



Effect of patellar denervation on mid-term results after non-resurfaced total knee arthroplasty A randomised, controlled trial

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Aim of this study is to determine the clinical effect of circumpatellar electrocautery on cases undergoing non-resurfaced total knee arthroplasty.

Patients and methods : 184 patients undergoing non-resurfaced total knee arthroplasty were included and randomized into two, patient and outcome assessor-blinded, parallel groups : 92 patient in denervation group & 92 patients in no-denervation group. Pre-operative and final most recent follow up's Western Ontario McMaster score and anterior knee pain rating were used for statistical analysis.

Results : There was no statistically significant difference between both groups preoperatively in anterior knee pain, WOMAC score, or range of motion. While on all the three parameters there was a statistically significant difference in improvement in favor of denervation group.

Discussion : Our study demonstrated that post-operative functional score and anterior knee pain score were significantly better in electrocauterised group. This shows that patellar denervation significantly improve clinical outcome and decreased anterior knee pain in NR-TKA.

Keywords : non-resurfaced total knee arthroplasty ; patellar denervation anterior knee pain.

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BACKGROUND AND OBJECTIVE

Whether or not to resurface the patella in primary total knee arthroplasty (TKA) remains controversial, with few exceptions for both choices (6). Total knee arthroplasty complications related to resurfacing the patella became a primary concern (3,10,11). They include : fracture, avascular necrosis, patella tendon injury, over or under-restoration of patellar thickness, eccentric reaming and implant positioning, aseptic loosening, patellar polyethylene wear, patellar clunk syndrome, catastrophic failure of component, and not surprisingly : anterior knee pain. Traditional indications for not resurfacing the patella include : younger age, non-inflammatory arthritis, well-preserved patellofemoral articular cartilage, congruent patellar tracking, inadequate size or thickness of patella for resurfacing (3,6,10). In our Institution, and for more than a decade, we have

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pushed the envelope and opted not to resurface the patella in most of our patient pool with few no-choice exceptions, since definitive evidence for its benefit is lacking (7).

Anterior knee pain is reported in 4%-49% of patients after primary TKA (15,17, 20). It could be attributed to patient characteristics (10,23), patellar tracking and implant design (4), in addition to patellar cartilage thickness. A recent meta-analysis concluded that it is multifactorial (18). The patella is innervated by a handful of superficial sensory nerves, namely: lateral femoral cutaneous nerve of the thigh, medial femoral cutaneous nerve, lateral and medial retinacular nerves, and anterior cutaneous branches of the femoral nerve (14). A couple of studies on innervation of the anterior knee described the presence of substance-P nociceptive afferent fibers in the peripatellar soft tissue (21,22). Our hypothesis is that circumpatellar electrocautery when carried out with non-resurfaced Total Knee Arthroplasty (NR-TKA) would result in an improvement in anterior knee pain and clinical outcome compared to cases of NR-TKA without denervation.

Several studies have described the use of circumpatellar electrocautery in NR-TKA, with only a few designed to measure the outcome of circumpatellar electrocautery compared to non-electrocauterised NR-TKA. Some had a few number of cases (1,9), others had a short follow-up period (2,19), or were not blinded to the assessor (8).

This prospective, randomized, double-blinded two-armed study was carried out to evaluate effect of circumpatellar electrocautery compared to non-electrocauterised NR-TKA cases and specifically anterior knee pain and flexion range.

PATIENTS & METHODS

After obtaining approval from Committee for Biological and Medical Ethics, we initiated a prospective, double blind randomized clinical study. Between January 2008 and July 2011, all TKA's for primary osteoarthritis were included. Inclusion criteria were: Primary osteoarthritis of the knee with minimum follow-up 24 months. Exclusion criteria were: Inflammatory arthritis, major loss of patellofemoral articular cartilage accompanied by adequate size and thickness of the patella, intraoperative patellar maltracking not addressed by routine steps, pre-

vious high tibial osteotomy, total hip arthroplasty, inflammatory arthritis, contralateral total knee arthroplasty performed within 2 years, valgus of any degree, varus of more than 15 degrees, or any problem in the extensor mechanism. A written consent was obtained from all patients. One Hundred eighty-four patients were included and randomized into two parallel groups: Group I – denervation group (92 patient), Group II – no denervation group (92 patients).

Assessment

Preoperatively, demographic data were obtained and clinical assessment including Western Ontario McMaster score (WOMAC) and anterior knee pain rating described by Waters and Bentley (20) (Table I) were carried out. Post-operatively, patients were followed up at six weeks, three months, and annually thereafter. WOMAC scoring and anterior knee pain assessment was done by an assessor different from the surgeon. Both groups were matched for age, sex, severity of OA, and comorbid conditions.

Surgical technique

All of the 184 patients had medial parapatellar approach, osteophytes and anterior fat pad were removed intraoperatively. Lateral retinacular release was not needed in any of the cases. The same type of posterior stabilized knee (PFC-Sigma, JNJ, Leeds, UK) was implanted with cement in each patient. Any electrocautery was performed using Valleylab electrocautery unit (Valleylab Inc., Boulder, Colorado, USA) with monopolar coagulation set to 35 ECU (50W) to a depth of approximately 1mm, and within 2 mm margin around the patella. Post-operatively, both groups received the same management and physiotherapy protocol.

Preoperative and final most recent follow up were used for statistical analysis. P value of < 0.05 was considered to indicate statistical significance, with a two-sided 95% confidence interval. Power of the study was calculated by post-hoc power analysis. The data was entered in the data base and analyzed using SPSS Inc. Version 14.

RESULTS

One hundred eighty four patients were included in this study, Average follow up was 37.4 months for denervation group and 39.0 months for non-denervation group.

Table I. — Clinical anterior knee pain rating described by Waters and Bentley

Rating	Description
0	No Pain
I	Mild pain which does not intrude on daily activities
II	Moderate pain which is nuisance, patient not considering further surgery
III	Severe pain, patient considering further surgery

No deep infection, complication or revision performed in any of the cases. Two patients in denervation group and one patient in non-denervation group needed manipulation under anesthesia at six weeks because of limited range of motion.

There was no significant difference preoperatively between the two groups in anterior knee pain (Table II), WOMAC score, or range of motion (Table III).

At 24 months post-operatively, 8 patients (9%) in denervation group and 32 patients (33%) in non-denervation group reported anterior knee pain (grade I-III). The number of patients in each group and each grade of anterior knee pain is plotted in table II. This difference was statistically significant ($p = 0.02$).

Furthermore, there was a statistically significant difference between denervation and non-denervation group in improvement in WOMAC score and flexion range. Mean post-op WOMAC score for denervation group at one year was 17.1 (3-25.4), while for non-denervation group it was 21.6 (0-32.8), ($p = 0.03$). Mean post-op range of motion was $126.7 \pm 8.3^\circ$ for denervation group and $112.5 \pm 4.8^\circ$ for non-denervation group, ($p = 0.02$) (Table III). Power of the study was calculated as 86%.

DISCUSSION

Our study demonstrated that post-operative functional score and anterior knee pain score were significantly better in electrocauterised group. This shows that denervation of the patella when performed for NR-TKA provides improvement in knee function.

When denervation is carried out, electrocautery must be handled with utmost carefulness to avoid cartilage trauma. Margin distance, depth, and strength of cautery must be standardized to avoid under- or over-doing it.

We used for all cases in the study posterior stabilized, fixed bearing PFC-Sigma prosthesis without resurfacing. Breugmen (4), in a 1 year follow-up, found that a mobile bearing design may have a lower incidence of anterior knee pain than a fixed bearing one. Later, and in a 7.9 year follow-up (5), he amended his conclusion saying there is no difference in anterior knee pain between a fixed and a mobile posterior stabilized total knee arthroplasty.

Lehner (12), Macule (13) and Witonski (21) all reported that anterior fat pad carry abundance of substance-P positive fibers. This might explain difference in results between two surgeons doing

Table II. — Clinical outcome after total knee arthroplasty for both groups

	Denervation (92)	Non-Denervation (92)	<i>p</i> -value
WOMAC score			
Preop.	58.2 (21-76)	59.6 (19-82)	0.78
Postop.	17.1 (3-25.4)	21.6 (0-32.8)	0.03
ROM			
Preop.	$85.5^\circ \pm 6.1^\circ$	$89.2^\circ \pm 9.4^\circ$	0.81
Postop.	$126.7 \pm 8.3^\circ$	$112.5 \pm 4.8^\circ$	0.02

Table III. — Stratification of patients with anterior knee pain at two years follow up

Rating	0	I	II	III	Total
Denervation	80	7	3	2	92
Non-denervation	62	13	9	8	92

NR-TKA without denervation with one of them removing anterior fat pad. Handel & Riedt (9) published recently that there is no statistically significant difference in Hospital for Special Surgery Score between two groups composed of 40 each, while anterior knee pain was prevalent in 15% of cases with denervation and in 25% of cases without. Although groups were matched, a bigger number of patients would have given a better power of the study. Gupta *et al* (8) agreed with them in their results where they found that there is no statistically significant difference in Oxford Knee Score and patellar anterior knee score between the two groups. In contrast, and in a very recent, double-blinded controlled study, Pulavarti and colleagues (16) found that denervation group performed better in anterior knee pain, patient satisfaction, and flexion range. Strength of this study is in meticulous exclusion criteria, good number of patients and acceptable follow-up period. A bigger, multicenter study with a longer follow-up period would give more conclusive results.

CONCLUSION

Our study shows that standardized patellar denervation significantly improved clinical outcome and decreased anterior knee pain in NR-TKA. Further work has to be done to find effect of patella denervation in resurfaced TKA.

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