PROPOFOL ANESTHESIA IN EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY*

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SUMMARY

Extracorporeal shock wave lithotripsy (ESWL) has been a successful method for variously localized urolithiasis. The aim of this study was to observe the respiratory and cardiovascular effects of intravenous propofol infusion and to show if it produces a satisfactory anesthesia as a single agent in ESWL. The study was performed on 17 patients suffering from variously located urolithiasis. After premedication, induction of anesthesia was performed with 2.5 mg/kg propofol intravenously. Before and 1 minute after the induction; heart rate, systolic and diastolic blood pressure, end tidal carbondioxide, capillary oxygen saturation values of the patients were measured and recorded. Anesthesia was maintained by the infusion of 0.2% propofol with changing rates of 14,12,10,8,4, 2 mg/kg/h in periods of 10 minutes in turn. In the first minute of every dose period the variables were measured. During the procedure, patients were inhaled 41t/min oxygen through a nasal cannula. Propofol infusion was stopped 5 minutes before the last shock wave. After recovery cardiovascular and respiratory functions were measured again. The results showed no significant difference between the values of respiratory rate, end tidal CO2 and capillary 02 saturation at different measurements. Heart rate was significantly lower during induction (76.5±13.5) and during infusion rates of 14mg/kg/h (82.5±9.9) and 2mg/kg/h (82.8±7.7) than the control values (84.2±12.7) ($p<0.05$). In the measurements mean systolic arterial pressure were less than the control level. During the procedure there was not any requirement for an adjuvant analgesic agent. We conclude that; propofol can obtain sufficient analgesia during ESWL procedure and can be used safely on patients who do not have cardiovascular dysfunction.

Key Words: Extracorporeal Shock Wave Lithotripsy, Intravenous Anesthetic Agent, Propofol

INTRODUCTION

Extracorporeal shock wave lithotripsy (ESWL) has been a successful method for variously localized urolithiasis. During ESWL some anesthetic techniques should be used especially on the patients who have low pain threshold. The methods used for this purpose are epidural analgesia, intermittant bolus administration of sedative, hypnotic or analgesic agents (1-3). High doses of these agents may cause depression of ventilation or prolongation of the recovery period. However infusion of short acting intravenous anesthetic agents causes faster recovery period and less side effects than single dose administration of the same agents.

In this study, the aim was to observe the respiratory and cardiovascular effects of intravenous propofol infusion and to show if it produces a satisfactory anesthesia as a single agent in ESWL.

MATERIALS AND METHODS

This study was performed on 17 patients with urolithiasis. The data about the demographic characteristics of the patients, the localization of the stones and the ESWL process are shown in table I. At the ESWL room, patients were monitored and their control values of heart rate, systolic and diastolic blood pressure were measured. End tidal carbondioxide, capillary oxygen saturation and respiratory rate values of the patients were measured by using "Novometrix 7000" capnograph. After premedication with 0.01mg/kg atropine sulphate intravenously, induction of anesthesia was performed with 2.5 mg/kg propofol intravenously. One minute after induction all of the variables were measured and recorded. Anesthesia was maintained by the infusion of 0.2% propofol with changing rates of 14,12,10,8,4,2mg/kg/h in periods of 10 minutes in turn. In the first minute of every dose period the variables were measured and recorded. During the procedure the patients inhaled 41t/min oxygen through a nasal cannula. ESWL was performed by using "Philips Dornier Medizin Technik MFL-5000" lithotriptor. Propofol infusion was stopped 5 minutes before the last shock wave. After recovery cardiovascular and respiratory functions were measured again.

The data is evaluated by Student's t test and $p<0.05$

This study was presented in part at The 24th Turkish Anesthesiology and Reanimation Congress (Marmaris 1991), The 5th Annual Trauma Anesthesia and Critical Care Symposium Series (Amsterdam 1992), The 10th World Congress of Anesthesiology (The Hague 1992).

Table I. The demographics of the patients and ESWL

Number of patients	17
Age (yr)	39.1±17.1
Weight (kg)	69.3±20.0
Sex (M/F)	10/7
Localization of stone (%)	
Calix	% 76
Pelvis	% 12
Ureter	% 12
ESWL treatment (min)	76.0±25.5
Number of shock waves	2717.6±408.0
Mean voltage of ESWL (kV)	2235±8.0

is accepted as the border value of the statistical difference.

RESULTS

The propofol doses used for the induction and the maintenance of anesthesia are shown in table II. During the procedure there was not any requirement either for an adjuvant analgesic agent or a dose regulation. The results showed no significant difference between the values of respiratory rate, end tidal carbondioxide and capillary oxygen saturation at different measurements (Table III). Heart rate was significantly lower during induction and during infusion rates of 14 and 2mg/kg/h than the control values ($p<0.05$). However other measurements of heart rate values were higher than the control level ($p<0.05$). In the measurements mean systolic arterial pressure was less than the control value ($p<0.05$) (Table IV).

In two patients, for a short time involuntary muscle movements were observed after the induction of anesthesia. Three patients had nausea and one patient had erithematous lesions on his neck, chest and upper limbs. Apnea which lasted 1.5 minutes was observed in one patient after the induction. All complications and side effects disappeared spontaneously without any treatment.

DISCUSSION

Use of analgesics and sedatives as an alternative procedure to epidural analgesia during ESWL has considerably shortened both the preparation and recovery period. Ketamine, fentanyl, midazolam and their combinations can be used for this purpose (1-3). On the other hand studies in which propofol was used as a sole anesthetic agent during short procedures like colonoscopy have been done (4,5).

In our study, during ESWL period sufficient degree of analgesia has been obtained in every patient. Following awakening when it has been asked, all of the patients said that they remembered nothing about the procedure. The results we obtained, can be explained as sufficient blood concentration has been obtained by using propofol bolus during induction and infusion after induction and may also be explained as the agent can maintain a high degree amnesia with its analgesic dose.

Apnea is a frequent complication observed during propofol anesthesia. Apnea incidence is 70% when it is used as bolus injection, 65% during fast infusion and 15% during slow infusion and it is known that when opiates are used in conjunction with it, the incidence increases (6). During our study, only one patient (6%) had apnea of 1.5 minutes duration during induction period. The rate is low because bolus injection has been made within 2 minutes and the agent has been used as a sole anesthetic agent. On the other hand end tidal carbondioxide and capillary oxygen saturation levels did not show any negative changes because of the same reasons.

It is known that propofol causes a depression at the cardiovascular system functions especially at the elderly and at the patients who have low cardiovascular reserves (7-10). In our study the changes at the heart rate and the decrease at the systolic and diastolic pressure is insignificant clinically when compared with their control values. We think that these results depend on the fact that our patients were mostly young, that no other agent depressing cardiovascular function had been used, that the agent was injected slowly and with gradually decreasing doses.

It was observed that propofol can obtain sufficient analgesia during ESWL procedure. The agent did not show any depression at the respiratory system functions. However it was observed at the cardiovascular system, the change in heart rate was clinically insignificant. But the changes in diastolic and systolic blood pressure can cause problems at patients in high risk group.

As a result of these findings, we conclude that at the the patients who are not at risk because of cardiovascular system functions, propofol can be used safely and successfully as a sole anesthetic agent during ESWL procedure.

Table II. The dose of propofol administered to the patients

PATIENT NO	DOSE OF PROPOFOL (mg) INDUCTION	MAINTENANCE
1	80	230
2	60	270
3	160	264
4	150	250
5	145	310
6	175	420
7	175	590
8	210	625
9	100	173
10	225	740
11	225	720
12	225	600
13	158	672
14	125	414
15	135	550
16	125	500
17	175	600
Mean±SD	155.7±49.3	460.7±194.0

Table III. Respiratory rate, end tidal CO2 and capillary 02 saturation values of the patients (Mean±SD)

TIME	RESPIRATORY RATE (Breath/min)	END TIDAL CO2 (mmHg)	CAPILLARY 02 SAT. (mmHg)
CONTROL	15.9±1.9	36.2±1.1	98.1±0.6
INDUCTION	19.3±2.1	38.1±1.7	94.2±3.0
14mg/kg/h	18.8± 5.5	32.7±2.3	96.7±2.2
12mg/kg/h	19.6±1.7	32.0±2.1	96.0±2.3
10mg/kg/h	19.3±2.7	32.1±2.6	97.5±1.0
8mg/kg/h	18.6±1.1	32.4±2.0	97.7±4.9
4mg/kg/h	17.8±1.6	32.3±2.7	97.0±1.6
2mg/kg/h	17.1±1.2	33.4±2.2	96.7±2.2
RECOVERY	17.4±1.3	36.9±1.9	97.8±1.3

Table IV. Heart rate, systolic and diastolic blood pressure values of patients (Mean±SD)

TIME	HEART RATE (Beat/min)	SYSTOLIC BLOOD PRESSURE (mmHg)	DIASTOLIC BLOOD PRESSURE (mmHg)
CONTROL	84.2±12.7	134.3±24.2	86.8±17.4
INDUCTION	76.5±13.5*	130.0±24.4*	82.1±19.1*
14mg/kg/h	82.5±9.9*	121.7±16.1*	79.9±13.1*
12mg/kg/h	85.8±7.2*	119.3±12.5*	81.3±12.5*
10mg/kg/h	86.0±10.2*	116.9±8.9*	80.0±11.7*
8mg/kg/h	85.2±7.6*	125.6±22.7*	81.9±17.1*
4mg/kg/h	85.0±7.5*	121.2±12.7*	83.0±13.2*
2mg/kg/h	82.8±7.7*	128.0±12.9*	87.1±13.4*
RECOVERY	90.2±6.9*	132.9±19.3*	87.6±22.6*

p<0.05 Compared to control value

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