Perioperative Effect of Continuous Infusion of Dexmedetomedine on Indirect Gas Calorimetry Monitoring in Liver Transplantation

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Abstract

Objective: To study the perioperative effect of Dexmedetomedine on indirect calorimetry in recipients of adult living donor liver transplantation.

Background: Dexmedetomedine is newly used in liver transplant.

Material and Methods: Forty patients were assigned randomly to get Dexmedetomedine (Dex) beginning at 0.5 μg/kg/h (0.2-0.7μg/kg/h) or placebo (C) Anesthesia was guided by Enotropy (40-60) with Desflurane. Indirect calorimetry parameters, arterial blood gases, hemodynamics were taken at base line, dissection, an hepatic, reperfusion and 3 hours after end of operation. Trans esophageal Doppler was used for fluid optimization.

Results: No significant difference was noticed in either group regarding demographic data, and operative data, Dexmedetomedine affects oxygen consumption (VO2) and carbon dioxide production (VCO2) significantly at reperfusion and 3hours post reperfusion; Mean± SD for VO2 (273.1±36.1/227.1±82), (252.4±39/189.5±75) ml/min/m2 and P=0.019,0.005 for control/DEX groups. At reperfusion and intensive care unit (I.C.U) respectively, VCO2 (238.4±18/181.5±72), (210.5±27/159.0±63)±78.77ml/min/m2: p=0.002, 0.001 also for control/ DEX respectively. Respiratory Quotient (RQ) and were significant in C versus DEX at reperfusion and in intensive care, for RQ in C/DEX (0.79±0.08/0.73±0.08), (0.75±0.8/0.70±0.10) with p=0.014, 0.001. For C/DEX (1358.5±152.4/1231.5±84.9), (1264.3±147.0/1068.1±122.9) and P=0.000, 0.001 sequentially. Hemodynamics were insignificantly decreased in DEX versus C. DEX decreased the reperfusion, where pH and HCO3 decreased and PaCO2 increased significantly. The I.C.U. stay was comparable.

Conclusion: Dexmedetomedine has a depressing effect on indirect calorimetry especially in reperfusion.

Keywords: Dexmedetomedine; Indirect Calorimetry; Liver Transplant

Abbreviations: Intensive Care Unit; RQ: Respiratory Quotient; TED: Trans esophageal Doppler; CO: Cardiac Output (CO); SVR: Systemic Vascular Resistance; ROTEM: Rotational Thrombo Elastography; BL: Base Line; SPSS: Statistical Package for Social Science; TED: Transesophageal Doppler; ABG: Arterial Blood Gases; BMI: Body Mass Index; MELD: model for end stage liver disease. HCV: hepatitis C virus; HCC: Hepato Cellular Carcinoma, BCS: Bud Chiari Syndrome; HBV: Hepatitis B Virus; PVT: Portal Vein Thrombosis; DISS: Dissection; ANH: An hepatic; REP: Re Perfusion; ICU: Intensive Care; LOS: Length of Stay

Introduction

As clinicians in operations with significant phases of fluctuations, we are normally concerned about hemodynamic solidity. While anesthesia and intubation is the principal components animating the neuronal and endorcal responses. Hepatectomy phase have significant blood loss, a hepatic phase is characterized by accumulation of acid metabolites and unclamping, is marked by vasodilatation of the splanchnic bed creating an insufficient preload and critical hemodynamic instability particularly in cirrhotic patients with hyper dynamic circulation and fragile peripheral resistance [1].

Dexmedetomedine; a novel sedative profoundly selective α2 anesthetic agent may provide more hemodynamic stability [2,3]. At low doses the dominant action of α2-adrenoreceptor agonist activation is a reduction in sympathetic tone, the net effect of dexmedetomedine action is a significant reduction in circulating catecholamines with a slight decrease in blood pressure and
a modest reduction in heart rate [4]. When dexmedetomidine is administered as a nonstop infusion, it is associated with an expected and stable hemodynamic reaction [5].

**Patient and Methods**

This study was approved by the institutional review board (00003413 FWA000227– January 1st, 2013), pan African trial PACTR20140000776978. After providing written informed consent, 40 consecutive adult recipients (age 18-50 yr), MELD (14-20), scheduled for LT were enrolled. Exclusion criteria included recipients with evidence of cardiac decompensation, severe hemodynamic instability, chronic obstructive pulmonary disease; pulmonary dysfunction (PaO2 less than 60 mmHg) and those on pre-operative beta blockers were excluded and increased oxygen requirements (FiO2 >0.8) Patients were randomly allocated via a computer generated random number table into: control group (n = 20) that received a placebo, and Dexmedetomidine group (DEX; n = 20) that received continuous infusion starting at 0.5μg/kg/h (0.2-0.7) (Precedex; Hospira, Inc., Lake Forest, IL 60045 USA).

Dexmedetomidine 200μg/ vial were diluted to a concentration of 4μg/mL, and infusion started after the induction of anesthesia and continued till the end of surgery. The infusion in both groups had to be decreased or stopped with hemodynamic instability (heart rate <60 beats/min and/or mean blood pressure<60 mmHg), which did not respond to usual management including atropine or vasopressor drugs. All patients received noradrenaline support when indicated. The anesthesia team was blind to the cases that received Dexmedetomidine. After standard monitoring was in place, anesthesia was induced using propofol 2 mg/kg and rocuronium 1.2 mg/kg to facilitate endotracheal intubation. Anesthesia was maintained via desflurane in O2/air mixture (FIO2 = 0.4) and fentanyl as needed, anesthesia level was monitored by keeping spectral entropy (GE Healthcare, Helsinki, Finland) between (40-60). Rocuronium was given via neuromuscular blockade monitoring via acceleromyography, NMT module, Dragger, USA), in intermittent boluses according to the clinical needs. Normothermia was achieved with a forced-air warming device. An arterial line was placed in the left radial artery, and a central line was deployed in the right internal jugular.

Settings were adjusted to keep PaCO2 within normal, (Cardio QTM; DeltexMedical, Chichester, UK) was used for fluids adjustment, inotropic administration, and haemodynamic monitoring; cardiac output(CO), systemic vascular resistance(SVR), protocol of TED[6], base line data were collected continuously in patients operative sheet, blood products were given when clinically indicated guided by rotational thromboelastography (ROTEM) (Pentapharm GmbH, Munich, Germany).no patient received bicarbonate during the study. Patients in need for support received noradrenaline. M-COVX™ (Datex-Ommeda S/5 Avance workstation™, GE Healthcare, Helsinki, Finland)

Metabolic module was used in our operating room and ICU. It consists of a gas analyzer and a spirometer unit and displays oxygen consumption (VO2) and carbon dioxide production (VCO2). Partial pressures of O2 and CO2 are measured by the rapid paramagnetic analyzer and infrared analyzer, respectively and inspired tidal volume is measured using a pneumotachograph. RQ can be calculated from the Halden-equation, VCO2 subsequently calculated from RQ as VO2=VCO2/RQ, and EE=3.58xV02+1.44xVCO2-32.4. Reliability of displayed value of resting energy expenditure REE was assessed after considering the concomitant readings of RQ whose normal values range from (0.69 to 0.98). In each patient haemodynamics, arterial blood gases (ABG), VO2, VCO2, RQ, and EE were measured at baseline (BL), during dissection (DISS), an hepatic (ANH) and reperfusion (REP) phases, and as a protocol all recipients were discharged to ICU on mechanical ventilation where the last measure were taken (I.CU). Data were collected and entered to the computer using SPSS (Statistical Package for Social Science) program for statistical analysis, version 21. Data were entered as numerical or categorical, as appropriate. In the present study α was set to 0.05, and Maximum accepted=20% with a minimum power of the study of 80%.

A sample size of 20 per group would be required in each group to reveal a significant difference in the primary outcome of this RCT which is oxygen consumption (VO2) to detect a mean difference of 20 ml/kg/min and standard deviation of 19.2ml/kg/min and 15.9ml/kg/min in Dexmedetomedine and control groups respectively. Calculation of sample size was done using (IBM SPSS Sample power) software and was also confirmed using Lenth Java Applets for Power and Sample Size (Computer software). Correction of p value for multiple testing was set p to 0.01 to detect significance (Bonfornoni correction of multiple comparisons). So, in the present study an alpha level was set to 1% with a significance level of 99% and a beta error accepted up to 20% with a power of study of 80%.

Two types of statistics were done:

1. **Descriptive statistics:** Quantitative data were shown as mean, SD, and range. Qualitative data were expressed as frequency and percent at 95% confidence interval (95% CI).

2. **Analytical statistics:** Chi-square test ($\chi^2$) were used to measure association between qualitative variables. Student t-test and Mann Whitney U test were done to compare means and SD of 2 sets of quantitative data as appropriate. Paired sample t-test and Wilcoxon on Signed Ranks Test were done to assess the follow up of quantitative data as appropriate. The results of comparing the correlation between two continuous variables were indicated by the correlation coefficient (r) using correlation analysis. P (probability) value considered to be of statistical significance if it is less than 0.05.

**Results**

Age, sex, body mass index (BMI), and MELD score were comparable ($P>0.05$) between DEX (n=20) and C (n=20) groups.
Demographic, clinical characteristics and main indications for liver transplantation (mainly Hepatocellular carcinoma) are presented in Table 1 that demonstrates no significant differences between the control and DEX groups. Operative data of the included patients as in Table 1 demonstrating operative data in details, blood products and fluids transfusions in both groups.

**Table 1: Demographic, clinical characteristics and indications for liver transplantation with important intra operative data.**

| Variable                        | Control        | Dex            | P   |
|---------------------------------|----------------|----------------|-----|
| Age (years)                     | 46.0±7.8       | 44.6±9         | 0.58|
| BMI (kg/m2)                     | 26.0±1.5       | 26.3±1.1       | 0.41|
| MELD                            | 16.8±0.96      | 17.2±1.0       | 0.2 |
| Male                            | 19 (95%)       | 18 (90%)       | 1   |
| Female                          | 1 (5%)         | 2 (10%)        |     |
| HCC                             | 10 (50%)       | 11 (55%)       | 0.78|
| BCD                             | 1 (5%)         | 0 (0%)         | 1   |
| PVT+HCV                         | 2 (10%)        | 4 (20%)        | 0.66|
| HCV                             | 8 (40%)        | 6 (30%)        | 0.74|
| HBV                             | 1 (5%)         | 2 (10%)        | 1   |
| Operative time (hours)          | 11.9±2.35      | 12.45±1.77     | 0.97|
| Warm ischemia time (minutes)    | 44.09±17.2     | 43.75±15.2     | 0.649|
| Cold ischemia time (minutes)    | 62.9±43.4      | 56.0±28.4      | 0.78|
| Graft body/weight ratio         | 0.98±0.12      | 1.01±0.18      | 0.77|
| Anhepatic time/hour             | 3.18±1.006     | 3.25±1.03      | 0.24|
| FFP                             | 12 (60%)       | 8 (40%)        | 0.34|
| PRBCs                           | 10 (50%)       | 10 (50%)       | 1   |
| Platelets                       | 2 (10%)        | 3 (15%)        | 1   |
| Cryoprecipitate                 | 2 (10%)        | 2 (10%)        | 1   |
| Crystallloid (ml)               | 5386±871       | 5775±952       | 0.19|
| Colloid (ml)                    | 1368±337       | 1540±1798      | 0.1 |

Mean±SD for t-test# for Mann Whitney test, data presented as percentage, tested by Cramer’s V-Value< 0.05 statistically significant.

BMI: Body Mass Index; MELD: Model for End Stage Liver Disease. HCV: Hepatitis C virus; HCC: Hepatocellular Carcinoma; BCS: Bud Chiair Syndrome; HBV: Hepatitis B Virus; PVT: Portal Vein Thrombosis; BMI: Body Mass Index; MELD: Model for End Stage Liver Disease

**Table 2: study the oxygen consumption VO2, carbon dioxide production VCO2, respiratory quotient RQ and energy expenditure EE values all over the follow up in Dexametomidine (DEX) and control groups.**

| Variable | Control (Mean±SD) | Dex (Mean±SD) | P   |
|----------|-------------------|---------------|-----|
| VO2ml/kg/min |                   |               |     |
| BL       | 239.25±33.4       | 206.9±80.0    | 0.2 |
| DISS     | 229.2±36.3        | 189.9±72.6    | 0.072|
| ANH      | 210.2±27.2        | 175.3±69.0    | 0.062|
| REP      | 273.1±36.1        | 227.1±82.4    | 0.019*|
| ICU      | 252.4±39.55       | 198.5±75.8    | 0.005*|
| VCO2ml/kg/min |                 |               |     |
| BL       | 158.7±38.4        | 138.1±55.9    | 0.383|
| DISS     | 161.4±32.9        | 132.6±51.8    | 0.144|
| ANH      | 154.3±41.3        | 122.1±49.4    | 0.079|
| REP      | 238.4±18.8        | 181.5±72.4    | 0.002*|
| ICU      | 210.5±27.0        | 159.0±63.9    | 0.001*|

Mean±SD for t-test# for Mann Whitney test, data presented as percentage, tested by Cramer’s V-Value< 0.05 statistically significant.

BMI: Body Mass Index; MELD: Model for End Stage Liver Disease. HCV: Hepatitis C virus; HCC: Hepatocellular Carcinoma; BCS: Bud Chiair Syndrome; HBV: Hepatitis B Virus; PVT: Portal Vein Thrombosis; BMI: Body Mass Index; MELD: Model for End Stage Liver Disease
Continuous indirect calorimetry monitoring revealed insignificant changes in VO₂ and VCO₂ at (BL, dissection, an hepatic phases) but significantly decreased at reperfusion and in I.C.U. in DEX vs C groups (Table 2), with a trend of decrease in DEX group (Figure 1 & 2). EE and RQ showed the same fluctuations consistent with oxygen consumption and carbon dioxide production (Table 2).

As regarding hemodynamic, heart rate (HR) showed slight decrease in all phases in DEX group but in comparison to C significant changes were recorded at BL, a hepatic, I.C.U phases. Mean arterial pressure (MAP) systemic vascular resistance (SVR), corrected flow time (CFT) were maintained in both groups during different measuring points, and that was the same with cardiac output measurements (CO), (Table 3-5). Delivered for 11.93±2.3hours with significant decrease in both Fentanyl (1241±390/988±202) μg p=0.041and Desflurane consumption (221±52/179±59) ml p=0.016 in C vs. DEX respectively, and non significant Noradrenaline in C/DEX (9.4±1.5/10.3±1.0), P=0.076.

Table 3: follow up of hemodynamic parameters between DEX and Control groups.

| Variable | Control Mean±SD | Dex Mean±SD | P   |
|----------|-----------------|-------------|-----|
| CO(L/min)|                 |             |     |
| BL       | 6.8±1.4         | 7.1±1.7     | 0.927 |
| DISS     | 6.4±1.1         | 6.9±1.9     | 0.647 |
| ANH      | 6.6±1.5         | 6.3±1.3     | 0.403 |
| REP      | 7.1±1.4         | 7.6±1.8     | 0.657 |
| ICU      | 7.1±1.8         | 7.2±1.3     | 0.638 |
| SVR(dyn/sec/cm5) |           |             |     |
| BL       | 773±196.4       | 848.5±454.5 | 0.659 |
| DISS     | 869.5±208.2     | 836±323.9   | 0.341 |
| ANH      | 855.4±229.2     | 804.5±190.9 | 0.62  |
| REP      | 662.5±18.1      | 570.8±306.7 | 0.611 |
| ICU      | 744.6±248.4     | 687.3±151.3 | 0.434 |
| CFT      |                 |             |     |
| BL       | 368.2±43        | 378.3±64    | 0.166 |
| DISS     | 355.0±32        | 361.8±54    | 0.334 |
| ANH      | 351.8±45        | 351.4±42    | 0.629 |
| REP      | 352.5±52        | 358.0±52    | 0.548 |

Means±SD for test ≠ for Mann Whitney test. P-value<0.05* statistically significant.

BL: Baseline; DISS: Dissection; ANH: A hepatic; REP: Reperfusion; ICU: Intensive Care
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BL: Baseline; DISS: Dissection; ANH: A hepatic; REP: Reperfusion; ICU: Intensive Care

**Table 4**: Follow up of HCO$_3^-$, PCO$_2$ and pH parameters between DEX and Control groups.

| Variable | Control Mean±SD | Dex Mean±SD | P   |
|----------|-----------------|-------------|-----|
| HCO$_3^-$mmol/l |                  |             |     |
| BL       | 22.91±3.606     | 20.24±3.771 | 0.038 |
| DISS     | 21.12±3.381     | 19.73±2.425 | 0.131 |
| ANH      | 18.67±3.592     | 17.11±3.379 | 0.22 |
| REP      | 16.91±1.896     | 15.17±2.713 | 0.05 |
| ICU      | 16.08±2.231     | 15.18±3.293 | 0.663 |
| PCO$_2$mmHg |                 |             |     |
| BL       | 35.2±3.2        | 34.9±3.9    | 0.949 |
| DISS     | 33.3±4.7        | 33.3±3.3    | 0.987 |
| ANH      | 35.6±3.7        | 35.6±3.8    | 0.5 |
| REP      | 38.6±3.4        | 36.5±4.05   | 0.014* |
| ICU      | 37.53±2.1       | 36.7±2.78   | 0.216 |
| H+mmol/l |                  |             |     |
| BL       | 7.40±0.042      | 7.39±0.05   | 0.503 |
| DISS     | 7.36±0.06       | 7.33±0.04   | 0.088 |
| ANH      | 7.31±0.080      | 7.27±0.06   | 0.061 |
| REP      | 7.24±0.061      | 7.31±0.067  | 0.028* |
| ICU      | 7.33±0.03       | 7.32±0.08   | 0.37 |

Data were presented as mean±SD, tested by student t-test, P-value<0.05 statistically significant.

Regarding the ABG follow up during the operation there were no significant changes all over all times of measurements except at reperfusion where pH, HCO$_3^-$ showed significant decrease in DEX than C and PaCO$_2$ showed increase with general tendency of ABG parameters towards acidosis especially in an hepatic and reperfusion stages (Table 4). ICU stay was comparable too, DEX/C (6.95±2.53/6.70±1.36), P=0.683 (Figures 3-5).

**Discussion**

The principal finding in the study in National Liver Institute (NLI) revealed that changes of (VO$_2$, VCO$_2$, RQ and EE) which were significant in DEX vs. control group, and that occurred obviously after reperfusion and few hours later in intensive care admission,
these changes were consistent with restoration of blood to the implanted graft and were correlated with other well-established metabolic changes including the decrease in HCO₃⁻ and pH due to acid metabolites after unclamping. During liver transplantation, oxygen consumption decreased rapidly by 25% when clamping blood supply. After the hepatic period, there was a sharp increase of oxygen consumption with successful reperfusion of the allograft Carbon dioxide production fell by 14% and returned to pre anhepatic values after successful declamping [5]. Reperfusion is associated with rapid increase in cardiac output, central venous pressure and a decrease in systemic vascular resistance which when severe constitute the post reperfusion syndrome. It has been previously shown that the increase in whole body oxygen consumption occurs after reperfusion which may reflect oxygen uptake by the Metabolically active graft [7] but also it may be due to the hunger of splanchnic tissues to oxygen during an hepatic phase [8,9] VCO₂.

This also was supported by Walash et al. [10] who observed significant increase in VO₂, VCO₂ after reperfusion in uncomplicated transplant patients [10], in the study done by Sayed E et al. [11] entitled Dexmedetomidine infusion during LDLT, there were significant decrease in VO₂, VCO₂ in DEX group than control in, an hepatic reperfusion and end of surgery in liver transplant. In the study done by Tarntanon et al. [9] before operation Dexmedetomidine and Clonidine caused greater decrease in VCO₂, VO₂ and EE than placebo and there were no difference in RQ between groups, the maximum decrease in Dexmedetomidine group was 7%. During the operation there were no differences in metabolic variables between groups, though VO₂ and EE were lower in dexmedetomidine and clonidine groups than placebo. After operation VO₂ was lower 17% in Dexmedetomidine and Clonidine caused greater decrease in VCO₂, VO₂ and EE than placebo. Also EE were lower (17%,19%) respectively compared to placebo. Dex decreases central sympathetic outflow and modify intraoperative cardiovascular and endocrine responses favorably to surgical stimuli and laryngoscopy [12].

The diminishment in tachycardia, hypertension, purposful movement, steady serum catecholamine and its impact on sedation results in diminished entire body metabolism subsequently body oxygen utilization. It has been exhibited that successful absence of pain in the postoperative period can diminish VO₂ by up to 7-8% [10]. These combined effects may contribute to the reduction observed in VO₂ and VCO₂. The analgesic effects of Dex and the indirect effects of sedation and neuromuscular block might account in part for the reduction in VO₂. Arslan study results also suggested that Dex has beneficial effects on liver ischemia/reperfusion [13,14].

Similar to walash [10] We also observed that the increase in VCO₂ was correlated with PaCO₂ at reperfusion phase, the increase in PaCO₂ may be explained by release of acids and metabolites and may contribute to the decrease in SVR and the increase in CO in reperfusion more than other phases and this was accompanied by metabolic acidosis at the same stage.

The heart rate was seen to be diminished at all measuring points with significant decline in DEX versus C in baseline, an hepatic and l.C.U. stages where the impact of dexmedetomidine on HR was not masked by the surgical stimulation or blood loss. The baroreceptor reflex is all around saved in patients who get dexmedetomidine, and the reflex heart rate reaction to a pressor stimulus is enlarged other than the diminishing in noradrenaline discharge. These outcomes outline that the cardiovascular reaction is evoked for the most part by declines in sympathetic output. Dexmedetomidine could bring about cardiovascular sorrow; bradycardia and hypotension [15].

Despite what might been expected Unlugenc et al [16] gave 1 mic/kg dosage of dexmedetomide within 10 minutes of induction and they found similar readings in HR within the 10 minutes, though HR and mean blood vessel pressure (MAP) were like qualities found in the placebo group. Alpha 2-agonists diminish the perioperative anesthetic and pain relieving prerequisites, however in the review by Taittonen [17,18] there was no huge distinction between groups. In our study, we utilized entropy to quantify the profundity of anaesthesia. Entropy showing reaction Entropy in charge of opioid need and state Entropy in charge of anesthesia required, permits keeping up anesthesia level between (40-60), to avoid the mistakes from relying upon hemodynamics to change inhalational anesthesia [19].

The requirement for more Fentanyl in control group of our review might be right due to the sympatheticetic impact of dexmedetomidine intra-operatively and furthermore because of the time lag in ICU till extubation as a protocol in our organization thus the DEX group got the benefit of being sedated by dexmedetomidine. Aho et al. [20] indicated 25% diminishments of support focuses of isoflurane in patients who got dexmedetomidine. Another review found 35% to 50% decreases of isoflurane requirements in patients treated with either low or high dosages of dexmedetomide and isoflurane without premedication. The utilization of opioids (e.g Fentanyl) decreases minimal alveolar concentration (MAC) of sevoflurane significantly, adding opioids to dexmedetomidine can potentiate its saving impact on inhalational utilization [21] All are steady with our outcomes, but on the other side a study done by Taittonen [17] revealed insignificant distinction in opioids or I.V. analgesic necessities.

In a review by Basar et al. [22] who watched that a solitary measurements of dexmedetomidine given before induction of anesthesia diminished thiopental needs without serious hemodynamic impacts or any impact on recovery time. Correspondingly Khan et al. [23], observed additionally that dexmedetomidine diminished isoflurane necessities as an advantage of being sedated by the medication. The fluid volume needed during the intraoperative period to avoid hypotension.
was insignificantly higher in our dexmedetomidine group, a side effect that may be unfavorable in volume sensitive patients with reduced left ventricular function [24]. This effect might be outweighed, however, by the diuretic effects of α2-adrenoceptor agonists, whose mechanisms may include attenuation of the secretion or effect of antidiuretic hormone, inhibition of renin, or release of natriuretic peptide [25].

Similarly the fluid volume needed during the intra operative period to avoid hypotension was insignificantly higher in the dexmedetomidine group [26]. In our study we recorded more fluids: colloids (1540±1798/1368±337) ml, crystalloids (5775±952/5386±871) ml and Noradrenaline (10±1/9.4±1.5) mg in DEX/C groups non critical statistically, yet may add to stability of mean blood pressure weight as dexmedetomidine has a mild vasodilation effect on SVR and although we have fluctuations in hemodynamics, those were less recognizable and statistically insignificant between groups.

The first study to demonstrate the use of Dexmedetomidine in postoperative agitated LT ICU recipients in comparison with haloperidol, significantly decreased ICU length of stay (LOS) and safely reduced the use of supplemental midazolam. Despite the small number of patients in this study, they believe that dexmedetomidine reduces the rate and duration of intubation. One study on the relationship between intubation and the use of dexmedetomidine reported that dexmedetomidine was more effective in in tubated ICU patients [27]. Compared with other studies regarding Dexmedetomidine, in our study the reason why the intensive care stay was similar between dexmedetomidine and control may be related to other surgical issues [28-33].

Conclusion and Recommendation

Dexmedetomidine have a significant depressing effect on metabolism in the form of VO2, VCO2, EE, which may be used as a method of protection from reperfusion injury (undergoing further study), and even in major hemodynamic fluctuations dexmedetomidine can be used with close monitoring, one of our draw backs that we not assess the suitable dose for hepatic patients, we believe this will need further study in surgeries of less hemodynamic fluctuations. Could not assess the suitable dose for hepatic patients, we believe this will need further study in surgeries of less hemodynamic fluctuations.

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Data Availability

All relevant data are within the paper and its Supporting Information files.

Conflict of Interest

None. All authors approve for publication.

References

1. Burststein S, ED, Askanazi J, Kinney JM (1989) The theoretical framework of indirect calorimetry and energy balance. Williams and Wilkins, Baltimore, USA, p. 85.
2. Kenyva VM, Sushma Ladi, Naphade R (2011) Dexmedetomidine attenuates sympathoadrenal response to tracheal intubation and reduces perioperative anesthetic requirement. Indian J Anesth 55(4): 352-357.
3. Fischer LR, KS Henley, MR Lucey (1995) Acute cellular rejection after liver transplantation: variability, morbidity, and mortality. Liver Transpl Surg 1(1): 10-15.
4. Khan ZF, Ferguson CN, Jones RM (1999) Alpha-2 and imidazoline receptor agonists. Their pharmacology and therapeutic role. Anaesthesia 54(2): 146-165.
5. Gerlach AT, Murphy CV, Dasta JF (2009) An updated focused review of dexmedetomidine in adults. Ann Pharmacother 43(1): 206-2074.
6. Cavallaro F, Sandroni C, Antonelli M (2008) Functional hemodynamic monitoring and dynamic indices of fluid responsiveness. Minerva Anestesiol 74(4): 123-135.
7. Svensson KL, Persson H Henriksson BA, Karlberg I, Sonander H (1989) Whole body gas exchange: amino acid and lactate clearance as indicators of initial and early allograft viability in liver transplantation. Surgery 105(4): 472-480.
8. Ensinger H, Michel T Lindner KH, Grunert A, Ahnefeld FW (1993) Effects of norepinephrine, epinephrine, and dopamine infusions on oxygen consumption in volunteers. Crit Care Med 21(10): 1502-1508.
9. Camprubi I, Sabate A (1996) Perioperative Mucosal pH, in Orthotopic Liver. Br J Anaesth 77(4): 560-561.
10. Walsh TS, Hopton P, Garden OJ, Lee A (1998) Effect of graft reperfusion on haemodynamics and gas exchange during liver transplantation. Br J Anaesth 81(3): 311-316.
11. Sayed E, Yassen KA (2017) Intraoperative effect of dexmedetomidine infusion during living donor liver transplantation: A randomized controlled trial. Saudi J Anaesth 197(3): 63-199.
12. MT Taittonen, OA Kirvela, R Aantaa, JH Kanto (1997) Effect of clonidine and dexmedetomidine premedication on perioperative oxygen consumption and haemodynamic state. Br J Anaesth 78(4): 400-406.
13. Manpreet Kaur, PM Singh (2011) Current role of dexmedetomidine in clinical anesthesia and intensive care. Anaesth Essays Res 5(2): 128-133.
14. Muneyuki M, Ueda Y, Urabe N, Takeshita H, Inamoto A (1968) Postoperative pain relief and respiratory function in man: Comparison between intermittent intravenous injections of eperidine and continuous lumbar epidural analgesia. Anesthesiology 29(2): 304-313.
15. Mustafa Arslan, Faruk Metin Çomu, Aysegul Kılıç, Levent Oztürk, Faik Yaylak (2012) Dexmedetomidine protects against lipid peroxidation and erythrocyte deformability alterations in experimental hepatic ischemia reperfusion injury. Libyan J Med 2012: 7.
16. Unluengu H, Gunduz M, Guler T, Yagmur O, Isik G (2005) The effect of pre-anaesthetic administration of intravenous dexmedetomidine on postoperative pain in patients receiving patient-controlled morphine. Eur J Anaesthesiol 22: 386-391.

17. Taittonen MT, Kirvela O, Aantaa R, Kanto JH (1997) Effect of clonidine and dexmedetomidine premedication on perioperative oxygen consumption and haemodynamic state. Br J Anaesth 78(4): 400-406.

18. Kaur M, PM Singh (2011) Current role of dexmedetomidine in clinical anesthesia and intensive care. Anesth Essays Res 5(2): 128-133.

19. Afoloso J, F Reis (2012) Dexmedetomidine: current role in anesthesia and intensive care. Rev Bras Anestesiol 62(1): 118-133.

20. Aho M, LA, Erkola O, Kallio A, Korttila K (1991) The effect of intravenously administered dexmedetomidine on perioperative hemodynamics and isoflurane requirements in patients undergoing abdominal hysterectomy. Anesthesiology 74(6): 977-1002.

21. Ahmet K, Ozlem S, Yucel A, Topnak H, Ozcan M, et al. (2006) A comparison of the sedative, hemodynamic, and respiratory effects of Dexmedetomidine and propofol in children undergoing magnetic resonance imaging. Anesth Analg 103(1): 63-67.

22. Basar H, Akpinar S, Doganci N, Buyukkocak U, Kaymak C, et al. (2008) The effects of preanesthetic, single-dose dexmedetomidine on induction, hemodynamic, and cardiovascular parameters. J Clin Anesth 20(6): 431-436.

23. Grewal A (2011) Dexmedetomidine: New avenues. journal of anesthesiology and clinical pharmacology 27(3): 297-302.

24. Xu H, Aibiki M, Seki K, Ogura S, Ogli K (1998) Effects of dexmedetomidine, an alpha 2-adrenoceptor agonist, on renal sympathetic nerve activity, blood pressure, heart rate and central venous pressure in urethane-anesthetized rabbits. J Auton Nerv Syst 71(1): 48-54.

25. Ralph gerlter, H Geighton brown, Donald H Mitchell, Erin N Silvius (2001) Dexmedetomidine: a novel sedative-anaesthetic agent. Bumc Proceedings 14(3): 13-21.

26. Reding R (2005) [Contribution to the study of mechanisms of rejection and tolerance in organ transplantation: minimizing immunosuppression as a strategy for graft tolerance in pediatric liver transplantation]. Bull Mem Acad R Med Belg 160(5-6): 265-269.

27. Gamal Z, El-Morsya AFE (2014) Dexmedetomidine; an adjuvant drug for fast track technique in pediatric cardiac surgery. Egyptian Journal of Anaesthesia 30(4): 347-351.

28. Abdulla K, Hesham Abdeldayem, Ibrahim Abdel-Kader Salama, Khaled Badah, Badriyah Al-Somali, et al. (2007) Retrospective analysis of the causes of rejection of potential donors for living related liver transplantation. Hepatol Int 1(4): 431-436.

29. Bonaccorsi-Riani E, Pennycuick A, Londoño MC, Lozano JJ, Benítez C, et al. (2016) Molecular Characterization of Acute Cellular Rejection Occurring During Intentional Immunosuppression Withdrawal in Liver Transplantation. Am J Transplant 16(2): 484-496.

30. Cook TM, Pandit JJ (2013) National Institute for Clinical Excellence guidance on measuring depth of anaesthesia: limitations of EEG-based technology. Br J Anaesth 110(3): 325-328.