

A study to evaluate the efficacy of instillation of ropivacaine with tramadol through surgical drains for post-operative analgesia in patients undergoing mastectomy



Tarun Yadav¹, Mayuri Golhar², Sanjay Johar³, Naveen Malhotra⁴, Rajni Gupta⁵

^{1,2}Assistant Professor, ^{3,4}Professor, Department of Anaesthesiology and Critical Care, Pt BDS PGIMS, Rohtak, ⁵Consultant, Haryana Civil Medical Services, Haryana

Submission: 07-02-2021

Revision: 20-04-2021

Publication: 01-06-2021

ABSTRACT

Background: Post mastectomy pain is common and distressing complication seen in large number of women following mastectomy. Variety of modalities have been proposed to combat post mastectomy pain but are associated with disadvantages so simple technique like local infiltration through surgical drains avoid unnecessary complications and provide good analgesia to a standard general anesthetic opioid based technique. **Aims and Objectives:** To evaluate the efficacy of instillation of ropivacaine with tramadol through surgical drains for postoperative analgesia in patients undergoing mastectomy with respect to pain score, duration of analgesia and need for rescue analgesia. **Materials and Methods:** Seventy-five female patients aged between 30-70 years belonging to ASA physical status I & II scheduled for mastectomy with axillary clearance were enrolled in the study. Patient were randomly allocated into three groups of 25 each. Group I- 40ml saline was instilled through the surgical drain, group II- 40ml 0.25% ropivacaine was instilled through the surgical drain and group III- 40ml 0.25% ropivacaine with 100mg tramadol was instilled through the surgical drain. Pain score was assessed using VAS (0-10) at rest and at movement and hemodynamic monitoring like pulse rate, noninvasive BP, respiratory rate was recorded immediately after the surgery, every hourly up to 4hours, then four hourly for the next 24hours. Patient satisfaction regarding pain relief was assessed at 24hours post operatively. **Results:** VAS at rest was clinically and statistically significantly lower in group II and III at 1,3,4,8,12 and 16 hours postoperatively ($p < 0.05$) as compared to group I however was comparable in between groups II and III. Similarly, VAS at movement was clinically and statistically significantly lower in group II and III at 1,3,4,8,12 and 16 hours postoperatively ($p < 0.05$) as compared to group I but comparable in between groups II and III. Patient satisfaction when compared was statistically more significant in group II and III as compared to group I but comparable in between group II and III. **Conclusion:** Instillation of ropivacaine or ropivacaine with tramadol through surgical drain is safe, effective and inexpensive technique for post-operative analgesia. It provides good relief of pain, prolonged analgesia, decreases analgesic requirement and increase patient's satisfaction. However, addition of tramadol to ropivacaine serves no added advantage when compared to ropivacaine alone.

Key words: Surgical drain; Ropivacaine; Tramadol; Instillation

INTRODUCTION

Breast cancer is most common cancer in women both in developed and developing countries.¹ Mastectomy can be emotionally distressing and physically painful. Post

mastectomy pain is thought to develop from surgical damage to intercostobrachial nerve lateral cutaneous branch of the second intercostal nerve that is often resected at mastectomy.¹ This nerve is injured in 80-100% of mastectomy patients who undergo axillary dissection.²

Access this article online

Website:

<http://nepjol.info/index.php/AJMS>

DOI: 10.3126/ajms.v12i6.34795

E-ISSN: 2091-0576

P-ISSN: 2467-9100

Copyright (c) 2021 Asian Journal of Medical Sciences



This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

Address for Correspondence:

Dr. Mayuri Golhar, B 40 Suncity Sector 35, Rohtak, Haryana. **Mobile No:** +91-9599912334. **E-mail:** drmayuriyadav@gmail.com

Post mastectomy pain syndrome is a condition which occurs more often following breast surgery and is reported to affect more than 20% women.² Various modalities of post-operative pain management have been described but no drug has been identified that specifically inhibits nociception without associated side effects.³

Now a day's variety of regional and local anesthetic techniques like local anesthetic infiltration, field block, intercostal block, brachial plexus block, thoracic epidural and paravertebral blocks have become popular for mastectomy post-operative pain management, however not many of them have proven efficacies and some are associated with disadvantages of requiring a specialist experience and risk like pneumothorax and hypotension⁴⁻⁶. Simple technique like instillation of local anesthetic through surgical drain may avoid unnecessary complications and provide good analgesia to a standard general anesthetic opioid based technique.

Ropivacaine is a local anesthetic with greater degree of motor sensory differentiation with decreased potential for central nervous system toxicity and cardiotoxicity.⁷ Tramadol is mixed opioid analgesic commonly used for postoperative pain management through intravenous or intramuscular injections and wound infiltration. It is also used as an adjuvant to local anaesthetics for peripheral nerve blocks.⁸ However no study has been conducted to evaluate the efficacy of instillation of ropivacaine in combination with tramadol through surgical drain for postoperative analgesia in post mastectomy patients. Hence, we conducted this study to evaluate the efficacy of instillation of ropivacaine with tramadol and without tramadol.

MATERIALS AND METHODS

After approval from the institutional ethics committee, Pt BDS PGIMS, Rohtak. 75 female patients aged between 30-70 years belonging to ASA physical status I & II scheduled for mastectomy with axillary clearance were enrolled in the study. Patients with uncontrolled cardiovascular, hepatic, pulmonary, renal, neurological, psychiatric, diabetes mellitus, major blood loss during surgery or continuous blood collection in the drain and patients having drug allergies were excluded from the study.

The patients enrolled in the study underwent preanesthetic evaluation prior to the day of surgery and mandatory investigation as per institutional protocols were advised. Thereafter written informed consent was obtained and VAS (visual analogue score) for assessment of pain was explained to the patients.

Anesthesia induction was done with injection thiopentone (3-5mg/kg iv) and injection vecuronium 0.1mg/kg iv was used as muscle relaxant. Injection fentanyl 2ug/kg iv was used for intraoperative analgesia and sevoflurane with 66% nitrous oxide in oxygen was used for maintenance of anesthesia.

Patient were randomly allocated into three groups of 25 each. The study drugs were prepared by the anesthetist not involved in the study. Four 10ml syringes containing colorless drug made to 40ml volume were used for the study. Group I- 40ml saline was instilled through the surgical drain, group II- 40ml 0.25% ropivacaine was instilled through the surgical drain and group III- 40ml 0.25% ropivacaine with 100mg tramadol was instilled through the surgical drain. (Figure 1)

Following the instillation, the drain was clamped for 20minutes and then released to allow the drug solution (if any) into the negative pressure suction drain. (Figure 2)

If two drains were placed by the surgeon then 20ml of drug solution was instilled through each drain but total



Figure 1: Drug instillation via surgical drain



Figure 2: Clamping of surgical drain after drug instillation

volume was not more than 40ml in any case. At the end of the procedure the neuromuscular block was reversed and patient was extubated.

Assessment

Pain score was assessed using VAS (0-10) and hemodynamic monitoring like pulse rate, noninvasive BP, respiratory rate was recorded immediately after the surgery, every hourly up to 4hours, then four hourly for the next 24hours.

When VAS score was more than 3 on rest or more than 4 on movement inj diclofenac 75mg i.v was administered as rescue analgesic and the time of administration of first rescue dose and duration of analgesia was also recorded. Also, total analgesic requirement in 24 hours were recorded however injection diclofenac was not administered more than 8 hourly. If pain score after giving injection diclofenac was still more than 3 on rest and more than 4 on movement than second rescue analgesic injection tramadol 100 mg slow i.v was administered and the time of second rescue analgesia and total requirement was also noted.

Patient satisfaction regarding pain relief was assessed at 24hours post operatively as 1) excellent 2) good 3) satisfactory and 4) poor. Any side effects observed were also recorded.

All observations were recorded at the end of surgery, data was compiled and analyzed statistically using SPSS version 13. Data was expressed as mean values+- SD. Depending on the data either parametric or non-parametric tests were performed. Normally distributed continuous data was analyzed and compared by ANOVA. number of patients receiving rescue analgesia, number of analgesic demands were analyzed by using Fischer’s exact test. Patient generated VAS and ordered categorical variable was analyzed by using Kruskal Wallis test. P value of <0.05 was considered as statistically significant for all the test.

Observations

Age distribution and duration of surgery: data obtained was analyzed statistically using one way ANOVA test. The mean age of patients in group I was 54.5±12.95 years, in group II was 47.56±12.34 years and group III were 50.28±10.36

years. The mean age in all the groups was comparable and not statistically significant (p>0.05) (Table 1). the mean duration of surgery in group I was 121.80±25.73, in group II was 111.80±27.38 and in group III was 119.20±3.74 minutes. The mean duration of surgery and baseline clinical characteristics in all the groups were comparable and not statistically significant (p>0.05) (Table 1).

Hemodynamic parameter like heart rate, systolic and diastolic blood pressure and oxygen saturation was statistically comparable (p>0.05) in all the three groups when compared at different time intervals intraoperatively and post operatively.

VAS score

at rest was clinically and statistically significantly lower in group II and III at 1,3,4,8,12 and 16 hours postoperatively(p<0.05) as compared to group I however was comparable in between groups II and III (Table 2, Figure 3). Similarly, VAS at movement was clinically and statistically significantly lower in group II and III at 1,3,4,8,12 and 16 hours postoperatively(p<0.05) as compared to group I but comparable in between groups II and III (Table 3, Figure 4).

Duration and dose of rescue analgesia: Duration of analgesia was 7.884±1.20,11.10±1.95 and 11.80±1.17 hours in group I, II and III respectively. So, it was statistically significantly longer in group II and III as compared to group I, however was comparable in between the group II and III (Figure 5).

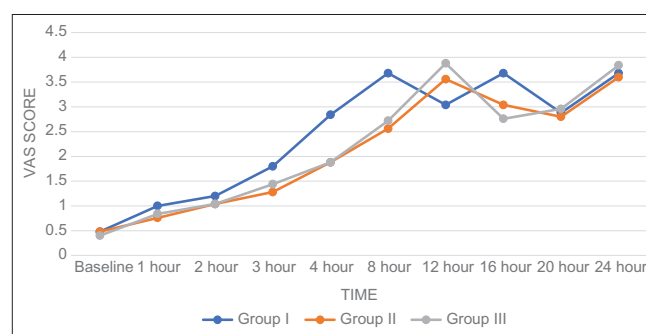


Figure 3: VAS at rest between different study variable

Table 1: Baseline clinical and demographic characteristics of the three groups				
	Group I	Group II	Group III	P value
Age	54.52±12.95	47.56±12.34	50.28±10.36	0.123
Duration of surgery	121.80±25.73	111.80±27.38	119.20±3.74	0.324
Baseline HR	90.72±9.61	90.08±14.03	91.04±9.49	0.954
Baseline SBP	133.12±10.03	127.00±14.01	125.08±12.55	0.061
Baseline DBP	84.84±8.00	83.16±10.90	78.40±9.62	0.054
Baseline SPo2	100	100	100	1.00
Baseline VAS at rest	0.48±0.50	0.48±0.50	0.40±0.50	0.809
Baseline VAS at movement	1.12±0.43	1.24±0.43	0.92±0.49	0.058

Table 2: VAS at rest between different study variables

VAS at rest	Group I	Group II	Group III	P value*
Baseline	0.48±0.50	0.48±0.50	0.40±0.50	0.809
1 hour	1.00±0.00	0.76±0.43	0.84±0.37	0.041
2 hours	1.20±0.40	1.04±0.35	1.04±0.35	0.220
3 hours	1.80±0.40	1.28±0.45	1.44±0.50	0.001
4 hours	2.84±0.37	1.88±0.60	1.88±0.60	0.001
8 hours	3.68±0.69	2.56±0.71	2.72±0.54	0.001
12 hours	3.04±0.35	3.56±0.76	3.88±0.43	0.001
16 hours	3.68±0.62	3.04±0.35	2.76±0.43	0.001
20 hours	2.88±0.33	2.80±0.50	2.96±0.35	0.353
24 hours	3.68±0.62	3.60±0.70	3.84±0.47	0.352

*Kruskal Wallis H test

Table 3: VAS on movement between different study variable

VAS on movement	Group I	Group II	Group III	P value*
Baseline	1.12±0.43	1.24±0.43	0.92±0.49	0.058
1 hour	1.40±0.50	1.40±0.50	1.28±0.45	0.059
2 hours	2.16±0.47	1.80±0.57	1.76±0.52	0.018
3 hours	2.80±0.40	2.24±0.52	2.44±0.50	0.001
4 hours	3.84±0.37	2.84±0.62	2.88±0.60	0.001
8 hours	5.24±1.05	3.56±0.82	3.72±0.54	0.001
12 hours	4.04±0.45	4.88±1.05	5.36±0.90	0.001
16 hours	5.20±1.00	4.04±0.35	3.76±0.43	0.001
20 hours	3.88±0.33	3.84±0.62	3.96±0.35	0.358
24 hours	5.28±1.02	4.96±1.01	5.24±0.83	0.372

*Kruskal Wallis H test

The total number of rescue analgesic doses were 2.96±0.02, 2.08±0.27 and 2.00±0.00 in group I, II and III respectively so it was statistically significantly lower in group II and III as compared to group I but comparable in between group II and III (Figure 6).

Patient satisfaction when compared was statistically more significant in group II and III as compared to group I but comparable in between group II and III (Figure 7).

No side effects were observed in any of the groups. None of the patients required second rescue analgesic.

DISCUSSION

In our study the patient’s demographic variable and the duration of surgery were comparable in all the three groups which were also observed in the other studies.^{9,10}

Pain relief was seen after instillation with all the injectate: normal saline, 0.25% ropivacaine and 0.25% ropivacaine with 100mg tramadol but it was significantly better in group II and III as compared to group I. Similarly, VAS score when compared at different time intervals postoperatively

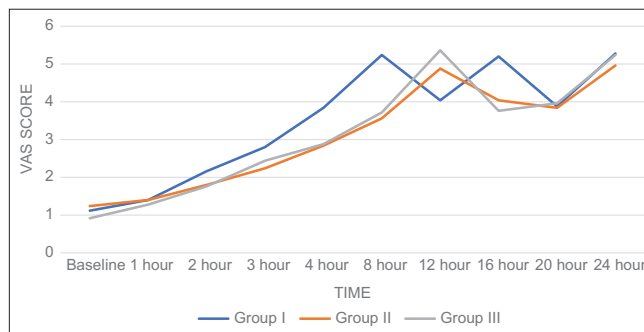


Figure 4: VAS on movement between different study variable

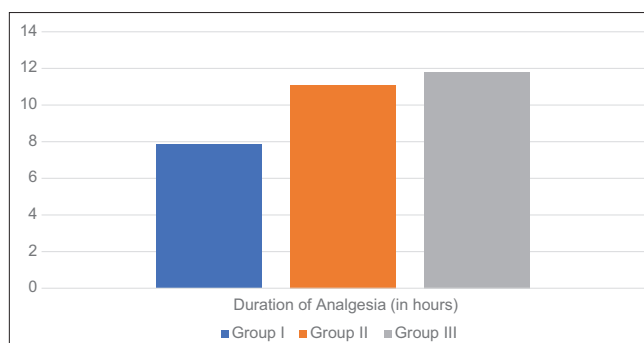


Figure 5: Duration of Analgesia (in hours) between among all three groups

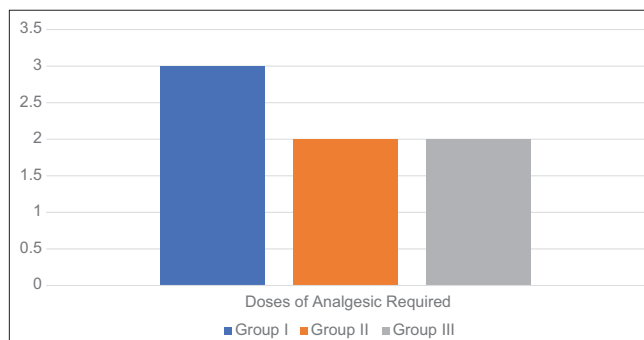


Figure 6: Number of doses of rescue analgesic required among all three groups

at rest and at movement was significantly lower ($p < 0.05$) in group II and group III as compared to group I, however was comparable in between group II and group III. These results were also found in other studies.¹⁰

Though in one study of Talbot et al., where local anesthetic was instilled in axillary drains for post-operative pain following modified Patey mastectomy it did not offer any contribution for post-operative analgesia in some of their patients which they opined could be because of mispositioned drains, blockage of some holes of the drains or unequal distribution of local anesthetic due to gravity and concluded that further refinement was needed.¹¹ In our study we instilled 20ml of drug through chest wall drain and 20ml through axillary drain which might have

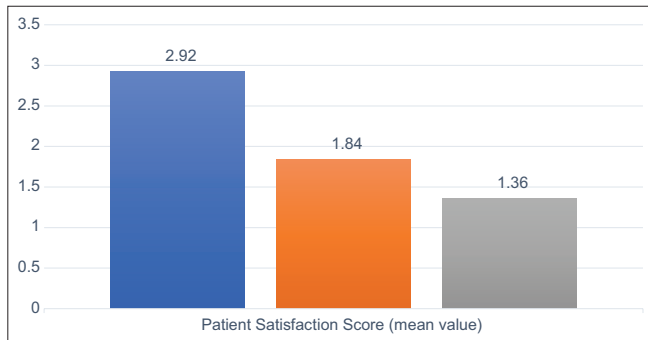


Figure 7: Patient satisfaction score among all three groups (mean value)

resulted in uniform distribution of drug hence improving the efficacy of technique.

Khajavi et al., in his study compared the therapeutic effects and complications of intravenous versus local wound infiltration of tramadol following pyelolithotomy. They concluded that wound infiltration with tramadol reduces post-operative opioid consumption and produces less nausea and vomiting,⁸ however in our study addition of tramadol did not offer any additional pain relief.

The duration of analgesia was significantly longer and consequently the doses of rescue analgesic injection diclofenac 75mg I.V administered were also less in group II and group III patients as compared to group I but comparable in between group II and III. None of the patients required second rescue analgesic injection tramadol 100mg iv. Similar results were also seen in other studies using injection bupivacaine as local anesthetic.¹⁰ In our study we used injection ropivacaine because of its better cardiac safety profile.

Hemodynamic parameters in all the groups were statistically comparable intraoperatively as well postoperatively. No hemodynamic instability or oxygen desaturation or any other side effects like nausea, vomiting or pruritis were seen in patients in any of the three groups similar results were seen in other studies.^{10,11} When patient satisfaction score was analyzed, excellent satisfaction was noted in group II and group III while satisfactory score was seen in group I.

The technique of drug instillation through drains is technically easy and well established in procedures like laparoscopic cholecystectomy,^{12,13} abdominal hysterectomy^{14,15} in is easily accepted by surgeons as well as it does not interfere with surgical procedure, less time consuming and drug is instilled at the end of surgery when hemostasis is complete.

Our study shows that tramadol with ropivacaine is not significantly different in efficacy to ropivacaine alone. It may be due to the reason that instillation of tramadol into

compartment may cause physical dispersal of the drug and reduced direct neural effects also, lipophilic properties of tramadol may have resulted in rapid diffusion similar to that seen by Alhashemi JA et al., in subarachnoid space.¹⁶

Limitations

1) we observed the patients for the first 24 hours only, however the mid and the long-term effects should be evaluated in future based on short term effects.2) the beneficial effects on incidence and severity of chronic post-surgical pain were not studied.

CONCLUSION

Instillation of ropivacaine or ropivacaine with tramadol through surgical drain is safe, effective and inexpensive technique for post-operative analgesia in patients undergoing mastectomy. It provides good relief of pain, prolonged analgesia, decreases analgesic requirement and thus increase patient's satisfaction. However, addition of tramadol to ropivacaine serves no added advantage when compared to ropivacaine alone.

ACKNOWLEDGEMENT

The authors take this opportunity to thank Department of Anaesthesiology, Pt BDS PGIMS for their whole hearted support for this study.

REFERENCES

1. Kwekkeboom K. Post mastectomy pain syndromes. *Cancer Nurs.* 1996; 19:37-43. <https://doi.org/10.1097/00002820-199602000-00005>
2. Wallace AM and Wallace MS. Postmastectomy and post thoracotomy pain. *Anesthesiol Clin N Am.* 1997; 15:353-370. [https://doi.org/10.1016/S0889-8537\(05\)70338-2](https://doi.org/10.1016/S0889-8537(05)70338-2)
3. Khater A, Adel M, Awad M, Yassin A, Ghazy H, Gad M, et al. Evaluation of preemptive mastectomy flap infiltration with bupivacaine adrenaline. *Egypt J Surg.* 2015; 34:177-181. <https://doi.org/10.4103/1110-1121.163125>
4. Culliford AT, Spector JA and Flores RL. Intraoperative sensorcaine significantly improves postoperative pain management in outpatient reduction mammoplasty. *Plast Reconstr Surg.* 2007; 120:840-844. <https://doi.org/10.1097/01.prs.0000277647.42662.29>
5. Hwang EG and Lee Y. Effectiveness of intercostal nerve block for management of pain in rib fracture patients. *J Exer Rehabil.* 2014; 10:241-244. <https://doi.org/10.12965/jer.140137>
6. Bhaskar SB. Case of local infiltration analgesia: is all the evidence in black and white? *Indian J Anaesth.* 2015; 59:1-4. <https://doi.org/10.4103/0019-5049.149437>
7. Scott CD, Lee A, Fagan D, Bowler GM, Bloomfield P and Lundh R. acute toxicity of ropivacaine compared with that of

- bupivacaine. *Anesth Analg.* 1989; 69:563-569.
<https://doi.org/10.1213/00000539-198911000-00003>
8. Khajavi MR, Aghili SBM, Moharari RS, Najafi A, Mohtaram R, Khashayar P, et al. subcutaneous tramadol infiltration at the wound site versus intravenous wound infiltration after pyelolithotomy. *Ann Pharmacotherapy.* 2009; 43:430-435.
<https://doi.org/10.1345/aph.1L494>
 9. Tiana S, Oreste B and Eleonora F. A prospective comparison of continuous wound infiltration with ropivacaine versus single injection paravertebral block after radical mastectomy. *Anesth Analg.* 2008; 106:998-1001.
<https://doi.org/10.1213/ane.0b013e31816152da>
 10. Jonnavithula N, Khandelia H, Durga P and Ramachandran G. role of wound instillation with bupivacaine through surgical drains for post-operative analgesia in modified radical mastectomy. *Indian J Anaesth.* 2015; 59:25-20.
<https://doi.org/10.4103/0019-5049.149443>
 11. Talbot H, Hutchinson SP, Edbrooke DL, Wrench I and Kohlhardt SR. evaluation of local anesthetic regimen following mastectomy. *Anesthesia.* 2004; 59:664-667.
<https://doi.org/10.1111/j.1365-2044.2004.03795.x>
 12. Pfeiffer U, Dodson ME, Van MG, Kirby J and McLoughlin GA. Wound instillation for post-operative pain relief: a comparison between bupivacaine and saline in patients undergoing aortic surgery. *Ann Vasc Surg.* 1991; 5:80-84.
<https://doi.org/10.1007/BF02021784>
 13. Boddy AP, Mehta S and Rhodes M. The effect of intraperitoneal local anesthesia in laparoscopic cholecystectomy: a systematic review and meta-analysis. *Anesth Analg.* 2006; 103:682-688.
<https://doi.org/10.1213/01.ane.0000226268.06279.5a>
 14. Zohar E, Fredman B, Phillipov A, Jedeiken R and Sharpio A. The analgesic efficacy of patient controlled bupivacaine wound instillation after total abdominal hysterectomy with bilateral salphingo-oophorectomy. *Anesth Analg.* 2001; 93:482-487.
<https://doi.org/10.1213/00000539-200108000-00048>
 15. Levack ID, Holmes JD and Robertson GS. Abdominal wound perfusion for the relief of post-operative pain. *Br J Anaesth.* 1986; 58:615-619.
<https://doi.org/10.1093/bja/58.6.615>
 16. Alhashemi JA and Kaki AM. Effect of intrathecal tramadol administration on postoperative pain after transurethral resection of prostate. *Br J Anaesth.* 2003;91:536-540.
<https://doi.org/10.1093/bja/aeg213>

Author's contribution:

TY, MG, SJ, NM and RG - Concept and design of the study, prepared first draft of manuscript, Interpreted the results, reviewed the literature and manuscript preparation, Statistically analyzed and interpreted, preparation of manuscript revision of the manuscript.

Work attributed to:

Pt BDS PGIMS Rohtak, Haryana, India.

Orcid ID:

Dr. Tarun Yadav - <https://orcid.org/0000-0003-4943-1031>
Dr. Mayuri Golhar - <https://orcid.org/0000-0002-1653-3261>
Prof. Dr. Sanjay Johar - <https://orcid.org/0000-0002-1039-1469>
Prof. Dr. Naveen Malhotra - <https://orcid.org/0000-0002-5427-2170>
Dr. Rajni Gupta - <https://orcid.org/0000-0003-1351-3238>

Source of Funding: None. **Conflict of Interest:** None