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Effect of different positive end-expiratory pressures in donor liver transplantation patients on hemodynamics and ICU admission period: A Prospective, randomized, double-blind study

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Abstract

Donors are generally volunteers without any sanitary problems. For this reason, security of the anesthesia practice and ICU admission period is significant. The goal of present study was to determine whether there was any important coalition among different positive end-expiratory pressure (PEEP) level hemodynamics and ICU admission in donor patients. This study was performed with40 patients who underwent general anesthesia. Patients were divided into two groups by their PEEP as0 cm H20 in the first group (group Z), and 10 H20 in the second group (group H). We investigated the data concerning demographical data, perioperative values, hemodynamic parameters, intraoperative blood loss, andICU admission. Patient characteristic,characteristicsand perioperative values were similar among the groups. Mean arterial pressure, and central venous pressure were importantly different among the groups (P<.05). Intraoperative bleeding remained statistically unchanged in both groups. The median ICU admission after surgery was longer in group Z versus the group H (2 and 1 days per patient, respectively; P>.05). We have concluded that our data pool is low and single-centered,we determined that PEEP values (10 cm H2O) may be a decisive element for the ICU admission after donor patients.

Keywords: Positive end-expiratory pressure, donors, liver transplantation, ICU admission

Introduction

Donor patients are generally volunteers without any sanitary problems. For this reason, safety of the patients is the foremost topic in anesthesia practice [1]. The intensive care unit (ICU) shows a crucial act in the application of donor liver transplantation. AnextendedICU admission increases health expenses.

Gas replacement inconvenience are extensive in patients with donors surgery [2]. Therefore, ventilatory assistance with positive end-expiratory pressure (PEEP) is frequently performed and increasesfunctional residual capacity and decreases intrapulmonary shunt [3].

The aim of thepresent studywas todetermine the impact of different PEEP levels on ICU admission period in donors with hemodynamics.

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Material and Methods

Institutional ethics board of the Inonu University Medical School (2013/19) approved the study, and written informed permissionswere receivedfrom each patient before the study. We prospectively examined 40 patients whose ages ranged from 18 to 65 years andwho passed right hepatectomy surgery between August 2013 and January 2014.

In the surgery room,the hemodynamic levels of thepatients were recorded. BIS was used to definethedepth of anesthesia. Patients received 100% oxygenfor 3 minutes before initiation of anesthesia. Anesthesia was induced 2 mg/kg propofol (1% propofol;Fresenius) and 1µg/kg remifentanil with 0.6 mg/kg atracurium. Anesthesia maintenance was continued to ensure an isoflurane concentrationof 0.5%–1.5% that the BIS value remained between 40 and 60.Ventilation was controlled with a tidal volume of 7–10 mL/kg andventilator rate adjusted to maintain an end-tidal CO2of 35– 40 mmHg. Concentrations of isoflurane were measured with the use of ananesthesia device (Dräger Primus, Germany). A constant fresh gasflow of 3 L/min (60% air and 40% oxygen) was used during themaintenance of anesthesia.Both groups received remifentanil (0.25µg/kg/min) and atracurium (0.5 mg/kg/h) infusions (Life Care5000 Infusion System; Abbott, Sligo, Ireland).A radial arterial

cannula was inserted into the patient's nondominant hand. Three-way 7.5-Fr Central venous pressure (CVP) was monitoredfrom the internal jugular vein via a central catheter. In addition, weinserted nasogastric tube and a nasopharyngeal heat probe. Neuromuscular conduction was monitored via a train-of-four device.All patients weremonitored to maintain normothermia during surgery and bodytemperature was monitored. Patients were followed in supine position during surgery. The patients were randomly divided into 2groups with the use of a computer-generated random number table. Forty patients were included in the studyand randomly divided into two groups considering their PEEP as 0 cm H20 in the first group (group Z) and 10 H20 in the second group (group H). The anesthesia was ensuredwith BIS levels between 45 - 60. The same surgical team performed all operations usingthe Pringle maneuver routinely. Pringle maneuver was recorded. The centers' protocol for total portal occlusion is 15-minute occlusion alternated with5-minute reperfusion for patients with normal liver parenchyma.All donors were extubated at theend of the operation and subsequently transferred to the intensive care unit. Observed complications were recorded during the operation. We investigated the demographical data, hemodynamics (mean arterial pressure [MAP], central venous pressure [CVP], and heart rate [HR]), intraoperative blood loss, ICU admission period.

Statistical Analyses

SPSS 16.0 package program was used in the statistical analyses of the characteristics. With Kolmogorov-Smirnov normality test, characteristicsconcerning the quantitative variables were defined to demonstrate normal distribution (P>.05). Paired t-test was used to test the change in characteristicsthroughout the process. Independent t-test was used in the intergroup comparisons. A point of P<.05 was considered statistically significant. The scoresare shown as mean values, standard deviation (SD), or numbers and percentages.

Results

No differences weredetected among the groups in respect to demographical data(P>.05; Table 1). We detected no differences in terms of surgery period, percentage of liver remnant, graft gravity and quantity of blood loss among groups (Table 2). Important variables in the MAP and CVP values were monitored in cases aerated with PEEP 0 or 10 cm H2O (P<.05; Table 3). When groups were checked for ICU admission,itwas longer in group Z versus group H (P >.05; Table 3).

Table 1 Demographic Characteristics

	Range	Mean ± std	n
Age (years)	7 – 61	38.90 ± 13.75	
Sex (male/female)	-	-	29/11
Weight (kg)	23 – 104	64.80 ± 17.25	
Cadaveric/living	-	-	8/32
ASA III/IV	21 – 30	24.95 ± 2.85	38/2
Hemoglobin(mg/dL)	6.3 – 10.3	8.02 ± 1.06	
Need for additional analgesics			8
Comorbidity			
None	-	-	22
Hypertension	-	-	12
Diabetes +Hypertension	-	-	3
Diabetes	-	-	2
FVII Deficiency	-	-	1
Sleep Apnea	-	-	1
Complications			
none			36
hemorrhage			1
thrombosis			1
mortality			1

ASA; American Society of Anesthesiology, n: number of cases, Range: min-max

Table 2. Procedure Datas

	Range	Mean ± std
Duration of anesthesia (min)	180-360	298.50±32.22
Duration of surgery (min)	170-320	253.50±30.93
Total crystalloid (mL)	600-4000	3062.50±833.80
Mannitol (mL)	30-150	93.75±26.57
Furocemid (mg)	80-180	131.50±18.05
Bupivacain (mg)	15-25	24.5±0.44
Blood Transfusions	-	-
Duration of cold ischemia (min)	67-1116	275.82±379.14
Duration of hot ischemia (min)	1.11-4	2.27±0.78
Duration of urinary flow (min)	3-34	7.96±8.81
Length of hospital stay (day)	5-35	10.95 ±10.38

Discussion

The key point of the present study was that 10 H20 PEEP was associated with reduced median ICU admission in postoperative period. In this trial, a PEEP of 0 or 10 during donor transplantation did not affect intraoperative bleeding. We have monitored that MAP and CVP levels were significantly different in ventilated 10 H20 PEEP donors. In former trials, PEEP at physiologic values didnot have a practical impact until 10-15 cm H2O; also, it disturbed hepatic function (4). Established affinity of 5 to the physiologic PEEP value, we select 10 cmH2O for the high level of PEEP- at 15 cm H2O- disturbed hepatic missions. Saner et al. (5) showed that dissimilar PEEP values on MAP, and CVP in hepatic transplant patients; CVP levels were showed to be highat a significant levelat PEEP levels of 5 and 10 cm H2O checked with a PEEP of 0 cm H2O. We have showed that there were no differences among patients for HR; however, there were significant differences for CVP, and MAP. In a prior trial of dissimilar PEEP levels in cases with hepatic resection, cardiac flow was showed to be decreased at a significant levelat a PEEP of 10 cm H2O and venous pressures were showed to be high at a significant levelin these locations, checked with a supine location (6). In previous trials by Saner et al. (7) in hepatic transplant patients, they showed differences at a significant levelat a PEEP of 15 cm H2O in CVP. In thepresent trial, we showed that there were no differences at a significant level among MAP (low in group Z). Also, we built our trial in fully healthy patients. Moreover, decreases in MAP are harmonious with former trials. Further, there were minimal differences in blood losswith rises in CVP andPEEP value. This is more prominent in situations in which PEEP level is ≥10 cm H2O.

There are a few limitations to thepresent trial. The present trial included a smallsampling. Further trials with a huge size of donors can be built to confirm present outcomes. Finally, the present data showed that different PEEP values might be definitive incases who are probably to demand an extended median ICU admission. Present results might have inclusions for both intraoperative PEEP administration strategies in donor patients.

Competing interests
The authors declare that they have no competing interest.

Financial Disclosure
All authors declare no financial support.

Ethical approval
Consent of ethics was approved by the local ethics committee.

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