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Efficacy of Ultrasound Guided TAP Block with the Standard Post-Operative Analgesic Regimen, In Providing Post-Operative Analgesia for Patients Undergoing Total Abdominal Hysterectomies

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Abstract

Introduction: A recent development in the treatment of post-operative pain is the use of peripheral nerve blocks. The technique involves blocking the conduction of nerve impulses by deposition of local anaesthetic around the nerve or nerves supplying the area of interest. Consequently, the sensory and/or motor supply to the area supplied by the nerves, are effectively abolished, thus helping to achieve anaesthesia and analgesia.

Methodology: The patients were selected by convenience sampling and those who matched the selection criterion, were briefed about the nature of the study and the procedures involved, in a language understood by them and written informed consent was taken. Descriptive data of the patient such as name, age, sex and detailed medical history, was collected. They were randomized into two groups with the help of computerized randomization software.

Results: In our study it was noted that the mean total rescue analgesic consumption in patients belonging to Group S (over a period of 24 hours) was 73.3 mg. Whereas the mean total rescue analgesic consumption in Group T was only 35 mg. This difference in the mean total rescue analgesic consumption between the two groups was found to be statistically significant (p value < 0.001).

Conclusion: Patients in both Group T and Group S experienced some degree of nausea at the 2, 4 and 6 hour intervals, but the PONV scores of both the groups were comparable. Thereafter, patients in both the groups were asymptomatic.

Keywords: Ultrasound guided TAP block; Post-Operative analgesia; Total abdominal hysterectomies.

Introduction

The International Association for the Study of Pain defines pain as "an unpleasant sensory and emotional experience associated with actual and potential tissue damage, or described in terms of such damage". Patients undergoing abdominal surgeries experience significant post-operative pain and discomfort, which is maximal in the first 24–48 hours post-operatively.

Any unaddressed pain stimulus triggers a neuro-hormonal stress response involving the hypothalamus-pituitary-adrenocortical axis and the sympathetic autonomic nervous system. The activation of this stress response shifts the body

into a hyper-catabolic state, which leads to negative nitrogen balance and delayed convalescence. Activation of the stress response to pain causes post-operative hyper-coagulability due to reduced levels of natural anticoagulants and increased levels of pro-coagulants, thereby predisposing the patients to develop episodes of venous thrombo-embolism. It also increases the risk for myocardial ischaemia and infarction, secondary to imbalances in myocardial oxygen demand and supply. Inadequate pain control may hinder the respiratory efforts of the patients and may be associated with an inadequate cough, thereby predisposing the patients to the development of post-operative pulmonary complications .

Therefore, it is highly necessary to contain the stress response following surgery by providing adequate post-operative analgesia. This ensures reduced post-operative morbidity, and facilitates improved surgical outcome.[1]

In the current scenario, most surgeries are performed as laparoscopic surgeries. Despite this trend, some surgeries, such as the total abdominal hysterectomy, are performed as open surgeries, requiring an incision on the abdominal wall. The skin incision and muscle retraction contribute significantly to the development of post-operative pain. Therefore, most of the pain that the patient experiences, originates in the abdominal wall. This pain is called parietal pain, because of the somatic innervation of the structures involved.[2]

In order to tackle the problem of post-operative pain, multiple analgesic modalities have been developed and practiced. The most commonly used modality is the administration of oral/ per rectal/ parenteral analgesics (opioids or non-steroidal anti-inflammatory drugs) at regular intervals. In many institutes, this is supplemented by patient controlled analgesia (PCA) with intravenous analgesics and neuraxial blocks (epidural analgesia in the form of continuous epidural infusions).

Parenteral opioids, commonly used for postoperative analgesia, are associated with a significant incidence of adverse effects, such as postoperative nausea and vomiting, sedation and pruritus. Besides, the analgesia provided by parenteral analgesics is not uniformly adequate. Pain scores tend to increase towards the end of a dose, secondary to the falling concentrations of the drug in the plasma. Consequently, there arises a need to use a poly-pharmacy approach or a continuous infusion based approach, to tackle breakthrough pain. This, in turn, increases the incidence of adverse effects in patients.[3]

Neuraxial modalities, such as epidural analgesia, are associated with problems like hypotension, delayed ambulation secondary to slow recovery of muscle tone and sedation, when narcotics are used as adjuvants in neuraxialanaesthesia. This warrants close monitoring of the patients in a High Dependency Unit or the Post Anaesthesia Care Unit. The nerve involvement in neuraxial modalities of anaesthesia and analgesia is not selective. Due to the involvement of a large number of nerves, there is unwanted sensory and/or motor blockade, which can cause undue anxiety in the patient. Consequently, there arises a need for other effective post-operative analgesic modalities to overcome the shortcomings of neuraxial modalities of analgesia, as well as those of parenteral analgesics.

Peripheral nerve blocks can be used in multiple settings to provide adequate anaesthesia and/or analgesia in patients undergoing surgeries. They can be used to anaesthetize single nerves, such as the ilio-inguinal and ilio-hypogastric nerves in patients undergoing inguinal hernia repairs. In addition, these nerve blocks can be employed to block an entire plexus of nerves, if a larger area needs to be anaesthetized viz. brachial plexus blocks for upper extremity surgeries, lumbar plexus blocks for patients undergoing hip and knee surgeries. Field blocks, such as the transversusabdominis plane block, the quadratuslumborum block and the erector spinae plane block, help to anaesthetize the nerves providing cutaneous innervation to the operative site i.e. the abdomen and thorax respectively.[4]

Due to the targeted nature of nerve blockade and lack of systemic effects such as hypotension and bradycardia, peripheral nerve blocks are safer as compared to neuraxial modalities of analgesia. These blocks provide effective analgesia over a long duration of time and hence, decrease the need for postoperative analgesics and their antecedent adverse effects such as post-operative nausea, vomiting and sedation. Consequently, the patient can be mobilized earlier and the duration of stay in the post-anaesthesia care unit is shortened. This leads to increased patient satisfaction. Hence, peripheral nerve blocks find application as a modality for administering anaesthesia, providing post-operative analgesia and also to treat chronic pain disorders.[5]

In patients undergoing lower abdominal surgeries, most of the post-operative pain originates from the abdominal wall, which receives its innervation from the anterior rami of the spinal nerves T_7-L_1. In such a setting, by administering field blocks such as the transversusabdominis

plane block (TAP block), one can achieve the goal of providing adequate and effective post-operative analgesia, while avoiding any compromise in the patient's physiology.[6]

The goal of our study is to evaluate the efficacy of the TAP block in providing post-operative analgesia in patients undergoing total abdominal hysterectomies, in comparison to the standard post-operative analgesic regimen being followed at our hospital.

Methodology

The patients were selected by convenience sampling and those who matched the selection criterion, were briefed about the nature of the study and the procedures involved, in a language understood by them and written informed consent was taken. Descriptive data of the patient such as name, age, sex and detailed medical history, was collected. They were randomized into two groups with the help of computerized randomization software. The groups were:

I. *Group S- Standard regimen group:* The patients in this group received the standard post-operative analgesic regimen of intravenous paracetamol 1 gm every 8th hour following the surgery.

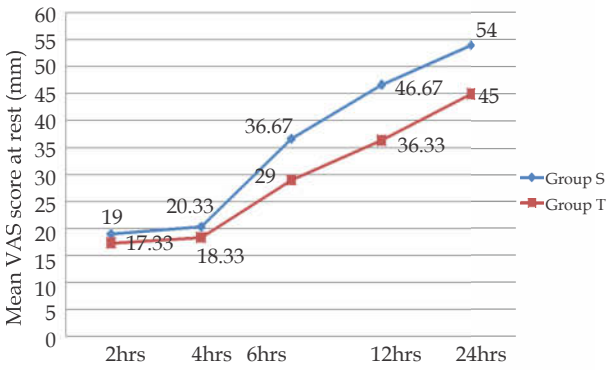
II. *Group T- TAP block group:* Patients in this group received post-operative ultrasound guided TAP block with 0.25% bupivacaine as the analgesic modality.

Patients in both the groups received rescue analgesic in the form of intramuscular tramadol (50mg), when VAS scores at rest were greater than 50 mm. The patients were then assessed for the efficacy of analgesia over a 24 hour post-operative period, with the help of the following parameters:

- Visual Analog Scale scores at rest at 2 hours, 4 hours, 6 hours, 12 hours and 24 hours, post-operatively.
- Visual Analog Scale scores with cough at 2 hours, 4 hours, 6 hours, 12 hours and 24 hours, post-operatively.
- Time to the first dose of rescue analgesic.
- Total amount of rescue analgesic used over a post-operative period of 24 hours.
- Post-operative nausea and vomiting at 2 hours, 4 hours, 6 hours, 12 hours and 24 hours assessed via a graded score.
- Post-operative sedation at 2 hours, 4 hours, 6 hours, 12 hours and 24 hours assessed via the Ramsay Sedation Scale.

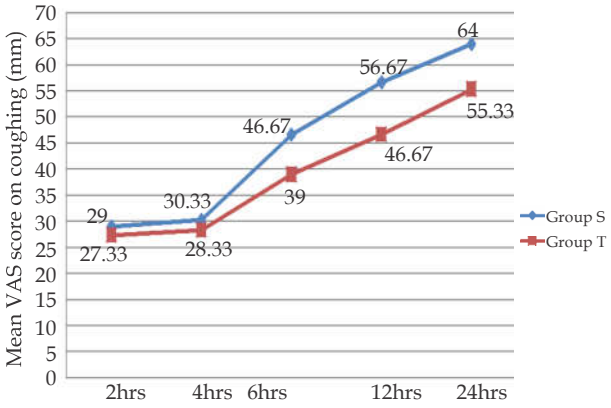
Pre-anaesthetic evaluation: All patients selected for the study underwent a thorough pre-anaesthetic evaluation via history and clinical examination. In all the patients- height, weight, basal heart rate, respiratory rate and blood pressure was measured and recorded. In addition to standard investigations bleeding time, clotting time, prothrombin time and International Normalized Ratio was done for all patients in the study.

Results



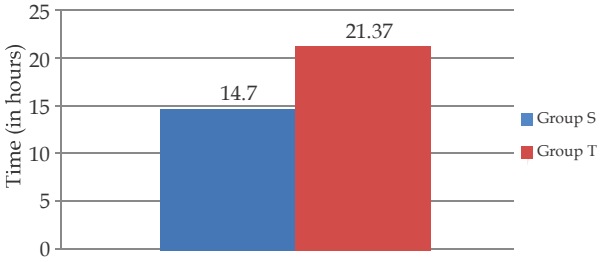
Graph 1: Comparison of mean VAS scores at restbetween the two study groups.

Inference: In our study, it was observed that there was no statistically significant difference in the mean VAS scores at rest of Group S and Group T, at the 2 hour interval (p value: 0.098). However, at the subsequent intervals of 4 hours, 6 hours, 12 hours and 24 hours, the mean VAS scores at rest of both the groups showed an increasing trend. Notwithstanding the increase in scores, the mean VAS scores at rest of patients in Group T were significantly lesser than those of Group S (p value in the range of 0.012 to < 0.001). (Graph 1).



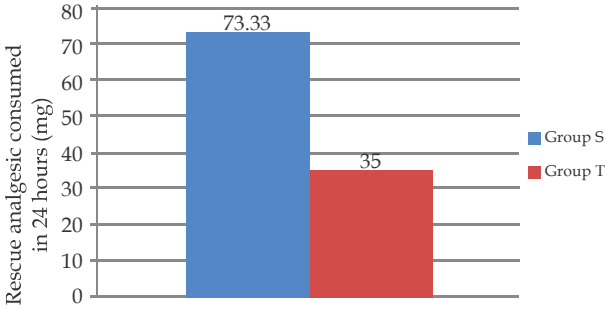
Graph 2: Comparison of mean VAS Score on coughing between the two study groups.

Inference: In our study, it was noted that the two groups did not show any statistically significant difference in the mean VAS scores on coughing at the 2 hour interval (p value: 0.098). Thereafter, the mean VAS scores on coughing in both the groups increased, when the patients were evaluated at the 4 hour, 6 hour, 12 hour and 24 hour intervals. Despite this increase, it was observed that the mean VAS score on coughing of patients in Group T were significantly lesser than those in Group S at all the time intervals studied (p value in the range of 0.012 to < 0.001). (Graph 2).



Graph 3: Comparison of time to first request for rescue analgesic between the two study groups.

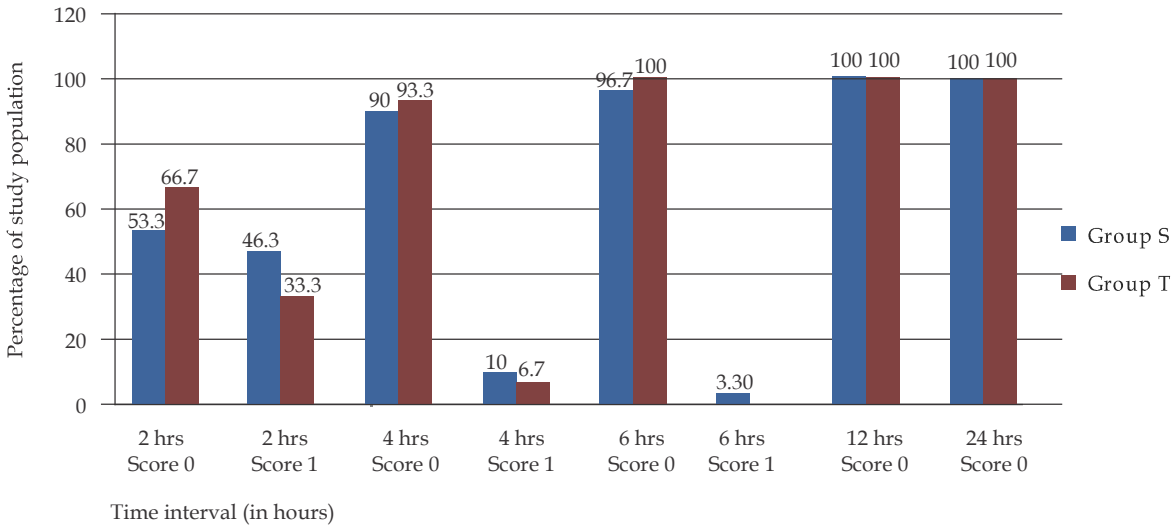
Inference: In our study, it was observed that the mean time for first request for rescue analgesic in patients belonging to Group S was 14.7 hours. It was noted that the mean time for first request for rescue analgesic was 21.37 hours in patients belonging to Group T. This difference in the time to request between the two groups was found to be statistically significant (p value < 0.001). (Graph 3).



Graph 4: Comparison of mean rescue analgesic consumption (over 24 hours) between the two study groups.

Inference: In our study it was noted that the mean total rescue analgesic consumption in patients belonging to Group S (over a period of 24 hours) was 73.3 mg. Whereas the mean total rescue analgesic consumption in Group T was only 35 mg. This difference in the mean total rescue analgesic consumption between the two groups was found to be statistically significant (p value < 0.001).(Graph 4).

Inference: In our study it was observed that the total number of patients in Group T experiencing nausea (PONV score 1) were lesser than those in Group S, when assessed for the same at 2 hours, 4 hours, 6 hours. But this difference was not statistically significant (p value > 0.05). At the subsequent intervals of 12 and 24 hours there was no difference in the incidence of PONV between the two groups. (Graph 5).



Graph 5: Comparison of PONV scores between the two study groups.

Discussion

In our study, it was observed that the mean time for first request of rescue analgesia in patients belonging to Group S was 14.7 hours, whereas it was 21.37 hours in patients belonging to Group T. This difference in the time to first request for rescue analgesic between the two groups was found to be statistically significant (p value < 0.001).

In a randomized controlled trial conducted by Sivapurapu V et al.,[7] to compare the analgesic efficacy of the TAP block with direct infiltration of local anaesthetic the time to first request for rescue analgesic was noted. It was found that the mean time to request for patients in the TAP block group was around 148 minutes while for the infiltration group it was 85.38 minutes. This difference between the two groups was statistically significant (p value: 0.001). Similar results were obtained in our study, where the mean time to request for rescue analgesia was 21.37 hours in Group T and 14.7 hours in Group S (p value < 0.001).

Bharti et al.,[8] carried out a study to evaluate the analgesic efficacy of a novelapproach to TAP block, in patients undergoing colorectal surgeries. The time to first request for rescue analgesic was noted in both the TAP block group and the control group. It was observed that although the time to first request for rescue analgesic was prolonged in the TAP block group, the difference was not statistically significant. It was also noted that the time to subsequent doses of rescue analgesic were significantly prolonged in patients belonging to the TAP block group (p value < 0.01). The comparable values for the time to first request for rescue analgesia could be due to the administration of intravenous morphine (0.15 mg/kg) as a part of the standard general anaesthetic plan. This could have provided a sufficient duration of analgesia peri-operatively in patients of both the groups. However, the longer intervals between subsequent instances of rescue analgesic administration could be due to the efficacious analgesia provided by the TAP block. In our study there was a significant prolongation in the time to first request for rescue analgesia in patients receiving TAP block due to effective analgesia obtained by the block.

Kanazi et al.,[9] carried out a study to compare the analgesic efficacy of sub arachnoidmorphine with that of TAP block in women undergoing Caesarean sections. Time to first request for rescue analgesic was noted in patients belonging to both the groups. It was observed that the median time to first request for rescue analgesic was longer in the group receiving sub arachnoid morphine (8 hours) as compared to the group receiving TAP block (4 hours) (p value: 0.005). This is in stark contrast to the findings of our study, where there wasa significant prolongation in the time to first request for rescue analgesia in Group T. This can be explained by the fact that intrathecal morphine produces an effective and prolonged analgesia, thereby delaying the need for any rescue analgesic.

In a meta-analysis conducted by Mishriky B M et al.,[10] to evaluate the efficacy of the TAP block in providing analgesia in women undergoing Caesarean sections, the time to first analgesia was assessed. In the sub analysis comparing TAP blocks with controls in patients who did not receive intra-thecal morphine, it was noted that TAP blocks produced a significant prolongation in the time to first analgesia when compared to the controls. These results concur with the findings of our study. In patients who had received intra thecal morphine, it was noted that the mean time to first analgesia was longer in patients who had received intrathecal morphine when compared to those who had received the TAP block.

In our study it was noted that the mean rescue analgesic consumption over 24 hours post-operatively, in patients belonging to Group S (73.3 mg) was greater than those in Group T (35 mg). This difference in the amount of rescue analgesic consumed between the two groups was statistically significant (p value < 0.001).

In a study evaluating the analgesic efficacy of ultrasound guided TAP block in patients undergoing open appendicectomy conducted by Niraj G et al.,[11] both the groups were assessed for 24 hour morphine consumption. It was found that there was a significant reduction in the 24 hour morphine consumption in the group receiving TAP block (28 mg) when compared to the group receiving standard post-operative analgesia (50 mg) (p value < 0.002). This is in concordance to the results of our study, which showed that the total dose of rescue analgesic consumed was significantly lesser in Group T when compared to Group S.

In a randomized controlled trial conducted by Sivapurapu V et al.,[7] to compare the analgesic efficacy of the TAP block with direct infiltration of local anaesthetic the 24 hour morphine consumption was observed. It was found that the patients who had received a TAP block had a significantly lesser 24 hour morphine consumption (22.15 mg) when compared to the group that received surgical site infiltration (29.15 mg) (p value: 0.001). In our study too the total dose of rescue analgesic consumed

over 24 hours was significantly lesser in Group T when compared to Group S (p value < 0.001).

Ebru Salman et al.,[12] conducted a prospective double blinded randomized studycomparing the TAP block with the placebo block in patients undergoing inguinal hernia repair. In the study the 24 hour morphine requirement in both the TAP block group and the control groups was assessed. It was found that the 24 hour morphine requirement was significantly reduced in the group receiving TAP block (p value <0.001). Similar results were found in our study.

Bharti et al.,[8] in their study to evaluate the analgesic efficacy of a novel approach toTAP block, found that the 24 hour morphine requirement (as a rescue analgesic) was significantly lower in the group receiving the TAP block (6.45 mg) when compared to the control group (17.55 mg) (p value < 0.0001). Similar results were obtained in our study.

In our study, patients in both Group S and Group T were assessed for severity of post-operative nausea and vomiting using a graded scale. It was observed that some patients in both Groups S and T experienced nausea (PONV score 1) at 2 hours, 4 hours, 6 hours. Thereafter none of the patients in either group were nauseous or had vomiting. This difference in PONV scores between Group S and Group T, in the early post-operative intervals was not statistically significant (p value> 0.05).

In a randomized controlled trial conducted by Sivapurapu V et al.,[7] comparing the analgesic efficacy of the TAP block with direct infiltration of local anaesthetic into surgical incision, the incidence of PONV was assessed. Patients in both the groups were evaluated at regular intervals, post-operatively for the incidence of PONV. It was found that there was a significant reduction in the incidence of PONV in the group receiving TAP block. This was due to the lesser demand for rescue analgesia (morphine 0.1 mg/kg bolus followed by morphine PCA). In our study, there was no significant difference in the incidence of PONV at 2, 4 and 6 hour intervals, in both Group S and Group T. This could be attributed to the effects of intrathecal buprenorphine used in our study. Thereafter patients in both the groups had no complaints of nausea or vomiting. This finding could be due to the lack of usage of opioids as rescue analgesic in our study, unlike the aforementioned study.

It should be noted that the incidence of post-operative nausea and vomiting is affected by multiple factors such as the use of opioids in the peri-operative analgesic plan, the frequent administration of antiemeticsperi-operatively and the predisposition of the patient towards GERD. These variables could lead to variations in the incidence of PONV in patients undergoing surgery.

Conclusion

The mean time for first request for rescue analgesic in patients belonging to Group T (21.37 hours) was significantly longer than that of patients in Group S (14.7 hours) (p value < 0.001).

The mean total rescue analgesic consumption in patients belonging to Group S (over a period of 24 hours) was 73.3 mg, whereas in Group T it was only 35mg

This difference in the mean total rescue analgesic consumption between the two groups was found to be statistically significant (p value < 0.001).

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