



The Effect of Patellar Denervation by Circumpatellar Electrocautery on Anterior Knee Pain Following Total Knee Replacement – An Experimental Study

Zacharia B¹, Paul M¹

Abstract

Objectives: Anterior knee pain is a common problem in patients who have undergone TKR which causes dissatisfaction among them. There are Various methods for prevention of anterior knee pain following TKR .The objective of this study is to determine the effect of circumpatellar electrocautery on anterior knee pain following TKR and to compare the results with that of those patients who have undergone TKR without circumpatellar denervation.

Methods: This is a cohort study conducted in Dept. of Orthopedics, Govt. Medical College, Kozhikode,kerala, 2014. Total sample size was 90.out of which 2 patients died during the study period. We lost follow up of 7 patients. Among the remaining 81 patients 42 had undergone TKR with circumpatellar denervation using electrocautery and 39 without circumpatellar denervation. They were kept under follow up. Patients were followed up postoperatively at 1 month, 3 months, 6 months and at one year. At all postoperative visits, a clinical score was determined using the Knee Society score and the clinical anterior knee pain rating system described by Waters and Bentley.

Results: There is no statistically significant difference in AKP score between both groups. There is a statistically significant difference in the knee society score at 1st month(p value <.001). But there is no difference on further follow up visits.

Conclusion: There is no statistically significant difference between final outcome of patients who underwent patella denervation using circumpatellar electrocauterisation and those without denervation with respect to anterior knee pain among patients who have undergone TKR.

Keywords: total knee arthroplasty; anterior knee pain; Circumpatellar denervation

Level of Evidence: AAOS Therapeutic Level III

¹ Professor Balaji Zacharia; Manu Paul
Govt. Medical College, Dept. Of Orthopedics, Kozhikkode (PO),
Kerala, India, PIN 673008
(Direct reprint requests to Balaji Zacharia)

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Introduction

Anterior knee pain is a common problem in patients who have undergone TKR which causes dissatisfaction among them. The reported incidence of anterior knee pain is about 8% [1]. Patellar denervation using circumpatellar electrocautery is a reasonable option in preventing anterior knee pain without any extra cost or technical difficulties.

The etiology of anterior knee pain after replacement is unknown but is thought to be multi-factorial and related to the patella-femoral joint. There are many predictors for anterior knee pain. The young age female sex, severe pain before surgery; low pain threshold is the non-modifiable predictors [2,3,4]. The modifiable predictors are anxiety, depression, problems of pain processing and preoperative expectations [5].

Nerve endings cut during surgery can regenerate and gets blocked in the scar tissue; a painful neuroma can be formed. Hypoxia of nerves produced due to compression between bone, ligaments or the scar tissue leads to abnormal signal conduction to the CNS which can be felt as an abnormal tingling sensation [6]. The cause of anterior knee pain after TKR can be divided into functional and mechanical problems. But in every case an infection should be ruled out.

There are many functional causes for anterior knee pain following TKR. Quadriceps weakness is a major problem after TKR. It can lead to patellar mal-tracking and quadriceps avoidance gait which is characterized by compensatory increased forward inclination of the trunk due to quadriceps weakness [7,8,9]. Another cause for knee pain is knee spine syndrome due to pathologies in lumbar spine causing lordosis and increased pelvic tilt. Patello-femoral instability and mal-tracking is the main cause for postoperative pain and functional limitations in the joint [10]. It can be caused by insufficient soft tissue balancing, component positioning or design of implant [11,12]. Femoral components with a posterior centre of rotation have a favorable influence on anterior knee pain [13]. It was thought that posterior stabilized (PS) prosthesis design leads to lower patella-femoral joint pressures than a cruciate-retaining (CR) design [14]. But no difference was found with regard to postoperative pain between CR prostheses and PS designs in recent studies [15].

Patella baja can cause anterior knee pain but incidence is low [16]. A progressive degenerative arthritic process of patella due to increased pressure on it by the knee prosthesis can cause anterior knee pain [12]. An increased internal rotation mal alignment of either tibial or femoral component or both can lead to lateral tilt of patella and anterior knee pain [17]. The patello-femoral joint contact pressure

is increased due to the posterior subluxation of tibio femoral joint [18]. Avascular necrosis or a transient ischemia can produce localized pain over the patella [19]. Patellar fracture is a rare complication after TKR [20]. Patellar clunk and Synovial hyperplasia can cause anterior knee pain [21,22].

There are various methods for prevention of anterior knee pain following TKR like patelloplasty patellar denervation, patellar resurfacing, avoiding patella malt racking, proper implant selection and component position [23]. Routine patellar resurfacing appears to be an option to reduce patello femoral-related pain. But AKP may still be identified in 5% of patients who undergo primary TKR with patellar resurfacing [24]. There are evidences to suggest that routine patellar resurfacing is not needed in order to preserve the patella and to reduce the risk of reoperation in resurfaced patients [25].

Immunohistochemical studies have confirmed the presence of substance-P nociceptive afferent fibers in the peripatellar soft tissues [26]. Hence It is suggested that circumpatellar electrocautery would lead to partial denervation and improved pain relief when patellar resurfacing is not possible. It was thought that primary TKR with circumpatellar electrocautery would lead to partial denervation and improved pain relief compared with no electrocautery. As our institution is catering patients from low and middle socioeconomic status population we do not routinely resurface the patella. The primary objective of this study is to determine the clinical effect of circumpatellar electrocautery on anterior knee pain following TKR and to compare the results with that of those patients who have undergone TKR without circumpatellar denervation.

Materials and Methods

This is a cohort study conducted in Dept. of Orthopedics, Govt. Medical College, Kozhikode, Kerala, India during the period January 2012 to December 2014 after getting institutional research committee and ethics committee approval. All patients above the age of 55 who have undergone TKR at our institution during above period were included after getting written informed consent. Those patients with inflammatory arthritis, secondary osteoarthritis of knee following trauma, TKR after high tibial osteotomy and patients with any medical disorder which restricted them from walking were excluded from our study. Those patients who have undergone total hip replacement (THR) and revision TKR were also excluded.

Those patients who have met inclusion criteria and those have given written informed consent were included

in the study. Total sample size was 90.out of which 2 patients died during the study period. We lost follow up of 7 patients. Among the remaining 81 patients 42 had undergone TKR with circumpatellar denervation using electrocautery and 39 without circumpatellar denervation. Total knee replacement was done using standard surgical technique in both groups.

They were kept under follow up. Patients were followed up postoperatively at 1 month, 3 months, 6 months and at one year. At all postoperative visits, a clinical score was determined using the Knee Society score and the clinical anterior knee pain rating system described by Waters and Bentley [27,28].

The clinical anterior knee pain rating system described by Waters and Bentley

Grade	Rating Description
0	No pain
I	Mild pain which does not intrude on daily activities
II	Moderate pain which is a nuisance
III	Severe pain

Results

Among the 81 patients, 51.9% underwent TKR with patellar denervation. Among patella denervation group, 59.5% were females and in group without denervation 51.3% were females. Among the total patients, 55.6% were females. Statistical analysis done using SPSS software. There is statistically significant improvement in the AKP score and knee society score in both groups at each follow up visit (tables 4 and 5). Although AKP score is gradually improving, there is no statistically significant difference in AKP score between both groups (table 2). There is a statistically significant difference in the knee society score at 1st month(p value <.001). Patients with patella denervation have better knee society score. But there is no difference on further follow up visits (table 3).

Discussions

Anterior knee pain after total knee replacement is a major problem. It has been addressed in a number of studies. Unfortunately, many aspects of anterior knee pain after total knee replacement have yet to be fully understood. Many techniques are used to prevent and treat anterior knee pain, including patellar resurfacing but their effectiveness is still controversial. In this study, we tried to assess the effect of

Table 1: Age distribution

Age (years)	Patella denervation +ve		Patella denervation -ve		Total	
	No.	%	No.	%	No.	%
55-59	18	42.9	13	33.3	31	38.3
60-69	19	45.2	20	51.3	39	48.1
70 and above	5	11.9	6	15.4	11	13.6
Total	42	100	39	100	81	100

Chart 1: Age distribution

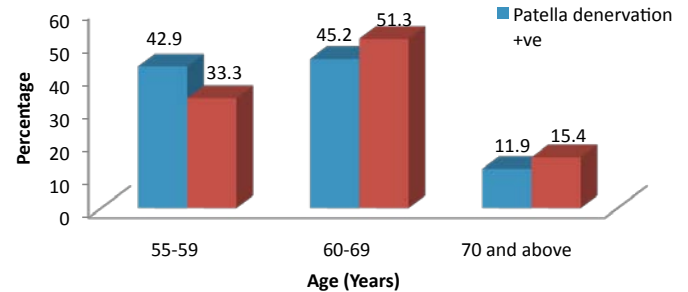
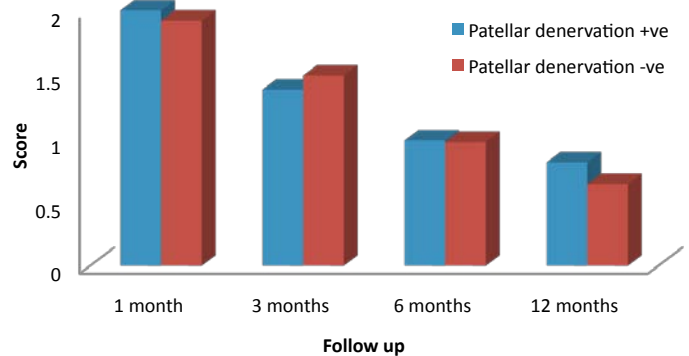


Table 2: Anterior knee pain score. Independent samples 't' test.

Followup	Average AKP score		p value
	Patellar denervation +ve	Patellar denervation -ve	
1 month	2.00 (0.49)	1.92 (0.62)	0.54
3 months	1.38 (3.62)	1.49 (0.50)	0.40
6 months	0.98 (0.71)	0.97 (0.54)	0.99
12 months	0.81 (0.70)	0.64 (0.54)	0.23

Chart 2: AKP score



circumpatellar denervation among patients who have undergone total knee replacement.

In our study, anterior knee pain is graded using anterior knee pain grading system of Waters and Bentley. Anterior knee pain score was improving in both groups but there was no significant difference between the two groups. Knee society score was compared between the two groups.

Table 3: Anterior society score. Independent samples 't' test.

Followup	Average AKP score		p value
	Patellar denervation +ve	Patellar denervation -ve	
1 month	3.02 (0.41)	3.41 (0.50)	<0.001
3 months	1.98 (0.81)	2.28 (0.76)	0.08
6 months	1.43 (0.63)	1.38 (0.59)	0.75
12 months	1.21 (0.56)	1.18 (0.50)	0.77

Chart 3: Knee society score

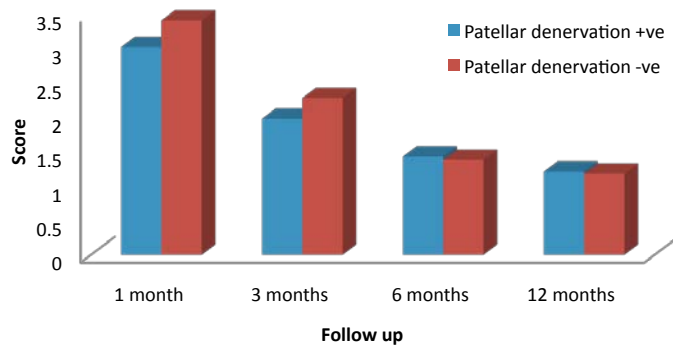


Table 4: Improvement in AKP score on each visit (Average AKP score paired difference). Paired sample 't' test.

	Patellar denervation +ve			Patellar denervation -ve		
	Mean	SD	p value	Mean	SD	p value
1-3 months	0.62	0.54	<0.001	0.44	0.60	<0.001
1-6 months	1.02	0.56	<0.001	0.95	0.76	<0.001
1-12 months	1.19	0.63	<0.001	1.28	0.72	<0.001

Table 5: Improvement in Knee society score on each visit (Average knee score paired difference). Paired sample 't' test.

	Patellar denervation +ve			Patellar denervation -ve		
	Mean	SD	p value	Mean	SD	p value
1-3 months	1.05	0.73	<0.001	1.13	0.57	<0.001
1-6 months	1.59	0.59	<0.001	2.03	0.58	<0.001
1-12 months	1.81	0.50	<0.001	2.23	0.63	<0.001

There was a statistically significant difference at one month but later this difference disappeared. There was a better knee society score among patella denervation group at 1st month.

In a study conducted by Balinga S et al, the outcome following circumpatellar denervation was assessed based on Oxford knee score (OKS) and anterior knee pain using Visual analog scale (VAS). This study showed statistically significant improvement in the OKS and VAS among the patella denervation group [29]. But when the post operative VAS score is compared with the pre op VAS score there was no significant difference in mean improvement in VAS score. Using logistic regression analysis, they found that a low VAS score preoperatively was the predictor of better VAS score than denervation using electrocautery. In another study conducted on 50 patients with bilateral TKR (One side patellar denervation done). They found out that there was no statistical significant improvement in KSS or WOMAC score with patella denervation [30].

But another study conducted by HPW Van Jonberger in 2008 concluded that in the absence of patellar resurfacing, patellar denervation using electrocautery improves the outcome [31]. A total of 131 patients received patellar denervation and another 131 didn't receive denervation. The relative risk reduction from electrocautery was 40%. The intervention group had a better WOMAC score. (16.3 Vs 21.6, p value 0.04). Knee society score (92.4 Vs 90.4, p value 0.14) was similar in both group. But a randomized control trial conducted by the same author showed that the initial clinical improvement with electrocautery denervation of patella in TKR is not maintained at a mean follow up of 3.7 years [32].

MA Altay and C. Erturk conducted a randomized control study in 2012 which showed that there is a definite advantage with patellar denervation [33]. There were 35 knees each in intervention and control group. In a meta analysis conducted by Tao Cheng et al concluded that there is no strong evidence either for or against circum patellar electrocauterisation compared with non electrocautery in TKR [34]. The clinical outcome of 131 patients followed for more than 9 years were retrospectively assessed and found that patellar non resurfacing techniques including patelloplasty and circumpatellar denervation are similar to patellar resurfacing [35].

So the available studies give conflicting results regarding the effect of patellar denervation. Our study shows that there is no advantage of doing patellar denervation on anterior knee pain or knee society score. This may be due to the fact that etiology of anterior knee pain is multi-factorial. Hence all the causes cannot be addressed by the patel-

lar denervation alone. So we cannot prevent anterior knee pain by doing patellar denervation alone. Apart from factors described in introduction, preoperative expectations and patient education have influence on the postoperative outcome as shown by focused group discussions conducted by us in our TKR patients.

There are some limitations in our study. Here the sample size is small and our follow up period is short. Preoperative severity of knee pain was not included in study. It is a determinant of severity postoperative knee pain.

Conclusion

There is no statistically significant difference between final outcome of patients who underwent patella denervation using circumpatellar electrocauterisation and those without denervation with respect to anterior knee pain among patients who have undergone TKR.

Disclosure

The authors declare that there is no conflict of interest regarding the publication of this paper. For full disclosures refer to last page of this journal.

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