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Editorial

Dear Colleagues,

We are pleased to announce the release of the first issue of The Eurasian Journal of Anesthesiology and Intensive Care (EAJAIC), under the auspices of Medihealth Academy, in February 2024.

We extend our gratitude to all researchers, referees, and members of the editorial board who contributed to the preparation of the journal. Additionally, we express our thanks to the printing team for their efforts in bringing it to publication.

With the launch of this journal, we aim to make innovative, up-to-date, and valuable contributions to the literature in the field of Anesthesiology and Intensive Care. In our first issue, we are delighted to present three original research articles, one review article, and one case report.

Moving forward, with your support, our goal is to have EAJAIC recognized in national and international scientific indexes. I would like to express my sincere gratitude for all the support and interest you have shown.

Best Regards,

Assoc. Prof. Dr. Musa ZENGİN
Editor in Chief

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Epidural versus intravenous analgesia for pain control in kidney donors: a retrospective cohort study

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ABSTRACT

Aims: It's crucial to ensure that live kidney donors receive top-notch care, including postoperative pain control. Treatment options include intravenous intermittent analgesics, intravenous or epidural patient-controlled analgesia (PCA). In this study we aimed to compare these modalities with respect to their analgesic efficacy.

Methods: A retrospective analysis of fifty-eight live donor nephrectomy patients operated in a 7-year-period in a university hospital was performed. Investigational Review Board approval has been obtained. Data of the patients' postoperative analgesia methods, degree of kinship with the recipient, postoperative pain scores, and rescue analgesic and antiemetic use were obtained from the patients. The patients were divided into three groups according to the analgesia method used, including intravenous intermittent, intravenous PCA and epidural PCA. Correlation of postoperative pain scores with the analgesia technique was investigated, as well as with the degree of kinship of the donor and recipient.

Results: Enhanced control of postoperative pain was achieved through PCA, epidural PCA being the best. Moderate to severe pain at 6th postoperative hour in the intravenous intermittent, intravenous PCA, and epidural PCA groups was 76, 37, and 14%, respectively. Rescue analgesic use on the day of operation was 32% and 5% in the intravenous intermittent and intravenous PCA groups, with no rescue analgesic use in the epidural PCA group. Postoperative antiemetic consumption was also less with the epidural PCA (P=0.024 and P=0.027 for postoperative days 1 and 2, respectively). No correlation was detected between the pain and the degree of kinship.

Conclusion: Epidural PCA provides better postoperative pain control after live donor nephrectomy, compared with intravenous intermittent or PCA. Postoperative pain scores were not related to the degree of kinship.

Keywords: Analgesia, kinship, postoperative pain, renal transplantation

The study was presented as poster at 54th National E-Congress of Turkish Anesthesiology and Reanimation Society on 28-30 October 2020

INTRODUCTION

Kidney transplantation is the last step in the treatment of end-stage renal failure, but is the best option for these patients, increasing survival rate and the quality of life. The kidney can be obtained from either cadaveric, or live donors, but the last is the best way in increasing the number of transplants and increasing the chance of graft survival.[1] Cold ischemic time is decreased, and the recipient's preoperative condition is optimized in the case of live donation, thus increasing the chance of the patient and graft survival.[2,3]

The conventional way of nephrectomy was open through a big flank incision often including a rib resection. This has many disadvantages like hyperesthesia, risk of incisional hernia, prolonged recovery and poor cosmesis.[4] Considering these unwanted effects of open surgery, minimally invasive laparoscopy was introduced for donor nephrectomy, with advantages of less blood loss, less pain, faster recovery, and earlier discharge.[5] Still it involves some challenges from the anesthetist's point of view and need special management, including postoperative pain.[6-10]

Pain is a major challenge for the donor. Several analgesic techniques have been proposed to relieve pain in kidney transplant donors, including paracetamol, nonsteroidal anti-inflammatory drugs (NSAIDs), opioids, patient-controlled analgesia (PCA) systems, epidural analgesia, transversus abdominis plane (TAP) block, skin and surgical cite local anesthetic infiltration, and acetazolamide, as well.[7,9,11]

The main objective of this study was to compare the pain scores of the kidney transplant donors that receive intravenous intermittent analgesia, intravenous PCA or epidural PCA. The secondary aim was to investigate the effect of the degree of kinship on the pain scores of the patients.

METHODS

Following the Institutional Ethics Board approval (Date: 03.01.2020, Decision No: 09.2020.127) data of 58 patients undergone live donor nephrectomy (LDN) between 2012-2019 in our Educational and Research Hospital were collected for the study. We have routine registration of the transplant patients in the Transplantation Committee of our institution. The patients' dossiers were collected from the hospital archive and their intraoperative follow-up forms, as well as ward nurse follow-up forms were obtained. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

We perform LDN for kidney transplant in our institution since 2012. Both open and laparoscopic techniques are performed, with the trend toward the latest. Analgesia is provided via intravenous (iv) intermittent analgesics, intravenous PCA or epidural PCA.

We have standard protocols in our institution for the intra- and postoperative management of kidney donors. General anesthesia was used routinely, with intravenous induction, endotracheal intubation and volatile-narcotic based maintenance. Invasive arterial blood pressure monitorization was performed in the recipients. Intraoperative fluid management was performed using hemodynamics and the fluid balance of the patient. Postoperative analgesia was provided by one of the three methods: 1) Intermittent intravenous analgesia, where morphine 0.1 mg kg^{-1} ideal body weight (IBW) and paracetamol 1 g intravenously are given perioperatively, followed by paracetamol 1 g every 6 hours (q 6 h); 2) Intravenous PCA, where paracetamol 1 g intravenously is given perioperatively, followed by iv PCA system (CADD-Legacy, Smiths Medical, USA) used by the patient with 0.4 mg mL^{-1} solution of morphine without continuous infusion, a demand dose of 15 µg kg^{-1} and a lockout of 10 min; 3) Epidural PCA, where paracetamol 1 g iv is given perioperatively, followed by epidural PCA system (CADD-Legacy, Smiths Medical, USA) through lower thoracic epidural catheter used by the patient with 0.125% bupivacaine and 3 µg mL^{-1} fentanyl with loading dose 10 mL, infusion 4 mL h^{-1}, demand dose 5 mL and lockout 30 minutes. Meperidine 0.5 mg kg^{-1} IBW was used as rescue analgesia in all the three groups.

Live donor nephrectomy is performed either open, or laparoscopically in our institution. For open surgery mini-incision retroperitoneal open procedure with the patient in lateral extended position is used. For laparoscopic, live donor nephrectomy in lithotomy position is done. Left nephrectomy is routinely performed unless there are anatomical reasons for the right nephrectomy.

The patients' demographic data, including age, sex, weight, height, American Society of Anesthesiologists (ASA) physical status; type of surgery (open vs laparoscopic); degree of kinship with the recipient; duration of surgery and intraoperative narcotic analgesic amount used was obtained from the intraoperative follow-up forms. Morphine equivalent was used as the amount of narcotic analgesic to standardize the data. Intraoperatively used tramadol and meperidine were converted to morphine equivalent in a ratio of 10:1.

The patients' numerical rating scale (NRS) pain scores measured at postoperative 6^{th}, 24^{th}, 48^{th} and 72^{nd} hours were obtained from the ward nurse follow-up forms, as well as meperidine rescue analgesic and antiemetic amounts for the postoperative days zero, one, two and three (PO0, PO1, PO2 and PO3). The obtained data were divided into three groups regarding the postoperative analgesia technique; as the patients receiving intravenous intermittent analgesia (Group iv), those having intravenous PCA (Group ivPCA) and those having epidural PCA (Group epiPCA). The patients' pain scores, postoperative analgesic and antiemetic consumptions were compared between the groups. Correlation between the demographics of the patients, degree of kinship and surgical technique in the groups was investigated.

Statistical Analysis

Data analysis was performed using Statistical Package for the Social Sciences 22.0 software (SPSS, IBM, USA). Data were presented as frequency, percentage, mean and standard deviation. Normal distribution was tested by Shapiro-Wilk test. Categorical variables were analyzed by Chi-Square test. Continuous variables were analyzed by One-way ANOVA with Tukey Post-hoc test or Kruskal-Wallis H test with Bonferroni adjusted Mann-Whitney U test for three and more groups. Pearson correlation coefficient was used for correlations between continuous variables. A P-value <0.05 was considered to be statistically significant.

RESULTS

Data of a total of 58 patients with the age range of 26-70 years (44.19±10.58) were analyzed, of whom 25 (43.1%) were males, and 33 (56.9%) females. The demographic characteristics, ASA physical status, surgical technique, degree of kinship, operation duration and intraoperative morphine consumption of the patients are presented in Table 1. The demographic variables and ASA physical statuses of the patients in all the three groups were similar. Forty patients had laparoscopic surgery, which comprised 69% of all the operations. No significant difference was observed between the groups regarding the surgery type. Left nephrectomy was performed in 56 out of the 58 patients. Degree of kinship was comparable between the groups, as well. Significant difference was observed in the operation duration between the groups, with the Group iv having the longest (Table 1). Intraoperative narcotic consumption did not show any significantly difference between the groups.

The patients' postoperative pain intensities are presented in Table 2.

The patients' postoperative rescue analgesic use is presented in Table 3. Group iv had the most rescue analgesic use among the study groups. Only one, if at all patients needed rescue analgesic in the Groups ivPCA and epiPCA.

Table 1. Demographic and surgical characteristics, physical statuses, intraoperative morphine consumption, and degree of kinship of the patients

	Group iv (n=25)	Group ivPCA (n=19)	Group epiPCA (n=14)	P
Sex				0.466
Male	10 (40.0)	7 (28.0)	8 (32.0)	
Female	15 (45.4)	12 (36.4)	6 (18.2)	
Age (years)	42.6±9.0	44.9±11.3	46.1±12.4	0.569
BMI (kg m^{-2})	26.5±4.0	27.2±4.4	26.9±4.1	0.835
ASA				0.720
I	17 (40.5)	15 (35.7)	10 (23.8)	
II	8 (50.0)	4 (25.0)	4 (25.0)	
Surgical technique				0.265
Open	5 (27.8)	8 (44.4)	5 (27.8)	
Laparoscopic	20 (50.0)	11 (27.5)	9 (22.5)	
Degree of kinship				0.769
1°	17 (40.5)	14 (33.3)	11 (26.2)	
≥2°	8 (50.0)	5 (31.3)	3 (18.8)	
Operation time (minutes)	226.2±34.5^{A}	199.5±63.2^{A,B}	170.0±47.5^{B}	0.002*
Intraoperative narcotic (mg)**	4.8±1.4	4.9±1.0	5.0±0.0	0.871

Note: Categorical data are given as frequency (percentage). Continuous data are given as mean±standard deviation. BMI, body mass index. ASA, American Society of Anesthesiologists physical status. iv, intravenous. ivPCA, intravenous patient-controlled analgesia. epiPCA, epidural patient-controlled analgesia. *P<0.05, and different capital letters in each row indicate significant differences between the groups. **Measured in morphine equivalents.

Table 2. Postoperative pain intensity of the patients

Postoperative times	Pain intensity	Group iv (n=25)	Group ivPCA (n=19)	Group epiPCA (n=14)
6th hour				
	None	-	-	3 (21.4)
	Mild	6 (24.0)	12 (63.2)	9 (64.3)
	Moderate	16 (64.0)	7 (36.8)	2 (14.3)
	Severe	3 (12.0)	-	-
24th hour				
	None	-	2 (10.5)	1 (7.1)
	Mild	19 (76.0)	11 (57.9)	9 (64.3)
	Moderate	6 (24.0)	6 (31.6)	4 (28.6)
	Severe	-	-	-
48th hour				
	None	4 (16.0)	4 (21.1)	5 (35.7)
	Mild	17 (68.0)	10 (52.6)	6 (42.9)
	Moderate	4 (16.0)	5 (26.3)	3 (21.4)
	Severe	-	-	-
72nd hour				
	None	16 (64.0)	15 (78.9)	12 (85.7)
	Mild	8 (32.0)	4 (21.1)	2 (14.3)
	Moderate	1 (4.0)	-	-
	Severe	-	-	-

Note: Data are given as number of the patients and their percentage in the parentheses. Pain intensity is presented as mild: Numerical Rating Scale (NRS) score 1-3; moderate: NRS score 4-6; and severe: NRS score 7-10. "None" stands for no pain, i.e. NRS score 0. iv, intravenous. ivPCA, intravenous patient-controlled analgesia. epiPCA, epidural patient-controlled analgesia.

Table 3. Postoperative rescue analgesic use for the patients

Postoperative days	Group iv (n=25)	Group ivPCA (n=19)	Group epiPCA (n=14)
PO0	8 (32.0)	1 (5.3)	0 (0)
PO1	3 (12.0)	1 (5.3)	1 (7.1)
PO2	6 (24.0)	1 (5.3)	1 (7.1)
PO3	2 (8.0)	0 (0)	0 (0)

Note: Data is represented as number of the patients having rescue analgesic and their percentage in the parentheses. PO0, PO1, PO2, PO3; postoperative day zero, one, two and three, respectively. iv, intravenous. ivPCA, intravenous patient-controlled analgesia. epiPCA, epidural patient-controlled analgesia.

Postoperative antiemetic use of the patients is presented in the Table 4. Significant difference was observed between the groups on the PO1 and PO2.

Table 4. Postoperative antiemetic use for the patients

Postoperative days	Group iv (n=25)	Group ivPCA (n=19)	Group epiPCA (n=14)	P
PO0	16 (64.0)	14 (73.7)	6 (42.9)	0.190
PO1	18 (72.0)	9 (47.4)	4 (28.6)	0.024*
PO2	13 (52.0)	8 (42.1)	2 (14.3)	0.027*
PO3	5 (20.0)	3 (15.8)	1 (7.1)	0.301

Note: Data represent number of the patients receiving antiemetic and their percentage in the parentheses. PO0, PO1, PO2, PO3; postoperative day zero, one, two and three, respectively. iv, intravenous. ivPCA, intravenous patient-controlled analgesia. epiPCA, epidural patient-controlled analgesia. *P<0.05.

Table 5 demonstrates the correlations of the patients' age, sex, BMI, degree of kinship, and surgical technique with the analgesia technique and postoperative pain scores. A negative correlation was observed between age and PO1 postoperative pain scores.

Table 5. Correlations of the patients' age, sex, BMI, degree of kinship, and surgical technique with the postoperative pain scores and postoperative rescue analgesic intake

	Analgesia technique	Postoperative pain scores			
		PO0	PO1	PO2	PO3
Age	0.140	-0.193	-0.277*	-0.160	-0.147
Sex	0.162	0.186	-0.195	0.107	-0.040
BMI	0.056	-0.030	-0.208	-0.141	-0.155
Degree of kinship	0.095	-0.069	0.109	-0.017	-0.026
Surgical technique	0.214	0.135	0.006	-0.063	0.102

Note: Data are represented as Pearson correlation coefficient. BMI, body mass index. PO0, PO1, PO2, PO3; postoperative day zero, one, two and three, respectively. *P<0.05.

DISCUSSION

This study investigated the efficacy of different analgesic techniques for postoperative pain relief in renal donor patients, and the factors affecting postoperative pain. The main finding of the study was that the patients with epidural PCA had better pain control after the operation. If we consider NRS of three as a threshold number for rescue analgesic application at the early postoperative period, three quarters of the patients in iv intermittent and about one third in the intravenous PCA groups had NRS scores above it at the 6th hour postoperatively. However, only 14% of the patients in the epidural PCA group had the pain scores above three at that time (see Table 2). This difference decreased at the 24th hour measurements and thereafter. The patients in the epidural PCA group did not receive any narcotics perioperatively. This can be advantageous in sparing the natural well-known side effects of the opioids, like nausea, vomiting, pruritus, urinary retention, bowel disfunction; but most importantly, sedation and respiratory depression.[12,13] Of these we only had the data of nausea of the patients, as metoclopramide was given "pro re nata" in these states, and the significantly lower number of antiemetic use in the epidural PCA group was concordant with that data.

Forty patients had laparoscopic operation, which comprised 69% of the nephrectomies. Minimally invasive laparoscopic donor nephrectomy was first introduced in 1995.[5] Since then many different minimally invasive approaches have evolved, like mini-incision muscle-splitting open technique; anterior vertical, posterior transcostal, transverse mini-incision technique; finger assisted technique, microinvasive technique; and video-assisted minilaparotomy.[4] Laparoscopic donor nephrectomy is a preferred method in many centers and even considered gold standard for donor nephrectomy.[14] It may be associated with

prolonged surgical times, especially in the early periods with unexperienced surgical team, but less pain, reduced narcotic use and so their side-effects, short hospital stay and early return to work are remarkable.[15] There is trend towards minimally invasive techniques, but this can be dangerous.[5] A recent article has stated that no deaths occurred since 1991 in open donor nephrectomies, but there have been several mortalities and graft losses after laparoscopic techniques.[16] We perform both techniques in our institution. Unfortunately, we had experienced one mortality; a 38-year-old female had serious postoperative hemorrhage and could not survive. This patient had also laparoscopic nephrectomy.

Left kidney is generally preferred because of anatomic reasons, but in the literature the percentage of left kidney preference varies between 45-94%.4 In our study all but two patients had left nephrectomy and so the left kidney preference was 97%.

The duration of surgery was significantly shorter in the group with epidural PCA, with the mean value of 170 minutes. Skin to skin time was reported between 117-180 minutes in the literature.[4] The duration of surgery in our study was comparable with the literature. The most plausible explanation for the shorter duration in the epidural PCA group was the trend in anesthesia towards neuraxial analgesic technique synchronously with the rising experience of the surgeons.

The consumption of rescue analgesics was higher in the intravenous intermittent analgesia group. Only few patients needed additional rescue analgesia in the PCA groups. Intermittent application of analgesics, especially "pro re nata" technique means that patients experience pain at certain intervals, and this condition is somewhat stressful, decreasing the quality of postoperative care. Uncontrolled postoperative pain may result in hemodynamic disturbances, psychological consequences. Many techniques are used for pain control in donor nephrectomy, like paracetamol, NSAIDs, opioids, epidural or neuraxial techniques, TAP block and local anesthetic infusions.[14,17-19] Yeap et al.[20] have used TAP block for postoperative analgesia in LDN and found a single injection TAP block with ropivacaine to be as effective as a catheter infusion. Erector spinae block have recently been demonstrated to provide good analgesia and reduce opioid consumption in LDN.[21] Gritsch et al.[22] have used quadratus lumborum block with liposomal bupivacaine for the pain management in laparoscopic LDN patients. The block was demonstrated to be a good adjunct for pain management in some patients with reduced opioid consumption in some patients. A recently described external oblique intercostal block may also be promising for pain control in LDN.[23] Deep neuromuscular blockade had been proposed as a method of reducing postoperative pain after laparoscopy.[24] Acetazolamide was also used to reduce pain after live donor nephrectomy.[11] There is no standard application to all the patients in our institution, and for the renal donor patients we use intravenous intermittent, intravenous PCA and epidural PCA analgesia. For all the groups we used meperidine 0.5 mg kg^{-1} for rescue analgesia. Nonsteroidal anti-inflammatory drugs are generally avoided in nephrectomy patients, because of their possible nephrotoxic effects, but they have good opioid sparing effects, and can be preferred for the treatment of postoperative pain for less than five days.[14] We do not prefer NSAIDs, considering their unwanted effects on gastrointestinal, hematologic systems, and kidneys, as well. In our study patients in the intravenous intermittent analgesic group needed more rescue meperidine, and this result emphasizes the importance of PCA systems in the pain management of live donor nephrectomy patients.

In this study we also measured the effect of the degree of kinship on postoperative pain. The patients can donate their kidney up to the 4^{th} degree relatives in our country, due to ethical and legal concerns. Most of the donations in our country is from first degree relatives, i.e. parents, siblings, children or spouses. We had 42 first degree relatives (parents, siblings, children, and spouses), which comprised 72% of all the donors. These findings are compatible with the literature.[25] We had two-sided H1 hypotheses at the beginning of the study; either less or more pain in the first-degree relatives. More pain in first degree relative donors could be explained by the added effects of their own perioperative physiological disturbances and the psychological effect of the recipient's condition. Lee et al.[25] have demonstrated a close relationship between trait anxiety and postoperative pain in liver donors. Non-drug therapies have been suggested to be added to the routine pain protocols after surgery.[26,27] On the other hand, the contrary could be the matter, and this may have been explained by the motivational effects of self-devotion of the donors to the people they appreciate. In our study no difference was observed between the groups regarding the degree of kinship. It is early to make solid judgement about the above-mentioned effects on postoperative pain and this needs validation by randomized controlled trials.

Limitations

The study had some limitations, firstly being retrospective in nature. Secondly, the treatment protocols in the intermittent iv analgesia group were not standardized, with patients having analgesics bis- ter- or quater in die, and sometimes as "pro re nata".

CONCLUSION

Epidural PCA has provided better postoperative pain control after live donor nephrectomy compared with intravenous intermittent and intravenous PCA. This effect was observed both for open and laparoscopic surgeries. Use of epidural PCA also resulted in less antiemetic use after the surgery. The degree of kinship was not related with postoperative pain scores. The hypothesis that we put forward regarding different postoperative pain scores in different degrees of relationship between donor and recipient can be studied in a larger population, with the inclusion of perioperative anxiety scales.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Marmara University Faculty of Medicine Clinical Researches Ethics Committee (Date: 03.01.2020, Decision No: 09.2020.127).

Informed Consent

Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Original Article

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Bronchoscopy guided percutaneous dilatational tracheostomy; performed by anesthesiology residents

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ABSTRACT

Aims: Percutaneous dilatational tracheostomy can be performed safely at the bedside in critical patients today. Clinical studies on tracheostomy were mostly carried out by experienced healthcare professionals. This study was designed to investigate the differences of percutaneous dilatational tracheostomy performed by anesthesiology residents using two different methods.

Methods: Patients hospitalized in anesthesia intensive care unit who underwent percutaneous tracheostomy were examined. All tracheostomy procedures were performed by anesthesiology residents using the "Griggs" or "Ciaglia" method. The procedure time, difficulty and complications of both methods were recorded.

Results: 38 patients were included in the study. It was observed that 22 of the patients had tracheostomy with the Griggs technique, and 16 with the Ciaglia technique. Tracheostomy application time was measured as 6.05 minutes with the Griggs technique and 6.35 minutes with the Ciaglia technique (p=0.939). There was no difference in complications and technical difficulties between the two methods.

Conclusion: In this study, where bedside bronchoscopy guided percutaneous dilatational tracheostomies were applied by two different methods by anesthesiology residents, no difference was found between the two methods in terms of complications and technical difficulties. We believe that "Griggs" and "Ciaglia Blue Rhino", two of the percutaneous dilatational tracheostomy methods, are not superior to each other in terms of ease of use and complications in anesthesiology education.

Keywords: Anesthesiology, bronchoscopy, critical care, education, tracheostomy

Preliminary data for this study were presented as a poster presentation at the National Congress of the Turkish Society of Intensive Care, online conference 10-15 September 2020.

INTRODUCTION

Percutaneous dilatational tracheostomy (PDT) is a procedure that can be performed safely at the bedside in critical patients today. It is mostly applied in patients who require mechanical ventilation due to respiratory failure. There are various views related to PDT indications, timing, and ideal technique selection. Many PDT methods are used today, and each of them has complications at various levels.[1,2]

The single-step dilatation method and forceps dilatation method are among the most used methods. The single-step dilatation method is referred to as "Ciaglia Blue Rhino Single-step" (CBR), and it has been used since 2004.[3] The forceps dilatation method is called the "Griggs Technique", and it was defined in 1990.[4] There are many studies in the literature comparing the two methods.[5,6] In some of these studies, bronchoscopy was used during PDT.[7,8]

When the literature on percutaneous dilatational tracheostomy was reviewed, it was seen that the tracheostomy procedure was mostly carried out by experienced healthcare professionals.[9,10]

The hypothesis of this study is that there are significant differences between the Griggs technique and the CBR method in bronchoscopy-guided PDT procedures, in terms of procedure success, complication rates, and execution times. The comparison of these two methods, conducted by anesthesiology residents, can provide clearer information for the selection of the ideal technique and may have significant implications in the care of critically ill patients.

In this study, we aimed to retrospectively evaluate patients who underwent bedside bronchoscopy guided percutaneous dilatational tracheostomy with Griggs and Ciaglia Blue Rhino methods by anesthesiology residents and to examine the differences between the two methods.

METHODS

The study was approved by the appropriate University of Health Sciences Dr. Abdurrahman Yurtaslan Ankara Oncology Health Practice and Research Center Clinical Researches Ethics Committee (Date: 13.01.2021, Decision No: 2021-01/940). Written informed consent obtained from all patients or their legal proxy. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Files of all the patients who electively underwent bronchoscopy guided percutaneous dilatational tracheostomy between June 2018 and December 2019 in Anesthesiology Intensive Care Unit, were examined retrospectively. The groups were named as "Griggs group" and "CBR group".

In our clinic, all bedside tracheostomies were performed by anesthesiology residents through percutaneous dilatation using Griggs or CBR technique. The procedure was accompanied by an anesthesiologist experienced in PDT, and bronchoscopy was carried out by a third anesthesiologist. The demographic data of the patients, PDT indications, APACHE II and SOFA scores of the procedure day, pre-procedure hemoglobin, thrombocyte, fibrinogen, aPTT and INR results were recorded from the intensive care follow-up forms. The tracheostomy follow-up form of the patient who was applied tracheostomy was examined from the patient records. From the tracheostomy follow-up form, information about cardiac arrhythmia, pulse oximetry and invasive or non-invasive blood pressure monitoring, arterial blood gas results before and after the procedure, ventilator parameters (PIP; peak inspiratory pressure, PEEP; positive end-expiratory pressure, Cdyn; dynamic compliance), MAP (mean arterial pressure) before the procedure, the lowest and highest MAP during the procedure, and the lowest SpO_2 during the procedure, ephedrine requirement, amount of bleeding, complications, technical difficulties related to the procedure and hemoglobin value of the patient, which was measured twenty-four hours after the procedure, were recorded. It was observed that anesthesia and analgesia were provided adequately during the procedure (midazolam, fentanyl, propofol and rocuronium). As the percutaneous tracheostomy kit, Portex (Blue Line Ultra, Percutaneous Tracheostomy Kit) was used for the Griggs method and Rüsch (PercuQuick set Worthley) for the CBR method. It was observed that all the patients were administered a mixture of local anesthesia and adrenaline (60 mg lidocaine, 30 mcg adrenaline) during the procedure. The time between the skin puncture of the needle and the placement of the tracheal cannula was recorded as duration of procedure.

Statistical Analysis

Statistical analysis was performed with SPSS 24.0. The normal distribution of continuous data was evaluated with the Kolmogorov-Smirnov test, and homogeneity was evaluated via the One-way ANOVA test. Independent t-test and Mann-Whitney test were applied in the analysis of the independent variables. The Wilcoxon test was used in the analysis of dependent variables. The Chi-square test was used in categorical data. $p<0.05$ was considered statistically significant in all tests.

RESULTS

38 patients were included in the study. It was observed that 22 of the patients had PDT with the Griggs technique, and 16 with the CBR technique. When the reasons for performing tracheostomy were reviewed, it was understood that PDT was performed in thirty-three patients (86.8%) due to prolonged mechanical ventilator therapy, in four patients (10.5%) due to their neurological condition, and in one patient (2.6%) for tracheobronchial aspiration. The mean time during which the patients were followed up in intubation before tracheostomy was 10.9 (±4.5) days; the APACHE II mean score was calculated as 23.6 (±6.6), SOFA mean score as 6.0 (±2.6), and mean age as 66.4 (±15.3) years.

Age, gender, body mass index (BMI), intubation time, APACHE II and SOFA score, dynamic compliance, PaO_2/FiO_2 ratio, platelet count, aPTT, INR and fibrinogen values of the groups are shown in Table 1.

Table 1. Demographic data, laboratory results (mean values)

	Griggs (n=22) (min-max)	CBR (n=16) (min-max)	p
Age; year	65.2 (40-89)	67.9 (38-89)	0.525
Gender (female: male)	12:10	9:7	0.590
BMI; kg/m^2	26.1 (17-34)	26.0 (20-34)	0.824
Intubation duration; day	10.6 (3-22)	11.4 (6-16)	0.556
APACHE II	23.1 (14-36)	24.2 (14-43)	0.618
SOFA	6.7 (2-13)	5.0 (3-8)	0.052
Cdyn; mL cmH_2O^{-1}	36.5 (17-96)	28.5 (10-45)	0.190
PaO_2/FiO_2; cmH_2O	205 (88-359)	203 (113-385)	0.935
Platelet; 1000 mm^3	217 (75-387)	217 (113-385)	0.500
aPTT; second	28.7 (18-80)	28.4 (21-51)	0.291
INR	1.2 (0.9-1.8)	1.1 (0.7-1.5)	0.073
Fibrinogen; mg dl^{-1}	341 (88-622)	473 (193-803)	0.045

CBR; Ciaglia Blue Rhino, BMI; body mass index, APACHE; acute physiological and chronic health assessment, SOFA; sequential organ failure evaluation, Cdyn; dynamic compliance, PaO_2; partial arterial oxygen pressure, FiO_2; Fraction of inspired oxygen, aPTT; activated partial thromboplastin time, INR; international normalized ratio.

The comparisons of hemoglobin values in both groups before and after the procedure are shown in Figure.

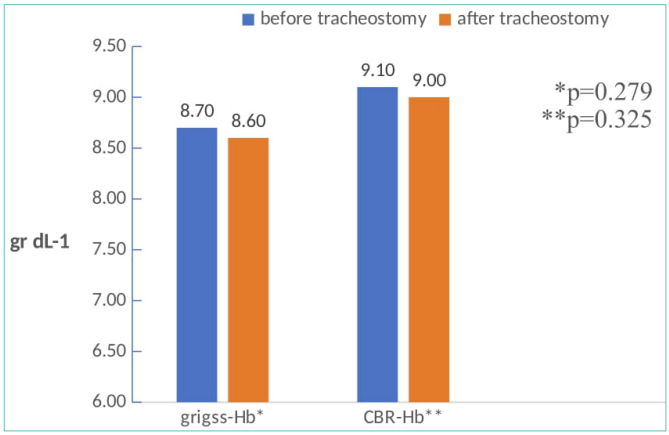

Figure. The comparisons of hemoglobin values

The hemodynamic, neurological, laboratory and ventilation values of the Griggs and CBR groups before and after the procedure and the data related to the anesthetic and analgesic drugs used during the procedure and the duration of procedure are given in Table 2. PDT procedure time was measured as 6.05 minutes with the Griggs technique and 6.35 minutes with the CBR technique (p=0.939). Data showing the complications of the Griggs and CBR techniques are given in Table 3.

Table 2. Hemodynamic, neurological, laboratory and ventilation values before and after the procedure, drugs used, duration of the procedure in Griggs and CBR groups (mean values)

	Griggs (n=22) (min-max)	CBR (n=16) (min-max)	p
Procedure time; minute: second	6:05 (3:40-10:00)	6:35 (4:20-13:00)	0.939
GCS, pre-procedure	10.1 (4-15)	11.5 (2-15)	0.976
GCS, post-procedure	10.9 (4-15)	11.4 (5-15)	0.803
MAP, pre-procedure; mmHg	83.2 (60-104)	76.7 (60-101)	0.203
MAP, lowest value during procedure; mmHg	67.7 (37-102)	63.0 (36-100)	0.391
MAP, highest value during procedure; mmHg	92.7 (56-125)	90.0 (68-120)	0.813
Peak inspiratory pressure, pre-procedure; cmH_2O	23.2 (12-35)	31.8 (17-57)	0.017
Peak inspiratory pressure, post-procedure; cmH_2O	22.9 (10-33)	33.5 (12-56)	0.004
PEEP, pre-procedure; cmH_2O	8.3 (5-12)	8.7 (5-14)	0.729
PEEP, post-treatment; cmH_2O	8.6 (6-12)	8.6 (5-13)	0.962
PaO_2/FiO_2, pre-procedure	205 (88-359)	203 (113-385)	0.918
PaO_2/FiO_2, post-procedure	185 (85-337)	190 (90-348)	0.929
pH, pre-procedure	7.47 (7.22-7.56)	7.47 (7.34-7.59)	0.929
pH, post-procedure	7.45 (7.20-7.60)	7.41 (7.20-7.60)	0.173
Lactate, pre-procedure; mmol L^{-1}	1.7 (0.5-5.7)	1.2 (0.3-2.5)	0.104
Lactate, post-procedure; mmol L^{-1}	1.6 (0.6-5.0)	1.3 (0.3-2.4)	0.519
Hemoglobin, pre-procedure; g dl^{-1}	8.7 (7.9-10.2)	9.1 (7.0-12.0)	0.771
Hemoglobin, post-procedure 24th hour; g dl^{-1}	8.6 (6.9-10.7)	9.0 (6.8-14.0)	0.988
The lowest SpO_2 during the procedure; %	92 (74-99)	94 (84-98)	0.363
Ephedrine; mg	2.5 (0-20)	7.2 (0-40)	0.250
Fentanyl; mcg	68 (15-100)	88 (50-150)	0.027
Propofol; mg	115 (50-200)	145 (80-250)	0.142
Rocuronium; mg	56 (50-130)	63 (50-100)	0.225

CBR; Ciaglia Blue Rhino, GCS; Glasgow coma score, MAP; mean arterial pressure, PEEP; positive end-expiratory pressure, PaO_2; partial arterial oxygen pressure, FiO_2; Fraction of inspired oxygen, SpO_2; oxygen saturation measured by pulse oximetry

Table 3. Complications of Griggs and Ciaglia Blue Rhino groups

	Griggs (n=22) (%)	CBR (n=16) (%)	p
Arrhythmia, number	1 (4.5)	0	0.579
Number of patients receiving noradrenaline	4 (18.2)	1 (6.3)	0.286
Bleeding >10 ml	2 (9.1)	1 (6.3)	0.604
Bleeding; major	0	0	-
Subcutaneous emphysema	0	0	-
Pneumothorax	1 (4.8)	1 (6.3)	0.685
Esophageal perforation	0	0	-
Tracheal posterior wall damage	0	0	-
Guide wire curling	4 (19.0)	0	0.091
Tracheal ring damage	6 (28.6)	4 (25)	0.555
Excessive stoma dilatation	0	0	-
Switching to another technique	0	0	-
Difficult cannula placement	1 (4.8)	2 (12.5)	0.396
Difficult stoma dilatation	3 (14.3)	4 (25)	0.342
Tracheal stenosis	1 (4.8)	0	0.568
Stoma infection	0	0	-
Late bleeding	0	0	-
Transfer to service	6 (27.3)	2 (12.5)	0.245
Exitus	15 (68.2)	10 (62.5)	0.490

CBR; Ciaglia Blue Rhino

DISCUSSION

In this study, where the patients who were applied bronchoscopy guided percutaneous dilatational tracheostomy with the Griggs and Ciaglia Blue Rhino methods by anesthesiology residents were retrospectively evaluated, no difference was found between the two methods in terms of duration of procedure and complications.

Elective tracheostomy is a common procedure applied frequently for prolonged mechanical ventilation in critically ill patients in intensive care. With the emergence of the Seldinger guidewire technique, PDT has almost replaced surgical tracheostomy. Many percutaneous tracheostomy techniques are used today. Ciaglia Blue Rhino and Griggs techniques are also among the methods preferred frequently.[11]

Many authors defend the use of bronchoscopy to view the correct placement of the needle, guidewire, dilator, and tracheostomy cannula. Moreover, the use of bronchoscopy may prevent the damage likely to occur on the posterior tracheal wall. Decreased ventilation, carbon dioxide retention, increased airway pressure, and increased cost can be counted among the disadvantages of bronchoscopy. Furthermore, it is necessary to be careful in patients with acute neurological symptoms or requiring high ventilator pressure and oxygen adjustment. In some European countries such as Germany and UK, the rate of using bronchoscopy during PDT is above 80%. In Spain, the rate of using bronchoscopy drops to 16%.[12] In Turkey, the rate of using bronchoscopy during PDT is 24%.[12]

In our study, we observed that PDT was applied to 33 of 38 tracheostomy patients due to prolonged mechanical ventilator therapy. When the data in Europe and the world are reviewed, it is seen that prolonged mechanical ventilator treatment is in the first place among the reasons for applying tracheostomy.[12,13]

There is no consensus on the time of performing tracheostomy[14] In a meta-analysis on approximately two thousand patients from nine studies, it was shown that early tracheostomy did not cause any decrease in mortality, length of stay in intensive care unit, ventilator-associated pneumonia and mechanical ventilation day compared to late tracheostomy[15] In a review published by Adly et al. in 2017, early tracheostomy (<7 days) in adult patients was shown to reduce nosocomial pneumonia, mortality, length of stay in intensive care unit and mechanical ventilation day[16] The average follow-up of the patients in our study with an endotracheal tube before tracheostomy was found as 10.9 days (±4.4).

In the publications where the Griggs and CBR techniques, which are the two methods we used in our study, were compared, we saw that PDT was previously performed by people who were experienced in this field.[5-7] In these studies, the mean duration of PDT with the Griggs method was between 6.5 and 11.7 minutes whereas the PDT duration with the CBR method was between 7.5 and 13.9 minutes. In all three studies, no significant difference was observed between the two techniques in terms of duration. In another study, which was conducted by Karvandian et al.[8] a 5-minute limitation was set to evaluate the time difference between the two methods, and it was observed that PDT was applied in less than 5 minutes in significantly more patients in the Griggs method compared to CBR.

In our study PDTs were carried out by individuals who were anesthesiology residents and had no previous PDT experience, or those who had less than five experiences, and the PDT application time with the Griggs technique was measured as 6.05 minutes on average, and with the CBR technique as 6.35 minutes (p>0.939). We anticipate that both methods can be applied in tracheostomy training without delay in the procedure.

When the complications and technical difficulties of both methods were reviewed, it was shown in a meta-analysis that the Griggs technique was technically more difficult than CBR (difficult cannula placement, difficult dilatation), and the amount of bleeding was higher; however, there was no difference in terms of mid-to-late complication rates.[11] In another review, it was demonstrated that the rate of tracheal ring fracture and minor bleeding was higher in CBR than the Griggs technique, but it was stated that CBR was technically easier.[10] In our study, it was observed that the most common complication in the Griggs method was tracheal ring damage (28.6%), which was followed by guidewire curling (19%). In the CBR method, the most common complication was tracheal ring damage (25%), which was followed by pneumothorax and bleeding more than 10 mL (6.3%). No significant difference was found between the two techniques in terms of complications. The rate of encountering technical difficulties were similar in both methods.

The incidence of tracheal ring damage, which was the most common complication in both methods, was calculated as 27% in total. In the literature, tracheal ring fracture rate varies between 2.9% and 36%.[11]

While the Griggs method is not primarily preferred as the PDT method in most European countries, it is preferred in our country by 70%.[12] We think that it is preferred more in terms of cost.

Pneumothorax is a serious complication which can be seen during PDT. In our study, pneumothorax was encountered in two patients (5.4%). In the literature, the incidence of pneumothorax during PDT is usually less than 1%, but there are also studies revealing a rate of 17%.[17,18] PDT-related mortality has been demonstrated to be 0.67%.[19] In our study, no PDT-related mortality was observed.

In most of the studies published on bedside elective percutaneous tracheostomy, PDTs are applied by experienced people. There is no sufficient evidence in tracheostomy training to determine the minimum number of procedures required to apply tracheostomy independently. PDT can be safely performed by the physicians of non-surgical branches, intensive care and chest diseases, anesthesiologists, emergency doctors and otolaryngologists.[2] As in any other procedure, it requires adequate training. The American College of Chest Physician recommends at least twenty procedures,[20] and the European Respiratory Society recommends at least 5-10 procedures before performing PDT independently[21] It is also recommended to continue to perform at least 10 procedures per year to sustain competency. In a study conducted by Nates et al.[23] no difference was discovered in terms of complications in PDTs performed by experienced and inexperienced people. In our study, the PDT procedure was carried out by individuals who were anesthesiology residents and had not performed PDT before or performed less than five PDTs in company with an experienced physician.

Limitations

The study faces several limitations that are important to address. Firstly, being a single-centered study, it may not adequately represent diverse geographical, cultural, or demographic groups, thus limiting its sample diversity and representativeness. Secondly, there are variations in the experience levels of the anesthesiology residents performing the procedures, coupled with a lack of standardized procedures, which could potentially influence the outcomes. Additionally, the study primarily focuses on short-term outcomes without including long-term follow-up data, which limits the scope of understanding the prolonged effects of the procedures. There are also potential impacts due to technical variations and differences in the equipment used for the tracheostomy procedures, which could affect the study's results. Lastly, as a retrospective study, it is subject to limitations such as inconsistencies in data collection and record-keeping processes, which might impact the accuracy and completeness of the data gathered.

CONCLUSION

Bronchoscopy guided percutaneous dilatational tracheostomy is a safe procedure performed at the bedside. It can be applied in different ways by physicians from various specialties. There is no recommended tracheostomy method to be used in tracheostomy training.

In this study, in which bedside bronchoscopy guided percutaneous dilatational tracheostomies were opened by anesthesiology residents with the "Griggs" and "Ciaglia Blue Rhino" methods and the two methods were compared, no difference was found between the two methods in terms of complications and technical difficulties.

We believe that "Griggs" and "Ciaglia Blue Rhino", two of the percutaneous dilatational tracheostomy methods, are not superior to each other in terms of ease of use and complications in anesthesiology education.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of University of Health Sciences Dr. Abdurrahman Yurtaslan Oncology Health Practice and Research Center Clinical Researches Ethics Committee (Date: 13.01.2021, Decision No: 2021-01/940).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Comparison of bupivacaine and levobupivacaine in continuous axillary brachial plexus block

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ABSTRACT

Aims: This study compares bupivacaine – lidocaine and levobupivacaine – lidocaine administrations in terms of initiation and duration of motor and sensorial blockage, total number of additional analgesic applications, analgesic amount consumed in 24 hours, side-effects and hemodynamic effects in continuous axillary brachial pleksus block in hand and forearm surgery.

Methods: Thirty ASA I-II physical status patients, scheduled hand or forearm surgery were enrolled for of the two groups in a randomized study. Axillary catheter duly placed in both group with appropriate guided techniques. Patients in group B received 0.5% bupivacaine 20 ml+2% lidocaine 20 ml and group L received 0.5% levobupivacaine 20 ml+2% lidocaine 20 ml through the axillary catheter. Initiation and duration of motor and sensorial block, total number of additional analgesic applications and analgesic amount consumed in postoperative 24 hours were recorded. Pre-block, peri-operative and post-operative blood pressures and heart beat rates were also recorded. Block application duration, operation duration, tourniquet duration and demographic data of patients (age, sex, weight, and length) were recorded. Demanded and applied analgesic doses by the patient controlled analgesia devices, side effects and complications were also recorded.

Results: There was no statistically significant difference between two groups in terms of initiation and duration of motor and sensorial block, amount of analgesic consumed in 24 hours, demanded and applied analgesic doses by the patient controlled analgesia devices and hemodynamic data ($p>0.05$). There is a mild and positive relation between block application duration and patient weight ($p=0.014$; $r=0.444$)

Conclusion: Both bupivacaine+lidocaine and levobupivacaine+lidocaine combinations can safely be used in axillary continuous brachial plexus block without any difference in terms of initiation and duration of block, total analgesic amount consumed. Their duration of action and effect on hemodynamic responses are similar.

Keywords: Axillary brachial plexus blockage, continuous brachial plexus block-age, bupivacaine, levobupivacaine

INTRODUCTION

Regional anesthesia continues to be a frequently used form of anesthesia in anesthesia practice. The fact that it has some advantages compared to general anesthesia increases its usability even more.[1] Regional anesthesia has advantages such as patient consciousness, avoidance of complications related to endotracheal intubation due to continuation of spontaneous breathing and preservation of airway reflexes, prevention of aspiration risk, early mobilization and recovery, postoperative pain control and early hospital discharge time.[2-4]

The suitability of the anatomy of the brachial plexus and its easy accessibility are the reasons for preference in anesthesia for orthopedic interventions in the upper extremity. In reconstructive surgery, vasodilation due to sympathetic blockade accompanying brachial plexus anesthesia significantly increases the incidence of surgical success.[5] Brachial plexus blockade can be performed with various techniques.

The aim of this study was to compare bupivacaine and levobupivacaine administration with continuous brachial plexus blockade via axillary approach in cases requiring hand and forearm surgery in terms of motor and sensory block onset, duration of block, total number of additional analgesic applications, 24-hour analgesic consumption, effects on hemodynamics and side effects.

METHODS

This study was conducted with the approval of the Ethics Committee of Ankara Clinical Researches Ethics Committee No. 1 (Date: 11.01.2010, Decision No: 2010/01/198) and written informed consent of the patients. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Thirty patients in the ASA I-II group aged 20-70 years who were planned to undergo upper extremity surgery were included in the study. Patients with known sensitivity to any of the drugs used in the study, peripheral neuropathy, non-cooperative, cutaneous infection at the procedure site, coagulopathy, history of cardiac, respiratory, hepatic or renal failure and patients who did not want to participate in the study also patients who proceeded to general anesthesia due to failed block were excluded. During the preoperative visit, all patients were physically examined, and laboratory findings were evaluated. Patient-controlled analgesia was initiated through a perineural axillary catheter.

Patients were divided into 2 groups with 15 patients in each group by closed envelope method: Group B (0.5% bupivacaine 20 cc/100 mg), Group L (0.5% levobupivacaine 20 cc/100 mg). (2% lidocaine 20cc 400 mg was used in both groups).

The patients were administered midazolam 0.05 mg/kg im as a premedication agent 30 minutes before surgery. Noninvasive arterial blood pressure (NIBP), electrocardiography (ECG) and peripheral oxygen saturation (SpO_2) monitoring were performed. O_2 was administered at 2 lt/min with a nasal cannula.

For axillary brachial plexus blockade, the forearm was flexed and externally rotated, and the hand was placed next to the head with the palm facing upwards. Axillary artery pulsation was taken, and its cross-section was drawn with a pencil. The axillary region was cleaned with povidion iodine solution and covered with sterile drape. The cathode pole of the nerve stimulator (Stimuplex® B Braun, Melsungen, Germany) was connected to the needle conductor tip and the anode pole to the ECG electrode placed on the inner side of the wrist of the arm to be blocked. The most proximal point where the axillary artery pulse was felt was palpated again, 2% lidocaine 2 ml of local anesthesia was administered to this point, and the skin and subcutaneous tissue was penetrated with a 22-gauge 50 mm short-bevelled peripheral nerve stimulator catheter set needle (Stimuplex®BBraun, Melsungen, Germany) from above the artery at an angle of approximately 45 to the skin. Stimulator stimulation frequency was set to 2 Hz and amplitude to 2 mA. During the insertion of the needle, entry into the axillary sheath was recognized by feeling the fascia click, paresthesia or oscillation of the released needle in accordance with the arterial pulse. The time of block was considered as the time from the introduction of the stimulator needle into the skin until the end of drug infusion.

The time of onset of sensory block was recorded as the time (min) when sensory block scale was 1 (Table 1) in any of the four nerves, that is, when pain disappeared but the sensation of touch persisted, and the time of sensory block was recorded as the time (min) when sensory block scale was 2 in all nerves, that is, when pain and tactile sensation disappeared.

The onset time of motor block was recorded as the time (min) when motor block scale was 1 (Table 1) in any of the four nerves, when the motor impulse was decreased but the arm was able to move, and the onset time of motor block was recorded as the time (min) when motor block scale was 3, complete block in all nerves.

Table 1. Sensory block and motor block onset and development times

	Group B (n=15)	Group L (n=15)	p
Sensory block onset time (min)	7.33±1.72	7.87±1.25	0.339
Motor block start time (min)	5.73±0.80	6.33±1.18	0.113
Sensory block development time (min)	15.67±2.26	16.07±1.62	0.582
Motor block development time (min)	13.33±2.26	14.80±1.70	0.054

Values are given as mean±standard deviation. p<0.05 was considered significant.

After the block was performed, patients were examined for sensory and motor block at 1-minute intervals.

Systolic (SBP), diastolic (DBP), mean arterial pressures (MAP), heart rate (HR) values were recorded before and 5, 10, 15 minutes after the block was performed. SBP, DBP, MAP, HR values were recorded intraoperatively at 1, 5, 10, 20, 20, 30, 40, 50, 60 minutes and postoperatively at 1, 2, 4, 6, 12 and 24 hours. The time of first analgesic requirement and the amount of analgesic consumed in the postoperative 24-hour period were documented.

Before starting the analyses, the compliance of the data with certain assumptions was investigated. In the comparison of means analyses, "Kolmogorov Smirnov Normality Test" was used to examine the conformity to normal distribution and "Levene Test Statistics" was used for the conformity of the homogeneous variance presumption. In the analysis of the relevant data, the test to be applied was decided by considering whether the assumptions were met and the structure of the data.

Independent Groups T Test was used to compare the two groups in terms of age, height, weight, block application time, number of demanded doses, number of administered doses, total amount of anesthetic, duration of anesthesia, tourniquet time and operation time. In the research of the relationship between these two patient groups and gender, sedation application, arterial puncture and venipuncture, Pearson Chi-Square Test was used when the presumptions of Pearson Chi-Square Test were met and Fisher's Exact Test was used when the presumptions were not met. In addition, Pearson Correlation Coefficient was used to investigate the relationship between block application time and height and weight. One-way and Two-way Analysis of Variance with Repeated Measures were used for intra-group and inter-group comparisons in terms of HR, SBP, MAP and DBP values at the measurement times. Descriptive statistics of continuous variables are presented as mean±standard deviation and categorical variables are presented as number of patients (N).

In this study, statistical analyses were performed using SPSS 16.0 statistical package program. The p values obtained in the test results were evaluated at α=0.05 significance level.

RESULTS

There was no significant difference between the groups in terms of sensory block onset time, motor block onset time, sensory block onset time, motor block onset time (Table 1).

There was no statistically significant difference between the groups in terms of demographic data, duration of anesthesia, tourniquet time and operation time (Table 2).

Table 2. Demographic data

	Group B (N=15)	Group L (N=15)	p
Age (years)	36±14.4	38.3±12.1	0.645
Height (cm)	172±9	167.7±10.3	0.232
Weight (kg)	82.4±13.1	75.2±11.2	0.117
Tourniquet duration (min)	62.9±27.5	64.2±22.1	0.887
Operation time (min)	76.4±30.4	81.4±30.3	0.655
Anesthesia duration (min)	115±40.6	112 ±32.2	0.82

Values are given as mean±standard deviation. p<0.05 was considered significant.

There was no statistically significant difference between the groups in terms of mean blood pressure and heart rate levels at any follow-up time (Figure 1).

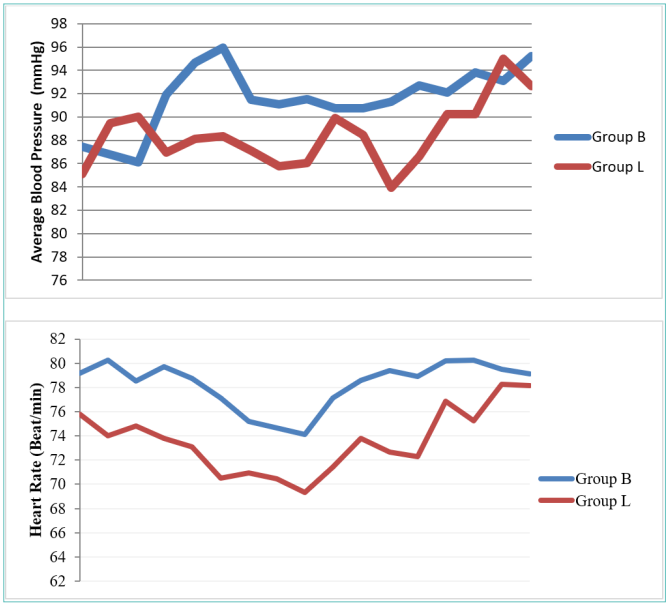

Figure 1. Mean blood pressure and heart rate levels

There was no significant difference between the groups in terms of duration of block administration, number of doses demanded, number of doses delivered, and total amount of anesthetic (Table 3).

Table 3. Block administration time, requested dose, administered dose, total anesthetic amount

	Group B (n=15)	Group L (n=15)	p
Block administration time (min)	5.33±1.54	5.07±0.88	0.566
Requested dose (n)	29.53±7.04	26.93±9.81	0.411
Administered dose (n)	16.07±5.75	12.60±4.67	0.081
Total anesthetic amount (ml)	199.33±31.33	183.00±23.36	0.117

Values are given as mean±standard deviation. p<0.05 was considered significant.

DISCUSSION

Due to the side effects of general anesthesia during induction, maintenance and awakening, regional anesthesia techniques are increasingly preferred for appropriate operations. Considering that a significant proportion of hand surgery procedures are emergency and all of patients, it is possible to avoid the side effects of general anesthesia with brachial plexus blockade in these patients. In the study performing by Hadzic et al.[6] general anesthesia and brachial plexus blockade were compared in outpatient hand surgery interventions, and it was revealed that the postoperative analgesia score was better with regional anesthesia, there was no need for additional analgesia, earlier ambulation was achieved and it was superior in terms of side effects.

Different doses and concentrations have been studied to find the ideal doses for axillary brachial plexus block. Cline et al.[7] reported that the onset times of sensory and motor blockade in the axillary brachial plexus block they performed with 40 ml 0.5% levobupivacaine were 19 and 27 minutes, respectively. In our study, this volume but low concentration of drug was used. The time to grade 2 sensory block was 16 minutes and the time to Grade 2 motor block was 14 minutes.

In patients where Cox et al.[8] used 0.25% levobupivacaine in supraclavicular brachial plexus block, the onset times of sensory and motor block were found to be 7 and 9 minutes, respectively. In our study, the onset time of sensory block was similar as 7 min in the 0.25% levobupivacaine group in which we used the same concentration but in higher volume. We think that this difference is due to another local anesthetic, lidocaine, which we added to the local anesthetics we used.

Transarterial, paresthesia and nerve stimulator techniques are used for axillary plexus blockade. The nerve stimulator technique provides exact needle localization without paresthesia. Success rates of all three techniques have been compared in various publications. Goldberg et al.[9] found the success rates after 40 mL of 1.5% mepivacaine injection to be 70%, 80% and 79%, respectively, in patients in whom they used the nerve stimulator, transarterial or paresthesia method with immobile technique (single injection), and found no statistically significant difference between them. Tuominen et al.[10] compared the success rates of paresthesia and nerve stimulator techniques using 0.5% bupivacaine. In the nerve stimulator group, adequate block level was achieved in all cases, whereas in the paresthesia technique group, 6.7% failure was encountered, but it was not statistically significant. In this study, we used the nerve stimulator technique similar to Tuominen et al.[10] and achieved adequate block level.

Although increasing concentration of local anesthetic solution does not increase the success rate of nerve block,[11] the total volume injected increases the chance of success and volumes >40 mL are recommended.[12] In our study, adequate surgical anesthesia was achieved with the nerve stimulator using the immobile technique without any neurological damage, using a low concentration and a total volume of 40 mL.

Sato et al.[13] investigated the efficacy of bupivacaine and levobupivacaine in equal doses in a study performed in 40 patients. A maximum dose of 40 ml of 0.5% bupivacaine and levobupivacaine was administered at 3 mg/kg or 0.6 ml/kg per patient, and 1/200,000 epinephrine was added to both local anesthetics. Casati et al.[14] performed sciatic nerve block using equal dose and volume of levobupivacaine and bupivacaine and found no significant difference in the quality and duration of motor block and sensory block. In our study, we administered 40 ml of 0.25% bupivacaine in 15 patients and 40 ml of 0.25% levobupivacaine in 15 patients. In our study in which we added lidocaine to two local anesthetic drugs, we found no statistically significant difference between the two groups in terms of the onset and duration of motor block.

In a study by Liisananttii et al.[15] in 90 patients undergoing hand and forearm surgery, 45 ml of 5% bupivacaine, levobupivacaine or ropivacaine was administered to each patient and the duration of sensory and motor block and the need for additional analgesics were noted. According to this study, complete motor blockade of the elbow was found to be 67% in the ropivacaine group, 30% in levobupivacaine and 47% in bupivacaine. Two patients in the levobupivacaine group and one patient in the ropivacaine group needed general anesthesia due to inadequate block. Local infiltration support was provided in 2 patients in the bupivacaine group, 6 in the levobupivacaine group and 4 in the ropivacaine group. In the same study, they also compared the times of first analgesic intake in the groups and found them similar. In this study, they used oral analgesics. In our study, there was no statistically significant difference between the two groups in terms of motor block onset times. No patient in either group required general anesthesia or additional nerve block. We think that this was due to lidocaine, another local anesthetic that we added to both groups.

Cox et al.[16] showed that the analgesic effects of levobupivacaine were mostly similar to bupivacaine at equal doses. Ozmen et al.[17] used levobupivacaine and bupivacaine infiltratively after tonsilectomy operation and found that their effects on postoperative analgesia were similar. In our study, we provided postoperative analgesia with patient-controlled analgesia with local anesthetic at a concentration of 0.125% through a catheter placed in the vascular-nerve bundle. We applied the patient-controlled analgesia PCA device at the end of surgery. We could not compare the first analgesic time, motor and sensory block termination times because we set the continuous dose of the PCA device as 5 ml/hour. We did not find a significant difference in local anesthetic consumption between the patients. In addition, in our study, we found that the postoperative analgesic effects of both local anesthetics at 0.125% concentration were similar in accordance with the literature.

Cox et al.[18] reported that a significant decrease in the incidence of systemic toxicity with local anesthetics from 0.2% to 0.01% has been observed in the last thirty years and that in peripheral nerve blocks, although the incidence of systemic toxicity was the highest at 7.5 per ten thousand, the rate of neural damage was the lowest at 1.9 per ten thousand. Urban et al.[19] compared the interscalene block they performed using the paresthesia method with the axillary block they performed using the puncture technique and observed that seizures occurred in only one case due to intravenous injection during the axillary approach. They also found mild paresthesia on postoperative day 1 in 19% and neuropraxia (transient conduction block) in 5% which disappeared within 2 weeks in the group in which axillary block was applied and reported that symptoms prolonged up to 4 weeks in 1 case. In our study, no side effects such as transient and permanent neurologic damage and seizures were observed in any of our patients and no intravenous injection was seen in any of our patients. In our study, we used a single injection method with a nerve stimulator and administered the drug by titrating and after frequent aspiration.

Although toxic symptoms associated with lidocaine usually occur when a plasma concentration of 10 µg/ml is reached, they can also be observed rarely at plasma concentrations between 6-10 µg/ml.[19] Palve[20] and Aantaa,[21] who used 900 mg of lidocaine with adrenaline in two separate studies of transarterial axillary block, achieved 100% success and reported that they did not encounter any problems in their patients who reached a plasma concentration of 5.6 µg/ml using a maximum of 18 mg/kg lidocaine. Although the maximum recommended dose of lidocaine has not been definitively established, it is known to vary according to the site of administration. For example, approximately 600 mg of lidocaine should be given to the plexus brachialis to achieve a plasma concentration of 5 µg/ml, while 300 mg of lidocaine used for intercostal block is sufficient to achieve this plasma concentration. The fact that no toxic reaction developed in the Palve[20] and Aantaa[21] studies despite the use of twice the maximum recommended dose may be related with the site of administration of the drug. It is known that venous absorption of drugs from the neurovascular sheath is slower and this is closely related with the therapeutic index of lidocaine.[22] In this study, we used 400 mg (mean 5 mg/kg) lidocaine in combination with other local anesthetics in both groups. It is known that there may be an additive interaction in local anesthetic combinations. Despite this, we did not encounter any side effects or complications with both drugs at the doses and concentrations we used. We believe that this is due to the slower venous absorption of drugs from the neurovascular sheath as mentioned above.

Unfortunately, this convenience with lidocaine cannot be said for bupivacaine. A dose twice the maximum dose cannot be recommended for bupivacaine. Cardiac side effects have been reported with the use of bupivacaine.[23] In addition, toxic plasma peak concentrations were reported to be reached in a patient in whom 3 mg/kg bupivacaine was used in axillary block.[22] We were able to limit the dose of bupivacaine to 1-2 mg/kg by using lidocaine, another local anesthetic. Therefore, no bupivacaine-related complications or side effects were observed in our study.

Limitations

The postoperative follow-up period for the patients in the study was 24 hours. The inability to monitor the long-term effects in the study participants was a limitation of our study.

CONCLUSION

We believe that both bupivacaine-lidocaine and levobupivacaine-lidocaine would be a very good combination and can be used safely without any difference in terms of block initiation and formation times and the total amount of local anesthetic consumed in postoperative analgesia.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was carried out with the permission of Ethics Committee of Ankara Clinical Researches Ethics Committee No. 1 (Date: 11.01.2010, Decision No: 2010/01/198).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

The authors declared that this study has received no financial support.

Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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Traditional and complementary medicine applications in preoperative anxiety

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ABSTRACT

Preoperative anxiety leads to increased sympathetic activity. This is reflected in the clinic as tachycardia, hypertension and arrhythmias mediated by catecholamines. These hemodynamic changes are also seen during laryngoscopy and intubation and can lead to complications. Pharmacologic agents are usually used to treat anxiety. However, adverse effects and drug interactions may be observed. Traditional and complementary medicine practices have been gaining popularity in recent years as safe and effective methods.

Keywords: Anxiety, surgery, acupuncture, reflexology, hypnosis, phytotherapy, music

INTRODUCTION

Traditional and complementary medicine methods (TCM) are used with increasing frequency in the treatment of diseases, health protection and maintenance. In some countries, health administrators are encouraging physicians trained in modern medicine to incorporate TCM practices into their professional practice as a complement to medical practices. Accordingly, more noninvasive, less pharmacologic agents and more economical treatment protocols are being developed.[1-3]

Anesthesiology and reanimation specialists have the opportunity to use TCM methods in all areas of sedation and anesthesia, intensive care and palliative care units, and pain management. Especially in anesthesia applications, studies on TCM applications in the peroperative process are being carried out.

ACUPUNCTURE

Acupuncture can be used in the treatment of preoperative anxiety. Acupuncture is a treatment that involves applying pressure, needling with steel needles, or applying electric current at certain frequencies to defined points on energy channels in the body. The stimulation of these points regulates the energy flow in the channels and thus the function of the relevant organs. In studies, as a result of stimulation of acupuncture points, functional MRI imaging methods have shown an increase in activity in the relevant points in the brain and the effect of acupuncture has been shown.[4-6]

Yintang (EX-HN3), DU 20, HT 7, Shenmen points are particularly used for anxiety. A study was conducted on the parents of pediatric patients who will undergo surgery. Parents were divided into 2 groups; Yintang point was applied to one group and sham point (placebo) was applied to the other group. While there was no difference in blood pressure, heart rate, bispectral index (BIS) values between the groups, a significant difference was found between State-Trait Anxiety Inventory (STAI) scores, and it was observed that anxiety scores of the people in the acupuncture group decreased significantly.[7] Acar et al.[8] They divided 52 patients scheduled for surgery into 2 groups. They applied acupuncture to the Yintang point to the preoperative acupuncture group and sham acupuncture to the control group. While there was no difference in the control group, it was found that instant anxiety (STAI-S) and BIS values decreased statistically significantly in the study group.

In Wiles et al.[9] study, a group of brain surgery cases were given acupuncture to the Yintang point while a group was made a control group. While STAI-S6 and APAIS scores decreased in the acupuncture group, no change was observed in the control group. These studies show that Yintang point can be used safely in the treatment of anxiety through scoring systems showing the degree of anxiety. As with the Yintang point, Shenmen, HT7, LU 7 points can be used, and ear or body acupuncture can be performed.[10-13] Cabrini et al.[13] evaluated the anxiety and restlessness of patients with the

VAS scale in their study on patients undergoing diagnostic fiberoptic bronchoscopy (FOB). According to the standard protocol, FOB is performed following topical local anesthetic application. Group A was the control group in which the standard protocol was applied, group B received acupuncture to LU 7, PC 6, LI 4, HT 7 (Shen Men), auricular Shen Men points in addition to topical anesthesia, and group C received sham acupuncture with topical anesthesia. In the comparison of anxiety and restlessness with the VAS scale, Group A and C were found to be similar, while in Group B, where acupuncture was applied, it was observed that the patients had less anxiety and felt more comfortable at a statistically significant level. These clinical studies have shown that acupuncture applied with different methods and the use of different points is effective in preventing anxiety.

PHYTOTHERAPY

Phytotherapy, which means treatment with plants, can also be used in the perioperative process. Especially medicinal aromatic herbal oils are used. These oils can be used by inhalation or massage.[14] Rose, lavender, mint, eucalyptus and orange oil are the most commonly used oils in the preoperative period. After inhalation or absorption of these oils through the skin, the central nervous system is stimulated and neurotransmitters such as serotonin and dopamine are released. This in turn regulates anxiety, depression and mood disorders. Lavender oil, which is known to have anxiolytic, analgesic and antispasmodic properties, is most commonly used for anxiety.[14,15] Experimental studies have shown that lavender essential oil produces relaxation by closing GABA-A and voltage-dependent Ca channels.[16,17]

Anxiety in children undergoing surgery is significant. There are researches on how anesthesiologists can detect anxiety in this special group and reduce sedative drugs by providing anxiolysis with nonpharmacological tools.[18-20] Arslan et al.[21] investigated the efficacy of lavender aromatherapy in children aged 6-12 years who were scheduled for dental treatment. The 126 children scheduled for dental intervention were divided into two groups as control group and aromatherapy group. While the control group received no additional intervention, the study group inhaled 100% lavender oil for 3 minutes before the dental procedure. Patients were followed up with face image scale (FIS), Face, Legs, Activity, Cry, Consolability (FLACC) and Wong-Baker pain rating scale (WBS) scales throughout the procedure and hemodynamic data were recorded. FIS scale and pain scores were found to be statistically significantly lower in the lavender aromatherapy group compared to the control group.

Dağlı et al.[22] investigated the effect of rose oil on preoperative anxiety. The otorhinolaryngology clinic patients were divided into 3 groups as control, sham and aromatherapy group. While distilled water/ethyl alcohol mixture was applied to the sham group, distilled water/ethyl alcohol/rose oil mixture was applied to the study group via diffusor. Anxiety scores were measured and compared with the STAI test in the clinic and before the surgical procedure. While the anxiety scores of the patients in the sham group did not change, preoperative anxiety scores in the control group increased statistically significantly and decreased significantly in the aromatherapy group, and it was reported that aromatherapy application with rose oil decreased the anxiety.

REFLEXOLOGY

Reflexology is done by massaging the reflection points of the body on the soles of the hands and feet with a special technique. It provides well-being by regulating the function of organs. It can be used for many purposes in the perioperative process and can be used in anxiety prophylaxis and treatment.[23-26]

Patients are generally anxious during cesarean section. However, due to the side effects that may occur in the baby with intrauterine transmission, pregnant patients are avoided to give anxiolytics in the preoperative period. Navaee et al.[25] planned a study considering that reflexology may be effective in this special group. Three groups were planned: a control group in which standard care was applied, a massage group in which classical simple foot massage was performed and a foot reflexology group in which foot reflexology was performed with a special technique. Preoperative massages were performed in the interventional groups and preoperative anxiety scores were re-examined in all groups. Baseline and control anxiety scores of the patients were compared. While anxiety scores increased in the control group, it was observed that anxiety scores decreased in the simple massage group and decreased to a greater extent in the reflexology group.[26]

In patients with cardiovascular disease, anxiety may lead to significant hemodynamic changes and thus complications. It has been reported to be associated with postoperative atrial fibrillation, prolonged hospitalization and increased need for revision surgery.[27,28] Chandrababu et al.[29] in their meta-analysis, they examined the studies on the efficacy of reflexology in cardiovascular interventional procedures. As a result of the evaluation of 10 research articles including a total of 760 patients, it was observed that anxiety scores were statistically significantly lower in patients who underwent reflexology.

MUSICTHERAPY

Music therapy is another TCM method that can be used to reduce stress related to surgery. Its effectiveness is observed more clearly especially in adults and sick individuals. In treatment, music types with anxiolytic and sedative efficacy can be used, as well as music in the style that the individual likes.[30] In a study conducted on 100 patients who were planned to undergo laparoscopic hysterectomy, 70 patients were planned as the control group and 30 patients as the music therapy group. While the control group received standard treatment, the music-treatment group was made to listen to music 1 hour before surgery. Anxiety levels of the patients in baseline, preoperative, early postoperative and late preoperative periods were evaluated with STAI-Y form. Anxiety scores in the preoperative, early and late postoperative period were found to be significantly lower in the music therapy group compared to the control group and the anxiolytic effect of music therapy was shown.[31]

HYPNOSIS

Hypnosis is defined as a state of focused attention with increased sensitivity to suggestions. In a hypnosis procedure, the patient is first put into a trance state by induction, and the patient is guided with suggestions during the continuation of the session. Hypnosis can be used to prevent preoperative

anxiety and increases the patient's compliance and comfort.[32] There are studies in the literature for this purpose.[33,34]

Saadat et al.[33] conducted a study to investigate the effect of hypnosis on preoperative anxiety. In this study, 3 groups were planned as control group with standard care, attention control group with listening without hypnotic suggestion and hypnosis group with hypnotic suggestion. Anxiety levels were evaluated with VAS and STAI form before and after the intervention and at the entrance to the operating room. While anxiety levels increased by 47% in the control group, it was found to decrease by 10% in the attention control group and 56% in the hypnosis group. Hypnosis seems to be very effective in preventing preoperative anxiety in this study. Zeng et al.[34] conducted a meta-analysis of 6 research articles involving 1242 patients. It was concluded that hypnosis significantly reduced anxiety levels in patients scheduled for minor surgery for breast cancer.

In addition to the physical trauma caused by surgery, psychological effects should also be taken into consideration. Although the frequency of anxiety varies according to the type of surgery, age and gender of the patient, a frequency of up to 97% has been reported.[35]

CONCLUSION

The anxiety and fears experienced will also affect the recovery and discharge process of the patient. The surgeon and anesthesiologist should determine the patient's anxiety level and plan intervention with the appropriate method. Thus, possible complications can be prevented and patient satisfaction can be increased.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

Financial Disclosure

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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A different airway management in double lumen tube intubation due to unexpected difficult airway

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ABSTRACT

A difficult airway is when an experienced anesthesiologist has difficulty in providing ventilation with a mask and/or endotracheal intubation. In cases where intubation cannot be achieved with laryngoscopy, devices such as laryngeal mask airway (LMA) or fiberoptic bronchoscope (FOB) can greatly contribute to the management of the difficult airway. This process may be further complicated when direct laryngoscopy and DLT intubation fail. In this case, the first goal should be to reach the airway. For this purpose, a single-lumen tube can be used first. Although there is not yet a clear algorithm for difficult intubation in DLT insertion, the gum elastic bougie (GEB) is widely used in clinical practice for this purpose. In this case report, we wanted to highlight two of our cases in which we encountered unexpected difficult intubation and we achieved successful endobronchial intubation with FOB-guided GEB through the LMA.

Keywords: Difficult intubation, difficult airway, laryngeal mask airway, double lumen tube, gum elastic bougie

INTRODUCTION

A difficult airway is when an experienced anesthesiologist has difficulty in providing ventilation with a mask and/or endotracheal intubation. Its incidence varies between 1-13%.[1] It is estimated that half of these are unexpectedly difficult intubations. Many conditions such as congenital, anatomical and acquired factors may complicate airway management.[2] Failure to successfully manage the difficult airway is estimated to be responsible for 30% of anesthesia-related deaths. The patient's previous anesthesia experience allows us to obtain information about the airway and may guide a detailed evaluation of unexpected difficult airway and difficult intubation. In addition, to determine the possibility of difficult intubation, anesthetists use many measurement methods such as Mallampati (oropharyngeal view), sternomental distance, and thyromental distance in preoperative evaluation. In addition, the Cormacke & Lehane test is used to evaluate the upper airways and vocal cords during laryngoscopy.[3] Although these tests and measurements are useful in predicting difficult intubation, many difficult intubation cases may occur after direct laryngoscopy is attempted to visualize the vocal cords after anesthesia induction. Endotracheal intubation is a standard method in general anesthesia practice. In cases where intubation cannot be achieved with laryngoscopy, devices such as laryngeal mask airway (LMA) or fiberoptic bronchoscope (FOB) can greatly contribute to the management of the difficult airway.[4] FOB application is a reliable method used to perform procedures such as confirmation or repositioning of endotracheal tube placement, replacement of endotracheal tubes, placement of double lumen endotracheal tubes (DLT), and placement of endobronchial blockers. Although the LMA does not completely protect the airway against aspiration, it does allow ventilation and oxygenation.[5] DLT are very commonly used in surgical operations involving the thoracic cage. Insertion of DLT is more difficult than a standard endotracheal tube due to its size and shape.[6] This process may be further complicated when direct laryngoscopy and DLT intubation fail. Although there is not yet a clear algorithm for difficult intubation in DLT insertion, the gum elastic bougie (GEB) is widely used in clinical practice for this purpose.[7] However, although GEB contributes to the success of DLT intubation, there may be a risk of airway trauma due to blind application.[7] For this reason, it may be advantageous to apply the GEB application with FOB. Especially during difficult intubation, if airway safety can be achieved with LMA, FOB-guided GEB application may be beneficial to reduce airway trauma in these patients.

In this case report, we wanted to highlight two of our cases in which we encountered unexpected difficult intubation and we achieved successful endobronchial intubation with FOB-guided GEB through the LMA.

CASE

Case 1: A 29-year-old 46 kg, 173 cm male patient who will be operated for pneumothorax was evaluated preoperatively. The patient had no known additional disease. The patient with normal preoperative laboratory parameters and stable vital signs was evaluated as American Society of Anesthesiologist (ASA) I. The patient's Mallampati score was 2 and there was no limitation in neck movements. The incisor distance was 5 cm. Also, thyromental and sternomental distances were 5 cm and 12 cm, respectively.

Case 2: A 56-year-old, 65-kg, 160-cm male patient who was planned to undergo VATS/thoracotomy due to a nodule in the lower lobe of the right lung was evaluated preoperatively. The patient had known hypertension disease. He had not undergone any previous surgical operation. The patient with normal preoperative laboratory parameters and stable vital signs was evaluated as ASA II. The patient's Mallampati score was 2 and there was no limitation in neck movements. The incisor distance was 6 cm. In addition, the thyromental and sternomental distances were 6 cm and 12 cm, respectively.

Both of the patients were pre-oxygenated with 100% oxygen after being monitored in the operating room according to standard ASA criteria before general anesthesia induction. Lidocaine (1 mg/kg), propofol (2 mg/kg), fentanyl (1 mg/kg), and vecuronium (0.1 mg/kg) were administered intravenously for anesthesia induction. An oral airway was placed. The patients were ventilated easily with a mask. Intubation was attempted with a laryngoscope (Heine, size 4) after 3 minutes in both patients; however, vocal cords could not be visualized. Cormacke & Lehane scoring was determined as 4 for both patients. Intubation was attempted with a video laryngoscope (McGrath), but vocal cords could not be visualized in both patients. After a LMA was placed for both patients, the location of the vocal cords was determined by advancing the FOB through the LMA. The vocal cords were passed in a controlled manner by advancing the GEB next to the FOB (Figure 1). GEB was fixed and FOB and LMA were removed (Figure 2). Appropriate sized left DLT was directed through the GEB. The placement of DLT was first demonstrated with end-tidal CO_2 and then confirmed by performing FOB. Anesthesia was maintained with 50% O_2, 50% air and 5-6% desflurane. Desaturation was not encountered during these procedures. The first patient's operation is approximately 120 minutes; In the second patient, it took 150 minutes. At the end of the case, the patients whose spontaneous respiration was returned with 2 mg/kg sugammadex were extubated without any problems and transferred to the postoperative recovery room.

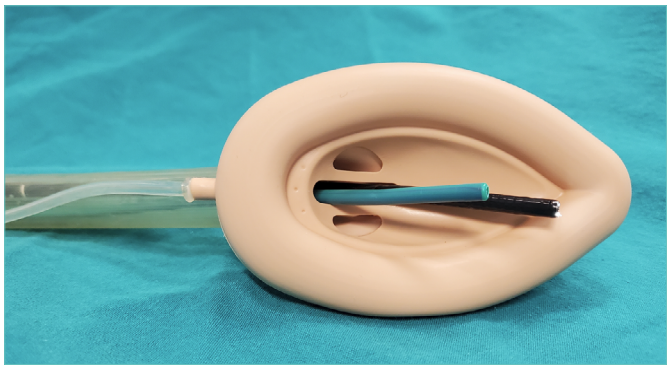

Figure 1. Demonstrative view of passing gum elastic bougie and fiberoptic bronchoscopy through laringeal mask airway

Figure 2. A fiberoptic bronchoscopy guided gum elastic bougie insertion through the laringeal mask airway in a case of difficult double lumen tube intubation

DISCUSSION

The difficult airway is one of the main causes of anesthesia-related morbidity and mortality. Difficult ventilation is defined as the inability of an experienced anesthesiologist to keep oxygen saturation above 90% using a face mask. Difficult intubation is defined as more than three attempts to intubate the trachea or requiring more than 10 minutes to complete the intubation, a condition that occurs between 1.5% and 8% of general anesthesia procedures.8 Preoperative evaluation is crucial in predicting difficult intubation. Although there are national and international difficult airway algorithms; each clinic must create its own algorithm. Examination findings such as Mallampati scoring, sternomental and thyromental distance, anterior mandibular region anatomy, degree of extension of the head, and radiological examinations can be used to predict intubation difficulty.[9] The most widely used scale is the Mallampati test, which divides patients into four classes based on the visualization of the soft palate, uvula, and anterior and posterior pillar. In addition, several conditions that predispose patients to difficult intubation have been reported. These conditions include infections, trauma, obesity, endocrine factors, foreign body, tumors, inflammatory conditions, and congenital problems.[10]

In some cases, although patients can be easily ventilated with a mask, endotracheal intubation is not easily performed. This situation can be even more problematic especially in DLT applications. The incidence of intubation difficulty in patients with Cormack & Lehane classification 4, which indicates the

visualization of the vocal cords during laryngoscopy, varies between 1-4%.[11] In such cases, methods such as repositioning the head and neck, cricoid compression, inserting a guide into the ETT, and using GEB can be tried.[10] If these methods are not successful, intubation can be performed using LMA, retrograde intubation, FOB, and video laryngoscope.[12] Conditions such as tachycardia, hypertension, increased intracranial pressure that develop with repetitive interventions may cause failure, especially in patients with limited cardiac reserve. This is especially important in thoracic surgery cases where respiratory problems are at the forefront. Therefore, in our cases, while avoiding hypoxia by providing airway patency with LMA instead of repetitive intubation attempts; By advancing GEB with FOB, we also protected it from respiratory tract traumas that may be caused by GEB.

A single airway test cannot provide a high index of sensitivity and specificity for predicting difficult airways. For this reason, a combination of multiple tests is often used. Shiga et al.[1] in a meta-analysis, differences were identified in the use of tests to detect difficult intubation before surgery, alone and in combination. They found that while the sensitivity of the tests alone was weak to moderate, the diagnostic value increased when used in combination.[13] Difficult intubation was not expected in our two cases, since the Mallampati score was determined as two and the thyromental-sternomental distances were normal. Although the multiple tests used are thought to be more valuable, such tests cannot prevent the unpredictable intubation difficulty. For this reason, one should be prepared for the difficulties of intubation and airway management, especially in situations where intubation can be performed more difficult, such as DLT. In this regard, institute-based algorithms can play an important role in success. Kheterpal et al.[13] was reported in a study by 77 of 53041 patients that difficulty in mask ventilation was experienced, difficult intubation was encountered in 19 patients, and alternative difficult airway methods were applied in 12 patients. GEB, which has pediatric and adult forms, has been used for a long time in cases of unexpected difficult intubation. The tip of the GEB has an angle to target the tracheal opening. However, blind applications of GEB may lead to catastrophic traumas in the upper airways and especially in the trachea. Kadry et al.[14] presented a case report in which they perforated the larynx wall while trying to intubate blindly with GEB in a patient who developed an unexpected difficult airway and difficult intubation. We could not provide intubation in both of our cases, and we performed controlled endotracheal intubation with FOB and GEB over LMA.

When difficult intubation is encountered under general anesthesia, LMA application is one of the options in the difficult airway algorithm to provide an alternative airway. LMA is a supraglottic airway device developed by British anesthesiologist Dr. Archie Brain. It has been used since 1981.[15] It has recently been used in emergencies. This is because it is easy and fast to use, even for inexperienced anesthesiologists. While intubation with FOB remains the preferred option for many anesthesiologists, the LMA and its modifications provide equal or better conditions for intubation compared to the awake FOB technique.[16] We also advanced the GEB into the trachea under the guidance of FOB, under the control of the LMA. Thus, we were able to perform visual endotracheal intubation, protected from traumatic complications that may be caused by GEB.

DLT is the gold standard in airway management for thoracic surgery operations. DLT is more difficult to insert than a standard tracheal tube due to the larger DLT dimensions. During intubation with DLT, the use of GEB may facilitate intubation.[17] Thus, complications such as bleeding and edema caused by failed and repeated intubation attempts can be reduced.

Wong et al.[18] in their study, compiled two studies in which intubation with a single lumen tube was performed by advancing FOB and GEB together through the LMA. However, to our knowledge, there is no other literature in which the same method is performed with DLT. Information on the successful use of the video laryngoscope and FOB for DLT placement in the unexpectedly difficult intubation situation is still limited. There are no accepted guidelines yet for difficult intubation situations when using DLT. A recent review considered an algorithm for thoracic surgery involving the use of introducers such as GEB for unexpectedly difficult intubation.[19] Watson et al.[20] described two difficult intubation patients who tried blind intubation with FasTrach TM and succeeded after failed intubation with FOB.

CONCLUSION

The main task of anesthesiologists is to solve problems that may develop perioperatively. Airline safety is one of the most important components of this management. Preoperative evaluations used to predict airway problems, although instructive, can be misleading from time to time. Repetitive intubation attempts due to difficult airway and intubation may cause serious problems, especially in patients with a limited respiratory reserve and accompanying comorbidities. Therefore, instead of repetitive intubation and long-term mask application, it may be a different and safe alternative to secure the airway with the LMA, and to place the pediatric GEB through the LMA with FOB into the trachea.

ETHICAL DECLARATIONS

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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