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*Full Length Research paper*

# Post Myomectomy Pain Management at University of Port Harcourt Teaching Hospital, Nigeria: A Case Report/Critical Analysis

**Eze Onyegbule Okubuiro[a*], Longinus Ndubuisi Ebirim[b] and Chinwe Edith Okoli[c]**

[a]Consultant Anaesthetist, Marina Specialist Hospital, Port Harcourt, Nigeria.
[b]Consultant Anaesthetist, University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.
[c]Consultant Anaesthetist, Federal Medical Centre, Umuahia, Nigeria.

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***Abstract***

**BACKGROUND: Fibroid is a common benign uterine tumour with a higher prevalence among women of African descent. The definitive treatment involves surgery. Post-operative pain management following such intervention in resource-limited settings may be challenged by paucity of skilled man-power and other infrastructural inadequacies. Different post-operative analgesia options have been explored by operators in such environments to achieve desired outcomes. CASE PRESENTATION: We report a case of 32-year-old woman who underwent myomectomy at the main theatre of the University of Port Harcourt Teaching Hospital (UPTH), Nigeria for symptomatic fibroid. Bupivacaine epidural anaesthesia was employed for the surgery. Top-up (repeat bolus) doses of bupivacaine (10mls of 0.25%) epidural analgesia and regular diclofenac, with tramadol for breakthrough pain were utilised in a multi-modal post-operative analgesia regimen, to achieve a satisfactory clinical outcome. CONCLUSION: We have presented a detailed report of an epidural-based multi-modal post-operative pain management technique following a major lower abdominal surgery. If a patient receives epidural anaesthesia for such surgical procedure, then an epidural-catheter in-situ for 1st 24 hours could be recommended for further use in the management of post-operative pain.**

**Keywords:** ‘epidural’, ‘analgesia’, ‘myomectomy’, ‘pain-management’.

## INTRODUCTION

Leiomyoma uteri (fibroid) is a monoclonal smooth muscle tumour of the uterus. It is the most common benign tumour in women. This disorder of uncertain aetiology has a higher preponderance among African-Americans; it affects more than half of women within the reproductive age in United States of America, Payson *et al*., 2006. It is associated with lower abdominal pain, dysmenorrhoea, menorrhagia, anaemia, infertility, increased preterm labour, fetal malpresentation/malposition and caesarean delivery. Fibroid presents a tremendous public health burden and economic cost on society, Payson *et al*., 2006; it is most common after the third decade of life.

The definitive treatment of uterine fibroids is surgery, Lefebvre *et al.,* 2003. This may involve open or laparoscopic myomectomy. Abdominal hysterectomy is indicated where the tumour is massive or the woman has completed her family size. In traditional (open) myomectomy, the uterus is approached through a lower abdominal (pfannenstiel or midline) incision under general or regional anaesthesia. Laparoscopic

Corresponding author email: ezeokb@gmail.com

myomectomy confers better cosmesis, less hospital stay, post-operative pain, and adhesions. It is ideal for small lesions but, equipment and skills for this is not universally available.

Pain following surgery (post- operative pain) can be distressful. Post-operative pain is termed 'acute pain' as it has a definite cause and end point (after healing is completed) under normal circumstances. Adequate post-operative analgesia is necessary to prevent central sensitization and emergence of chronic pain states, Sinatra, 2010. Good analgesia is imperative to prevent the adverse physiological and psychosocial effects of post-operative pain on patient's recovery. Adequate management of post-operative pain alleviates suffering and enables early mobilization, shortened hospital stay, reduced hospital costs, and increased patient satisfaction, Mariano *et al.,* 2018.

Different methods of post-operative pain relief such as opioid therapy, epidural analgesia and transversus abdominis plane (TAP) block have been employed following myomectomy, Rafi, 2001. While opioids are associated with more side effects than epidural analgesic techniques, both can be administered by bolus, infusion or patient controlled means. TAP block for post-operative pain management is not yet practiced routinely globally. Choice of post-myomectomy analgesic technique is informed by patients' clinical state, availability of drugs, equipment and trained man-power. This analytical case report would consider a patient who received bupivacaine epidural analgesia for post-myomectomy pain relief. Alternative evidence-based post-operative pain management strategies would also be considered. These would be analysed with a bias for the pharmacological and physiological principles underlying their use.

## CASE PRESENTATION

Mrs. A a 32 years old lady with a six months history of menorrhagia was admitted to the gynaecology ward of the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Nigeria, for elective myomectomy. The fibroid also manifested as a lower abdominal mass which had been increasing in size for 2 years. There was no history of concurrent medical ailment. She had neither been previously exposed to surgery nor anaesthesia. The patient had no previous narcotic experience and never smoked tobacco nor consumed alcoholic beverages. She had been married to a middle-aged civil servant for eleven months prior to admission. She was para 0+0 with a basal metabolic index (BMI) of 26.2.

She was categorised in class II of the American Society of Anaesthesiologists classification on account of anaemia (HB: 8.3g/dl). She received two units of packed cells a day before surgery. Other laboratory and radiological results were within normal limits. Post-operative analgesic options were discussed and written informed consent for anaesthesia, surgery, and post-operative pain management technique were obtained pre-operatively. Prophylactic antibiotic cover was given by the anaesthetist before surgical incision. Surgery was performed under epidural anaesthesia using 15mls of 0.5% plain bupivacaine, which was administered via a catheter at the L3/L4 interspace (after a test dose). She also received intravenous diazepam 5mg for anxiolysis intra-operatively. Twenty-two fibroid nodules of different sizes were extracted from the sub-mucous, intramural and sub-serosal portions of the uterus. Surgery lasted about 105 minutes, uterine tourniquet was applied for 82 minutes and the estimated blood loss was 600mls. The average intra-operative numerical rating score (NRS) was 1/10. Intra-operatively, there was no incidence of hypotension and the average systolic, mean, and diastolic blood pressures were 134mmHg, 95mmHg, and 76mmHg, respectively. And, the average pulse rate, temperature, respiratory rate, and oxygen saturation were 78 beats per minute, $37.2^0$C, 18 cycles per minute, and 98% (on room air), respectively. Intra-operative surgical anaesthesia was uneventful.

In recovery ward, when the numerical rating score (NRS)for pain increased to 4/10,post-operative top-up epidural analgesia using 10mls of 0.25% bupivacaine was administered thru the epidural catheter which was left in-situ. This dose was repeated 8-hourly by on-call Anaesthetist for the first 24 hours and the epidural catheter was removed thereafter. Multimodal analgesia was achieved with the addition of diclofenac rectal suppository 100mg before transfer to the recovery room and 12-hourly for 24-hours. Any exacerbation of post-operative pain (NRS >3) after top-up epidural analgesia within 24 hours was managed with intravenous bolus doses of tramadol 100mg (8-hourly) as required. However, this was required only once within this period and the average NRS score in the first 24 hours post-surgery was 3/10. During this period (first 24 hours post-surgery), the average modified-bromage score was 3 out of 4.

On the 1st day post-surgery, patient commenced oral fluids and was able to sit out of bed. She had NRS of 4and her post-operative analgesic regimen was changed to diclofenac tablets 50mg 8 hourly, paracetamol tablets 1000mg 6 hourly, and tramadoltablets 100mg 6hourly (when required)for another seven days. She recorded good clinical outcome with good pain control and stable vital signs on this regimen. She complained of insomnia for which she received diazepam 10mg nocte per oral for 2 days in addition to prophylactic antibiotics (co-amoxiclav) for 5 days. During the period of epidural anaesthesia/ analgesia, the patient was monitored for epidural complications such as accidental dural-puncture, epidural-catheter migration/ displacement, hypotension, shivering, nausea/vomiting, post-dural puncture headache, failed epidural blockade, total spinal anaesthesia, epidural haematoma, urinary retention and

systemic toxicity of bupivacaine. None of these was noticed following the procedure.

Her serum haemoglobin on the 2nd day post-op was 9.3g/dl and was managed with enteral haematinics. Average NRS was 3 by the 2nd day post-op on the above regimen. She made continuous progress clinically over the next 2-3 days, mobilized satisfactorily and was discharged home on the 5th post-operative day on routine haematinics (for 4 weeks),and current analgesics for another 7 days.

## CRITICAL ANALYSIS

Post myomectomy pain is usually multifactorial and originates from different sources. It may arise from surgical incision, injury to visceral structures and post-operative activities such as coughing, straining or mobilization. While parietal nociceptors convey pain sensation via the spino-thalamo-cortical tracts, visceral pain stimuli are transmitted via the vagus nerve to the higher centres. In order to achieve good post-operative analgesia, methods that address the parietal and visceral nociceptive inputs are required.

Multimodal analgesia is the mainstay of effective post-operative pain management*,* Jin and Chung, 2001. It is achieved by combining different analgesic agents with different mechanisms of action, resulting in synergistic analgesia, lower total doses of analgesics and fewer side effects, Dahl and Kehlet, 1999. In the case of Mrs. A, multimodal analgesia was achieved in the first 24 hours using epidural bupivacaine, diclofenac rectal suppository and intravenous tramadol (if necessary). Thereafter, it was maintained using oral diclofenac, paracetamol and tramadol (when required). Where it is indicated, epidural analgesia has been shown to be superior to other techniques of postoperative pain relief, Block *et al.,* 2003

A combination of epidural local anaesthetics combined with opioids such as sufentanil, remifentanil or fentanyl are preferred because of analgesic superiority compared to epidural local anaesthetic agent alone,Taylor and Stranbury, 2009. Bupivacaine is commonly used in epidural analgesia because it has a long duration of action (4-8 hours), profound conduction blockade and significant separation of sensory to motor blockade*,* Yentis *et al.,* 2007.It is an amide with a pka of 8.1 and can be used for peripheral nerve block, epidural analgesia/anaesthesia or sub-arachnoid block. It is presented as a 0.25%, 0.5% or 0.75% solution. Although concentrations less than 0.25% bupivacaine has achieved epidural analgesia successfully, lower concentrations are associated with minimal blockade of the motor neurones, Babst and Gilling. 1978.

Bupivacaine reversibly binds to intracellular sodium channels, blocking influx of sodium ions, thereby preventing depolarisation of neurones and transmission of impulses. Following the administration of analgesic doses of bupivacaine into the epidural space, there is blockade of transmission of nociceptive stimuli through the spinal nerve roots. Bupivacaine epidural postoperative analgesia can be achieved by intermittent bolus doses, continuous infusion or patient controlled administration via an epidural catheter. The maximum safe dose of bupivacaine is 2mg/kg body weight, with a risk of toxicity at plasma concentrations of 2-4µg/ml, Rosenberg *et al.*, 2004. It is metabolised in the liver by cytochrome p450 to pipecolyxylidine and excreted in the urine. Bupivacaine toxicity is a rare complication which may occur following its inadvertent injection into epidural vessels, it may be treated with intravenous infusion of Intralipid 20% preparation, Rosenblat *et al*., 2006. Other side effects of bupivacaine epidural analgesia include hypotension, motor weakness of the lower extremities and urinary retention.

In a meta-analysis of 100 studies, epidural therapy was compared with parenteral opioids for post-operative analgesia. This concluded with epidural analgesia better than parenteral opioids ($p<0.001$). Different epidural opioids, local anaesthetics and combinations of both which were compared with different parenteral opioids (with various modes of administration) highlighted the marked heterogeneity of this study. The meta-analysis of results from studies that employed different (non-uniform) pain assessment tools further reduced the sensitivity of their findings. A randomised clinical trial compared the analgesic efficacy of intravenous and epidural patient controlled postoperative analgesia in the elderly, Mann *et al*., 2000 Patients in both groups had major abdominal surgery under general anaesthesia with the same agents. It was adequately powered and showed that patient controlled epidural analgesia using 0.25% bupivacaine and 1µg/ml sufentanil mixture was superior to patient-controlled analgesia with intravenous morphine 1.5mg ($p= 0.002$). However, impaired motor function and orthostatic hypotension hampered early mobilization of patients who had epidural analgesia.

Mrs. A also received diclofenac as part of a multimodal analgesia regimen throughout her postoperative care. Surgical trauma causes local inflammatory reaction; the damaged tissues exude protons and neurotransmitters and attract immune cells. These immune cells release chemical mediators such as prostanoids and bradykinnins (prostaglandins) which sensitize and reduce the firing threshold of local nociceptors. Diclofenac, a non-steroidal anti-inflammatory drug (NSAID) prevents prostaglandin production by inhibiting the cyclo-oxygenase enzyme, thereby reducing localized pain.

A recent prospective, double blind, randomised study compared the analgesic efficacy of tramadol and diclofenac rectal suppositories in pain management after caesarean section, Joshi *et al*., 2013. The primary outcome was pain intensity measured by visual analogue scale. Sixty percent of patients had adequate analgesia for 8 hours in the diclofenac group compared to 6 hours in the tramadol group. Their result showed that diclofenac

suppositories provided superior postoperative analgesia with lesser side effects than tramadol suppositories. However, this study lacked a control group which would have distinguished the analgesic potentials of both regimens. Also, a single dose of diclofenac 50mg given postoperatively have been reported to produce up to 50% reduction in pain with a number to treat of 2.1, Derry *et al*., 2009. However, NSAIDs must be used cautiously with careful patient selection as they have been associated with gastric mucosa irritation, bronchospasm, nephrotoxicity and impairment of platelet function, Jahr *et al*., 2009.

From the second day post-op, Mrs. A received a combination of diclofenac and tramadol (as required) tablets for postoperative analgesia. Tramadol is an analgesic with mixed opioid and non-opioid mechanisms of action, Keith, 1999. It is a weak opioid which binds onto pre-synaptic opioid receptors of nociceptive afferents, indirectly blocking voltage dependent ion channels thereby preventing neurotransmitter release and pain. It also acts on the periaqueductal grey to initiate the descending spinal inhibitory analgesic pathway. Tramadol inhibits neuronal reuptake of serotonin and norepinephrine, thereby potentiating the inhibitory effects of these chemical mediators on the dorsal horn of the spinal cord. With a dose of 1-2mg/kg (recommended), tramadol lasts 4-6 hours, Lee *et al.,* 1993. It provides useful analgesia with minimal sedation, respiratory depression, gastrointestinal stasis, tolerance and abuse potential, Power and Barat et al., 1998. It has been used successfully in postoperative pain relief, Joshi *et al*., 2013; Keith, 1999; Power and Barrat, 1998. The analysis above supports the analgesic regimen received by Mrs. A. However, other alternatives that could provide good post-operative analgesia and patient satisfaction with less risk of side effects are discussed below.

## ALTERNATIVE POST-OPERATIVE MANAGEMENT

Another regimen that could provide satisfactory postoperative analgesia and promote early mobilization is transversus abdominis plane (TAP) block with ropivacaine and intravenous patient-controlled morphine. This multimodal analgesic regimen will effectively block nociceptive afferent inputs from the surgical injury to the abdominal wall and pelvic/abdominal viscera and activate the descending spinal inhibitory pain pathway. TAP block is achieved by introduction of local anaesthetic agents into the neuro-fascial plane between the internal oblique and transversus abdominus muscles of the abdominal wall, McDonnell *et al*., 2007. This results in blockade of the mid/lower thoracic and lumber first order afferents travelling through this plane to the spinal cord. Studies have shown segmental blocks extending from T7-L1 spinal segments using bilateral TAP injections, McDonnell *et al*., 2007. TAP block can be performed by landmark (blind) or ultrasound guided techniques. TAP catheters can also be placed in the neuro-fascial plane under direct vision intra-operatively, before closure of abdominal incision. Tap has been shown to provide excellent analgesia to the skin and anterior abdominal wall muscles after abdominal surgeries, McDonnell *et al*., 2007.

Mrs A could have received 20mls of 0.5% ropivacaine bolus (total – 200mg) through TAP catheter bilaterally after surgery (once). This could be given in the recovery room when the NRS exceed 3/10. Ropivacaine is a long acting local anaesthetic that produces analgesia similar to bupivacaine by reversible inhibition of sodium ion influx in neurones, Kuthiala and Chaudhary, 2011. It is produced as a pure enantiomer. Ropivacaine is less lipophilic than bupivacaine and hardly penetrates large myelinated motor fibres resulting in relatively reduced (differential) motor blockade, Kuthiala and Chaudhary, 2011. This low lipophilicity is associated with less neuro- and cardio-toxicity and, greater sensory-motor differential blockade compared to bupivacaine. The maximum recommended dose is 3mg/kg body weight. It is metabolised in the liver to 3-hydroxy-ropivacaine by the cytochrome p450 and excreted in urine. Its efficacy is similar to bupivacaine and levo-bupivacaine in peripheral nerve blocks.

Support for the use of TAP block is derived from a randomised control trialin 2008 which compared its effects (as part of a multimodal analgesic regime) with placebo in 50 women who had total abdominal hysterectomy, Carney *et al*., 2008. TAP block demonstrated superior analgesia ($P<0.001$), less opioid consumption and sedation compared to placebo. Incidence of nausea and vomiting were similar among those who had placebo and opioids, this suggests confounding effect of tactile stimulation of the visceri during the surgery on these two related outcomes. Other side effects such as pruritus, constipation and respiratory depression were not assessed. Another randomised clinical trial compared the analgesic effects of TAP block with placebo in 8 healthy male volunteers under non-surgical settings, Peterson *et al.,* 2013. All the subjects had bilateral TAP block with 20mls of 0.5% ropivacaine bolus and also received active infusion (0.2% ropivacaine at 5mls per hour) on one side of the abdomen and placebo infusion through the TAP catheter on the contralateral side.

They reported that analgesia (by pin-prick test) was achieved between T10 and T12 dermatomes following TAP block. Their result also showed that analgesia so achieved lasted 4 to 8 hours without continuous ropivacaine epidural infusion. However, the study was grossly under-powered thereby diminishing it clinical relevance. Pinprick which was used to measure the primary and secondary outcomes is not a standard pain assessment tool further questioning the acceptability of this experiment. Also, the use of same subject as test and control, at the same time, may have created confusion in perception of painful

stimuli thereby reducing the integrity of their findings. Despite the advantages of TAP block, complications such as bowel and hepatic injury, intra-peritoneal injection, failure of block and local anaesthetic toxicity can occur, this is rare with the direct visual and ultrasound guided techniques. It is contraindicated following patient refusal, allergy to local anaesthetic and infection at site of injection.

Mrs A could have received co-analgesic regimen of intravenous patient-controlled morphine in addition to the TAP block. Using this method, the patient self-administers small amounts of morphine intravenously via a pump that has predetermined settings. This system grants patient-autonomy as she determines when she needs and gets analgesics. Accidental overdose is prevented by a set lock-out period within which no opioid can be delivered to the patient. Studies have shown that patients had less total daily opioid consumption and side effects using PCA than routine nurse-administered opioid regimes, Crisp *et al.,* 2012. TAP block with morphine PCA regimen provides superior analgesia with less side effects than opioid based PCA regimen alone, Carney *et al*., 2008.

Morphine is a potent analgesic with a high affinity for the mu, kappa and delta G-coupled opioid receptors in the gastrointestinal tract, peripheral and central nervous systems. It exerts its analgesic effect by preventing depolarisation of pre-synaptic membranes of nociceptive C- and A delta fibres. On binding to nociceptive pre-synaptic opioid receptors, it indirectly inhibits voltage dependent calcium channels, decreasing levels of cAMP in the cytosol and blocking release of neurotransmitters such as glutamate, substance p and calcitonin gene-related peptide resulting in analgesia, Trescot et al., 2008. It also binds to opioid receptors on the periaqueductal grey to initiate the descending spinal inhibitory analgesic pathway. Morphine is about 10 times more potent than tramadol. It has about 30 to 40% bioavailability following oral ingestion due to extensive first pass metabolism in the liver. It is metabolised in the liver to 2 active metabolites (morphine-3 and morphine-6 glucuronide). The elimination half-life of morphie is about 120 minutes, Trescot et al., 2008. However, morphine is associated with undesirable side effects such as nausea, vomiting, dysphoria, constipation, pruritus, hypotension and respiratory depression. These are less pronounced in reduced doses.

## REFLECTIVE ANALYSIS

Mrs A needed myomectomy as treatment for recurrent lower abdominal pain, anaemia, menstrual disorders and infertility associated with uterine fibroids. Post-op analgesia was necessary for good recovery and the ideal regimen should provide effective pain relief with minimal side effects, Jin and Chung, 2001. Apart from anaemia (which was corrected pre-op), Mrs A was otherwise healthy with no co-morbidities. Blood loss following the procedure was average and required no transfusion during or after surgery. This enabled a good selection from a wide range of available post-op analgesic regimens.

This service was given in a resource limited environment where patient-controlled infusion devices and relevant opioids (morphine, fentanyl, remifentanil) were not readily available. Mrs A would have benefitted from low epidural doses of bupivacaine (0.0625-0.125%) combined with fentanyl. This would have offered better analgesia with near elimination of the motor blockade which hampered her early post-op mobilization, Taylor and Stanbury, 2009. Also, patient controlled epidural analgesia (PCEA)for 48 hours following the initial epidural bolus dose of local bupivacaine would have provided better analgesia than the intermittent routine epidural injections used, Block *et al*., 2003; Taylor and Stanbury, 2009 .The importance of the good analgesia following PCEA for 24-48 hours post-op include; early post-op ambulation, improved pulmonary function, improved blood circulation, reduced risk of deep vein thrombosis, better wound healing and patient satisfaction, Sinatra, 2010; Mariano *et al*., 2018. Other complications of epidural analgesia such as accidental dural puncture, post-dural puncture headache, epidural haematoma, total spinal anaesthesia or failed epidural blockade were not encountered but calls for caution.

As shown in this report, if a patient is anaesthetised via epidural rout for a major lower abdominal surgery, then an epidural-catheter in-situ for 1st 24 hours post-surgery could be suitable for administration of post-operative epidural analgesia. Where such surgery is achieved with general anaesthesia alone, post-operative epidural analgesia may not be advisable because of its invasiveness and complication profile. Epidural analgesia was found to be the superior postoperative analgesic option following lower abdominal before the emergence of TAP blocks, Block *et al*., 2003. The superiority of the post-op analgesic efficacy and side effect profiles of these two options are subjects of ongoing debate among clinicians. More randomised control trials with standardized protocols are required to distinguish the effects of these interventions.

## CONCLUSION

This report explored a bupivacaine epidural analgesia based multi-modal post-operative pain management technique following myomectomy in a resource limited setting. It analysed alternative post-operative pain management options which could be employed to ensure better clinical outcome following lower abdominal surgeries in such environment. Availability of optimal post-operative pain management interventions is a

source of consternation among clinicians in resource-limited settings. This is heightened by paucity of skilled manpower and infrastructural challenges. This can be improved by more political involvement and increased investment by the Governments and support (Donor) agencies in such environments.

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## REFERENCES

Babst RC, Gilling BN (1978). Bupivacaine: A review Anesth Prog 25(3): 87-91.

Block BM, Lie S and Rowlingson AJ (2003). Efficacy of postoperative epidural analgesia; a meta-analysis. J AM Med Assoc. 290: 2455-63.

Carney J, McDonell JG, OchanaA, Bhinder R, Laffey JG (2008).Transversus abdominis palne block provides effective postoperative analgesia in patients undergoing total abdominal hysterectomy. AnesthAnalg. 107(60: 2056-2060).

Crisp CC, Bandi S and Kleeman SD (2012). Patient controlled versus scheduled nurse-administered analgesia following vaginal reconstructive surgery; a randomised trial. Am J Obstet Gynecol. 207: 433.e1-6.

Dahl JB, Kehlet H (1991). Non-steroidal anti-inflammatory drugs: rationale for use in severe postoperative pain. Br J Anaesth. 66: 703-12.

Derry P, Derry S, Moore RA, McQuay HJ (2009). Single dose oral diclofenac for acute postoperative pain in adults. Cochrane Database of systematic Reviews.Issue2 Art No: CD004768.

Jahr JS, Donkor KN, Sinatra RS (2009).Non-selective non-steroidal anti-inflammatory drugs, COX-2 inhibitors and acetaminophen in acute peri-operative pain. In Sinatra RS, de Leon-Casasola OA, Gisenberg B, ViscusiEr. Acute Pain Management Cambridge Medicine, 1st edition: 245-286.

Jin F, Chung F (2001).Multimodal analgesia for postoperative pain control. J Clin Anesth. 13(7): 524-39.

Joshi VS, Vyavahare RD, Khade G, Shiledah V, Jamadar NP (2013). Comparative study of analgesic efficacy of rectal suppository of tramadol versus diclofenac in suppressing postoperative pain after caesarean section. International J of Healthcare & Biomedical Research. 2(1): 32-37

Keith B (1999).The role of tramadol in acute pain management, Acute Pain. 2(4): 189-196.

Kuthiala G, Chaudhary G (2011). Ropivacaine: A review of its pharmacology and clinical use. Indian J Anaesth. 55(2): 104-110.

Lee CR, McTavish D, Sorkin EM (1993).Tramadol: A preliminary review of its pharmacokinetic properties and therapeutic potential in acute and chronic pain states. Drugs. 49: 131-5.

Lefebvre G, Vilos G, Allaire C, Jeffrey J, Arneia J (2003). The management of uterine leiomyomas. J Obstet Gynaecol Can. 25(5): 396 -418.

Mann C, Pouzeratte Y, Boccara G, et al. (2000).Comparison of intravenous or epidural patient-controlled analgesia in the elderly after major abdominal surgery. Anesthesiology.92: 433-41.

Mariano ER, Fishman S, Crowley M (2018). Management of acute perioperative pain. Retrieved on August 30, 2018. Available online at: http://www.uptodate.com/contents/management-of-post-operative-pain.

McDonnell JG, O'Donnell B, Curley G, Heffernan A, Power C, Laffey JG (2007). The analgesic effect of transversus abdominis plane block after abdominal surgery. Anesth Analg. 104(1); 193-197.

Payson M, Leppert P, Segars J (2006). Epidemiology of myomas. Obstet Gynaecol Clin North Am. 33(1): 1 – 11.

Petersen PL, Hilsted KL, Dahl BJ, Mathiesen O(2013).Bilateral transversus abdominis plane (TAP) block with 24 hours ropivacane infusion via TAP catheters: A randomized trial in healthy volunteers. BMC Anesthesiology. 13: 30.

Power I, Barrat S (1998). Approaches to reducing postoperative opioid requirements. CNS Drug. 10: 257-270.

Rafi AN (2001). Abdominal field block: a new approach via the lumbar triangle. Anaesthesia. 56: 1024-6.

Rosenberg PH, Veering BT, Urmey WF (2004). Maximum recommended doses of local anaesthetics: a multifactorial concept. Reg Anesth Pain Med. 29: 564-575.

Rosenblatt MA, Abel M, Fischer GW, Itzkovich CJ, Eisenkraft JB (2006). Successful use of a 20% lipid emulsion to resuscitate patient after a presumed bupivacaine related cardiac arrest. Anesthesiology. 105: 217-218.

Sinatra R (2010). Causes and consequences of inadequate management of acute pain. Pain Medicine. 12(11): 1859-71.

Taylor A, Stanbury L (2009). A review of postoperative pain management and the challenges. Curr Anaesth and Crit Care. 20: 188-189.

Trescot MA, Datta S, Lee M, Hansen H (2008).Opioid Pharmacology, Pain Physician. 11: S133-153.

Yentis SM, Hirsh NP, Smith GB. Extradural anaesthesia (2007). In: Yentis SM, Hirsh NP, Smith GB (editors) Anaeshesia and intensive care A-Z. An encylopaedia of principle and practice, third edition, Elsevier Inc. London; pp195-197.