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## A prospective randomised controlled study in patients undergoing patelloplasty in total knee replacement with coagulation diathermy and without coagulation diathermy

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### Abstract

Anterior knee pain in the patella femoral area after TKA has been addressed in a growing number of studies. Picetti *et al.* reported that anterior knee pain was present in 29% of the knees after TKA without patellar resurfacing. Unfortunately, many aspects of anterior knee pain after TKA have yet to be fully understood. This was a prospective randomized control study conducted in patients undergoing patelloplasty in TKA to compare the outcomes with and without coagulation diathermy. In the present study it was observed that 78 % patients with denervation had excellent satisfaction compared to 54 % with no denervation. 14 % patients with denervation had good satisfaction compared to 26 % with no denervation and 8 % patients with denervation had fair satisfaction compared to 20 % with no denervation.

**Keywords:** patelloplasty, total knee replacement, coagulation diathermy

### Introduction

Anterior knee pain is still a major problem in total knee arthroplasty (TKA). Although the most widely accepted opinion is that anterior knee pain is often associated with a patellofemoral etiology, there is no clear consensus as to etiology or treatment. Disabling pain receptors by electrocautery could theoretically achieve denervation of the anterior knee region. This prospective randomized controlled study aims to evaluate results after patellar denervation with electrocautery and without electrocautery in TKA at a minimum follow-up of 1 year<sup>[1]</sup>.

Anterior knee pain in the patellofemoral area after TKA has been addressed in a growing number of studies. Picetti *et al.* reported that anterior knee pain was present in 29% of the knees after TKA without patellar resurfacing. Unfortunately, many aspects of anterior knee pain after TKA have yet to be fully understood. In addition, patellar resurfacing for anterior knee pain reduction in TKA still remains controversial, because it has been associated with fracture, subluxation and dislocation of the patella, aseptic loosening, and patella necrosis<sup>[2, 3]</sup>. Many studies compared outcome in resurfaced and non-resurfaced patella in total knee arthroplasty (TKA), reporting that patients had similar pain and function scores. However, the results of recent meta-analyses show that patellar resurfacing reduces the risk of re-operation, while not reducing anterior knee pain after TKA. Patella-related problems are responsible for patient dissatisfaction, morbidity and re-operation after TKA<sup>[4]</sup>.

Normal joint cartilage is aneural, so that lesions in the surface are thought not to induce pain. Although the most widely accepted opinion today is that anterior knee pain is often associated with a patellofemoral etiology, there is no clear consensus as to etiology and treatment.

Anterior knee pain was reported in 4 to 49% of patients after primary TKA. In some studies, both the peripatellar soft tissue, such as retinaculum and synovium, and the infrapatellar fat pad were implicated as the source of anterior knee pain<sup>[5]</sup>.

Medial patellar nerve travels within vastus medialis and so does lateral patellar nerve within

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vastus lateralis. In an attempt to interrupt these potential pain pathways, Gupta *et al.* performed patellar rim cauterization. Some authors associated peripatellar soft tissues and infrapatellar fat pad with anterior knee pain, Wojtys *et al.* reported that distribution of substance-P nerve fibers in the soft tissues around the knee suggests that anterior knee pain is linked with hyperinnervation of the peripatellar soft tissues [6]. Several studies on innervation of the anterior knee found substance-P nociceptive afferent fibers in the peripatellar soft tissue. Disabling these pain receptors by electrocautery could theoretically achieve desensitization or denervation of the anterior knee region.

In general, denervation of the patella by electrocautery and patelloplasty with removal of osteophytes have been used for treatment of anterior knee pain in TKA. This attitude also has the advantage of easy implementation and fewer additional surgical procedures.

**Methodology**

This was a prospective randomized control study conducted in patients undergoing patelloplasty in TKA to compare the outcomes with and without coagulation diathermy.

**Inclusion Criteria**

1. Patients undergoing Total Knee Replacement in SVS Hospital,
2. Patients with Osteoarthritis and Rheumatoid Arthritis
3. Patients between 50 to 80 yrs

**Exclusion Criteria**

1. Previous patella surgery,

2. Patients who have undergone high tibial osteotomy,
3. Patients with previous patellar fracture,
4. Revision total knee replacement,
5. Patients < 40 years.

**Management**

All the patients who were planned admitted for Total knee arthroplasty underwent routine blood investigations for surgical profile, physician fitness & consent was taken prior to surgery.

X-rays of involved knees in AP and Lateral views were taken, grading of patellofemoral and tibiofemoral arthritis was done, radiological assessment was made, and clinical assessment was made in the form of varus deformities, crepitus, and anterior knee pain. Prophylactic antibiotic was given at the time of surgery.

Patient who underwent total knee replacement surgery were followed up post operatively at 3 months, 6 months 12 months and 24 month. At all preoperative and postoperative visits, all clinical score was determined with respect to function, range of motion VAS etc.

The data obtained was analyzed using SPSS version 17.0. Continuous variables were expressed as mean ± SD values. Appropriate statistical tests were used to determine outcomes of patelloplasty in total knee arthroplasty (TKA) using with and without coagulation diathermy. Probability value (p value) was used to determine the level of significance p value < 0.05 was considered as significant, p value < 0.01 was considered as highly significant.

**Results**

**Table 1:** Distribution of patients based on Age

Age group in years	Denervation		Non denervation	
	Number	%	Number	%
≤ 40	1	2	1	2
41 – 50	3	6	2	4
51 – 60	11	22	13	26
61 – 70	28	56	24	48
≥ 71 yrs	7	14	10	20
Total	50	100	50	100
Chi square		1.20	P value	0.877

It was observed that there was no significant difference in the distribution of patients based on age p >0.05.

**Table 2:** Comparison based on Mean Age

Age	Denervation		Non denervation		T value	P value
	Mean	SD	Mean	SD		
Age	62.7	7.5	63.6	8.1	0.57	0.56

Mean Age group in patients with denervation 62.7 ± 7.5 and the mean age group in patients without denervation was 63.6 ± 8.11. There was no statistically significant difference in mean age distribution between groups p >0.05.

**Table 3:** Distribution of patients based on gender

Gender	Denervation		Non denervation	
	Number	%	Number	%
Male	11	22	10	20
Female	39	78	40	80
Total	50	100	50	100
Chi square		0.06	P value	0.806

In the present study it was observed that there was no statistically significant difference in distribution of patients based on gender in either groups p >0.05 Male to female ratio was 0.26:1

**Table 4:** Mean Kujala score pre and post operatively between groups

Kujala	Denervation		Non denervation		T value	P value
	Mean	SD	Mean	SD		
Pre operatively	19.2	4.03	17.7	5.94	1.45	0.148
3 months	50.34	6.23	37.8	5.6	10.53	<0.001
6 months	66.4	6.15	52.18	6.95	10.86	<0.001
12 months	71.68	6.20	60.64	5.65	9.29	<0.001
24 months	78.64	6.75	66.68	6.33	9.13	<0.001

In the present study it was observed that there was no statistically significant difference in Mean Kujala score preoperatively p >0.05. post operatively the patient was followed 3months, 6months, 12 months and 24 months it was observed that the mean Kujala score was significantly higher in denervation group than when compared to TKR with no denervation p <0.05.

**Table 5:** Mean VAS score pre and post operatively between groups

VAS	Denervation		Non denervation		T value	P value
	Mean	SD	Mean	SD		
Pre operatively	8.1	0.58	8.22	0.67	0.95	0.344
3 months	3.54	1.29	4.18	2.02	1.8	0.63
6 months	2.52	0.7	3.14	0.7	4.4	<0.001
12 months	1.68	0.65	2.52	0.50	7.2	<0.001
24 months	1.34	0.47	1.6	0.53	2.56	0.012

In the present study it was observed that there was no statistically significant difference in Mean VAS score preoperatively  $p>0.05$ . post operatively the patient was followed 3months there was no significant difference in Mean VAS score observed at 3months post operatively  $p>0.05$ , however at 6months, 12 months and 24 months it was observed that the mean VAS score was significantly lower in denervation group than when compared to TKR with no denervation  $p<0.05$

**Table 6:** Mean KSS score pre and post operatively between groups

KSS	Denervation		Non denervation		T value	P value
	Mean	SD	Mean	SD		
Pre operatively	53.1	5.05	52.5	4.4	0.63	0.53
3 months	58.5	5.6	57.9	4.9	0.56	0.57
6 months	65.2	6.3	64.4	5.5	0.62	0.53
12 months	71.6	6.86	70.8	6.1	0.57	0.57
24 months	78.6	7.6	77.7	6.7	0.62	0.53

In the present study it was observed that there was no statistically significant difference in Mean KSS score preoperatively and post operatively  $p>0.05$ .

**Table 7:** Mean ROM score pre and post operatively between groups

ROM	Denervation		Non denervation		T value	P value
	Mean	SD	Mean	SD		
Pre operatively	86.1	5.2	85.54	6.04	0.566	0.57
3 months	96.06	5.5	93.3	5.53	2.49	0.014
6 months	99.2	5.7	96.4	5.76	2.4	0.018
12 months	105.8	6.55	101.9	6.51	2.98	0.004
24 months	106	6.1	101	6.74	3.88	<0.001

In the present study it was observed that there was no statistically significant difference in Mean Range of movements (ROM) score preoperatively  $p>0.05$ . post operatively the patient was followed 3months, 6months, 12 months and 24 months it was observed that the mean ROM was significantly higher in denervation group than when compared to TKR with no denervation  $p<0.05$ .

**Table 8:** Distribution of patients based on patient satisfaction

patient satisfaction	Denervation		Non denervation	
	Number	%	Number	%
Excellent	39	78	27	54
Good	7	14	13	26
Fair	4	8	10	20
Total	50	100	50	100

In the present study it was observed that 78 % patients with denervation had excellent satisfaction compared to 54 % with no denervation. 14 % patients with denervation had good satisfaction compared to 26 % with no denervation and 8 % patients with denervation had fair satisfaction compared to 20 % with no denervation.

## Discussion

It was hypothesized that patellar denervation with electrocautery would have some advantages in terms of pain and clinical results after TKA without patellar resurfacing.

The most important finding of the present study was that certain studies found that circumferential electrocautery of the patella could not improve the outcome after surgery, whereas other studies found that the technique was very effective. The ultimate goal of TKR is to relieve pain and to improve the functional outcome.

AKP is reported to occur in up to one-half of all patients following primary TKR. The presence of AKP after TKR is negatively correlated with patient satisfaction and quality of life. Therefore, how to improve outcomes after primary TKR without patellar replacement is a significant clinical problem.

Our results show that postoperative knee and function scores, ROM, patellar score and VAS were significantly better in the denervation group. These findings indicate that patellar denervation by electrocautery can provide decreased anterior knee pain and clinical improvement after TKA without patellar resurfacing.

In TKA, electrocautery was used for patellar denervation by several authors. Rand and Gaffey<sup>[1]</sup>, described electrocautery has potentially harmful effects on the articular cartilage and, when utilized in an intra-articular location, must be handled carefully to avoid cartilage trauma.

The consensus in the literature is that adult joint cartilage is capable of a limited response following injury. We therefore applied electrocautery only to the peripheral rim of the patella to prevent surface exposure.

Vega and Golano *et al.*<sup>[7]</sup> surmised that a thermal lesion applied to this region would lead to desensitization of the anterior knee area in a process known as patellar denervation. Circumpatellar electrocautery was performed using a standard technique with monopolar diathermy set at 50 W, and the synovial soft-tissue layer within 1 cm of the circumference of the patella was cauterized. The technique used only superficial electrocautery to a depth of no more than 1–3 mm. Although the pathophysiology of anterior knee pain in osteoarthritis is often uncertain and frequently multifactorial, patellar cartilage erosion and surface incongruities (patellar maltracking) probably contribute to anterior knee pain in many patients<sup>[6, 7]</sup>.

In cases with patellar component-related complications such as component wear, loosening, fracture, ligament and tendon rupture, maltracking or anterior knee pain, patellar retention or selective resurfacing of the patella has been recommended<sup>[8]</sup>. According to Krompinger and Fulkerson<sup>[9]</sup> lateral retinacular release is best indicated in patients with intractable pain in the lateral retinaculum; Witoński and Wagrowska-Danielewicz however, showed that substance-P positive fibers appear to be more prevalent in the fat pad and medial retinaculum than in the other soft tissue around the knee in case of anterior knee pain. These results may explain why lateral retinacular release was not as effective as expected.

Our study used a medial parapatellar approach for all knees,

and we did not need to perform lateral retinacular release. Residual patellofemoral pain is one of the main problems in TKA without patellar resurfacing. To reduce the prevalence of anterior knee pain, circumpatellar electrocautery has been used by several authors [3] following demonstration of a positive effect of patellar denervation in intractable patellofemoral pain [10] researchers tried to establish the relationship between patellar denervation and treatment of patellofemoral pain.

In a postal questionnaire study, van Jonbergen *et al.* [11] found that 56% of Dutch orthopedic surgeons performing TKA used circumpatellar electrocautery to prevent anterior knee pain when not resurfacing the patella, compared to 32% in case of patellar resurfacing. Although patellar denervation is not a new technique in TKA, there are few articles about patellar innervations and denervation.

Horner and Dellon [12] showed that innervation to the lateral skin of the knee is variable and may come either from the lateral femoral cutaneous nerve or from branches of the femoral nerve, but the pain mechanism and innervations of the patella have not been completely elucidated.

### Conclusion

The concept of patellar denervation is intriguing, but the proper technique remains poorly understood. Although our technique of patellar denervation has resulted in a decrease in anterior knee pain when compared with non denervation of patella.

This study has shown that there is clinical difference in postoperative anterior knee pain scores, increased range of motion, significant lower VAS scores when comparing non denervation of patella with circumpatellar denervation without resurfacing during TKA. Based on the clinical and radiological results in our randomized control study patellar denervation by electrocautery in TKA seems to decrease anterior knee pain and to improve clinical and radiological outcome.

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