Original Article

Effect of Patellar Electrocautery Neurectomy on Postoperative Pain among Patients Referred for Total Knee Arthroplasty

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Abstract

Background: Anterior knee pain is a major problem in total knee arthroplasty (TKA). It is accepted that anterior knee pain (AKP) often contributes to a patellofemoral etiology; however, its etiology or treatment is not understood completely. Disabling pain receptors by electrocautery could theoretically lead to anterior knee area denervation. The present study aimed to evaluate the pain post-patellar denervation (PD) with electrocautery in TKA. **Materials and Methods:** Clinical results for 92 patients who underwent TKA (58 women, 34 men; mean age 67.5 years) were analyzed. In addition to removal of all osteophytes, PD by electrocautery was performed on patella of treatment group (n = 46) and debridement alone including removing of all osteophytes was performed on the control group (n = 46). Knee Society System (KSS) score, patella score (PS), and visual analog scale (VAS) were used to determine pre- and post-operative AKP. **Results:** The follow-up duration was 10 months. No revision or reoperations were performed. There were no patellar fractures. On all parameters (KSS score, PS, and VAS), there was a statistically significant pre- to post-operative difference in favor of the denervation group only 3 weeks after operation; however, there was no statistically difference postoperation on other follow-ups (3, 6, and 10 months). **Conclusions:** PD with electrocautery could reduce AKP in TKA without patellar resurfacing only in a short-term period postoperation.

Keywords: *Denervation, patella, total knee arthroplasty*

Introduction

Total knee arthroplasty (TKA) is a surgical procedure performed to alleviate knee pain and improve function patients with knee rheumatoid or osteoarthritis. However, despite the incidence of TKA and the postoperative rehabilitative approaches, anterior knee pain (AKP) is reported in 4%–49% of individuals after primary TKA.[1-3] However, management of the patella in TKA remains controversial. Resurfacing increases rate of secondary patellar revision or other reoperations and AKP in patients without patellar resurfacing. Some surgeons avoid resurfacing the patella to reduce complications such as fracture, instability, loosening, and patella tendon damage.[4] Although the recent meta-analysis revealed reduced risk of reoperation in patellar resurfacing, the AKP was not improved after TKA.[5,6] Clinical outcomes for patellar nonresurfacing including patelloplasty and circumpatellar denervation are similar to those for patellar resurfacing in TKA.[7] Therefore, greater attention is being paid to patellar nonresurfacing which offers less postoperative complications as compared to resurfacing. The mechanism of AKP still remains unclear; however, the peripatellar soft tissue, rich in substance-P nerve fibers, has been implicated as a major source of AKP.[8] Disabling these nerve fibers by electrocautery could theoretically achieve denervation of the anterior knee region and relieve pain in the patella femoral area. In this study, we hypothesized that patellar denervation (PD) by electrocautery would present advantages in terms of pain after TKA without patellar resurfacing. Therefore, apart from a control procedure consisting in the removal of all osteophytes in our groups, electrocautery around patella was used for denervation in treatment group without denervation on control group.

Materials and Methods

Patients were visited to a clinic of either Alzahra or Kashani hospitals; otherwise, we called them to ask the questionnaire from January 2014 for up to 10 months. With

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power of 0.8, alpha error of 0.05, and effect size of 0.3, the estimated total sample size needed was 86. Taking into account a drop-out rate, we recruited a total of 94 patients for this study. Two patients died before the 10 months follow-up and were excluded from the analysis. The remaining 92 patients were randomized into either PD or control group (46 each) and were reviewed clinically and none were lost to follow-up. There were no differences between groups in terms of side, preoperative clinical assessment, and patellar cartilage status. The power of the study was calculated as 80%. No revisions or reoperations were performed, and no patellar fractures or deep infectious were observed. The patients were randomly allocated to either electrocautery group or nonelectrocautery group using a computer-generated random number table. The numbers were blocked to ensure equal distribution. Blinded independent observer accessed the clinical outcomes [Figure 1].

All performed TKAs by two surgeons were included from January to October 2014. Written informed consent was obtained from all patients.

Inclusion and exclusion criteria

All patients after primary TKA with the minimum of 10 months follow-up were eligible. Patients with revision of TKA, previous knee surgery, hemophilia arthritis and serious knee deformity (≥15° of the varus or valgus), previous patella realignment, tibiofemoral realignment, and clinically severe arthritis were excluded from the study.

Surgical procedure

All patients were treated without patellar resurfacing. The midvastus approach was systemically performed. After removal of all osteophytes, electrocautery was also performed to a depth of 1–2 mm around the patella in the PD group. In control group (non-PD [NPD]), debridement alone and removal of all osteophytes on the patella were performed while the same medications were used to relieve pain in both groups.

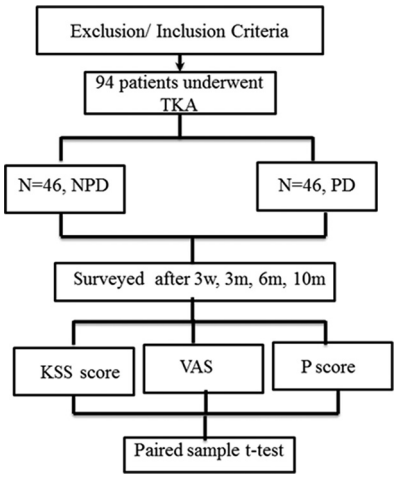

Figure 1: Study flow diagram. NPD: Nonpatellar denervation; PD: Patellar denervation

Clinical assessment

Preoperative data regarding age and sex were recorded [Table 1]. Patients were followed up postoperatively at 3 weeks, 3 months, 6 months, and 10 months. At all postoperative visits, a clinical score was determined using the Knee Society System (KSS; knee and function score), a specific patellofemoral pain questionnaire including patella score (PS), and a visual analog scale (VAS) to assess postoperative AKP.

Statistical analysis

Statistical analysis used SPSS 19 software (SPSS® 19.0, Chicago, IL, USA). Continues variables were expressed as mean ± standard deviation (SD) Normality of distribution was assessed by one-sample Kolmogorov–Smirnov test. Group comparison used independent-samples *t*-test. Different postoperative values were compared by paired-sample *t*-test. Using the sample variance, a *post hoc* power calculation showed that to demonstrate an effect size of three points with 80% power at a statistical significance of 0.05, a minimum of 43 patients in each group would be required. A repeated measures analysis of variance tested for the effect of electrocautery on the time-effect for the KSS, PS, and VAS scores. The effect of age and gender were tested by their addition to the repeated measures model (KSS) and logistic regression (VAS).

Results

Clinical results

In PD group, 71.7% of patients were female and the average age was 54.3 years (mean ± SD). In both PD and NPD groups, KSS score, PS, and VAS scores were determined. There were an increase in PS and KSS scores ($P < 0.05$) and a significant reduction in VAS scores between NPD group and PD 3 weeks postoperation [Table 2]. However, there was no statistical difference between these two groups in other follow-up examinations ($P > 0.05$ for all).

Discussion

A number of studies have reported the advantages of patellar resurfacing to relieve AKP and achieve better knee function; however, others have shown similar clinical outcomes with either resurfaced or nonresurfaced patellar in TKA.[9-11] Many studies have found that PD can decrease AKP and offer better knee function postoperative.[12-14] For example, 56% of Dutch orthopedic surgeons who

Table 1: Characteristics of patients (both genders)

Number of patients			Female (%)			Age (mean)		
Total	PD	NPD	PD	NPD	*P*	PD	NPD	*P*
94	46	46	71.7	64.1	0.664	64.3	68	0.221

Data presented as mean±SD. $P \leq 0.05$ considered significantly different. NPD: Nonpatellar denervation, PD: Patellar denervation, SD: Standard deviation

Table 2: Comparison of the two groups

Time/Type of assessment	Denervation group (*n*=46)	Nondenervation group (*n*=46)	*P*
Postoperative 3 weeks			
KSS knee	82.74±6.62	79.85±4.75	0.036
KSS function	82.88±7.70	77.71±7.70	0.015
PS	37.82±1.63	36.37±1.39	0.001
VAS score	3.20±1.10	3.82±1.20	0.027
Postoperative 3 months			
KSS knee	89.9±10.3	92.7±4.6	0.909
KSS function	92.88±7.70	87.71±7.70	0.016
PS	24.2±4.6	24.8±3.5	0.853
VAS score	7.9±1.2	8.3±1.6	0.239
Postoperative 6 months			
KSS knee	81.5±4.4	83.6±1.5	0.605
KSS function	92.74±6.62	89.85±4.75	0.038
PS	25.3±3.3	21.7±2.5	0.282
VAS score	7.4±2.1	7.7±1.0	0.156
Postoperative 10 months			
KSS knee	92.1±7.4	92.7±7.4	0.881
KSS function	90.2±6.13	91.6±7.7	0.618
PS	25.2±3.9	25.3±4.5	0.643
VAS score	8.6±1.9	8.7±2.0	0.852

Values are presented as mean±SD. $P \leq 0.05$ considered significantly different. KSS: Knee Society System, PS: Patellar score, VAS: Visual analog scale, SD: Standard deviation

performed TKA apply PD to relieve AKP.[3] Conversely, other surgeons observed no difference in neither AKP nor knee function between PD and NPD.[15-17]

The patellar is innervated by the medial patellar nerve and the lateral patellar nerve.[18,19] In theory, PD can block the pain receptors thus interrupt the pain pathways, leading to reduced AKP after TKA.[13,10,11]

Our results showed that PD was associated with a significantly decrease incidence of AKP only 3 weeks after surgery. We did not observe any difference between the control group and the PD group when followed for longer duration. Therefore, we did not follow up the survey further than 10 months. Our data suggest the benefit of PD only over a short period (3 weeks). This result is also confirmed by a very recent study[20] that shows no difference in clinical outcomes between patients who did and did not undergo electrocautery of the patella during patellar nonresurfacing TKAs up to 5 years. However, Pulavari *et al*.[21] have reported better pain scores for AKP following PD at 3 months but not 12 and 24 months. In another study by Altay *et al*.,[12] it was shown that PD can reduce AKP with satisfactory clinical and radiological outcomes after 36 months. Currently, patellar innervation and PD are not well studied even though PD is not a new technique. The limited descriptions that were present often differed between studies, which could have affected the results. Thus, a standard description of the procedures of the patella would be needed.

Conclusions

We suggest that an effective and selective denervation can benefit from better understanding of the patellar nerve supply. Increasing the number of included patients and different circumpatellar electrocautery depths used in PD may affect our conclusion on the contribution of PD with AKP.

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Conflicts of interest

There are no conflicts of interest.

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