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Regional anaesthetic technique for laparoscopic appendicectomy in Ibadan

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Abstract

Background:Laparoscopy is now readily being deployed for abdominal surgeries in our centre, thanks to the surgeons'interest and the desire to follow best practice as obtained in other climes. General anaesthesia (GA) with intermittent positive pressure ventilation is usually the preferred mode of anaesthesia for this procedure. There are reports of laparoscopic surgery of abdomen performed under spinal and or epidural anaesthetic techniques.

Methods: With Intra-Abdominal Pressure (IAP) from CO_2 insufflations limited to 10-12mmHg, Laparoscopic Appendicectomy (LA) was performed under Combined Spinal Epidural (CSE) for ten consenting ASA I and II patients with mean age 23.6 years and BMI of 24.9kg/m^{2}in University College Hospital Ibadan, Nigeria. Intra-operative events and ease of operation were studied; systemic drugs were administered if patients complained of pain and discomfort, and G.A if regional techniques and sedation failed.

Results: Eight(8)patients had the procedure completed under spinal anaesthesia supplemented with sedation, two (2) patients whose block went as high as T4 had no need of sedation. There were operative difficulties in four patients out of which 2 had sedations and the surgeons could continue operating. We converted to GA in two (2) patients when regional techniques and sedation failed.

Conclusion: We concluded that with proper selection of patients and limiting IAP to 10-12mmHg, LA can be safely performed with spinal anaesthesia with some supplementation.

Keywords: *Regional anaesthetic techniques, Epidural, Spinal, Laparoscopic abdominal surgery, Laparoscopic appendicectomy, sedation.*

Résumé

Introduction : La laparoscopie est maintenant aisément déployée pour les chirurgies abdominal dans notre centre, grâces a l'intérêt et désire des chirurgiens à suivre les la pratique meilleure comme obtenue dans les autres régions. L'anesthésie générale (AG) avec pression positive de ventilation intermittente est usuellement la mode d'anesthésie préférée pour cette procédure. Il ya des rapports de chirurgie de l'abdomen à laparoscopie exécutées sous des techniques anesthétiques dorsale et ou épidurale.

Méthode : Avec la Pression Intra-Abdominal (PIA) des insufflations du CO_2 limitées à 10-12mmHg, l'Appendicectomie à Laparoscopie (AL) était exécutée sous une Coalition Spinale Epidurale (CSE) pour dix patients ASA 1 et 2 (sous accords) avec un âge moyen de 23,6 ans et BMI $\leq$ 24,9kg/m^2 au Collège Hospitalier Universitaire (CHU), Ibadan, Nigeria. Les issues intra-opérative et aisance d'opération étaient étudiées; des drogues systémiques étaient administrées si les patients se plaignaient de douleur et déconfort, et AG si les techniques régionales et sédation échouaient.

Résultats : Huit (8) patients avaient la procédure achevée sous l'anesthésie spinale supplémentée avec sédation, deux (2) patients dont les bloques sont allées aussi haut que T4 n'avaient pas besoin de sédation. Il y avait des difficultés opérative dans quatre patients parmi ou 2 avaient sédations et les chirurgiens pouvaient continuer à opérés. Nous avons converti à l'AG dans deux (2) patients quand les techniques régionales et sédation ont échouées.

Conclusion : Nous avons conclu qu'avec une propre sélection de patients et en limitant PIA à 10-12mmHg, AL peut être sûrement exécuté avec l'anesthésie spinale avec certain supplémentassions.

Mots Clé : *Techniques d'anesthésie régionales, Epidurale, Spinale, Chirurgie abdominale à laparoscopie, Appendicectomie à laparoscopie, Sédation.*

Introduction

Laparoscopic surgery (LS) of the abdomen otherwise called minimal access surgery is routinely performed under general anaesthesia with endotracheal intubation. The argument for this has been: to secure the airway to prevent aspiration; for better management of the heamodynamic and ventilatory changes that arise from creation of pneumoperitoneum and for optimal abdominal relaxation [1,2].

Studies both internationally and in Nigeria have shown the merits and safety of laparoscopic

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surgery when performed by trained personnel [3, 4]. The recent increase in therapeutic laparoscopic abdominal surgery in University College Hospital(UCH) followed the collaboration between UCH and a team of laparoscopic surgeons from Germany in 2009. Until recently general anaesthesia (GA) with endotracheal intubation and application of intermittent positive pressure ventilation was the technique of choice for anesthesia for all cases of laparoscopic surgery of the abdomen in our centre.

However, there are many published reports of laparoscopic appendicectomy, cholecystectomy and inguinal hernia repair performed under spinal and epidural anesthesia with some supplementation [5-7] .We hereby present a case series of laparoscopic appendectomy in ten healthy patients performed under combined spinal-epidural anesthesia in Ibadan.

Methods and materials

We prospectively documented intra-operative findings on 10 consenting, American Society of Anaesthesiologists (ASA) Grade I and II patients, aged 16 – 43, who underwent elective laparoscopic appendicectomy under combined spinal epidural (CSE) anaesthesia. Exclusion criteria included patients with HbSS, ASA> II, obesity, and patients with fixed cardiac output or any abnormality in the spine.

During preoperative visit by the anaesthesiologist the procedures was explained to the patients. The patients were encouraged to report any anxiety, pain, or discomfort occurring during surgery which would be managed with intravenous medications or conversion to general anaesthesia.The patients were encouraged to also report any, abdominal or shoulder pain, nausea and vomiting during and after the procedure. All patients received oral diazepam 5 mg on the night prior to surgery.

In the operative room an 18 FG IV line was secured and all patients received adequate preloading with 15 ml/kg of 0.9% Normal saline over 30 min and intravenous dexamethasone 4mg and metoclopramide 10mg as premedication. All routine monitors namely, non-invasive blood pressure, peripheral oxygen saturation by pulse oximetry (SpO_2) and electrocardiogram were attached and baseline vital signs were recorded.

With the patients in sitting position, and under aseptic precautions the L_2 –L_3 epidural space was accessed using an 18G Tuohy needle and loss-of-resistance technique and epidural catheter was threaded cephalad and fixed at 3-4 cm within the epidural space. Spinal anaesthesia was then performed with 12.5 mg (2.5 ml) of 0.5% heavy bupivacaine with 15mg pethidine injected into L_{3}-L_{4} subarachnoid space through a 25G pencil point spinal needle after free flow of cerebrospinal fluid.The patients were turned to the supine position with pillow under their heads and the head end of the table tilted down to achieve T6 sensory level of block assessed with pinprick. The CSE was performed by the same anaesthetist.

Pulse rate, blood pressure, and SpO_2were recorded every 5 minute for the first 30minutes and 10 min thereafter. Surgery commenced once T6 sensory level was achieved, with pneumoperitoneum created at a maximum intra-abdominal pressure limit of 12 mmHg and a 10 -15 degree head down and a minimal left lateral tilt of the table. The surgeries were performed by the same consultant general surgeons who have had further training in laparoscopic abdominal surgery. There was no modification in the surgical technique.

Conscious sedation to Ramsey sedation score of 2 or 3with intravenous midazolam and fentanyl were administered for complaint of shoulder/neck pain and other discomfort baring desaturation or hypoxia.Ramsey Sedation Scale (RSS) is one of the sedation scales validated for use where sedatives/opioids are administered for sedation and analgesia [8]. RSS 2 or 3 corresponds to conscious sedation without the need for cardiopulmonary support. This was used in this study.

Hypotension was treated with fluids and if not responding, with intravenous ephedrine 3 mg during the intra-operative period. The epidural injections were to be administered if the level of sensory blocks regressed to the point patients complain of pain at the operative site and conversion to general anaesthesia if all regional anaesthetic methods failed. The surgeons were also asked to grade the surgical procedure on the scale of good, fair and poor and requested for general anaesthesia if they felt that the anaesthetic technique was adding to technical difficulty for the surgical procedure. A Nasogastric tube was inserted at induction of anaesthesia and removed immediately after the surgery.

The surgical procedure of laparoscopic appendectomy was carried out according to standard protocol. Operative time as well as any intra-operative events was recorded and at the end of the procedure a single dose of 6mls of 0.125% plain bupivacaine was injected through the epidural catheter for post-operative pain management.

Results

Ten patients including 6 females and 4 males aged 16- 43 with a mean age of 23.6 ± 3.8 years had laparoscopy appendicectomy under regional

anaesthetic technique during the study period. The Ten (10) patients had successful CSE procedures, and none had pain on injection into the subarachnoid space. Within 5 minutes of the injection, T_6 sensory block was achieved in 8(80%) of the patients but went as high as T_4 in 2(20%) patients, these two patients developed hypotension defined as (≤20% below the baseline value) following spinal anaesthesia but responded to fluid administration before pneumoperitoneum was created. No patient was given ephedrine.

The mean duration of the surgery was 68.5 ± 38.5; the surgeons complained of difficulty in 4 patients, two of them were restless and complained of shoulder and chest pains about 20 minutes following pneumoperitoneum, the two patients were converted to GA when sedation failed; the other two along with 4 other patients who complained of discomfort were successfully sedated. 6 patients had sedation, 4 to Ramsey sedation score of 2 while 2 to Ramsey sedation score of 3, and 2 patients had no need of sedation. Overall 8 patients had the procedure completed with spinal anaesthesia, 2 patients were converted to GA table 1.

sites. 80% of the patients completed the procedure under spinal anaesthesia.

Discussion

With the increased interest of the surgeons to perform therapeutic laparoscopic abdominal surgeryin our centre, we were careful not to deploy anaesthetic technique that will hamper this progress. We therefore, naturally started with the use of general anaesthesia technique that is traditionally believed to enhance the management of the haemodynamic and ventilatory changes due to carbon dioxide insufflations and the required positioning. [1, 2]

This case series, however, demonstrates that with good selection of patients and slight reduction in the intra-abdominal pressure during insufflations to 10-12mmHg, regional anaesthetic techniques can be used safely. Additional benefits are avoidance of complications of GA, and cost reduction [9].

Our patients in this study were fit and young with mean age of 23.6 years, this allowed leveraging on their good cardiopulmonary reserve as they could accommodate the 30-50% alterations in the haemodynamics and ventilation that usually

Table 1: Intraoperative Data

Patient	Sensory level @ 5mins	Surgical Condition	Supplements Midazolam (mg)	Fentanyl (μg)	Ramsey Sedation Score (RSS)	Complaints/ Complications during Surgery
1.	T6	Fair	2	25	2	Shoulder/Neck pain
2.	T4	Good	—	—	—	Transient Bradycardia
3.	T6	Poor (GA)	Failed	Failed	GA	Restlessness,shoulder pain, discomfort
4.	T6	Fair	1.5	25	2	Neck pain
5.	T5	Good	3	40	3	Shoulder pain, discomfort
6.	T6	Poor (GA)	Failed	Failed	GA	Chest pain, discomfort
7.	T4	Good	—	—	—	Transient Bradycardia
8.	T6	Fair	2	25	2	Shoulder pains
9.	T5	Good	1	20	2	anxiety, discomfort
10.	T6	Good	2	50	3	Neck/shoulder pains

There were no other cardiovascular changes except for brief bradycardia HR ≤60 beats/minute noticed in two patients whose block went as high as T_4 after CO_2 insufflations, oxygen was administered with face mask and no medication was given. None experienced respiratory changes and the oxygen saturation were not less than 98%. None reported nausea and vomiting intra or postoperatively.

Epidural injections were not required in any patient as none had pain or discomfort over the port accompanied pneumoperitoneum as pointed out in a review by Maria *et al* [10]. It has been found that under regional anaesthesia, the respiratory mechanism remains intact, and the diaphragm the main inspiratory muscle is unaffected allowing patient to adjust minute ventilation without any significant changes in ventilatory parameters or CO_2 level [5].

Study by Ciofolo *et al* [11] also showed that the ventilatory measurements and arterial blood gasses were maintained within normal limits at

different stages during laparoscopy under epidural anaesthesia.The ease of the procedure was assessed by the surgeons, as fair and good in 80% of the patients and were able to proceed and complete the surgery though with some supplementation. This was in agreement with other studies where spinal anaesthesia supplemented with some sedatives/ analgesics, were used for laparoscopic appendicectomy [6, 12]

We observed with interest that 2 patients who did not need sedation and their surgical conditions were described as good, had an initial sensory block up to T_4even 20minutes after the pneumoperitoneum had been created. It was not impossible that this high level of sensory block could account for why both patients had no complaint because of good abdominal relaxation and minimal peritoneal irritation.

Studies [12,13] had found that most of the complaints patients have while undergoing laparoscopic surgery under regional anaesthetic technique were due to poor abdominal relaxation and peritoneal irritation. However, maintaining a low intra-peritoneal pressure of 8-10mmHg when using spinal anaesthesia have also been reported to reduce the discomfort and chances of neck and shoulder pain [13].

The observed bradycardia in these 2 patients, which could be due to the affectation of the cardio accelerator fibres sub-served by (T_2-T_4), was brief and there was no need to use atropine. It was not surprising that these two patients also developed transient spinal hypotension which responded to fluid administration. Studies had shown various incidences and risk factors of hypotension and bradycardia associated with spinal anaesthesia. [14,15].In the study of Carpenter *et al* [14], the incidence of hypotension and bradycardia was reported to be 33% and 13% respectively, in non-obstetric patients and Bernd *et al* [15] in their study revealed that sensory block height was one of the anaesthesia related variables contributing to spinal hypotension and bradycardia. Prompt administration of fluids and the use of vasopressors is the mainstay for management of transient spinal hypotension.

Although Chui *et al*[16] mentioned that a high block of T_2-T_4 could cause myocardial depression and reduction in venous return, but none developed hypotension following creation of pneumoperitoneum, it has been observed that an intra-peritoneal pressure of between 8-10mmHg does not add to the problem of decreased venous return and persistence of hypotension in patient who had laparoscopic surgery under spinal anaesthesia [17].

We converted to GA in 2 patients who had persistent chest and shoulder pain and discomfort despite sedation; this is comparable to similar studies from other centres [18,19]. In a series by Hamad *et al* [18], 1 in 10 patients who had laparoscopic surgery under spinal had to be given GA because of intolerable shoulder pain. Chiu *et al* [19] also reported conversion to GA on account of abdominal distension discomfort in one out of 11patients who underwent laparoscopic abdominal surgery under epidural anaesthesia.The mean duration of surgery was 68.5minutes;this was more than double the mean duration in a similar study where the mean duration was 25.35minutes [12]. These could be partly due to: the added time to convert to GA in 2 of our patients, the learning curve which was initially steep for the surgeons, and the time taken generally to overcome some of the technical challenges peculiar to resource limited setting like ours as pointed out in a review by Akute [20] and Afuwape *et al* [21]in their audit.

None of our patients reported nausea and vomiting even in the immediate post-operative period as also observed in a similar study[6], this might be due to adherence to our protocol of administering antiemetic agents (Metoclopramide and Dexamethasone) to all patients coming for laparoscopic surgery, which has been shown to be a risk factor for postoperative nausea and vomiting [22].

Although the purpose of inserting epidural catheter in our series was to ensure continued regional anaesthesia should the spinal anaesthesia wears out during the surgery, but epidural injection was only administered at the end of the surgery for immediate postoperative analgesia in this study;this was similar to the study by Mane *et al* [6] where epidural catheter was only employed for immediate postoperative analgesia. This showed that spinal anaesthesia only as a form of regional anaesthetic technique could suffice for this procedure, and CSE should be used only when we have developed protocol for epidural analgesia for postoperative pain management.

The use of spinal anaesthesia only for this procedure apart from being cost effective will also bring about reduction in anaesthesia time because it is more technically demanding performing CSE than spinal anaesthesia.

Conclusion

The outcome of this study has shown that with careful selection of patients, and limiting and maintaining intra-abdominal pressure due to carbon-dioxide insufflations to 10-12mmHg, laparoscopic appendicectomies could be carried out with the use of spinal anaesthesia, a mode of regional technique, with supplemental sedations.

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