International Surgery Journal
Laoutid J et al. Int Surg J. 2017 Apr;4(4):1417-1421
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20171153

Original Research Article

Low dose spinal anesthesia for open cholecystectomy: a feasibility and safety study

Jaouad Laoutid[1,3]*, Fouad Sakit[2,3], Nabil Jbili[1], Moulay Ahmed Hachimi[1]

[1]Department of Anesthesiology and critical care, Military Hospital Moulay Ismail, Meknes, Morocco
[2]Service of Suergery, Military Hospital Moulay Ismail, Meknes, Morocco
[3]Faculty of Medicine and Pharmacy. University Sidi Mohamed Ben Abdellah, Fes, Morocco

Received: 08 February 2017
Accepted: 07 March 2017

***Correspondence:**
Dr. Jaouad Laoutid,
E-mail: jaouadl@hotmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Cholecystectomy is performed either open or a laparascopic route. the traditional and invasive open cholecystectomy is still in frequent practice for various reasons. Spinal anesthesia (SA) has been widely used as alternative to General Anesthesia (GA) for laparoscopic cholecystectomy. SA could be a safe and effective anaesthetic procedure for open cholecystectomy. This study was conducted to uncover feasibility and safety of low dose SA for conducting open cholecystectomy.
Methods: All consented patients of ASA grade I and II of either sex scheduled for elective open cholecystectomy received SA using 2 ml of 0.5% hyperbaric Bupivacaine mixed with 100 µg Morphine. Peri-operative preparations and management were all standardized. Other drugs being only administered to manage anxiety, pain, nausea/vomiting, hypotension, and any adverse event. Open cholecystectomy by right oblique incision. Intra-operative events and post-operative events were observed for 48 hours, operative difficulty, post operative pain free interval, analgesia requirements, hospital stay and the surgeon and patient satisfaction were studied.
Results: 20 patients were included in the study from 1st may 2016 to December 2016. Spinal anesthesia was adequate for surgery in all patients. Operative difficulty scores were minimal and surgery in one patient was converted to open cholecystectomy. Intraoperatively, five patients presented hypotension and Ephedrine was given. Four patients experienced pain and received Fentanyl and midazolam. Postoperatively, pain scores were minimal and paracetamol was not sufficient only in four patients who received ketoprofen and no patient received opioid. One patient required antiemetic for vomiting and two patients suffered urinary retention and one headache. 19 patients were discharged within 48 hours of surgery and patient satisfaction scores were very good.
Conclusions: Spinal anesthesia is safe and effective anesthetic technic for uncomplicated open cholecystectomy in terms of peri-operative events and, in prolonged post-operative analgesia, as well as in terms of patient and surgeon's satisfaction.

Keywords: Hyperbaric bupivacaine, Intrathecal morphine, Open cholecystectomy, Spinal anesthesia

INTRODUCTION

Cholecystectomy is performed under two approaches Open and laparoscopy. Laparoscopic cholecystectomy is a gold-standard procedure for it is short operative time, early mobilization, less postoperative pain, fast recovery, short hospital length of stay (LOS) and early return to work.[1] However, open cholecystectomy is frequently performed especially in developing countries because of lack of laparoscopic equipments or expertise.[2]

general anesthesia (GA), a gold-standard anesthetic technique.[3] For the both procedures but, it can be extremely challenging for patients with difficult intubation, obstructive pulmonary.

Recently, spinal anesthesia (SA) is recognized as an effective alternative to GA in laparoscopic cholecystectomy.[4] Laparoscopic procedures are a change in access and still require the same anesthesia compared to open procedures, so we believe that SA is expected to be effective in open cholecystectomy as in laparoscopic approach.[5,6]

The aim of our study is to evaluate the feasibility and safety of low dose SA for conducting open cholecystectomy.

METHODS

The prospective study was conducted at the military hospital of Meknes, Morocco, after the institutional ethics committee's approval. From 1st may 2016 to December 2016, all patients posted for open cholecystectomy who gave written informed consent for the procedure and study were considered eligible, provided that they fulfilled the following criteria: American Society of Anesthesiologist's physical status I or II, between 18 and 65 years of age, and body mass index of 30 kg m2 or less. Exclusion criteria were acute cholecystitis, pancreatitis or cholangitis, suspected common bile ductstones, previous open upper abdominal surgery, patients receiving any other study drug and the presence of any condition complicating and contraindicating SA.

Patients were explained during the preoperative visit by the anesthesiologist, that any anxiety, discomfort, or pain occurring during surgery would be dealt with intravenous medications or if they wished, conversion to GA. Additionally, they were made clear about scoring on the visual analogue scale (VAS = 0: no pain, VAS: 1-3 = Mild Pain, VAS: 4-5 = Moderate Pain and VAS: 6-10 = severe pain). Preoperative preparations were standardized for all patients. Diazepam 5 mg was given to relieve anxiety on the night prior to surgery.

In the operating room, after establishing non-invasive monitoring, an intravenous access was achieved and 500 mL of saline solution was commenced. To prevent infection, patients were administered one dose of a third generation Cephalosporin. Pre-anesthetic values of heart rate, mean arterial pressure, respiratory rate, and pulse oximetry were recorded.

SA was performed with the patient in the sitting position. With all aseptic precautions 2 ml of 1% Lidocaine was used for infiltrating skin at the L1-L2 interspinous space. Through a 25 gauge introducer needle a 25 gauge pencil point spinal needle was introduced into the subarachnoid space at the L2-L3 intervertebral space using a midline approach. After confirming a free flow of cerebrospinal fluid, 2 mL of 0.5% hyperbaric Bupivacaine mixed with 100 µg of Morphine was injected intrathecally within 20 seconds. Then after, the patients were kept in Trendelenburg position for 5 minutes or till the level of sensory block of T4 was achieved, whichever occurred the first. The level of sensory block was assessed with a pin-prick stimulus every minute. General anesthesia was proposed if the sensory level was not achieved after 10 min. Time taken from the spinal anesthesia realization to the start of surgery is defined as the 'time for induction', was recorded.

Open cholecystectomy was performed by right oblique incision. Intraoperatively, patients were monitored throughout the procedure; clinical observation was made and hemodynamic status was recorded at five minute intervals. Hypotension, defined as mean arterial pressure decreasing by more than 20% below the paranesthesia value, was treated with Ephedrine 6 mg intravenous bolus and repeated every 3 min to titrate to the effect. Bradycardia, defined as a heart rate of or less than 60/min, was treated with 0.75 mg Atropine, and hypertension was defined as a mean arterial pressure increasing by more than 20% above the pre-anesthetic value. Patients were encouraged to report events such as any discomfort, abdominal pain, headache, nausea and vomiting. Each of these events was recorded. Anxiety was treated with Midazolam 2 mg and pain with Fentanyl 50 mcg intravenous boluses as required. Oxygen was administered at a flow rate of 2 l/min via mask. Patients were reminded of the possibility of conversion to GA if they felt any disappointment with SA.

In case of conversion to general anesthesia was noted with specific reasons behind it. Operating surgeons were requested to rank technical difficulty associated with the procedure on a 10 points scale ranging from 1 to 10 (1: no difficulty at all and 10: extremely difficult).

Postoperatively, all patients were infused 1 L of saline solution and 1 L of Dextrose 5% for the next 24 hours. Respiratory rate, heart rate, blood pressure and pulse oximetry values were recorded every hour. Respiratory depression was defined as a respiratory rate at or below 8 per minute and a pulse oximetry value of less than 90% at any given time in the postoperative period.

Postoperative analgesia was aimed to be provided with intravenous Paracetamol 1000 mg every 6 hours. Postoperative pain was assessed by using the visual analog scale at time 1, 2, 4, 8, 12, 24 and 48 hours after the completion of surgery. If the patient was not satisfied with postoperative pain control and had a VAS score of more than 3, intravenous ketoprofen 100 mg was utilized as a first rescue analgesia. If pain persisted, 30 minutes after, nefopam 20 mg was supplemented intravenously as a second rescue analgesia, but only on patient's demand and for severe pain (VAS >6) titration of morphine was used. Other events such as, nausea and vomiting, urinary retention, pruritus, and headache were also asked. If they

occurred, these symptoms were recorded. Patients were fed orally the morning after surgery, the sub hepatic drain was removed at the end of 24h and discharged 48 hours after surgery, unless complications had occurred.

Patients were asked at the time of discharge to rank their satisfaction with regards to the anesthetic procedure on a score ranging from 0 to 10.

RESULTS

During the period of the study, 20 patients were included in the study, there were 16 females (80%) and 4 males (20%). Their age ranged from 18 – 70 years, with a mean of 47 (22-65) years. body mass index (BMI) and ASA physical status, as shown in Table 1. Spinal anaesthesia was performed without difficulty in all patients and the highest level of sensory blockade achieved was at T3- T4. SA was adequate for surgery in all patients (Figure 1).

Table 1: Patient details and outcome indicators. Data are mean or number of patients. ASA, American Society of Anesthesiologists physical status.

Sex (M/F) (n)	4/16
Age (year) 32 (21-48)	47 (22-65)
BMI (kg m-2)	26 (19-31)
ASA I: ASA II (n)	17:3
Time for induction (min)	10 (7-15)
Operative time (min)	30 (17-40)
Intraoperative fluid (mL)	1368
Conversion to general anaesthesia (n)	0
Operative technical difficulty score (1:2:3)	4:9:7
Time to reach dermatome T4 level (min)	5 (5-9)
Discharge from Hospital within 48 hrs/72hrs (n)	19/1
Patient satisfaction score at discharge (7:8:9:10) (n)	1:5:8:6

Figure 1: Calm and painless patient breathing spontaneously undergoing open cholecystectomy under spinal anesthesia.

Intra-operatively, hypotension was the most frequent incident in 5 patients (25%) and was treated by ephedrine 3-9 mg IV. Bradycardia less than 50/min in 3 patients (15 %) were treated by atropine IV.

During operation, 4 patients (20%) complained of dragging sensation during intraabdominal packing of tetra and upward retraction towards diaphragm and liver retraction. It was relieved by removal of retraction and was treated with fentanyl 50 µg and midazolam 1-2 mg IV.

Difficulty in breathing was observed in 1 patients and was treated by 5 ltr/minute of O_2 supplement by face mask. Nausea in 1 patient (5%) observed and was treated by 4mg ondansetron IV. There was no need of conversion from SA to GA. There was no operative technical difficulty. The average surgical duration was 40 min (ranged from 17 minutes to 40 minutes). The intraoperative events were tabulated in Table 2. The average duration of hospital stay was 2 days for all patients except one who presented headache and stayed 3 days.

Table 2: Intraoperative events.

Hypotension	5 (25 %)
Hypertension	0
Bradycardia	1 (5 %)
Fentanyl need	4 (20 %)
Midazolam need	3 (15 %)
Nausea/vomiting	1/0
Difficulty breathing	1
Respiratory depression	0

Post-operative pain, as presented in Figure 2 was minimal and easily treatable. All patients received paracetamol 1 g and there was need of the first rescue analgesia with ketoprofen 100 mg IV only in 5 patients (25%) and no need of other supplementary analgesia.

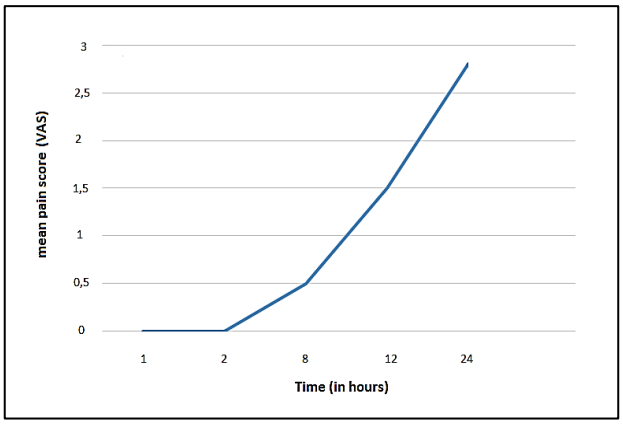

Figure 2: Pain curve at different time.

Post-operative nausea and vomiting (PONV) observed in 2 patients (10%) and treated by 4mg ondansetron IV. two patients (10%) required instant catheterization for urinary retention. Post-dural puncture headache were observed in

1 patients (5%), it was relieved with standard medication without need of blood patch and it prolonged the LOS for that patient to 3 days.

The postoperative events were tabulated in Table 3. There was, however, no respiratory depression.

Table 3: Postoperative events.

Nausea/vomiting	**2 (10 %)**
Urinary retention	2 (10 %)
Prurits	0
Post-dural headache	1 (5 %)
Respiratory depression	0
NSAID need (n)	5 (25 %)
nefopam need (5)	0
length of stay (48h:72h)	19:1

Technical difficulty scores as ranked by the surgeon were minimal. and the surgeon were very satisfied with the SA approach in open cholecystectomy specially concerning abdominal relaxation.

Discharge from hospital at 48 hours after surgery was possible for all the patients except the one who presented. There was no mortality and no major morbidity in any of the patients. At the time of discharge all patients reported overall satisfaction score.

DISCUSSION

Despite of the feasibility and popularity of laparoscopic cholecystectomy, open cholecystectomy is still in practice in places where required technologies and expertise for laparoscopic cholecystectomy are limited or unavailable.[1] General Anesthesia is usually employed for open cholecystectomy as it provides adequate muscle relaxation for the surgery. However, it is associated with a number of complications especially if the patient is suffering from co-morbid conditions that might increase LOS hence the cost of hospital stay and that might also be avoided in a regional anesthetic setting.[6]

For laparoscopic cholecystectomy, anesthesiologists now have the choice of GA and SA. GA is generally preferred due the major advantage of adequate muscle relaxation for surgery in comparison with Spinal anesthesia, but an advantage over GA for it can be safely used in patients with cardio-respiratory co-morbid conditions.[7-9]

Post operative Pain is a universal phenomenon; it is often underestimated and undertreated.[10] It is very important in open cholecystectomy keeping in view of the post operative respiratory problems. Firstly, because of the strategic location of incision for open cholecystectomy which hampers the patient's respiratory movement causing poor cough reflex which leads to atelectasis and pneumonia. Secondly, intubation not only traumatize the airway leading to edema and fluid exudation, but also it is a potential risk factor for introducing pathogen in the lower airway making the patient more prone to respiratory infections.

Intraoperative hemodynamic changes are a common undesired consequence of SA. In our study five patients (25%) suffered from intraoperative hypotension and tree (15%) from bradycardia. The high incidence of hypotension could be attributed to the highest sensory blockade of spinal anesthesia. Hypotension and bradycardia occurring in our patient was easily overcome with ephedrine and atropine IV respectively, and it did not essentially affect the planned procedure. It is unlikely that intrathecal Morphine administration would contribute to hypotension.[11,12]

The first apprehension associated SA with low dose hyperbaric Bupivacaine and employing head down (15 degrees) tilt for 5 minutes posing a risk of total spinal blockade is unfounded; as the highest level of sensory blockade attained in our patients was at T4. Although forceful expiration may get affected because it primarily entails anterior abdominal wall muscles which are innervated by thoracic nerves, the diaphragm, main inspiratory muscle, will be spared as its supply, the phrenic nerve, originates from the cervical level.[13] No patient in our study had pre-existing respiratory disease and only one patient complained of difficulty in breathing due to surgical manipulation tackled easily with O_2 supplement. During the operation, 4 patients (20%) had dragging pain due to stretch on mesentery and liver traction which was managed with analgesic dose of fentanyl and midazolam and gentle retraction of liver.

Adequate pain relief is obviously a pre-requisite for optimal recovery, early mobilization and consequently the patients' comfort and satisfaction. In this study, we noted that open cholecystectomy can be done very conveniently under SA and it procures important post-operative analgesia. Post-operative pain-free interval was long (8 hours) may be attributable to presence of adequate levels of residual analgesia, minimal stress response associated with spinal anesthesia (ref) and the confidence gained and high pain threshold attained by the patients during this pain-free interval so they become satisfied with simple analgesics. In 4 cases, no pain killer was given for more than 10 hours as the patients did not complain of pain.

The result of our study was comparable to Khan et al and Koju et al where they also reported longer average painfree interval for open cholecystectomy under SA, they managed majority of the patients in SA group by NSAID.[4,5] In our study, paracetamol was often sufficient. PONV was rarely present (10%), even if the prophylactic administration of ondansetron was not provided. It was reported that 50-70% of patients under GA suffer from PONV, especially in laparoscopic cholecystectomy.[14,15] Postoperative urinary retention developed in 10% patients from the spinal anesthesia (1 female and 1 male patients).

Headache was another side effect noted in one patient (5%) which was responsible of the prolongation of the LOS to 3 days. No respiratory problem was reported post-operatively. Similar results were found in the literature.[4] Postoperative urinary retention developed in 2 patients (10%); this is known to be related to spinal anesthesia.[16] The incidence of urinary retention after surgery may be further increased in patients receiving intrathecal Morphine.[17] Instant catheterization was required with no adverse effect on our two patient's recovery as well as discharge times.

Inadequate relaxation of abdominal musculature is one of the most important problems of open cholecystectomy under regional anesthesia causing difficulties in performing the operation.[18] In open cholecystectomy, it is reported that spinal anesthesia provided a satisficing relaxation, our surgical team was very satisfied with the technique and claimed that the relaxation was sufficient enough to perform the operation.[4,5]

CONCLUSION

In conclusion, we believe that the use low dose hyperbaric Bupivacaine and Morphine for conducting elective open cholecystectomy in otherwise healthy patients is safe and efficient providing a prolonged post operative analgesia without respiratory problems or prolongment of the length of hospital stay.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the institutional ethics committee

REFERENCES

1. Talpur KA, Malik AM, Sangrasi AK, Memon AI, Leghari AA, Qureshi JN. Comparative study of conventional open versus laparoscopic cholecystectomy for symptomatic cholelithiasis. Pak J Med Sci. 2011;27:33-7.
2. Shaikh GS, Shaikh SM, Bhatti Y, Deenari RA, Baloch I, Soomro Q. Risk factors resulting in conversion of laparascopic to open cholecystectomy. Med Channel. 2010;16(2):302-5.
3. Pursnani KG, Bazza Y, Calleja M, Mughal MM. Laparoscopic cholecystectomy under epidural anesthesia in patients with chronic respiratory disease. Surg Endosc. 1998;12:108:2-4.
4. Sinha R, Gurwara AK, Gupta SC. Laparoscopic cholecystectomy under spinal anesthesia: a study of 3,492 patients. J Laparoendosc Adv Surg Tech A. 2009;19:323-7.
5. Koju RB, Dongol Y, Verma R. Effectiveness of Spinal Anaesthesia versus General Anaesthesia for Open Cholecystectomy. J Nepal Health Res Counc. 2016;14(33):93-8.
6. Khan MN, Ashraf MN, Khan HD. Spinal anesthesia versus general anesthesia for open cholecystectomy: comparison of postoperative course. Ann Pak Inst. Med Sci. 2013;9:95-8.
7. Van Zundert AA, Stultiens G, Jakimowicz JJ, Peek D, Van der Ham WG, Korsten HH, et al. Laparoscopic cholecystectomy under segmental thoracic spinal anesthesia: a feasibility study.Br. J. Anaesth. 2007;98:682-6.
8. Gupta A, Gupta K, Gupta PK, Agarwal N, Rastogi B. Efficacy of thoracic epidural anesthesia for laparoscopic cholecystectomy. Anesth Essays Res. 2011;5:138-41.
9. Yousef GT, Lasheen AE. General anesthesia versus segmental thoracic or conventional lumbar spinal anesthesia for patients undergoing laparoscopic cholecystectomy. Anesth Essays Res. 2012;6:167-73.
10. Ahmed S, Boota M, Khan RA, Ishaque M, Khurshid T, Waseem SHM. Post operative analgesia following open cholecystectomy; is intermittent epidural bupivacain bolus administration more effective than continuous administration? Professional Med J. 2011;18(3):411-7.
11. Grass JA. Epidural analgesia. Probl Anesth. 1998;10:445.
12. Wheatley RG, Schug SA, Watson D. Safety and effi cacy of postoperative epidural analgesia. Br J Anaesth. 2001;87:47.
13. Freund FG, Bonica JJ, Ward RJ, Akamatsu TJ, Kennedy WF. Ventilatory reserve and level of motor block during high spinal and epidural anesthesia. Anesthesiology. 1967;28(5):834-7.
14. Thune A, Appelgren L, Haglind E. Prevention of postoperative nausea and vomiting after laparoscopic cholecystectomy.A prospective randomized study of metoclopramide and transdermal hyoscine. Eur J Sur. 1995;161:265-8.
15. Iitomi T, Toriumi S, Kondo A, Akazawa T, Nakahara T. Incidence of nausea and vomiting after cholecystectomy via laparotomy or laparoscopy. Masui. 1995;44:1627-31.
16. Jensen P, Mikkelsen T, Kehlet H. Postherniorrhaphy urinary retention: effect of local, regional and general anesthesia, a review. Reg Anesth Pain Med. 2002;27(6):612-7.
17. Wheatley RG, Schug SA, Watson D. Safety and efficacy of postoperative epidural analgesia. Br J Anaesth. 2001;87:47.
18. Zahoor MU, Masroor R, Khurshid T, Azhar R, Yasin MMA. Thoracic epidural anaesthesia for open cholecystectomy. J Coll Physicians Surg Pak. 2011;21(11):654-8.

Cite this article as: Laoutid J, Jbili N, Kechna H, Hachimi MA. Low dose spinal anesthesia for open cholecystectomy: a feasibility and safety study. Int Surg J 2017;4:1417-21.