

COMPARATIVE CHARACTERISTIC OF THE METHODS OF THE SUBSIDIZED AND  
BOLUS ADMINISTRATION OF FENTANYL, AS A COMPONENT OF  
ANTI-STRESS BODY PROTECTION OF THE PATIENT,  
IN THE CONDITIONS OF MODERN ANESTHESIA

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## INTRODUCTION

To achieve adequate analgesia is an important part of modern anesthesia and patient protection leading anti-stress component on the stages of surgical treatment [1, 2, 5, 6]. Among the different anti nociceptive medicines the leading position occupied by opioids and in particular fentanyl [7]. Action of a preparation depends on its distribution, fat solubility, interactions with other medicines [2]. However, the most defining is maintenance of constant working concentration of medication during anesthesia [3].

Traditional (bolus) technologies of infusion of preparations assume their introduction in the form of recommended doses and frequencies. Dose corresponds to the desired therapeutic effect with the regular introduction of medication [8]. Infusion through perfusers, allows supporting a constant therapeutic concentration of medicines [3, 4].

The most important is effective reduction of pain syndrome at an altitude of operating trauma, during manipulations in zones with high levels of nociceptive stimulation [6]. Here, it becomes necessary to create peak concentrations of narcotic analgetics [3, 4, 14]. Consequently, It is possible to receive good results using a subsidized method of drug administration to achieve a constant concentration of the narcotic painkiller using programme infusion, and based on the perioperative situation – short-term, peak increases of the effective concentration in the blood by bolus injection [10]. According to our data, such comparison in anesthesiology practice it is not carried out yet.

The purpose of current study is to assess the effectiveness of the anti stress protection of fentanyl in the cases of the bolus and subsidized administration.

## MATERIALS AND METHODS.

Observations are carried out on 42 female patients, ranging in age from 18 to 58 years, equal in scale and operating trauma gynecological operations (extirpation uterus with appendages, myomectomy, adnexectomy), without grave concomitant pathology.

On the anaesthesiological monitor BeneViewT5 (China) the basic parameters of vital functions were registered. Prescription for general anesthesia included: induction of anesthesia – Propofol (1.5 mg/kg), Fentanyl (5.0 mcg/kg), tracheal intubation under myoplegia by the Atracurium 5.0 mg/kg, maintenance of anesthesia with Isoflurane MACK 1.1% O<sub>2</sub>: Air, 50: 50, with moderate hyperventilation (p<sub>a</sub> CO<sub>2</sub>=28-32 mm Hg), mioplegia by the Atracurium 5.0 mg/kg/h.

Depending on the method of maintaining analgesia with fentanyl, patients were divided into 2 groups. In the first group (n=22) included patients where analgesia was supported by bolus infusion only. In the II Group (n=20) analgesia was supported by subsidized introduction of fentanyl. This included an infusion of the drug by the speed of 5mcg/kg and boluses for 100 mcg., based on situational evidence.

In advance (10-15 min) before the end of the surgery we were reduced Atracurium infusion and stopped introduction of fentanyl and inhalation anesthetic.

With a view of rapid exit status patients from general anesthesia we started the infusion of Propofol (dose of 1.6 mg/kg/h). After applying the skin sutures introduction of Propofol was stopped. Extubation of patients was provided according the common anaesthesiological practice criteria.

At all stages of anesthesia: before surgery, at the operating altitude of operative trauma, at the end of anesthesia and surgery and in the postoperative period (via 2 hours) the value of HR/min, AP (mm Hg), temperature gradient (T°C) \*, consumption of fentanyl were recorded (\*temperature gradient is the difference between Central and peripheral temperatures.). Concentration of Cortisol (NG. ml) in the peripheral venous blood was determined by enzyme immunoassay KIT set Cortizol for ELizeUNO Analyzer (Germany).

Central temperature was registered using electric thermometer in the eardrum area, and peripheral on the skin of the thumb of the right foot (the furthest from the heart area). Considered reliable differences at p<0,05 by the Student's (Table 1).

## DESCRIPTION AND DISCUSSION OF THE RESULTS.

Comparison of the parameters of Central hemodynamics in groups identified the following trends. In cases of bolus introduction of Fentanyl (group I), it was indicated an increasing of HR (Heart Rate) from  $76.2 \pm 6.9$  to  $82.3 \pm 5.7$  bpm at the height operating trauma as well as subsidized introduction of the same medicine (group II) it was observed tendency of shortening of HR (Heart Rate) from  $87 \pm 7.2$  to  $72.4 \pm 7.9$  bpm. During the follow-up stages study, the HR in the groups would not have been materially different from the original values.

**TABLE 1. Dynamics of parameters of HR (cycle. min), BP (mmHg), temperature gradient (Tgrad.C), and cortisol (ng/ml) on the stages of anesthesia, surgery and in the postoperative period in conditions of bolus and subsidized introduction of Fentanyl**

(n=42)

Parameter\ stage	Outcome (stage I)	The height of the operative trauma (phase II)	The end of anesthesia and surgery (phase III)	Nearest postoperative period (phase IV)
<b>HR/min</b>				
Group I (n-22)	$76.2 \pm 6.9$	$82.3 \pm 5.7$	$76.4 \pm 5.6$	$76.2 \pm 7.4$
Group II (n-20)	$87 \pm 7.2$	$72.4 \pm 7.9$	$79.8 \pm 5.8$	$79.8 \pm 5.8$
<b>Blood Pressures rmtl</b>				
Group I (n-22)	$72.4 \pm 6.7$	$93.2 \pm 6.5$	$96 \pm 7.8$	$96 \pm 7.9$
Group II (n-20)	$86.4 \pm 6.7$	$92.5 \pm 4.8$	$99 \pm 6.3$	$86.2 \pm 5.7$
<b><math>\Delta T</math> GradC°</b>				
Group I (n-22)	$4.9 \pm 0.8$	$+2.47 \pm 0.3$	$+3.16 \pm 0$	$+6.7 \pm 0.7$
Group II	$5.4 \pm 0.7$	$-4.9 \pm 0.5$	$-1.8 \pm 0.3$	$-1.9 \pm 0.5$
<b>Cortisol ng/ml</b>				
Group I (n-22)	$134.1 \pm 10.7$	$181 \pm 10.0$	$276 \pm 9.7$	$253 \pm 9.8$
Group II (n-20)	$130 \pm 10.6$	$120.1 \pm 5.7$	$167 \pm 9.5$	$164 \pm 11.8$
<b>Consumption of fentanyl mkg/kg</b>				
Group I (n-22)	$7.9 \pm 1.8$			

Group II(n-20)	11± 0.2
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p<0.05 by the Student's

When registering arterial BP in the I group it was increasing at all stages of registration, accordingly from 72,4±6,7 ( stage I), up to 93.2±6.5\* (II stage), 96±7.8\* (stage III), and 96±7.9\* (stage IV) mmHg. In the II group this option was not changed significantly from the original values at all stages of the study.

Registration and calculation of the temperature gradient ( $\Delta T_{grad} C^0$ ) revealed that in cases of bolus fentanyl introduction at all stages it increased respectively by +2,47±0,3; +3,16 ±0,5 And +6,7 ±0,77\*.  $\Delta T_{grad} C^0$  with the outcome. In the II group it was observed gradual reduction of temperature gradient in all phases, respectively -4,9±0,5; 1,8±0,3 and 1,9±0,5.  $\Delta T_{grad} C^0$  with the outcome.

Cortisol secretion in the peripheral venous blood with bolus introduction of the Fentanyl increased more than 2 times of the outcomes and respectively stood at 181±10,0; 276±9,7\* and 253±9,8 ng/ml\* at the research stages. In cases of subsidized introduction of Fentanyl it was noted only a tendency to increase from 130±10,7 (baseline) to 167±9.5 (phase III) and 164±11,8 ng/ml at the end of the anesthesia and surgery.

Fentanyl consumption in groups was 7,9±1,8 and 11±0.2 mkg.kg.

### CONCLUSION

In this way, general anesthesia and surgery in the conditions of bolus introduction of Fentanyl Accompanied by the hyper dynamic function of the circulatory system and the expressed violation of circulation (spasm), as confirmed by the permanent increasing of the temperature gradient and the steady increasing of the concentrations of cortisol in the blood [9, 10, 12]. These changes were accompanying with the insufficient level of anti-nociceptive and anty-stress protection [8, 9, 12, 13].

The above is due to the fact that effective concentration of Fentanyl in the cases of bolus administration of medicine remains in the body not more than 4-5min. The subsequent concentration of this narcotic analgetic decreases and the level of anesthesia is not corresponding of the degree of the pain. On the contrary, subsidized introduction of fentanyl supported constant concentration of narcotic analgetics in the blood 5,0 mkg.kg./h [3, 4, 5, 11, 15], capable to provide the certain level of anesthesia and provided stability parameters of hemodynamics and microcirculation. On the adequate level of protection indicated stable

anti-stress hormone cortisol secretion during anesthesia, surgery and in the postoperative period that clearly demonstrates an appropriate level of protection of the body from pain and stress [8, 9, 10, 12].

Thus the subsidized introduction method of Fentanyl in conditions of the general balanced anesthesia provides a higher level of anti-stress protection than bolus (traditional) infusion of this narcotic analgetic.

**Key words: Fentanyl, Cortizol, subsidized and bolus mehods of infusion, antistressful protection**

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