). Out of 32 cases we achieved 22 cases with excellent results and Good in 9 case and Fair in 1 case based on criteria by Judet.

Conclusion: Judet's technique of Quadricepsplasty by disinsertion and muscle sliding is a useful technique in fixed flexion deformity of knee extension commonly seen in patients undergoing indigenous method of treatment and limb reconstruction surgery after a prolonged immobilisation of Knee due to conservative management of fractures around knee or application of external fixators.

Keywords: Quadricepsplasty, Judet quadricepsplasty, Judet criteria, FFD knee

Introduction

Stiffness of the knee is a major problem which can restrict the functional capacity of the patient. It may even lead to a change in job and hobbies, thus limiting occupational and recreational opportunities. Also, the psychological impact it may impose on patients can result in embarrassment in various situations ^[1]. The most common causes of knee stiffness are complications following periarticular fractures which can often develop into periarticular and quadriceps fibrosis and subsequently deteriorate into a knee extension contracture ^[2]. Though extension contractures of the knee are less common than flexion contractures, they are more prone to cause disability, especially in some Asian countries where kneeling down is an integral part of daily routine due to the prevalent social and religious customs.

Quadricepsplasty, an operative procedure, aims to release the contracture and increase the range of motion at the knee joint ^[3]. Though several techniques for quadricepsplasty have been described in the literature, yet primarily Thompson's and Judet's technique and their modifications prevail ^[4,5]. Thompson's method includes release of vastus medialis and lateralis at the patella while it is often related with high morbidity rates and great risk of developing extension lag ^[6].

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Judet^[12] described his technique using the principle of muscle disinsertion and sliding, minimizing damage to the quadriceps mechanism. Judet's procedure has not gained much popularity as judged by the few reports in the English literature^[4, 5, 22]. This technique is particularly useful in Indian scenario of patients presenting with FFD of knee due to indigenous method of management of fractures around the knee and after limb reconstruction with external fixators because it may be used to address pin site tethering in the lateral femur. The main aim of the study is to assess the functional results of Judet Quadricepsplasty for patients presenting with FFD knee.

Materials and Methods

This is a prospective study conducted in Omanthurar Multispecialty Hospital from 2013-2018. Patients presenting with FFD of any reason due to post op immobilisation or conservative management of the fractures around the knee are included in the study while patients with previous history of surgery to improve flexion deformity were excluded. All the patients were evaluated clinically to measure the available range of movement in the preoperative period.

Surgical Technique

Judet's quadricepsplasty is a sequential procedure with the range of flexion determined after each stage of dissection, affording the opportunity to stop as soon as adequate flexion is obtained^[4]. The procedure is done through single incision in all cases except one by a short medial parapatellar incision

extending to the medial side of the tibial tuberosity. This permits access to the patellar tendon releasing the medial retinaculum, suprapatellar pouch, and intraarticular adhesions. The second incision used in one case with severe FFD was a lateral incision made from the lateral aspect of the lower pole of the patella to 5 cm distal to the greater trochanter. Through the distal part of this incision, the patella and lateral retinacular tissues are freed ensuring that the patella may be easily lifted off the femoral condyles. This incision permits release of pin site adhesions, and frees the vastus lateralis from the linea aspera. The vastus intermedius then is lifted extraperiosteally from the lateral and anterior surfaces of the femur^[14].

In most instances, this muscle is fibrotic and requires resection. Cautious debulking of redundant bone within the fracture callus may be done at this stage. The third stage is proximal release of the vastus lateralis at its origin from the greater trochanter, and if necessary the rectus femoris from its iliac origin, with care being taken to protect the femoral nerve^[12]. The tissues are extensively fibrotic and surgical release with a scalpel may lead to large raw bleeding surfaces in which haemostasis is difficult; for this reason, the use of cutting diathermy is recommended. Meticulous haemostasis is essential, suction drains are inserted, and only the skin is closed. The range of flexion after release and skin closure was recorded as shown in Figure 1. The latter was 20° lower because there was a relative lack of skin and reluctance to apply tension to the repaired wound.



Fig 1: Showing A - Preoperative available range of movement and B- Final post-operative range of movement achieved by Judet's Quadricepsplasty.

The postoperative regime involves immediate slow continuous passive motion from 0° to 60° flexion, under epidural pain control with ice packs to reduce swelling. The range and speed gradually were increased until the maximum possible flexion was achieved. Gentle manipulation under general anaesthesia was done when necessary during the first 6 weeks if the patient did not maintain at least 90° flexion. After discharge, supervised physiotherapy as an outpatient was done three times weekly.

Results

We included 32 patients into the study and the M:F ratio 1.42:1 with male preponderance. Etiology of the FFD being 18 patients due to indigenous management fractures around knee while 9 were due to external fixator for compound injuries and 5 due to post op immobilisation. Mean

preoperative flexion was 33° (Range 5°-50°) while intraop immediate mean flexion achieved was 112° (Range 95°-120°) and flexion at final follow-up was 108° (Range 90°-115°). Mean follow up of the patients under study was 2.6 yrs (Range 2-5 yrs).

The functional evaluation of results was assessed according to Judet's criteria¹² and were considered excellent if the final flexion was greater than 100°; good if flexion was between 80° and 100°; fair if flexion was between 50° and 80° and poor, if flexion was less than 50°. Out of 32 cases we achieved 22 cases with excellent results and Good in 9 case and Fair in 1 case based on criteria by Judet.

One case of superficial infection settled with antibiotics and one case required manipulation under anaesthesia to regain flexion which was lost in the initial follow-up since the patient was not adherent to the postop protocol.

Discussion

Posttraumatic joint stiffness may cause various degrees of disability depending on the joint involved. Some joints, such as the wrist or ankle, can tolerate significant loss of movement and still be compatible with good function; whereas in others, such as the knee, stiffness can impose a severe handicap and degree of disability that can severely threaten the occupational and leisure activities of the patient.¹⁷

Quadricepsplasty is the recommended procedure for release of severe extensor knee ankylosis. The four conditions that cause a block to knee flexion are fibrosis and shortening of the medial and lateral parapatellar retinaculum, adhesions from the deep surface of the patella to the femoral condyles, fibrosis of the vastus intermedius with adherence to the rectus femoris muscle and to the front of the femur, and actual shortening of the rectus femoris^[2, 12, 17]. In addition fracture callus and adherence of skin to underlying muscle should be included. Furthermore, where unilateral external fixation has been used, pin site tethering on the lateral side of the femur may occur. This problem is common particularly in limb lengthening when the fixator is applied for a long period and is conveniently treated by Judet's technique because of the long lateral incision.

Thompson described a technique which is based principally on isolating the rectus femoris completely from the vasti, and releases it to such an extent that it takes over the action of knee extension.²¹ This involves sectioning the vasti from their patellar insertion causing a major weakness to the quadriceps muscle. If the rectus femoris remains tight limiting flexion, lengthening of the rectus femoris is done, which in turn might cause considerable weakening of the extensor mechanism and an extensor lag^[7, 17]. Extensor lag has been widely reported using the Thompson technique^[8, 9, 11, 16, 17, 18, 21].

Pick¹⁸ reported two of three patients with an extensor lag, Moore *et al*^[16] had six of nine, and Ratliff¹⁹ had three of four. Nicoll^[17] reported seven of 30 patients with an average 20⁰ extensor lag, but this was evident only when the rectus femoris was lengthened. In comparison, Judet's^[12] technique depends on sliding of the rectus femoris for severe cases, and we think extensor lag is less of a problem. Judet¹² reported a 4% rate of extensor lag. Similar favourable results were reported by Ebraheim *et al*^[5] in a series of 11 patients using Judet's technique with one case of extensor lag and no infection or skin breakdown.

Judet's procedure as an alternative technique offers a controlled staged correction of the stiffness. It permits sequential release of the intrinsic and extrinsic components limiting knee flexion and affords the opportunity to stop as soon as adequate flexion is obtained, therefore minimizing disturbance to the quadriceps muscle^[4] may be considered candidates for quadricepsplasty when they reach a plateau in gaining flexion movement during their physiotherapy at least 1 year after injury and when flexion remains less than 90⁰^[2].

Although a minimum of 70⁰ flexion is acceptable for walking, this would not be sufficient for normal daily activities and a minimum of 110⁸ would be preferable in young patients^[13]. However, careful patient selection is paramount because this is a major procedure requiring vigorous postoperative physiotherapy. Compliance and motivation is essential for a satisfactory outcome.

Postoperative management is an integral part of the quadricepsplasty, because postoperative motion should be maintained with continuous active and passive exercises to minimize loss of the final range of movement. This requires adequate pain control to allow continuous exercise and an

experienced physiotherapy team.

Manipulation under general anaesthesia has been used frequently postoperatively. Fifty-five percent of patients in Nicoll's series^[17] had manipulation under anaesthesia compared with 14% in the series of Merchan and Myong^[14]. In our current series one patient had loss of flexion range gained in the early post-operative period who required MUA to regain the flexion range. Therefore, early manipulation under anaesthesia as soon as any noticeable loss of flexion arises postoperatively is recommended.

Early postoperative rehabilitation is critical and exercises should start long before the wound has healed, which may increase the risk of wound complication^[10]. Posttraumatic knee stiffness cannot always be prevented, this is not a common problem, and the limb reconstruction surgeon will face similar cases infrequently due to prevalence of the indigenous method of management of the fractures among the Indian population. Therefore, Judet's quadricepsplasty, although a major surgical procedure with demanding rehabilitation, should be considered a useful procedure to correct this disabling complication.

Conclusion

Judet's technique of Quadricepsplasty by disinsertion and muscle sliding is a useful technique in fixed flexion deformity of knee extension commonly seen in patients undergoing indigenous method of treatment and limb reconstruction surgery after a prolonged immobilisation of Knee due to conservative management of fractures around knee or application of external fixators.

This study is the authentic work of the authors. No financial benefits were received from any commercial party for this study.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article

References

1. Ali F, Saleh M. Treatment of isolated complex distal femoral fractures by external fixation. *Injury*. 2000; 31:139-146.
2. Bellemans J, Steenwerckx A, Brabants K *et al*. The Judet quadricepsplasty: A retrospective analysis of 16 cases. *Acta Orthop Belg*. 1996; 62:79-82.
3. Bennett GE. Lengthening of the quadriceps tendon. *J Bone Joint Surg*. 1922; 4:279-316.
4. Daoud H, O'Farrell T, Cruess RL. Quadricepsplasty: The Judet technique and results of six cases. *J Bone Joint Surg*. 1982; 64B:194-197.
5. Ebraheim NA, DeTroye RJ, Saddemi SR. Results of Judet quadricepsplasty. *J Orthop Trauma*. 1993; 7:327-3303.
6. Gustilo RB, Anderson JT. Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: Retrospective and prospective analyses. *J Bone Joint Surg*. 1976; 58A:453-458.
7. Hahn SB, Lee WS, Han DY. A modified Thompson quadricepsplasty for the stiff knee. *J Bone Joint Surg*. 2000; 82B:992-995.
8. Hesketh KT. Experiences with the Thompson quadricepsplasty. *J Bone Joint Surg*. 1963; 45B:491-495.
9. Ikpeme JO. Quadricepsplasty following femoral shaft fractures. *Injury*. 1993; 24:104-108.
10. Jeffery CC. Quadricepsplasty. *Injury*. 1972; 4:131-136.

11. Jovanovic S, Orlic D, Wertheimer B, Zelic Z, Has B. Quadricepsplasty after war fractures. *Mil Med.* 2000; 165:263-267.
12. Judet R. Mobilisation of the stiff knee. *J Bone Joint Surg.* 1959; 41B:856-857.
13. Kettelkamp DB, Johnson RJ, Smidt GL, Chao EY, Walker M. An electrogoniometric study of knee motion in normal gait. *J Bone Joint Surg.* 1970; 52A:775-790.
14. Merchan EC, Myong C. Quadricepsplasty: The Judet technique and results of 21 posttraumatic cases. *Orthopedics.* 1992; 15:1081-1085.
15. Mira AJ, Markley K, Greer III RB. A critical analysis of quadriceps function after femoral shaft fracture in adults. *J Bone Joint Surg.* 1980; 62A:61-67.
16. Moore TJ, Harwin C, Green SA, Garland DE, Chandler RW. The results of Quadricepsplasty on knee motion following femoral fractures. *J Trauma.* 1987; 27:49-51.
17. Nicoll EA. Quadricepsplasty. *J Bone Joint Surg.* 1963; 45B:483-490.
18. Pick RY. Quadricepsplasty: A review, case presentations, and discussion. *Clin Orthop.* 1976; 120:138-142.
19. Ratliff AH. Quadricepsplasty. *Injury.* 1972; 4:126-130.
20. Sanders R, Regazzoni P, Ruedi TP. Treatment of supracondylar-intracondylar fractures of the femur using the dynamic condylar screw. *J Orthop Trauma.* 1989; 3:214-222.
21. Thompson TC. Quadricepsplasty to improve knee function. *J Bone Joint Surg.* 1944; 26A:366-379.
22. Warner JJ. The Judet quadricepsplasty for management of severe posttraumatic extension contracture of the knee: A report of a bilateral case and review of the literature. *Clin Orthop.* 1990; 256:169-173.