



## Original article

## Outcome of Judet's quadricepsplasty for knee contractures and the effect of local infiltration of epinephrine on reducing blood loss

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## ABSTRACT

**Objective:** To evaluate the effectiveness of Judet's quadricepsplasty for treatment of knee contractures and to identify the effect of local infiltration of epinephrine on blood loss associated with this procedure.**Methods:** A retrospective cohort study was conducted in which all cases of knee contractures managed with Judet's quadricepsplasty from 1st January 2009 to 31st December 2013 were included and were divided into two groups. The epinephrine group included patients who were infiltrated with diluted epinephrine (1:400,000) along with xylocaine, around the operative field 15 min prior to the incision time, while the control group did not receive any infiltration. Judet's outcome, blood loss, drop in hemoglobin and required blood transfusion were noted for all patients and compared between both groups.**Results:** Most common preceding pathology identified for the development of knee contractures was periarticular fracture while ilizarov application was the most common etiology. Both groups were found similar in all preoperative characteristics except preoperative flexion contracture ( $p = 0.02$ ). All functional outcome measures including Judet's outcome were similar in both groups. In contrast, duration of surgery ( $p = 0.01$ ), blood loss ( $p = 0.02$ ), drop in hemoglobin ( $p = 0.01$ ) and number of transfusions ( $p = 0.03$ ) were significantly reduced in epinephrine group.**Conclusion:** Judet's quadricepsplasty is a useful procedure to increase the range of motion of rigid knees and local infiltration of epinephrine is effective in decreasing the amount of subsequent blood loss and transfusion requirements.

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## 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.<sup>1</sup> 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.<sup>2</sup> 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.<sup>3</sup> Though several techniques for quadricepsplasty have been described in the literature, yet primarily Thompson's and Judet's technique and their modifications prevail.<sup>4,5</sup> 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.<sup>6</sup> Judet's technique which is based on sequential release of extensor mechanism without disruption of the vasti was described in 1956.<sup>7</sup> It is the more preferred option as it causes less damage to the quadriceps and provides greater increase in flexion. However, due to the extensive incisions and dissections involved, it is associated with significant blood loss.<sup>3</sup>

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Local epinephrine infiltration has been used in multiple surgical specialties to reduce blood loss during surgery. It has been reported to be used successfully in various surgical procedures including liposuction, tonsillectomy, functional endoscopic sinus surgery, reduction mammoplasty, burn eschar excision with skin grafting and even total knee arthroplasty.<sup>8,9</sup> Epinephrine helps bring vasoconstriction in the infiltrated area and thus leads to decreased intraoperative and postoperative blood loss, postoperative edema, pain and bruising.<sup>10,11</sup> Since reports of postoperative complications and adverse effects attributed to epinephrine infiltration have been negligible, epinephrine infiltration is recognized as a safe and cost-effective method.<sup>11</sup>

Recently, epinephrine infiltration was adopted at our institute as a modality to reduce blood loss and surgical time, but there has been no report observing its effectiveness in relation to Judet's quadricepsplasty. Hence we formulated this study with the objective to evaluate the outcomes of Judet's quadricepsplasty, and to identify the effect of local epinephrine infiltration on blood loss, surgical time and postoperative complications.

## Materials and methods

A retrospective cohort study was conducted and all the cases of knee contractures managed operatively from 1st January 2009 to 31st December 2013 at our institute were reviewed. All of the cases managed with original Judet's technique were included, whereas cases managed with any other procedures or with known coagulation disturbances were excluded from this study. Medical record files were reviewed for demographics, operative procedure and pre- and post-operative parameters. Ethical Review Committee exemption was granted for this study. The procedures were performed by 2 separate surgeons while similar operative approach and postoperative rehabilitation protocol were followed.

## Patients

The study included 33 patients in total, 21 males and 12 females, with the mean age of (30.9 ± 11.1) years. They were divided into two groups: the epinephrine consisting of 12 patients and the control of 21. The epinephrine group included patients who were infiltrated with diluted epinephrine (1:400,000) along with xylocaine around the operative field for 15 min prior to the incision time while the control group did not receive any infiltration. The baseline characteristics for both groups are summarized in Table 1 and both groups were found to be similar in all characteristics.

## Surgical technique

Surgical technique involved sequential release of the extensor mechanism along with release of the intraarticular adhesions by using separate medial and lateral incisions. Initial intraarticular release was performed under tourniquet control which was released when the lateral incision was extended proximally. Flexion was measured at each step to determine whether further release was needed. The incisions were closed over suction drains and an anterior knee splint was placed with the knee in maximum possible flexion, avoiding stress on the suture line. Epidural analgesia was given for postoperative pain control. On the second postoperative day, the wound was redressed and the drains were removed. Active and passive range of motion exercises started after the epidural was discontinued. Patient was discharged on postoperative 4/5d, while overnight splinting was continued for 6 weeks.

**Table 1**  
Comparison of baseline characteristics between both groups.

Characteristics	Epinephrine (n = 12)	Control (n = 21)	p value
Age (years)	33.1 ± 12.2	28.7 ± 10.0	0.27
Sex (%)			0.78
Male	8 (66.7)	13 (61.9)	
Female	4 (33.3)	8 (38.1)	
Site (%)			0.26
Right	7 (58.3)	8 (38.1)	
Left	5 (41.7)	13 (61.9)	
ASA status (%)			0.36
Grade I	8 (66.7)	17 (81.0)	
Grade II	4 (33.3)	4 (19.0)	
Etiology (%)			0.64
Femoral fracture	4 (33.3)	9 (42.9)	
Limb lengthening	5 (41.7)	7 (33.3)	
Infection	2 (16.7)	3 (14.3)	
Degloving/burn contractures	1 (8.3)	2 (9.5)	
Duration of contracture (months)	27.7 ± 21.9	24.4 ± 23.0	0.70
Preoperative flexion (degrees)	29.4 ± 9.8	43.1 ± 17.6	0.40
Preoperative hemoglobin (g/L)	118 ± 12	114 ± 15	0.40
Duration of follow-up (months)	22.8 ± 9.7	18.4 ± 23.0	0.45

## Data collection and analysis

The degrees of flexion of the operated knees were noted pre-operatively, intraoperatively and at last follow-up with the definitive flexion gain and subsequent flexion loss calculated. Quadriceps muscle strength was noted in accordance with the Medical Research Council scale along with presence or absence of extension lag >10°. Estimated blood loss at the time of surgery, drop in hemoglobin level and the number of transfusions administered were reviewed. Transfusion was undertaken when Hb <80 g/l or signs of acute anemia were observed.

Follow-up clinic visits were conducted to observe whether complications arose and whether further intervention was needed. Outcomes were classified according to Judet's criteria with final flexion >100° being excellent, 80°–100° good, 50°–80° fair and <50° poor.

Data were analyzed using IBM SPSS version 20.0 with categorical and continuous variables expressed as percentage and mean ± standard deviation respectively. All of the baseline parameters and outcome measures were compared between both groups. Chi-square test was used to compare categorical variables while independent sample *t* test to compare continuous variables. Paired sample *t* test was used to compare difference between preoperative flexion and final flexion in the same group. Univariate analysis was used to determine the effect of preoperative characteristics on final Judet's outcome criteria. A *p* value of <0.05 was considered to be a statistically significant difference.

## Results

The overall mean preoperative flexion was 36.3° ± 27.4° while final flexion at last follow-up was found to be 85.6° ± 27.3° with the difference being statistically significant (*p* = 0.01). Twenty five out of 33 patients (75.8%) achieved >80° flexion and therefore were classified as either good or excellent according to Judet's criteria with 11 patients (33.3%) graded as excellent, 14 (42.5%) good, 4 (12.1%) fair and 4 (12.1%) poor. The most common etiology identified for these extension contractures was femoral fractures in 13 patients (39.4%), followed by limb lengthening 12 (36.3%), infection 5 (15.2%), and degloving/burn contractures 3 (9.1%).

Both groups had a similar duration of follow up, 22.8 months for epinephrine group and 18 months for the control group respectively (*p* = 0.45) and it was found that administering epinephrine

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