|| ISSN(online): 2589-8698 || ISSN(print): 2589-868X ||
International Journal of Medical and Biomedical Studies
Available Online at www.ijmbs.info
NLM (National Library of Medicine ID: 101738825)
Index Copernicus Value 2018: 75.71
Original Research Article
Volume 4, Issue 9; September: 2020; Page No. 137-143

THE EFFICACY OF LOCAL ANAESTHESIA FOR APPENDICECTOMY

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Article Info: Received 14August 2020; Accepted 24 September 2020
DOI: https://doi.org/10.32553/ijmbs.v4i9.2529
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Conflict of interest: No conflict of interest.

Abstract

Introduction: Appendicitis is the acute or chronic inflammatory condition of the vermiform shaped appendix which is manifested mainly as pain in the Right Lower Quadrant (RLQ) of the abdomen, usually affecting patients aged between 5 years old and 45 years old. The prevalence of this condition is quite high, especially in developing nations. The obstructed appendiceal orifice is one of the primary pathophysiologies behind appendicitis. This occlusion of the orifice can be due to several reasons depending on factors like gender, age, race, underlying conditions, infection, etc. There are several other etiologies that can lead to appendiceal orifice including parasitic infection, benign or malignant tumour, etc. This study effectively presents the comparison between the efficacy of general anaesthesia with that of local anaesthesia in appendicectomy to avoid the complications of general anaesthesia. This study would bring the evaluation of general anaesthesia and local anaesthesia in appendicectomy.

Materials and Methods: The current study is of retrospective design and it was conducted during the period of one year two months. According to each anaesthesia received, they were divided into 4 groups. The study classified the patients into 4 groups, namely, Group 1 to Group 4. In Group 1 patients (Control group), no local anaesthesia was used. In Group 2 patients, 1% lidocaine was given at specific site. In Group 3 patients, 5 mL of 0.5% of levo-bupivacaine was injected. In Group 4 patients, 5 mL of 0.5% ropivacaine and 10 mL of 0.5% ropivacaine was applied. The outcome was assessed by Visual Analog Scale (VAS).

Results: The study found that there is significant differences in pain intensity among Group 3 patients and Group 4 patients when compared with Group 1 patients, throughout the assessment of their pain intensity at each fixed interval. In group 1, complications like sore throat, dizziness and diificult urination were found while in group 2, group 3 and group 4 patients had similar complications but of lesser severity like vomiting, dizziness, headache and muscle twitching, etc.

Conclusion: The study revealed that significant number of patients using local anaesthesia had significantly reduced pain after the appendicectomy when compared to group 1 patients. Group 3 and Group 4 who were anaesthesized with levo-bupivacaine and ropivacaine had more efficacy in terms of pain reduction after the surgery assessed at intervals.

Keywords: appendicectomy, anaesthesia, general anaesthesia, local anaesthesia

Introduction

Appendicitis, as the name suggests, refers to the inflammation of the appendix (vermiform shaped) in the right lower quadrant of the abdomen which is usually caused due to the bacterial infection. It is an acute condition which is manifested as excruciating pain in the abdomen. This can also results in chronic stage when left untreated. This acute inflammed condition of appendix is featured by abdominal discomfort in the Right Lower Quadrant (RLQ) which later spread to periumbilical region and diffuse to right upper quadrant as well when it becomes severe. The diagnosis can be done by several signs and physical examinations and also by the help of imaging and blood tests when it becomes moderate severity[1,2].

Usually, it can be seen that appendicitis (inflammation of the appendix) occurs to the people ranging from 5 years old to 45 years old. Many studies have shown that the mean value of appendicitis is 28 years old. According to the current data, the rate of prevalence of appendicitis is 233 per 0.1 million individuals and there is male predominance globally. Globally, the incidence rate among males is 8.6% while among female population is 6.7%[3].

The obstructed appendiceal orifice is one of the primary pathophysiology behind appendicitis. This occlusion of orifice can be due to several reasons depending on factors like gender, age, race, underlying conditions, infection, etc. Conditions like lymphoid hyperplasia can be one of the reasons. Other reasons that are responsible for this blockage of the orifice are ischemia, perforation, abscess, inflammation, peritonitis, etc. There are several other etiologies that can lead to appendiceal orifice including parasitic infection, benign or malignant tumour, etc [4].

This obstruction of orifice can lead to increased pressure inside the lumen (intramural or intraluminal pressure) which results in vessels occlusion. This leads to failure of the lymphatic system to drain properly resulting in inflammation of the appendix. Pathophysiologically, appendix gets filled up by mucus and hence swollen up, leading to damaging the vascular structures. This also causes obstruction and necrosis of the appendiceal tissue. This is aggravated by the aerobic and anaerobic bacterial invasion like Escherichia coli, Pseudomonas and Peptostreptococcus. One of the grave complication of appendicitis is perforation which is characterized by the necrosis apart from the inflmmatory condition. This can lead to the formation of local abscess and severe peritonitis [4,5]. Mostly, the position of the appendix is retrocecal (tail of the appendix). Microscopic pathological observation shows that there is increased neutrophils in the layer of muscularis propria in acute condition and the severity and duration of the appendicitis is proportional to severity of the inflammation. Appendiceal fat and tissues adjacent to appendix are also affected during its inflammatory process [5].

The traditionally used treatment options for acute condition of appendicitis which is most commonly used is the surgical removal (appendectomy or appendicectomy). The antibiotic therapy is now a days used as an alternative option. In studies with more than a thousands patients, thoroughly discussed the randomised trials conducted analytical evaluation between antibiotic monotherapy and surgical removal [6].

Only patients with a few severe symptoms were included in the research, weakening the findings. Antibiotics were normally given intravenously first, and later orally. Amoxicillin and clavulanic acid, cefotaxime, or fluoroquinolone were the antibiotics employed. Tinidazole or metronidazole was frequently used. The antibiotic treatment lasted 8 to 15 days in total. In the immediate appendectomy group, the overall incidence of appendicitis complications (perforation, peritonitis, and surgical wound infections) was 25%, compared to 18% in the antibiotic group. There was no difference in the rate of perforations and peritonitis between the groups. In 78% of patients in the antibiotic group, all symptoms of appendicitis vanished within the first month, with no relapse or rehospitalization[5,6]. There are studies which have analysed that more than 60% of the patients treated with antibiotics, did not show any significant feature. Another study evaluated 5 RCTs showed that there are more than 70% of patients who are managed with antiobiotic mono-therapy have showed the best clinical outcome in the first year. This is compared with another case in which patients were given surgical removal of appendix. The mono-therapy antiobiotic regimen proved to be more clinically effective as compared to the surgical removal. The disadvantages of antibiotic therapy is more efficient than appendectomy in patients with mild to moderate appendicitis[7,8].

The patients with acute appendicitis are asked to maintain NPO (Nil Per Oral) in the emergency department and also infused with IV fluid with crystalloid. IV antibiotics are suggested during this time pre-operatively under strict monitoring. Patients are also given broad-spectrum antibiotics by their doctors. Preoperative antibiotic treatment for uncomplicated appendicitis is a point of contention. Some surgeons believe routine antibiotics are unnecessary in these circumstances, while others believe they should be given on a regular basis. There have also been various studies advocating for the use of antibiotics alone to treat simple appendicitis rather than surgery. Some surgeons give antibiotics to patients with an appendiceal abscess for several weeks before performing an elective appendectomy[9,10].

Surgical removal of inflammed appendix (appendicectomy) can be considered as the standard guideline for acute signs of appendicitis (pain on McBurney's point). Laparoscopic appendectomy was performed first via laparotomy which is considered as the first line management option in the western nations now a days [11].

Laparoscopic surgery is used frequently to treat acute appendicitis than open laparotomy. The advantages that can be obtained from Laparoscopic surgery are managed pain after surgery, better result in terms of cosmetic side, shorter duration of stay in hospital, reduced rate of complications, etc. These advantages of Laparoscopic surgery are over laparoscopic appendectomy[12]. However there are several drawbacks to the general anaesthesia when it is compared with regional one. General anaesthesia has difficulty in its application and expertise is expected during the maintenance. It can cause hemodynamic instability more often than the regional anaesthesia. After surgery, post-operative nausea and vomiting, post-operative analgesia, complications due to intubation like sore throat and cough, etc [11,12].

Materials and Methods

The current study is of retrospective design and it was conducted during the period of one year two months.

Inclusion and Exclusion Criteria

The included patients were the patients who visited our hospital's outpatient department, who did appendicectomy from our hospital and cooperated in our study. The patients who were excluded are those who did not give consent to out study and had underlying chronic condition other than appendicitis.

Groupings

The study considered 105 patients and grouped into 4 groups randomly.

In Group 1 patients (Control group), no local anaesthesia was used.

In Group 2 patients, 1% lidocaine was given at the place of trocar insertion and also 10 mL of 1% lidocaine was applied under the right iliac fossa. 10 mL of 1% lidocaine was also applied in the stump of the appendix.

In Group 3 patients, 5 mL of 0.5% of levo-bupivacaine was injected at the place of trocar insertion and 10 mL of 0.5% of levobupivacaine was injected under the right iliac fossa.

In Group 4 patients, 5 mL of 0.5% ropivacaine and 10 mL of 0.5% ropivacaine was applied in the right iliac fossa and also in the stump of the appendix.

The outcome was assessed by Visual Analog Scale (VAS) which is a well accepted assessment tool for determining the extent of pain. It is characterized by a scale of 10 cm representing score which can be picked up the patients to describe their feeling of pain [11].

The assessment was done by recording VAS from each patient from all the groups, 2 hours after the appendectomy, 6 hours after the appendectomy, 12 hours after the appendectomy, 24 hours after the appendectomy and 48 hours after the appendectomy.

Ethical Approval

The study was ethically approved by the hospital concerned.

Data Analysis

The data analysis was conducted in SPSS 25 and Excel software for proper analysis. Other analysis have been shown by determining the percentages and plotting graphs.

Results

The study randomly assigned all the patients in each group. Group 1, group 2 and group 3 had 26 patients each while group 4 was assigned with 27 students.

The study found that the age of the patients in each group is almost similar. In group 1, the mean value of patients is 42.65 ± 13.21 years old, in group 2, the mean value of patients is 46.42 ± 12.26 years old. The mean vlue of group 3 an group 4 patients were found to be 46.42 ± 11.16 years old and 43.42 ± 11.85 years old.

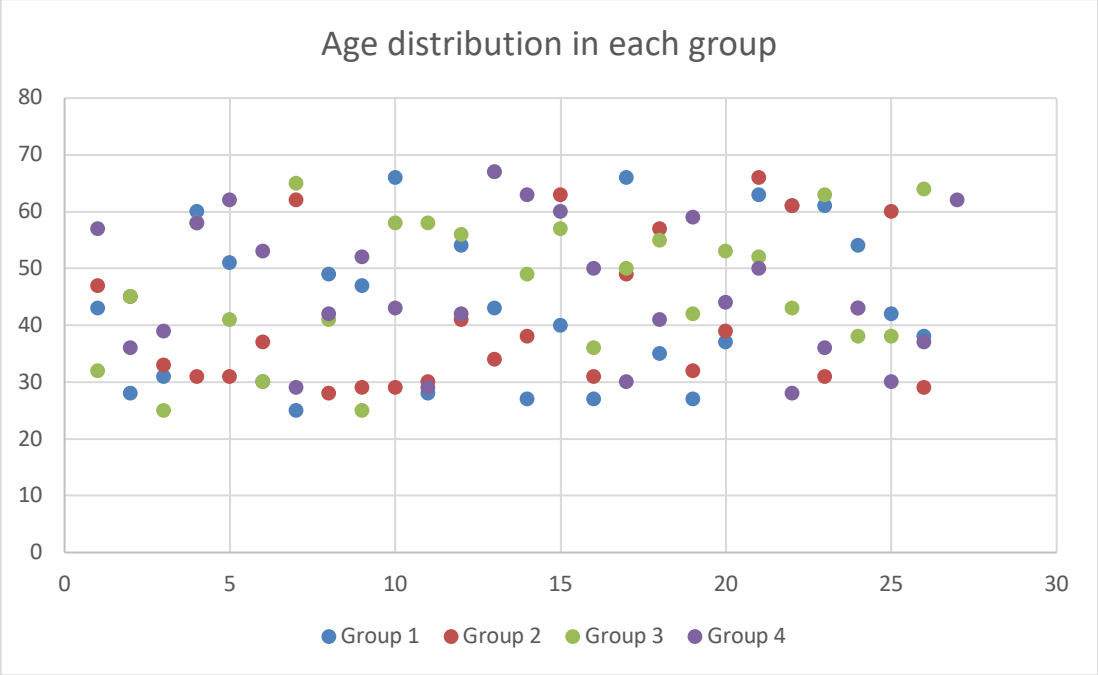

Figure 1: The age distribution of the patients in each group

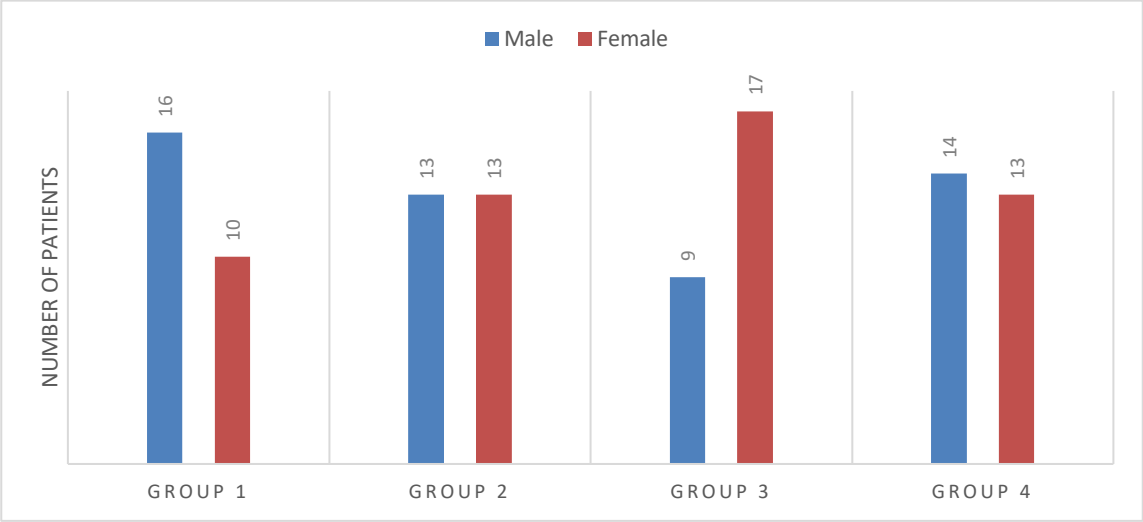

Figure 2: The gender distribution of the patients in each group
(Represents the number of males and females separately for each group)

The significance test was done for each group comparing with the general characteristics of the patients like age and gender. It was found that there is no significant difference (P>0.05) betweem the 4 groups regarding pain intensity felt by them.
VAS score was recorded at each interval and it was monitored as feeling of pain it is shown in the Table 1

Table 1: The findings of VAS scores in each group at fixed intervals of time

	VAS			
	Group 1	Group 2	Group 3	Group 4
VAS (2 hours)	5.72	5.38	3.11	3.55
VAS (6 hours)	4.59	4.12	2.38	3.00
VAS (12 hours)	3.85	3.25	2.01	2.45
VAS (24 hours)	3.22	2.55	1.71	2.05
VAS (48 hours)	2.58	1.95	1.15	1.52

The study found that there is significant differences in pain intensity among Group 3 patients and Group 4 patients when compared with Group 1 patients, throughout the assessment of their pain intensity at each fixed interval. The study further revealed that there is significant difference in pain intensity between group 1 and group 2 after 24 hours and 48 hours. Other comparisons are insignificant between specified groups.

Table 2: The findings of Significant differences of pain intensity between mentioned groups at fixed intervals of time

Category	2 hours	6 hours	12 hours	24 hours	48 hours
Group 1 vs Group 2	P>0.05	P>0.05	P>0.05	P<0.05	P<0.05
Group 1 vs Group 3	P<0.05	P<0.05	P<0.05	P<0.05	P<0.05
Group 1 vs Group 4	P<0.05	P<0.05	P<0.05	P<0.05	P<0.05
Group 2 vs Group 3	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05
Group 2 vs Group 4	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05
Group 4 vs Group 3	P>0.05	P>0.05	P>0.05	P>0.05	P>0.05

The complications of the patients in each group were monitored after the appendicectomy and was recorded. In group 1, complications like sore throat, dizziness and diificult urination were found while in group 2, group 3 and group 4 patients had similar complications but of lesser severity like vomiting, dizziness, headache and muscle twitching, etc. Group 2, group 3 and group 4 patients revealed significantly less complications as compared to group 1 patients.

Table 3: The complications of the patients in each group

Group 1		
Complication	**N**	**P-value (when compared to Group 1)**
Sore Throat	25	n/a
Dizziness	18	
Difficult urination	15	
Group 2		
Complication	**N**	**P-value (when compared to Group 1)**
Vomiting	14	P<0.05
Dizziness	12	
Headache	9	
Muscle Twitching	3	
Group 3		
Complication	**N**	**P-value (when compared to Group 1)**
Vomiting	8	P<0.05
Dizziness	6	
Headache	3	
Muscle Twitching	0	
Group 4		
Complication	**N**	**P-value (when compared to Group 1)**
Vomiting	9	P<0.05
Dizziness	8	
Headache	5	
Muscle Twitching	0	

Discussion

It is well known that many laparoscopic surgery for repairing inguinal hernia and cholecystectomy are done under local anaesthesia. It has been noted that less researches have been done on Laparoscopic appendectomy. Previously, it can be dound that laparoscopic surgeries have been done with local anaesthesia which have resulted in post-operative shoulder pain, accumulation of carbon dioxide inside peritoneum. Apart from these complications, cases of pain, abdominal discomfort, anxiety attacks and sedation have been reported[13].

Because of the increase in intra-abdominal pressure and end-tidal carbon dioxide, pneumoperitoneum for laparoscopic operations has anaesthetic concerns. If the patient only has one lung, the effects are more pronounced. Laparoscopy, on the other hand, has the advantage of reducing postoperative pain and allowing for a quicker recovery. A 30-year-old patient was referred for laparoscopic appendicectomy after undergoing pneumonectomy. The treatment went smoothly thanks to general anaesthesia and certain changes in breathing, and we were able to extubate the patient on the table. The provision of safe anaesthesia was made easier by understanding the physiological repercussions of pneumonectomy[14].

There is a anaesthetic agent known as dexmedetomidine which is a selective adrenoreceptor agonist that acts as anxiolytic, analgesic, sedative and also has ability to stabilise hemodynamic status. It has been well noted that dexmedetomidine is effective at running the ventilatory mechanism. Dexmedetomidine is used for spinal anaesthesia via IV route and prolongs the motor and sensory blocks and also providing a sedative effect. Thus, it is considered to be a beneficial and safe supplement to local anaesthesia. A pilot study was conducted for its investigation of the feasibility and safety profile of dexmedetomidine (IV route) based on the properties of the anaesthetic agent. There are records of performing Laparoscopic Appendicectomy with spinal anaesthesia given by dexmedetomidine (IV route)[15].

26 individuals received LA under spinal anaesthesia with dexmedetomidine infusion intravenously. Referred shoulder pain and abdominal discomfort were observed by eight and six patients, respectively, however, these symptoms were controllable with fentanyl with or without ketamine injection. Seven patients were found to have bradycardia. There were no general anaesthesia or open surgery conversions[16].

The first study comparing SEA (spinal-epidural anaesthesia) with GA (general anaesthetic) for laparoscopic appendectomies was undertaken. Endotracheal intubation and controlled ventilated GA are used to perform laparoscopic appendectomies. This work supports earlier feasibility studies by demonstrating that SEA may be a viable option for GA for laparoscopic appendectomies. For LA under spinal anaesthesia, it has been suggested that the sensory block level should be at least T4–T6. Unlike earlier research, they used the SEA approach, and despite the fact that the sensory block reached the T2–T4 dermatome level, we found no major SEA-related side effects[17].

The study's key finding was that the SEA approach outperformed GA in terms of postoperative pain control. We believe this conclusion is due to the long-term effects of local anaesthetics and analgesics used in the subarachnoid and epidural spaces following surgery. Because of the risk of aspiration, abdominal pain, and hypercapnia caused by carbon dioxide pneumoperitoneum, general anaesthesia was previously chosen. However, several studies have now been published that confirm the safety of regional anaesthetic for laparoscopic procedures. However, there is little research on LA under regional anaesthesia. In combined SEA patients with pneumoperitoneum, we found intraoperative right shoulder pain, stomach discomfort, anxiety, and nausea/vomiting[18].

Right shoulder pain after Laparoscopic Appendicectomy with spinal anaesthesia is reported to be between 20% and 30%. This findings are found similar to the outcomes of laparoscopic procedures. Referred shoulder pain can be caused by CO_2 induced pneumoperitoneum which can lead to phrenic nerve irritation. In many cases, patients were given general anaesthesia instead of local anaesthesia due to severe pain. It was noted that 24% of patients with spinal-epidural anaesthesia showed shoulder pain [19].

Twenty-six patients having LA underwent intravenous dexmedetomidine infusion as a spinal anaesthetic. Supplemental fentanyl or ketamine injections were used to reduce the patient's pain or discomfort throughout surgery, and all side effects were assessed. There was no need for general anaesthesia in any of the patients, and all of the surgeries were performed laparoscopically without the need for open surgery. Seventeen patients (65.4%) required additional fentanyl or ketamine injections. Bradycardia was found in seven (26.9%) of the patients. For LA, spinal anaesthesia with dexmedetomidine infusion can be an option. However, for a satisfactory anaesthetic outcome, further analgesics, sedation, and careful monitoring of the possibility of bradycardia are required[12].

Because it is associated with less surgical field discomfort, a longer postoperative pain-free period, and less nausea and vomiting, spinal/epidural anaesthesia should be favoured. In awake patients, pneumoperitoneum-related side effects such as shoulder pain and anxiety can be easily controlled[20].

Intraperitoneal local anaesthetics are becoming more popular these days. They are, however, not frequently used in laparoscopic appendectomy, and there are numerous questions concerning their use in this technique. The efficiency and safety of intraperitoneal local anaesthetics in laparoscopic appendectomy were investigated in a study. Comprehensive assessment of postoperative pain over time and safety outcomes such as postoperative nausea and vomiting and shoulder discomfort We also looked at the length of stay in the hospital and the number of opioids consumed after surgery within the first 24 hours[21].

This study comprised seven RCTs with a total of 579 patients. When comparing intraperitoneal local anaesthetics to control, we found a substantial difference in postoperative pain at different durations. Furthermore, intraperitoneal local anaesthetics were associated with a lower risk of PONV and shoulder discomfort. After controlling for heterogeneity, the intraperitoneal local anaesthetics group had a shorter hospital stay (MD= -0.39, 95 percent CI [-0.63, -0.16], p = 0.001). SMD = -0.60, 95 percent CI [-0.96, -0.24], p = 0.001). Intraperitoneal local anaesthetics were significantly linked to less postoperative opioid intake (SMD = -0.60, 95% CI [-0.96, -0.24). Intraperitoneal local anaesthetics can be used routinely during laparoscopic appendectomy since they are associated with decreased postoperative pain and fewer adverse effects[21].

Conclusion

The study revealed that significant number of patients using local anaesthesia had significantly reduced pain after the appendicectomy when compared to group 1 patients. Group 3 and Group 4 who were anaesthesized with levo-bupivacaine and ropivacaine had more efficacy in terms of pain reduction after the surgery assessed at intervals. In case of post operative complications, there are more severe complications found in group 1 patients like sore throat, dizziness, difficult urination, post operative pain while group 2, group 3 and group 4 patients who had mild complications like vomiting, dizziness, headache and muscular twicthing. Thus, from all the perspective analysed, local anaesthesia can be considered to be first line anaesthesia in appendicectomy.

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