Section: Anaesthesiology

Original Research Article

COMPARATIVE STUDY TO EVALUATE THE ANALGESIC EFFICACY OF A LOCAL ANESTHETIC PLUS CORTICOSTEROID VERSUS A LOCAL ANESTHETIC ALONE IN ULTRASOUND GUIDED GENICULAR NERVE BLOCK FOR KNEE OSTEOARTHRITIS

Lohith Basavaraju[1], Mahidhara S N[2], Manjunath Bhat[3], Kailash P Dev[4]

[1]Assistant Professor, Department of Anaesthesiology, Karwar Institute of Medical Sciences, Karnataka, India
[2]Assistant Professor, Department of Orthopaedics, KRIMs Karwar, Karnataka, India
[3]Professor and HOD, Department of Anaesthesiology, KRIMs Karwar, Karnataka, India
[4]Associate Professor, Department of Anaesthesiology KRIMs Karwar, Karnataka, India.

Received : 09/03/2023
Received in revised form : 06/04/2023
Accepted : 19/04/2023

Keywords:
Local Anesthetic, Corticosteroid, Ultrasound Guided Genicular Nerve Block, Knee Osteoarthritis.

Corresponding Author:
Dr. Lohith Basavaraju,
Email: dr.lohith@gmail.com

DOI: 10.47009/jamp.2023.5.3.167

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5 (3); 806-813

Abstract

Background: Improved health care facilities are increasing the life span of humans also necessitating a need for improved pain free old age which is otherwise painful because of problems like OA knee. Old age being full of comorbidities also makes surgeries like knee replacement riskier, therefore procedures like Genicular nerve blocks can become a handy tool in improving the lifestyle of people suffering from OA knee without wanting the patients go through side effects of multiple analgesics or through the stress of surgeries. OA knee being a chronic disability and drugs like corticosteroids having known to provide prolonged nerve blockade should be used to study their analgesic efficacy and duration. The current study aims to assess the effects of combining corticosteroids and local anesthesia during ultrasound-guided GNB in patients with chronic knee OA. **Materials and Methods:** Study Design: A randomized, double-blinded institutional study. Setting: This study took place at teaching hospital attached to Karwar institute of medical sciences, Karwar. Methods: Fifty two patients with chronic knee OA were randomly assigned to either the lidocaine alone group (n = 26) or lidocaine plus triamcinolone (TA) group (n = 26) before ultrasound-guided GNB. Visual analog scale (VAS), Oxford Knee Score (OKS), and global perceived effects (7-point scale) were assessed at baseline and at 1, 2, 4, and 8 weeks after the procedure. **Result:** There was significant decrease in VAS scores in lignocaine plus triamcinolone group at 2nd ,4th and 8th week duration. Also OKS scores were significantly lower in group receiving lidocaine with triamcinolone at 4th week postprocedural period. Also,there were more successful responders in group receiving lignocaine plus triamcinolone at 2 weeks after the procedure,who had more than 50 percent decrease in VAS score. The emotional state of the patients, which might affect the perception of knee pain, was not evaluated. The follow-up period was 8 weeks; this period might be insufficient to validate the long-term effects of GNB. **Conclusion:** Ultrasound-guided GNB, when combined with a local anesthetic and corticosteroid, can provide short-term pain relief. Given the potential adverse effects, different corticosteroids with different concentrations have to be tested for arriving at optimal dosage conclusions The study protocol was approved by our institutional ethics committee, and written informed consent was obtained from all patients.

INTRODUCTION

Elderly people are frequently affected by chronic knee osteoarthritis (OA), which is defined by excruciating pain, stiff joints, and disability.[1] Conservative therapies for persistent knee OA include oral analgesics, visco supplementation, intraarticular corticosteroid injections, acupuncture, and prolotherapy. Many people continue to experience refractory knee pain in spite of these treatments.[2] When non-operative treatments are unsuccessful, total knee arthroplasty may be an

ISSN (O): 2687-5365; ISSN (P): 2753-6556

effective surgical choice. Surgery is only used in high-risk patients with comorbidities as it is linked to higher morbidity and mortality among patients with chronic knee OA.[3] Recent research suggests that radiofrequency (RF) ablation of the genicular nerves, a treatment choice for intractable knee OA pain, is both safe and effective.[4-6] Before RF genicular ablation, a diagnostic genicular nerve block (GNB) with local anesthetic is typically done, and a positive response to GNB is taken into consideration to suggest the need for RF genicular ablation. But according to one research, GNB combined with corticosteroids is just as effective as RF genicular ablation.[7] The analgesic impact of corticosteroids on a peripheral nerve block is still debatable despite this and other reports suggesting that adjuvant corticosteroid therapy may enhance and prolong the analgesic effect of the local anesthetic.[8–10] The successful performance of GNB or RF genicular ablation under ultrasound guidance has been documented in a number of investigations. Based on anatomical studies showing that genicular nerves are connected to genicular arteries or are situated close to them near the adductor tubercle and medial collateral ligament.[4,11,12] Both a substantial decrease in knee pain and an increase in functional capacity were produced by ultrasound-guided RF genicular ablation.[13-15] Therefore, the purpose of the current research is to compare the effectiveness of local anesthesia combined with a corticosteroid to local anesthesia administered solely during ultrasound-guided GNB.

MATERIALS AND METHODS

Source of Data: Knee Osteoarthritic patients having no improvement from conservative treatment in teaching hospital attached to Karwar institute of medical sciences, Karwar.

Study Design: A Randomized control Trial.

Study Period: September 2022 to December 2022.

Place of Study

Knee Osteoarthritic patients having no improvement from conservative treatment in teaching hospital attached to Karwar institute of medical sciences, Karwar.

Sample Size

Based on mean values and standard deviations taken from previous studies, Sample size was n= 2 [Zα/2 + Zβ]2 × SD2 (μ1-μ2)2 Where, Zα/2= 1.96 at 5% level of significance Zβ= 0.84 at 80% power (1-β) SD= Combined standard deviation μ1 and μ2 were the means of 2 groups Therefore, in each group 26 subjects were considered, and therefore the total sample size was 26+26=52.

Inclusion Criteria

1. Knee pain of moderate or greater intensity on most or all days for ≥ 3 months) and radiological tibiofemoral OA (Kellgren-Lawrence grade 2–4

Exclusion Criteria

2. 1.Acute knee pain, prior knee surgery, other connective tissue diseases that had affected the knee.
3. Serious neurological or psychiatric disorders.
4. Steroid or hyaluronic acid injection therapy during the previous 3 months.
5. Sciatic pain, use of anticoagulant medication., use of pacemaker.
6. Prior electroacupuncture treatment.

Methodology

This was a randomized control study after approval of the research protocol by the hospital ethics committee for human studies. After having met inclusion and exclusion criteria and having obtained informed consent, patients were randomized based on a computer-generated randomization table into one of the two groups. In the interventional procedure, pre-medications or sedatives were not administered.

Each patient was placed in the supine position with a pillow under the popliteal fossa to alleviate discomfort. The examined area was prepared and draped according to standard sterile techniques, and the 12 MHz linear transducer was covered with sterile plastic. The transducer was first placed parallel to the long bone shaft and moved up or down to identify the epicondyle of the long bone. The genicular arteries were identified near the periosteal areas, which were the junctions of the epicondyle and the shafts of the femur and tibia, and confirmed by color doppler ultrasound. Accordingly, GNB target points should be next to each genicular artery because the superior lateral, superior medial, and inferior medial genicular artery travel along each genicular nerve. After using color Doppler to confirm the genicular artery, the needle was inserted in the plane of the ultrasound probe in the long-axis view. After confirming the placement of the needle-tip next to a genicular artery, a gentle aspiration was performed, and a 2 mL injection volume was administered. This method was used to inject a total of 6 mL of lidocaine or 6 mL of lidocaine plus 20 mg of triamcinolone (TA) at 3 separate target sites: the superior lateral, superior medial, and inferior medial genicular nerves.

After the procedure, all of the patients were advised to continue using any previously prescribed medications when their symptoms persisted, whereas they were advised to stop or reduce current medication when their symptoms were alleviated. The patients were prohibited from using any additional medications or physiotherapy regimens during the 8-week postprocedure period.

The patients were prohibited from receiving any additional medications or physiotherapy regimens during the 8-week post-procedure period.

Outcome measurements and follow-up were performed by an independent physician who was blinded to the treatment allocations. The physician conducted all preoperative baseline and postprocedural outcome measurements (1, 2, 4, and

ISSN (O): 2687-5365; ISSN (P): 2753-6556

8 weeks) at the outpatient pain clinic. Baseline characteristics were recorded for all patients, and weight-bearing radiographs were reviewed at baseline, with the Kellgren-Lawrence system used to grade the degree of OA. Outcome measures were assessed according to hospital visits at baseline and at 1, 2, 4, and 8 weeks after the procedure (Table 3). Before each procedure, the patients were instructed in the use of a 100 mm visual analog scale (VAS) (range: no pain to unbearable pain) and Oxford Knee Score (OKS, Table 3), and baseline values were obtained. OKSs were based on self-administered, joint-specific 12-item questionnaires. Each question was scored from 1 to 5, with one representing either the best outcome and/or the fewest symptoms. The scores from each question were summed to yield overall scores ranging from 12–60, with 12 representing the optimal outcome. At 1, 2, 4, and 8 weeks after the procedure, each patient completed a written questionnaire requesting an estimation of these measurements. Additionally, these questionnaires assessed global perceived effects on a 7-point scale (1 = worst ever, 2 = much worse, 3 = worse, 4 = not improved but not worse, 5 = improved, 6 = much improved, and 7 =best). To quantify changes in analgesics, the Medication Quantification Scale (MQS) was also measured. Pain data were expressed as absolute values. Primary outcomes included the mean changes from baseline levels of knee pain to 1, 2, 4, and 8 weeks after GNB, measured using the VAS. Secondary outcomes included functional changes in the knee, patient satisfaction with treatment, changes in analgesics, the incidence of adverse effects, and the proportion of successful responders. Successful responders were decided according to a prior study, as the patient with a reduction of at least 50% of median VAS score and no increase from baseline OKS and MQS. Patients were asked to report any adverse effects to their physician at each visit or by telephone at any other time and were given additional advice and management. All adverse effects (e.g., numbness, paresthesia, neuralgia, and motor weakness) were recorded.

Kellgren-Lawrence classification scale for knee OA

Grade	Description
0	No radiologic features of osteoarthritis
1	Doubtful narrowing of joint space, possible osteophytic lipping
2	Possible narrowing of joint space, definite osteophytes
3	Definite narrowing of joint space, multiple osteophytes, some subcondral sclerosis, possible bony deformity
4	Marked narrowing of joint space, large osteophytes, severe subcondral sclerosis, definite bony deformity

Patients with grade 3 ,4 of Kellgren -Lawrence classification for knee OA were selected in the study.

The transducer being placed parallel to the long bone shaft and moved up or down to identify the epicondyle of the long bone. The genicular arteries identified near the periosteal areas, which were the junctions of the epicondyle and the shafts of the femur and tibia, and confirmed by color doppler ultrasound. And drug mixture being administered adjacent to it.

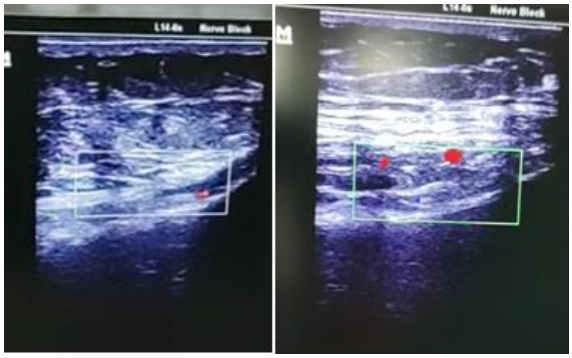
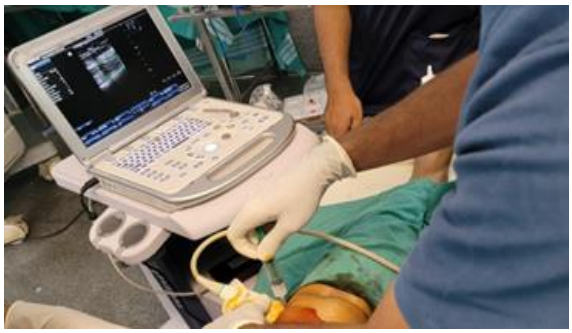


Figure 1: Ultrasonographical visualisation of genicular nerves. Ultrasound-guided identification of GNB target sites. Pulsating superolateral, superomedial and inferomedial genicular arteries being visualised and the presence of genicular nerves just adjacent to it recognised.



Characteristics	LIDOCAINE	LIDOCAINE PLUS TA
Age(yrs)	68.26	65.53
Gender(M/F)	07M /19F	8M/ 18F
Height(cms)	155.35	154.23
Weight(kgs)	58	60.8
Duration (yrs)	4	4.2
Treatment sites(right/left)	12R,14L	14R,12L
BASELINE VAS score(0-100)	67.3	68.2
OKS (12-60 POINTS)	37.5	38.1
Radiographic disease severity(K-L GRADING)		
2	2	1
3	15	16
4	9	9

All the characteristics of both the groups were comparable and there was no significant difference in the randomised groups present.

OKS Questionnaire

1. How would you describe the pain you usually have in your knee?
   - None
   - Very mild
   - Mild
   - Moderate
   - Severe

ISSN (O): 2687-5365; ISSN (P): 2753-6556

2. Have you had any trouble washing and drying yourself (all over) because of your knee?
   - No trouble at all
   - Very little trouble
   - Moderate trouble
   - Extreme difficulty
   - Impossible to do
3. Have you had any trouble getting in and out of the car or using public transport because of your knee (with or without a stick)?
   - No trouble at all
   - Very little trouble
   - Moderate trouble
   - Extreme difficulty
   - Impossible to do
4. For how long are you able to walk before the pain in your knee becomes severe (with or without a stick)?
   - No pain > 60 minutes
   - 16 – 60 minutes
   - 5 – 15 minutes
   - Around the house only
   - Not at all - severe on walking
5. After a meal (sat at a table), how painful has it been for you to stand up from a chair because of your knee?
   - Not at all painful
   - Slightly painful
   - Moderately pain
   - Very painful
   - Unbearable
6. Have you been limping when walking, because of your knee?
   - Rarely/never
   - Sometimes or just at first
   - Often, not just at first
   - Most of the time
   - All of the time
7. Could you kneel down and get up again afterwards?
   - Yes, easily
   - With little difficulty
   - With moderate difficulty
   - With extreme difficulty
   - No, impossible
8. Are you troubled by pain in your knee at night in bed?
   - Not at all
   - Only one or 2 nights
   - Some nights
   - Most nights
   - Every night
9. How much has pain from your knee interfered with your usual work (including housework)?
   - Not at all
   - A little bit
   - Moderately
   - Greatly
   - Totally
10. Have you felt that your knee might suddenly 'give away' or let you down?
    - Rarely/never
    - Sometimes or just at first
    - Often, not just at first
    - Most of the time
    - All of the time
11. Could you do household shopping on your own?
    - Yes, easily
    - With little difficulty
    - With moderate difficulty
    - With extreme difficulty
    - No, impossible
12. Could you walk down a flight of stairs?
    - Yes, easily
    - With little difficulty
    - With moderate difficulty
    - With extreme difficulty
    - No, impossible.

RESULTS

VAS Scores	Baseline	1 wk	2wks	4wks	8wks
Lidocaine alone	67.3	32.5	38.5	59.15	65.2
Lidocaine plus ta	68.23	31.11	34.3	47.3	50.2

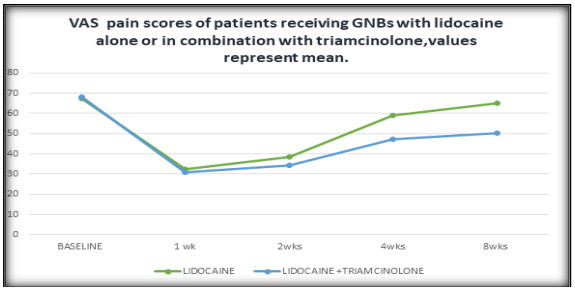


Figure 3: VAS scores were significantly lower In lidocaine with triamcinolone group during both 4th week duration and 8th week duration when compared to lidocaine alone.

No of positive responders	1 wk	2 wks	4 wks	8 wks
Lidocaine	17	9	0	0
Lidocaine with TA	25	17	3	3

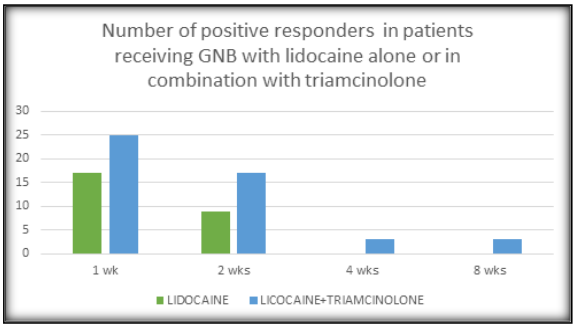


Figure 4: Number of positive responders that is people having greater than 50 percent decrease in VAS scores and no increase from baseline OKS, were significantly higher in lignocaine with triamcinolone during the first 2 weeks of GNB.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Marked improvement in range of flexion of the knee joint seen immediately after genicular nerve block. left image- before block,right-after genicular nerve block.

Classical genu varus deformity seen in osteoarthritis patients

Table 1: COMPARISON OF KL GRADE,VAS SCORE,OKS BETWEEN THE TWO GROUPS

	Group	N	Mean	SD	SE	Unpaired 't' test value	p-value
Duration of pain	LA	26	4	1.13	0.22	0.811	0.421
	LA+TA	26	4.23	0.91	0.18		
KL grade	LA	26	3.27	0.60	0.12	0.24	0.811
	LA+TA	26	3.31	0.55	0.11		
Baseline VAS	LA	26	67.31	5.77	1.13	0.637	0.527
	LA+TA	26	68.23	4.62	0.91		
VAS 1Wk	LA	26	32.54	4.50	0.88	1.38	0.174
	LA+TA	26	31.12	2.72	0.53		
VAS 2Wk	LA	26	38.54	6.70	1.31	2.858	0.006*
	LA+TA	26	34.31	3.47	0.68		
VAS 4Wk	LA	26	59.15	4.83	0.95	7.264	< 0.001*
	LA+TA	26	47.35	6.74	1.32		
VAS 8Wk	LA	26	65.23	4.90	0.96	10.31	< 0.001*
	LA+TA	26	50.27	5.54	1.09		
Baseline OKS	LA	26	37.5	2.40	0.47	0.905	0.37
	LA+TA	26	38.19	3.07	0.60		
OKS 1Wk	LA	26	27.77	2.54	0.50	1.209	0.232
	LA+TA	26	26.92	2.51	0.49		
OKS 2Wk	LA	26	30.88	2.47	0.49	0.814	0.42
	LA+TA	26	30.35	2.30	0.45		
OKS 4Wk	LA	26	32.88	2.23	0.44	2.025	0.048*
	LA+TA	26	31.54	2.55	0.50		
OKS 8Wk	LA	26	35.92	1.83	0.36	0.0001	1
	LA+TA	26	35.92	2.73	0.54		
GPES 1Wk	LA	26	5.35	0.49	0.10	1.395	0.169
	LA+TA	26	5.54	0.51	0.10		
GPES 2Wk	LA	26	4.65	0.49	0.10	0.837	0.406
	LA+TA	26	4.54	0.51	0.10		
GPES 4Wk	LA	26	4.23	0.43	0.08	0.693	0.491
	LA+TA	26	4.15	0.37	0.07		
GPES 8Wk	LA	26	3.42	0.81	0.16	0.379	0.707
	LA+TA	26	3.5	0.65	0.13		

There was significant decrease in VAS scores in lignocaine plus triamcinolone group at 2nd, 4th and 8th week postprocedural period.

Also OKS scores were significantly lower in group receiving lidocaine with triamcinolone at 4th week postprocedural period.

Table 2: COMPARISON OF VAS SCORE AND OKS SCORE AT DIFFERENT INTERVALS IN BOTH GROUPS

		Group	N	Mean	SD	SE	Unpaired 't' test value	p-value
Change in VAS score from baseline to	1 Week	LA	26	34.77	6.263	1.228	1.609	0.114
		LA+TA	26	37.12	4.003	0.785		
	2 Week	LA	26	28.77	8.031	1.575	2.926	0.006*
		LA+TA	26	33.92	4.019	0.788		
	4 Week	LA	26	8.15	5.829	1.143	7.029	< 0.001*
		LA+TA	26	20.88	7.163	1.405		
	8 Week	LA	26	2.08	2.51	0.49	11.97	< 0.001*
		LA+TA	26	17.96	6.28	1.23		

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Change in OKS score from baseline to	1 Week	LA	26	9.73	b	0.57	1.79	0.08
		LA+TA	26	11.27	3.281	0.643		
	2 Week	LA	26	6.62	3.275	0.642	1.263	0.213
		LA+TA	26	7.85	3.738	0.733		
	4 Week	LA	26	4.62	2.639	0.518	2.084	0.043*
		LA+TA	26	6.65	4.233	0.83		
	8 Week	LA	26	1.58	1.391	0.273	1.225	0.228
		LA+TA	26	2.27	2.523	0.495		
* Significant SD - Standard deviation SE - Standard error								

There was significant decrease in VAS scores in lignocaine plus triamcinolone groups at 2nd, 4th and 8th week duration when compared to their baseline VAS scores. Furthermore, the group receiving lignocaine with triamcinolone had a very significant reduction in VAS score during the 4th week postprocedural duration.

Also, OKS scores were significantly lower in group receiving lidocaine with triamcinolone at 4th week postprocedural period.

DISCUSSION

During the GNB procedure performed with ultrasound guidance, the genicular arteries were used as landmarks. The three genicular arteries (superior lateral, superior medial, and inferior medial) were identified through color Doppler at the junctions of the femur and tibia shafts with the epiphysis. Previous studies have suggested that genicular nerves could be visualized on ultrasound scans alongside the genicular arteries.[13,14] The results of the study are presented in Figures 3 and 4, which show the mean and standard deviation of VAS pain scores and the proportion of successful responders between patients receiving GNBs with lidocaine alone and those receiving lidocaine in combination with TA. The statistical significance of the results is denoted by asterisks and other symbols.

The study confirmed that the nerves could be differentiated using ultrasound [Figure 1], but sometimes the genicular nerves cannot be identified through this method. Since these nerves mostly follow the arteries, the targets for the genicular nerve block should be placed next to each genicular artery, regardless of whether the nerve can be seen on the ultrasound or not. The study concluded that the genicular nerve block can be effectively performed under ultrasound guidance, which supports the findings of other studies that also used ultrasound.[15-20]

There was significant decrease in VAS scores in lignocaine plus triamcinolone group at 2nd and 4th week duration. Furthermore, the group receiving lignocaine with triamcinolone had a very significant reduction in VAS score during the 4th week postprocedural period. Also OKS scores were significantly lower in group receiving lidocaine with triamcinolone at 4th week postprocedural period.

There was significant decrease in VAS scores in lignocaine plus triamcinolone groups at 2nd, 4th and 8th week duration when compared to their baseline VAS scores.

Moreover, while there were more successful responders in group receiving lignocaine plus triamcinolone at 2 weeks after the procedure, there were 3 positive responders in group of lignocaine with triamcinolone at 4 and 8 weeks. Therefore, the study suggests that adding corticosteroid therapy to ultrasound-guided GNB with a local anaesthetic may provide significant benefits when compared to GNB with a local anaesthetic alone up to 8 weeks.

Deciding whether to use corticosteroids during a peripheral nerve block is a significant decision as they can cause adverse effects like alopecia, cutaneous atropy, cortisol suppression, glucose intolerance, decreased bone mineral density.[21-23] The use of corticosteroids to enhance peripheral nerve block effects is a controversial topic as dexamethasone failed to provide prolonged analgesia in pudendal nerve block in pudendal analgesia and also in scalp blocks and occipital nerve block for transformed migraines.[24-26] Studies have found no benefits, while others have reported improved outcomes like a study for occipital nerve blocks were it provided complete pain free result.[27] Corticosteroids have been shown to provide better postoperative analgesia and lower pain scores in some studies28-30. In one study, the addition of corticosteroids to a genicular nerve block yielded long-term analgesic effects for 6 months in patients with persistent knee pain after total knee replacement arthroplasty.[7] However, the total administered dose of corticosteroids was higher in that study, and the effect of a genicular nerve block with corticosteroids might be systemic in nature. Most studies supporting the use of corticosteroids as an adjuvant during peripheral nerve blocks were conducted during the perioperative period, and only short-term alleviation of acute postoperative pain was demonstrated.[28-30] Therefore, the use of corticosteroids as an adjuvant during peripheral nerve blocks for chronic pain has not been found to be very beneficial. An injection of steroids into an epidural space can suppress the pituitary axis system in a dose-dependent manner.[31] Although we used a single 20 mg dose of TA, cortisol depression might still have occurred in some patients. Additionally, the optimal steroid type or dose is unknown, and a different dose or type might have yielded different results Further well-designed studies are needed to evaluate the use of perineural corticosteroid administration.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

This study had a relatively short follow-up period of only 8 weeks, which might have been insufficient to detect the long-term effects of TA. Moreover, the sample size was small, and the lack of a placebo control group limited the study's ability to determine whether the observed effects were due to the addition of TA or simply the natural course of knee OA pain. Finally, we did not evaluate the effect of corticosteroid administration on other outcomes, such as opioid consumption or quality of life, which might have been affected by the addition of TA to GNB.

CONCLUSION

In conclusion, our study demonstrated that the addition of TA to GNB provided improvements in both VAS scores and baseline OKS values significantly up to 8 weeks when compared to GNB with lidocaine alone in patients with chronic knee OA pain. Future large-scale studies with longer follow-up periods and placebo control groups are needed to confirm our findings and to determine the optimal dose and type of corticosteroid to use as an adjuvant during peripheral nerve blocks for chronic pain.

Limitations

The study has several limitations, including the lack of evaluation of post-procedural plasma cortisol concentrations, the absence of a placebo group, and the short follow-up period. Furthermore, the emotional state of the patients was not assessed, which might affect the perception of knee pain. Considering the potential adverse effects of corticosteroids, the addition of these agents to local anaesthetics might not be necessary during GNB for chronic knee OA. However, further large-scale studies with a longer follow-up period and more precise evaluation methods are necessary to validate these preliminary findings.

REFERENCES

1. Peat G, McCarney R, Croft P. Knee pain and osteoarthritis in older adults: A review of community burden and current use of primary health care. Ann Rheum Dis 2001; 60:91-97.
2. Crawford DC, Miller LE, Block JE. Conservative management of symptomatic knee osteoarthritis: A flawed strategy? Orthop Rev (Pavia) 2013; 5:e2.
3. Santaguida PL, Hawker GA, Hudak PL, Glazier R, Mahomed NN, Kreder HJ, Coyte PC, Wright JG. Patient characteristics affecting the prognosis of total hip and knee joint arthroplasty: A systematic review. Can J Surg 2008; 51:428-436.
4. Choi WJ, Hwang SJ, Song JG, Leem JG, Kang YU, Park PH, Shin JW. Radiofrequency treatment relieves chronic knee osteoarthritis pain: A double-blind randomized controlled trial. Pain 2011; 152:481-487.
5. Sari S, Aydin ON, Turan Y, Özlülerden P, Efe U, Kurt Ömürlü I. Which one is more effective for the clinical treatment of chronic pain in knee osteoarthritis: Radiofrequency neurotomy of the genicular nerves or intra-articular injection? Int J Rheum Dis 2016; doi:10.1111/1756-185X.12925. [Epub ahead of print].
6. Kirdemir P, Çatav S, Alkaya Solmaz F. The genicular nerve: Radiofrequency lesion application for chronic knee pain. Turk J Med Sci 2017; 47:268-272.
7. Qudsi-Sinclair S, Borrás-Rubio E, Abellan-Guillén JF, Padilla Del Rey ML, RuizMerino G. A comparison of genicular nerve treatment using either radiofrequency or analgesic block with corticosteroid for pain after a total knee arthroplasty: A double-blind, randomized clinical study. Pain Pract 2017; 17:578-588.
8. Johansson A, Hao J, Sjölund B. Local corticosteroid application blocks transmission in normal nociceptive C-fibres. Acta Anaesthesiol Scand 1990; 34:335-338.
9. Lewis RN. The use of combined suprascapular and circumflex (articular branches) nerve blocks in the management of chronic arthritis of the shoulder joint. Eur J Anaesthesiol 1999; 16:37-41.
10. An K, Elkassabany NM, Liu J. Dexamethasone as adjuvant to bupivacaine prolongs the duration of thermal antinociception and prevents bupivacaineinduced rebound hyperalgesia via regional mechanism in a mouse sciatic nerve block model. PLoS One 2015; 10:e0123459.
11. Hirasawa Y, Okajima S, Ohta M, Tokioka T. Nerve distribution to the human knee joint: Anatomical and immunohistochemical study. Int Orthop 2000; 24:14.
12. Yasar E, Kesikburun S, Kiliç C, Güzelküçük Ü, Yazar F, Tan AK. Accuracy of ultrasound-guided genicular nerve block: A cadaveric study. Pain Physician2015; 18:E899-E904.
13. Protzman NM, Gyi J, Malhotra AD, Kooch JE. Examining the feasibility of radiofrequency treatment for chronic knee pain after total knee arthroplasty. PMR2014; 6:373-376.
14. DemIr Y, Güzelküçük U, Tezel K, AydemIr K, Taşkaynatan MA. A different approach to the management of osteoarthritis in the knee: Ultrasound guided genicular nerve block. Pain Med 2017; 18:181-183.
15. Kesikburun S, Yaşar E, Uran A, Adigüzel E, Yilmaz B. Ultrasound-guided genicular nerve pulsed radiofrequency treatment for painful knee osteoarthritis: A preliminary report. Pain Physician 2016; 19:E751-E759.
16. Kellgren JH, Lawrence JS. Radiological assessment of osteo-arthrosis. Ann Rheum Dis 1957; 16:494-502.
17. Dawson J, Fitzpatrick R, Murray D, Carr A. Questionnaire on the perceptions of patients about total knee replacement. J Bone Joint Surg Br 1998; 80:63-69.
18. Gallizzi M, Gagnon C, Harden RN, Stanos S, Khan A. Medication Quantification Scale Version III: Internal validation of detriment weights using a chronic pain population. Pain Pract 2008; 8:1-4.
19. Geurts JW, van Wijk RM, Wynne HJ, Hammink E, Buskens E, Lousberg R, Knape JT, Groen GJ. Radiofrequency lesioning of dorsal root ganglia for chronic lumbosacral radicular pain: A randomised, double-blind, controlled trial. Lancet 2003; 361:21-26.
20. Adiguzel E, Uran A, Kesikburun S, Köroğlu Ö, Demir Y, Yaşar E. Knee pain relief with genicular nerve blockage in two brain injured patients with heterotopic ossification. Brain Inj 2015; 29:1736-1739.
21. Al-Shoha A, Rao DS, Schilling J, Peterson E, Mandel S. Effect of epidural steroid injection on bone mineral density and markers of bone turnover in postmenopausal women. Spine (Phila Pa 1976) 2012; 37:E1567-E1571.
22. Raynauld JP, Buckland-Wright C, Ward R, Choquette D, Haraoui B, Martel-Pelletier J, Uthman I, Khy V, Tremblay JL, Bertrand C, Pelletier JP. Safety and efficacy of long-term intraarticular steroid injections in osteoarthritis of the knee: A randomized, double-blind, placebocontrolled trial. Arthritis Rheum 2003; 48:370-377.
23. Shields KG, Levy MJ, Goadsby PJ. Alopecia and cutaneous atrophy after greater occipital nerve infiltration with corticosteroid. Neurology 2004; 63:2193-2194.
24. Labat JJ, Riant T, Lassaux A, Rioult B, Rabischong B, Khalfallah M, Volteau C, Leroi AM, Ploteau S. Adding corticosteroids to the pudendal nerve block for pudendal neuralgia: A randomised, double-blind, controlled trial. BJOG2017; 124:251-260.
25. Jose R, Chakravarthy K, Nair S, Joseph M, Jeyaseelan V, Korula G. A randomized controlled trial studying the role of

ISSN (O): 2687-5365; ISSN (P): 2753-6556

dexamethasone in scalp nerve blocks for supratentorial craniotomy. J Neurosurg Anesthesiol 2017; 29:150-156.
26. Ashkenazi A, Matro R, Shaw JW, Abbas MA, Silberstein SD. Greater occipital nerve block using local anaesthetics alone or with triamcinolone for transformed migraine: A randomised comparative study. J Neurol Neurosurg Psychiatry 2008; 79:415-417.
27. Afridi SK, Shields KG, Bhola R, Goadsby PJ. Greater occipital nerve injection in primary headache syndromes--prolonged effects from a single injection. Pain 2006; 122:126-129.
28. De Oliveira GS Jr., Castro Alves LJ, Nader A, Kendall MC, Rahangdale R, McCarthy RJ. Perineural dexamethasone to improve postoperative analgesia with peripheral nerve blocks: A meta-analysis of randomized controlled trials. Pain Res Treat 2014; 2014:179029.
29. Albrecht E, Kern C, Kirkham KR. A systematic review and meta-analysis of perineural dexamethasone for peripheral nerve blocks. Anaesthesia 2015; 70:71-83.
30. Knezevic NN, Anantamongkol U, Candido KD. Perineural dexamethasone added to local anesthesia for brachial plexus block improves pain but delays block onset and motor blockade recovery. Pain Physician 2015; 18:1-14.
31. KayJ, Findling JW, Raff H. Epidural triamcinolone suppresses the pituitaryadrenal axis in human subjects. Anesth Analg 1994; 79:501-505.

ISSN (O): 2687-5365; ISSN (P): 2753-6556