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Addition of Morphine to Bupivacaine in Ultrasound Guided Transversus Abdominis Plane Block Prolongs Postoperative Analgesia after Gynaecological Cancer Surgery

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Abstract

Background: There is significant postoperative pain in major gynecological cancer surgery patients. Ultrasound (USG) guided Transversus Abdominis Plane (TAP) block is a novel approach to provide analgesia to anterior abdominal wall. We evaluated the analgesic efficacy of the morphine added to bupivacaine in USG guided TAP block to patients undergoing major gynecologic cancer surgeries in a prospective randomized controlled clinical study. *Method:* After ethical committee approval, 60 ASA grade I and II adult female patients were included and randomly divided into 2 groups (30 each) to receive either 20ml 0.5% bupivacaine +morphine 0.1mg/kg diluted in 20ml saline (BM group) or 20ml 0.5% bupivacaine alone diluted in 20ml saline (B group) bilaterally in USG guided TAP block. Observation was done for time for first rescue analgesic requirement, total analgesic requirement, VAS score at rest and on movement, hemodynamics and drug related side effects for 24 hours in postoperative period. *Results:* Time for requirement of first rescue analgesic was significantly longer in BM group 11.20±3.16 hours in comparison to B group 8.10±2.13 hours ($p<0.001$) Total diclofenac sodium requirement in 24 hrs in BM group was 30.70±10.20mg and in B group was 93.20±20.36 mg ($p<0.001$). In BM group VAS score at 6, 8, 12hours were significantly lower compared to B group ($p<0.001$). No significant difference in hemodynamic changes and side effects. *Conclusion:* The USG guided TAP block using morphine with bupivacaine provided superior postoperative analgesia when compared to bupivacaine alone after major gynecological cancer surgeries without any significant side effects.

Keywords: Bupivacaine; Gynecological Cancer Surgery; Morphine; Transversus Abdominis Plane Block; Ultrasound.

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Introduction

TAP block is a regional anaesthesia technique providing analgesia to the parietal peritoneum, skin and muscles of anterior abdominal wall by blocking the abdominal wall neural afferents (T7-L1) with deposition of local anaesthetic in the neurofacial planebetween the internal oblique and transversus abdominis muscle [1]. Rafi first documented the TAP block in 2001 [2]. An ultrasound guided approach was first described in 2007 by Hebbard et al. [3].

TAP block has been described as a safe and effective postoperative analgesia technique in many abdominal surgeries [4,5,6]. It is considered as an important component of multimodal anaesthesia approach to enhance recovery after lower abdominal surgeries [7,8].

In several knee surgeries, Intraarticular morphineinjections for postoperative analgesia have been found to be effective [9,10]. Denis et al. [11] and Fatma et al. [12] found improvement in postoperative analgesia with morphine when

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added to local anaesthetic solution in axillary block and USG guided TAP block respectively.

Our study was aimed to investigate the analgesic efficacy and safety of morphine added to bupivacaine in USG guided TAP block bilaterally at the end of surgery in gynecological cancer patients.

Material and Method

After getting ethical committee approval from instituteand written informed consent, 60 ASA grade I and IIadult female patients were enrolled for gynecological cancer surgery [total abdominal hysterectomy with bilateral salpingo-ophorectomy]. Patients excluded in this study were those having significant cardiac, respiratory, renal and hepatic diseases, coagulation disorders, known allergy to study drugs and psychiatric illnesses resulting in poor perception and assessment of post-operative pain.

In preoperative period all patients were informed about use of Visual Analogue Scale (VAS), scored from 0 to 10 (where 0=no painand 10=worst imaginable pain) for evaluation of pain intensity.

Patients were centrally divided with central computer guided sequence held by an investigator not involved with the clinical management or data collection into two equal groups of 30 each to receive either.

Group BM (n=30)- USG guided TAP block with 20ml of 0.5% bupivacaine with 0.1mg/kg of morphine diluted in 20ml saline, 20ml on each side of anterior abdominal wall.

Group B (n=30) USG guided TAP block with 20ml of 0.5% bupivacaine alone dilute in 20ml saline, 20ml on each side of abdominal wall.

Oral lorazepam 1mg was given the night before surgery. In Operation Theater intravenous line was securedand monitors like electrocardiography (ECG), noninvasive blood pressure (NIBP), arterial oxygen saturation (SPO_2) and end-tidal carbon dioxide ($ETCO_2$) were applied.

Induction of anaesthesia was done with 0.2mg glycopyrolate, 2 µg/kg fentanyl, 2mg/kg propofol and lignocaine 1.5mg/kg. Succinylcholine 2 mg/kg was given for ET intubation, Ryle's tube wasinserted and removed at end of surgery and continued paralysis with atracurium 0.5mg/kg. Maintenance was done with sevoflurane on MAC 2 with oxygen and nitrous oxide (40:60 %) with intermittent bolus of atracurium. USG guided TAP block was performed immediately after skin closure and before reversal of patient.

To produce bilateral TAP block high frequency linear ultrasound probe (Sonosite R, Inc. U.S.A.) was placed in a tranverse plane to the lateral abdominal wall in the mid-axillary line, between the lower costal margin and the iliac crest. The niddle was inserted in a sagittal plane approximately 3-4cm medial to the ultrasound probe.After watching three muscle layers properly, needle tip was directed into the plane between internal oblique and transversus abdominis muscle. Upon reaching the plane, after negative aspiration of blood 2ml of saline was injected to confirm correct needle position and full dose of study drug was administered.

All patients received paracetamol 1gmat the start of peritoneal closure and repeated every 8 hourly in post-operative period. At the end of surgery all patients were reversed with neostigmine 0.05 mg/kg and glycopyrolate 0.008 mg/kg and were transferred to surgical intensive care unit. Monitoring was done for VAS score at rest and on movement at 0, 1, 2, 4, 6, 8, 12, 18, 24 hours postoperatively. Patients were given diclofenac sodium 1.5mg/kg intravenously (to a maximum 3mg/kg), when VAS score was >/=3. Sedation was evaluated along with VAS using a four point additional scale (1= awake and alert, 2=awake but drowsy responding to verbal stimulus, 3=arousable, responding to physical stimulus, 4=not arousable, not responding to physical stimulus). Sedation was defined as sedation score >1 at any postoperative period. Time for request to first rescue analgesic (diclofenac sodium) was recorded and total amount of rescue drug required was noted. Monitoring for respiratory rate, arterial oxygen saturation, hemodynamics, and side effects like nausea, vomiting, pruritus was done postoperatively at 2, 4, 6, 8, 12, 18, 24 hours and treated accordingly. Primary outcome was to note the time for first request of rescue analgesic and VAS score for pain intensity. Secondary outcome was to observe total 24 hours rescueanalgesic requirement and side effects.

Statastics

The results were analyzed with Graph Pad software. p value <0.05 was considered significant and p <0.001 as highly significant. VAS score comparison at each time interval was done using the t-test or Mann-Whitney U-test as appropriate. Time for first request to rescue analgesic and total 24 hours analgesic requirement was analyzed using student's t-test. Analysis of categorical data was done using Chi-square or Fisher's exact test.

Results

Total 60 patients were included in our study. All patients were similar in terms of demographic data (age, weight), duration of surgery, and types of surgical incision. (p>0.05) (Table 1).

The mean time to first inj.diclofenac sodium was significantly prolonged in BM [11.20±3.16 hrs] compared with B group (8.10±2.13 hrs) P value <0.001 (Table 2).

VAS pain score at rest and on movement were significantly lower in group BM in comparison to group B at 6,8,12 hrs postoperative study period with statistical significance (p <0.001) Figure 1 and Figure 2.

The 24 hours diclofenac consumption was significantly lower in BM group as compared to B group with significant p value (<0.001).No significance difference in incidences of nausea [BM-2 (6.7%), B-3 (10%) p value >0.05 and vomiting [BM-3 (10%), B-2 (6.7%)] p value >0.05 were found. Postoperative hemodynamic parameters, sedation, respiratory rate, peripheral arterial oxygen saturation were not statistically different at any point (p>0.05).

Discussion

TAP block provides post-operative analgesia for various abdominal procedures demonstrating reduction in postoperative analgesic requirement, lower pain score and/or reduction in opioid related side effects [12,13,14].

Table 1: Demographic data

Patients characteristics	Group BM (n-30)	Group B (n-30)	P Value
Age	46.13±5.08	47.43±4.32	0.2
Weight	56.66±5.01	54.42±6.18	0.12
Duration of surgery (hrs)	3.01±0.53	2.98±0.54	0.82
Types of incision Infra umbilicus vertical	30 (100%)	30(100%)	

Data presented as mean±SD or Number (%):
*p value < 0.05 is considered significant

Table 2: Postoperative Diclofenac Requirement

Analgesic requirement	Group BM (n-30)	Group B (n-30)	P Value
Time for 1st need of diclofenac(hr)	11.20±3.16	8.10±2.13	<0.001
Total diclofenac consumption (mg/24hr)	30.70±10.20	93.30±20.36	<0.001
Total no. of patients needed diclofenac(%)24 hr	10(33.33%)	30(100%)	

Data presented as mean±SD or Number (%):
*p value < 0.05 is considered significant
*p value <0.001 is considered highly significant

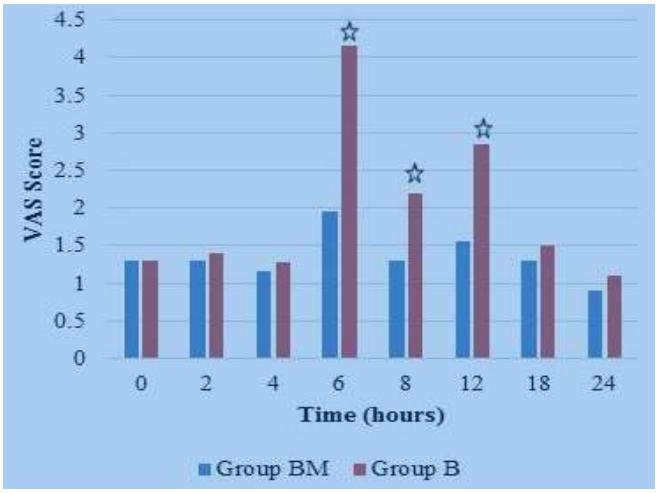

Fig. 1: Post-operative pain score (VAS Score at rest) during first 24 hours in both groups. The mean score were lower in group BM than in group B. The difference was statistically significant at 6, 8 and 12 hours after surgery (shows p value < 0.05). Data presented as mean

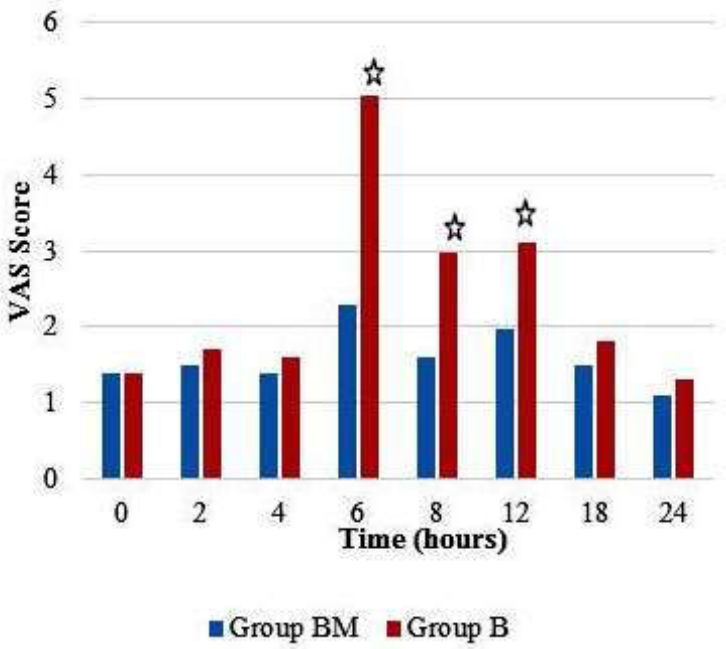

Fig. 2: Post-operative pain score (VAS Score on movement) during first 24 hours in both groups. The mean score were lower in group BM than in group B. The difference was statistically significant at 6, 8 and12hours after surgery (shows p value < 0.05). Data presented as mean

TAP block can be given using landmark guided blind technique or USG guided technique [15]. USG guided technique facilitates the visualization of movement of needle and controls the spread of anaesthetic drug to proper regions with improvement in quality of nerve block. Other advantages of USG Guided technique are reduction in procedure time due to less number of attempts, acceleration of block starting time and prevention of gastrointestinal injury [16].

These are the reasons of our study being carried out under USG guidance without any complications.

In our study comparisons done between bupivacaine morphine combination and bupivacaine alone in USG guided TAP block at the end of surgery in major gynecological cancer surgery patients and results we found were mainly reduction in pain score resulting in less post-operative analgesic requirement and prolongation of time to first request to analgesic in BM group compared to B group.

Morphine may have ability to inhibit nociceptive sensation of peripheral sensory neurons and excitatory effects in spinal cord proinflamatory reflex mechanism [17]. In a review study Sehgal N et al. [18] summarized that morphine acts by its peripheral mechanism in peripheral opioids receptors not by its systemic absorption.

We selected to use morphine with bupivacaine in TAP block in gynec cancer surgery patients as Fatma et al. [12] used this combination with better results in morphine group than in bupivacaine alone group. Hussain et al. [9] also used intraarticular morphine vs. bupivacaine for post-operative analgesia.

In our study we gave USG guided TAP block at the end of surgery as Dirican B [7] found that post-operative administration of USG guided TAP block decreased total 24 hours morphine consumption with decreased post-operative pain sensation compared to preoperative administration of the TAP block in total hysterectomy patients. Many studies have demonstrated the efficacy of TAP block for post-operative analgesia complementary to general anaesthesia in abdominal surgeries [8,19,20].

Yousry Kandi [4] found that TAP block provided highly effective postoperative analgesia in first 24hours period and reduced mean intravenous morphine requirement by more than 70% in patients following lower abdominal surgery. Petersen et al. [16] reviewed that there is reduction in 24 hour morphine requirement of 22mg in favour of TAP block patients compared to standard management.

Our study demonstrates that first request to diclofenac sodium was at (11.20±3.16) hours in BM group and (8.1±2.13) hours in B group suggesting

prolonged analgesia with addition of morphine to bupivacaine. Total postoperative diclofenac sodium requirement was significantly less in BM group (30.70±10.20mg) in comparison to B group (93.30±20.36mg). There was significant decrease in VAS score at rest and on movement at 6, 8, 12 hours in BM group when compared to group B.In various studies, this findings are in accordance with our study when morphine is added to local anaesthetic [9,10,11,12].

When other adjuvants like clonidine and magnesium sulphate are added to local anaesthetic for TAP block, there is also prolonged analgesia with reduction in post-operative analgesic requirements [13,22,23].

We selected morphine dose of 0.1mg/kg as Garcia JB [24] et al. observed somnolence in16% of patients with use of 10mg intraarticular morphine.

In our study there was no difference in hemodynamics, sedation, incidence of nausea and vomiting and pruritusin both groups.

Conclusion

Morphine acts as an effective adjuvant to bupivacaine in TAP block for postoperative analgesia in terms of prolonged analgesia and better pain relief with less rescue postoperative analgesic requirement in major gynecological cancer surgery patients without any side effects.

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