

## Original Research Article

## To determine difference between pain score in total knee replacement in patient with intra operative periarticular steroid infiltration vs without periarticular steroid infiltration in 1st month of post surgery period

Sandip Rathod<sup>1</sup>, Mitul Mistry<sup>2</sup>, Manish Shah<sup>3</sup>, Mohnish Gadhvi<sup>4\*</sup>

<sup>1</sup>Associate Professor, Department of Orthopaedics, Banas Medical College & Research Institute, Palanpur, Gujarat, India

<sup>2</sup>Associate Professor, Department of Orthopaedics, GMERS Medical College, Gandhinagar, Gujarat, India

<sup>3</sup>Associate Professor, Department of Orthopaedics, GMERS Medical College, Sola, Ahmedabad, Gujara, India

<sup>4</sup>Associate Professor, Department of Orthopaedics, B. J. Medical College, Ahmedabad, Gujarat, India

Received: 15-11-2021 / Revised: 26-12-2021 / Accepted: 15-01-2022

### Abstract

**Background:** Total knee arthroplasty (TKA) has been much improved recently and it is regarded as one of the most common and successful surgical procedure that provides pain relief and improves function in patients with severe knee arthritis. The aim of the present study is to determine difference between pain score in total knee replacement in patient with intra operative periarticular steroid infiltration vs without periarticular steroid infiltration in 1st month of post-surgery period. **Methods:** There are 200 patients scheduled in the present study conducted from March 2019 to December 2020. Eligible patients included patients were between the ages of 50 and 70 years. Out of 500 patients, 200 patients were recruited, and one knee was randomly assigned to the intra operative periarticular steroid infiltration or without periarticular steroid infiltration. **Result:** For patients in the group receiving steroid injection, significantly lower pain scores from the second postoperative day were noted. The pain level was significantly lower in steroid-treated knees compared to non-steroid treated knees on the night of the operation (VAS, 1.2 vs. 2.3;  $p=0.021$ ). Interestingly, rebound pain was observed in both groups 1 day after the surgery (VAS, 3.2 vs. 3.8;  $p=0.248$ ). **Conclusion:** The present study has demonstrated the efficacy and safety of periarticular infiltration of corticosteroid, bupivacaine and epinephrine following TKA. Patients who received the steroid cocktail have reported better visual analogue pain scores and required less parenteral morphine postoperatively.

**Keywords:** Corticosteroid, periarticular injection, pain, total knee arthroplasty.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

### Introduction

Osteoarthritis (OA) is among the most common joint diseases affecting the hip and knee, and the incidence is expected to increase with extended life expectancy and increasing obesity[1]. Pain related to OA can be debilitating and can limit an individual's activity and quality of life[2,3]. Nonsurgical approaches, including pain control, are the recommended first-line treatments prior to considering joint replacement in patients with late-stage disease[4].

Total knee arthroplasty (TKA) has been reported to be the most effective procedure for pain relief in patients with advanced osteoarthritis. Ironically, however, many patients are concerned of immediate postoperative pain, preoperatively and actually experience considerable pain after surgery[5,6].

Periarticular injection (PI) of a drug cocktail has been particularly effective in decreasing pain and improving early function after TKA[7-10]. The use of systemic corticosteroids in a multimodal analgesic protocol is documented to be efficacious in the treatment of postoperative pain, nausea, and vomiting[11,12]. Various papers have described the use of periarticular injections of anaesthetic concoctions to relieve pain[13,14]. These drug cocktails commonly include combinations of nonsteroidal anti-inflammatory drugs (NSAIDs), local anaesthetics and opioids such as morphine. Concerns with the

use of periarticular steroids in this group of patients include the risk of postoperative infection and patellar tendon rupture.

The aim of the present study is to determine difference between pain score in total knee replacement in patient with intra operative periarticular steroid infiltration vs without periarticular steroid infiltration in 1st month of post-surgery period.

### Materials and methods

There are 200 patients scheduled in the present study conducted from March 2019 to December 2020. Eligible patients included patients were between the ages of 50 and 70 years. Out of 500 patients, 200 patients were recruited, and one knee was randomly assigned to the intra operative periarticular steroid infiltration or without periarticular steroid infiltration. The steroid group received a periarticular steroid infiltration containing corticosteroid (40 mg of triamcinolone acetone), and the non-steroid group received a periarticular without steroid infiltration. All patients received the same spinal anesthetic and multimodal protocol to improve pain relief. Spinal anesthesia, using 0.5% bupivacaine, was administered by an anesthesiologist; throughout surgery, anesthesia was maintained with propofol using a target-controlled device.

Preoperative clinical status was evaluated using the American Knee Society (AKS) knee and function scores, and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores. Postoperative clinical evaluation was performed at 1 month using the same scales.

Statistical analyses were conducted using SPSS for Windows Version 15 (SPSS Inc., Chicago, IL, USA). Chi-squared test or Fisher's exact test was used to determine the differences in categorical variables

\*Correspondence

Dr. Mohnish Gadhvi

Associate Professor, Department of Orthopaedics, B. J. Medical College, Ahmedabad, Gujarat, India.

E-mail: [Dr.mohnish@gmail.com](mailto:Dr.mohnish@gmail.com)

(frequency of acute rescuer and incidence of wound complications). Continuous variables (pain, functional recovery and clinical score) were analyzed using Student’s t-test. An a priori power analysis using

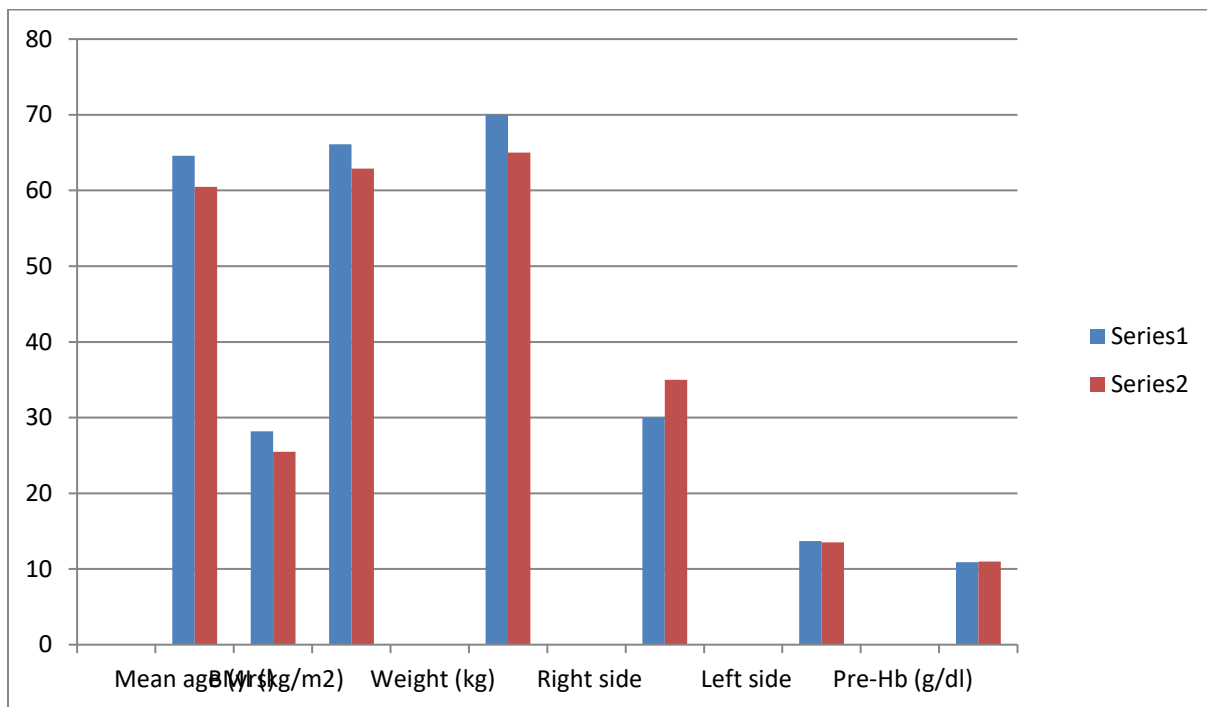
a 2-sided hypothesis test, at an alpha level of 0.05 and a power of 80%, was used to determine the sample size statistical power.

**Results**

**Table 1: Demographic data of the study groups**

	Non-steroid	Steroid	p-value
Mean age (yrs)	64.6	60.5	0.205
BMI (kg/m <sup>2</sup> )	28.20	25.5	0.350
Weight (kg)	66.1	62.9	0.171
Right side	70	65	0.750
Left side	30	35	0.780
Pre-Hb (g/dl)	13.7	13.5	0.367
Post-Hb (g/dl)	10.9	11.0	0.650

The demographic data was similar between the two groups (Table 1 and Graph 1). For patients in the group receiving steroid injection, significantly lower pain scores from the second postoperative day were noted. The pain level was significantly lower in steroid-treated knees compared to non-steroid treated knees on the night of the operation (VAS, 1.2 vs. 2.3; p=0.021).



**Figure 1: Demographic data of the study groups**

**Table 2: Comparison of Postoperative Clinical Outcomes and Complications**

Parameters	Non-steroid	Steroid	p-value
<b>Postoperative (1 month)</b>			
AKS knee	94.6±3.7	90.0±2.7	0.809
AKS function	70.5±16.6	75.0±19.1	0.605
WOMAC pain	1.8±2.5	1.6±2.6	0.765
WOMAC function	18.6±7.5	22.8±8.4	0.745

The addition of corticosteroid did not increase the risk for wound complications, including infection or narcotic-related side effects, during the immediate postoperative period.

**Table 3: Comparison of results between the study groups**

	Non-steroid	Steroid	p-value
Average LOS (days)	7.5	6.2	0.044
Mean drop in Hb (g/dl)	2.8	2.5	0.072
Drainage (ml)	246	281	0.450
SLR on postoperative day (days)	2.8	2.3	0.084

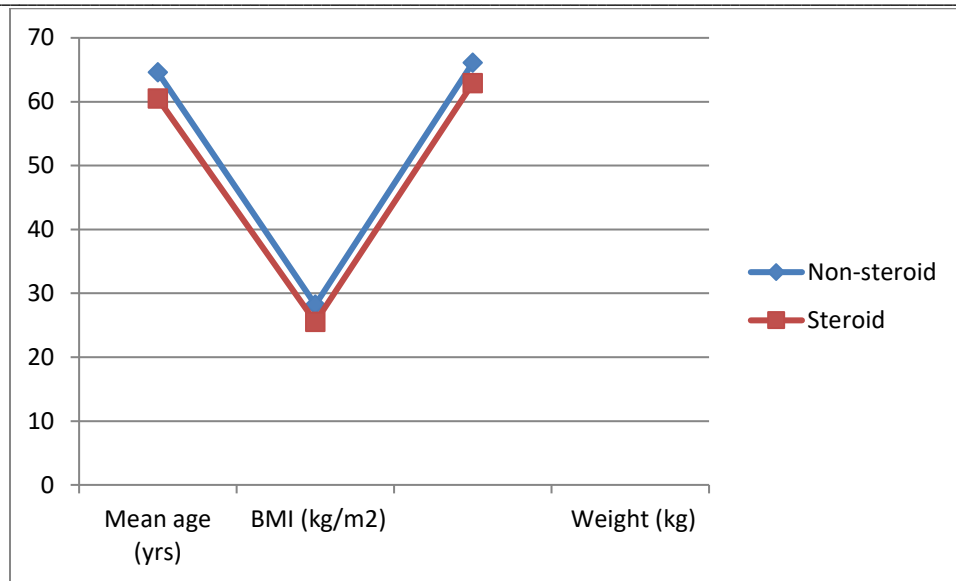


Figure 2: Line diagram showing comparison of results between the study groups

The steroid group was also able to achieve straight leg raise at a mean of 2.3 days compared to 2.8 days for the control group. The length of hospital stay was also shorter in the steroid group. The mean length of stay was 6.2 days in the steroid group compared to 7.5 days in the control group ( $p = 0.04$ ). The mean drop in haemoglobin was lower in the steroid group by 0.5 mg/dl, although it was not statistically significant. There was no significant difference in the postoperative drainage between the two groups. (Table 2 and Line Diagram 2)

### Discussion

Total knee arthroplasty (TKA) has been much improved recently and it is regarded as one of the most common and successful surgical procedure that provides pain relief and improves function in patients with severe knee arthritis. The aim of the present study is to determine difference between pain score in total knee replacement in patient with intra operative periarticular steroid infiltration vs without periarticular steroid infiltration in 1st month of post-surgery period.

TKA is associated with significant postoperative pain[15] and good pain relief allows effective rehabilitation[16]. Effective pain relief should be delivered pre-, peri- and postoperatively to prevent the establishment of pain hypersensitivity. Postoperative pain hypersensitivity is caused by the sensitisation of both the central and peripheral nervous system. Surgical trauma decreases the threshold for afferent nociceptors in the peripheral nerves, as well as increases the excitability of the central spinal neurons. Together, these changes result in an increase in the response to noxious stimuli and decrease the pain threshold at the site of the injured and surrounding uninjured tissues[13]. The administration of preemptive analgesics directly into the operative site has been shown to prevent central sensitisation and improve postoperative pain control[17].

Previous studies have shown that the mean serum concentrations in patients who received up to 30 ml of 0.5% bupivacaine were well below the toxic level[18]. Lombardi et al have found no perioperative complications related to the injection[14].

The most important finding of the current prospective study is that a periarticular infiltration containing a corticosteroid provided an additional pain-relieving effect on the night of the operation but did not influence pain levels for the remainder of the postoperative period. This study also confirms the safety of a periarticular infiltration containing a corticosteroid for use in a multimodal analgesic protocol.

The current findings support these earlier observations by demonstrating that a periarticular infiltration with a corticosteroid

provides additional pain relief on the night of the operation. However, our findings are in contrast to those of another study that compared PIs with and without a corticosteroid and found no effect of the corticosteroid on pain relief and functional recovery[9].

This study also suggests that a PI with corticosteroid partially improves functional recovery. The steroid PI group was able to perform SLR earlier than the non-steroid PI group, but maximal flexion was same between groups. This finding concurs with that of a PI study by Koh, et al.[19], but most previous studies have reported that PI does not improve functional recovery[13,14].

The anti-inflammatory effect of corticosteroid stems from its inhibition of phospholipase A2, resulting in a reduction of the pro-inflammatory derivatives of arachidonic acid[20]. Injection of corticosteroid into the surrounding tissues can thus provide effective pain relief by reducing the inflammatory response at the sites of the surgical trauma.

### Conclusion

The present study has demonstrated the efficacy and safety of periarticular infiltration of corticosteroid, bupivacaine and epinephrine following TKA. Patients who received the steroid cocktail have reported better visual analogue pain scores and required less parenteral morphine postoperatively. Postoperatively, the steroid group was also able to perform straight leg raises earlier, had a shorter hospital stay and a smaller drop in haemoglobin. Further studies focused on sustaining a low level of pain level, without rebound, during the postoperative period should be conducted. In addition, corticosteroid PI did not increase perioperative complications after TKA, which confirms the safety of PI containing corticosteroid for use in a multi-modal analgesic protocol.

### References

1. Losina E, Weinstein AM, Reichmann WM, Burbine SA, Solomon DH, Daigle ME, Rome BN, Chen SP, Hunter DJ, Suter LG, Jordan JM. Lifetime risk and age at diagnosis of symptomatic knee osteoarthritis in the US. *Arthritis care & research*. 2013 May;65(5):703-11.
2. Thakur M, Dickenson AH, Baron R. Osteoarthritis pain: nociceptive or neuropathic?. *Nature Reviews Rheumatology*. 2014 Jun;10(6):374-80.
3. Bijlsma JW, Berenbaum F, Lafeber FP. Osteoarthritis: an update with relevance for clinical practice. *The Lancet*. 2011 Jun 18;377(9783):2115-26.

4. McAlindon TE, Bannuru RR, Sullivan MC, et al. OARSI guidelines for thenon-surgical management of knee osteoarthritis. *Osteoarthritis Cartilage* 2014;22(3):363–388
5. Park KK, Shin KS, Chang CB, Kim SJ, Kim TK. Functional disabilities and issues of concern in female Asian patients before TKA. *Clinical Orthopaedics and Related Research* 2007 Aug 1;461:143-52.
6. Trousdale RT, McGrory BJ, Berry DJ, Becker MW, Harmsen WS. Patients' concerns prior to undergoing total hip and total knee arthroplasty. In *Mayo Clinic Proceedings* 1999 Oct 1 (Vol. 74, No. 10, pp. 978-982). Elsevier.
7. Busch CA, Shore BJ, Bhandari R, Ganapathy S, MacDonald SJ, Bourne RB, Rorabeck CH, McCalden RW. Efficacy of periarticular multimodal drug injection in total knee arthroplasty: a randomized trial. *JBJS*. 2006 May 1;88(5):959-63.
8. Parvataneni HK, Shah VP, Howard H, Cole N, Ranawat AS, Ranawat CS. Controlling pain after total hip and knee arthroplasty using a multimodal protocol with local periarticular injections: a prospective randomized study. *The Journal of arthroplasty*. 2007 Sep 1;22(6):33-8.
9. Christensen CP, Jacobs CA, Jennings HR. Effect of periarticular corticosteroid injections during total knee arthroplasty: a double-blind randomized trial. *JBJS*. 2009 Nov 1;91(11):2550-5.
10. Han CD, Lee DH, Yang IH. Intra-synovial ropivacaine and morphine for pain relief after total knee arthroplasty-A prospective, randomized, double blind study. *Yonsei Medical Journal*. 2007 Apr 30;48(2):295-300.
11. Salerno A, Hermann R. Efficacy and safety of steroid use for postoperative pain relief: update and review of the medical literature. *JBJS*. 2006 Jun 1;88(6):1361-72.
12. Wang JJ, Ho ST, Lee SC, Tang JJ, Liaw WJ. Intraarticular triamcinolone acetonide for pain control after arthroscopic knee surgery. *Anesthesia & Analgesia*. 1998 Nov 1;87(5):1113-6.
13. Busch CA, Shore BJ, Bhandari R, Ganapathy S, MacDonald SJ, Bourne RB, Rorabeck CH, McCalden RW. Efficacy of periarticular multimodal drug injection in total knee arthroplasty: a randomized trial. *JBJS*. 2006 May 1;88(5):959-63.
14. Lombardi Jr AV, Berend KR, Mallory TH, Dodds KL, Adams JB. Soft tissue and intra-articular injection of bupivacaine, epinephrine, and morphine has a beneficial effect after total knee arthroplasty. *Clinical Orthopaedics and Related Research* 2004 Nov 1;428:125-30.
15. Bonica JJ. Definition and taxonomy pain. *The management of pain*. 1990:18-27.
16. Shoji H, Solomonow M, Yoshino S, D'Ambrosia R, Dabezies E. Factors affecting postoperative flexion in total knee arthroplasty. *Orthopedics*. 1990 Jun 1;13(6):643-9.
17. Woolf CJ, Chong MS. Preemptive analgesia—treating postoperative pain by preventing the establishment of central sensitization. *Anesthesia & Analgesia*. 1993 Aug 1;77(2):362-79.
18. Badner NH, Bourne RB, Rorabeck CH, MacDonald SJ, Doyle JA. Intra-articular injection of bupivacaine in knee-replacement operations. Results of use for analgesia and for preemptive blockade. *JBJS*. 1996 May 1;78(5):734-8.
19. Koh IJ, Kang YG, Chang CB, Kwon SK, Seo ES, Seong SC, Kim TK. Additional pain relieving effect of intraoperative periarticular injections after simultaneous bilateral TKA: a randomized, controlled study. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2010 Jul 1;18(7):916-22.
20. Creamer P. Intra-articular corticosteroid injections in osteoarthritis: do they work and if so, how?. *Annals of the rheumatic diseases*. 1997 Nov 1;56(11):634-5.

**Conflict of Interest: Nil Source of support: Nil**