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Comparison of blood loss and reduction of blood morphological values in patients undergoing pharmacological anesthesia during labor

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Abstract

Aim: To assess and compare blood loss and reduction of blood morphological values in patients undergoing pharmacological anesthesia during labor.

Material and methods: The study included 128 pregnant women ≥ 37 weeks, who were delivered vaginally.

The women were divided into four groups:

1. PCEA (n = 33) women giving birth under patient-controlled epidural anesthesia (PCEA) in a horizontal position;
2. Pethidine (n = 24) women giving birth subjected to analgesia by parenteral supply of pethidine;
3. Fentanyl (n = 25) women giving birth subjected to analgesia by parenteral supply of fentanyl;
4. Control (n = 46) women giving birth without analgesia.

In each patient, in order to assess maternal blood loss during vaginal delivery, red blood cell (RBC) count, hematocrit (HT) value and hemoglobin (HGB) concentration before and after delivery, were assessed. Additionally, subjective evaluation of blood loss during delivery in milliliters, by a physician who assisted the delivery was performed.

Results: A significantly greater decrease of maternal RBC-loss and greater decrease of HT-loss in the group of patients anaesthetized with pethidine in comparison to other groups was observed. There were no differences in the values of HGB-loss during labor between the study groups. Also the analysis of blood loss during delivery in milliliters, has not shown significant difference between the groups.

Conclusion: Analgesia of labor with pethidine results in a significant reduction of the number of red blood cells and reduction of hematocrit values after delivery, in comparison to patient-controlled epidural anesthesia or analgesia with the use of fentanyl, as well as in comparison to the patients without any analgesia.

Keywords: fentanyl, hematocrit, hemoglobin, patient-controlled epidural anesthesia, pethidine, red blood cells

Introduction

The most commonly used methods of intrapartum analgesia in current obstetrics are parenteral administration of opioid drugs and epidural anesthesia. However the first method is the most popular in the developed countries, available scientific proofs and reports generally

confirm the second one to be more effective [1]. Despite of it, intrapartum analgesia is also expected to have a broad safety profile for both the mother and the infant [1].

The aim of the study was to assess and compare blood loss and reduction of blood morphological values in patients undergoing pharmacological anesthesia during labor. In the available literature, there are few reports on this subject.

Material and methods

The study included 128 pregnant women ≥ 37 weeks, who were delivered vaginally in the Department of Obstetrics and Gynecology of the Pomeranian Medical University in Szczecin in 2013-2017. The study was approved by the University Bioethic Committee No. KB-0012/56/13.

The women were divided into four groups:

1. PCEA (n = 33) women giving birth under patient-controlled epidural anesthesia (PCEA) in a horizontal position;
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In each patient, in order to assess maternal blood loss during vaginal delivery, red blood cell (RBC) count, hematocrit (HT) value and hemoglobin (HGB) concentration before and after delivery, were assessed. Additionally, subjective evaluation of blood loss during delivery in milliliters, by a physician who assisted the delivery was performed.

Statistical analysis was performed using the statistical program STATA 11. Differences between two groups were assessed with t-Student and U-Mann-Whitney tests. Differences between several groups were made using analysis of variance test (ANOVA) test or the Kruskal-Wallis test.

Results

No statistically significant difference between the study groups in terms of the number of RBC before and after childbirth was observed (Tab. 1, 2).

Table 1. Number of maternal red blood cells in the studied groups before delivery.

Group	The number of red blood cells (mln/µL)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	3.67	0.36	3.08	4.49	3.39	3.64	3.97	NS
Pethidine	24	3.53	0.38	2.52	4.20	3.27	3.58	3.80	
Fentanyl	25	3.69	0.28	3.08	4.14	3.50	3.69	3.90	
Control	46	3.60	0.41	2.73	4.53	3.34	3.59	3.91	

Table 2. Number of maternal red blood cells in the studied groups after delivery.

Group	The number of red blood cells (mln/µL)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	3.67	0.36	3.08	4.49	3.39	3.64	3.97	NS
Pethidine	24	3.53	0.38	2.52	4.20	3.27	3.58	3.80	
Fentanyl	25	3.69	0.28	3.08	4.14	3.50	3.69	3.90	
Control	46	3.60	0.41	2.73	4.53	3.34	3.59	3.91	

However, in respect to the values of maternal RBC-loss, a significantly greater decrease in the group of patients anaesthetized with pethidine in comparison to other groups was observed (Table 3).

Table 3. Comparison of the loss of red blood cells before and after delivery between the groups.

Group		p
PCEA	pethidine	NS
PCEA	Fentanyl	NS
PCEA	Control	NS
Pethidine	Fentanyl	**0.0037**
Pethidine	Control	**0.0145**
Fentanyl	Control	NS

Analysis of maternal hematocrit values before delivery showed statistically significant (p = 0.0406) the highest value of this parameter in the group of patients anaesthetized with pethidine and significantly the lowest value (p = 0.0346) in the PCEA group (Tab. 4).

Table 4. Values of maternal hematocrit in the studied groups before delivery.

Group	Hematocrit (%)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	35.68	2.87	31.60	40.50	32.90	35.90	38.20	NS
Pethidine	24	36.40	2.83	31,40	41.70	33.90	37.25	37.90	**0.0406**
Fentanyl	25	35.45	2.37	31.60	41.60	34.00	35,00	36.70	NS
Control	46	34.45	2.85	25,40	39.30	32.50	34.30	37.10	**0.0346**

No differences were observed between the groups in respect to the maternal hematocrit values after delivery (Tab. 5).

Table 5. The value of maternal hematocrit in the studied groups after delivery.

Group	Hematocrit (%)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	31.93	3.17	27.00	39.00	29.10	31.50	34.20	NS
Pethidine	24	30.48	2.53	23.90	35.00	28.75	30.45	32.25	
Fentanyl	25	31.43	2.12	26.90	34.20	29.80	31.50	33.40	
Control	46	30.92	3.34	24.00	36.70	28.90	31.30	33.20	

A significantly greater decrease in HCT-loss in the Pethidine group compared to other groups was observed. (tab. 6).

Table 6. Comparison of loss of the hematocrit before and after delivery between the groups.

Group		p
PCEA	Pethidine	NS
PCEA	Fentanyl	NS
PCEA	Control	NS
Pethidine	Fentanyl	**0.0106**
Pethidine	Control	**0.0102**
Fentanyl	Control	NS

The analysis of hemoglobin content in the maternal blood showed no significant difference between studied groups, both before and after delivery (Tab. 7, 8).

Table 7. Content of hemoglobin in the maternal blood before delivery.

Group	Hemoglobin (mmol/dL)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	7.59	0.65	6.66	8.58	6.97	7.63	8.14	NS
Pethidine	24	7.74	0.71	6.50	9.00	7.10	7.80	8.25	
Fentanyl	25	7.47	0.56	6.60	8.70	7.00	7.50	7.80	
Control	46	7.48	0.80	4.42	8.45	7.18	7.55	7.96	

Table 8. Content of hemoglobin in the maternal blood after delivery.

Group	Hemoglobin (mmol/dL)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	6.71	0.66	5.65	8.68	6.20	6.58	7.21	NS
Pethidine	24	6.52	0.68	4.70	7.70	6.02	6.57	6.97	
Fentanyl	25	6.59	0.54	5.50	7.40	6.20	6.60	7.20	
Control	46	6.56	0.75	4.57	7.84	6.09	6.65	7.14	

There were also no differences in the values of HGB-loss during labor between the study groups (Tab. 9).

Table 9. Comparison of loss of hemoglobin between the studied groups.

Group		p
PCEA	Pethidine	NS
PCEA	Fentanyl	NS
PCEA	Control	NS
Pethidine	Fentanyl	NS
Pethidine	Control	NS
Fentanyl	Control	NS

Analysis of blood loss during delivery, in milliliters, has not shown significant difference between the groups (Table. 10).

Table 10. The loss of amount of blood during delivery in the studied groups.

Group	Blood loss (mL)								
	N	Mean	SD	Min.	Max.	Q25	Median	Q75	p
PCEA	33	206.06	113.71	100.00	600,00	150.00	150.00	200.00	NS
Pethidine	24	208,33	61.97	150.00	400,00	150.00	200.00	250.00	
Fentanyl	25	210.00	47.87	100.00	300.00	200.00	200.00	250.00	
Control	46	197.83	47.09	100.00	300.00	150.00	200.00	200.00	

Discussion

In the analyzed material, in any case, there was no loss of blood in an amount of authorizing the diagnosis of postpartum hemorrhage. However, in the group of the patients anaesthetized with pethidine a significant reduction in the number of red blood cells and in hematocrit values in relation to the other groups was found. In the available literature there are few reports on the morphological values of postpartum blood in patients undergoing anesthesia during delivery.

Weigl et al. [2] found no differences in the macroscopic estimation of blood loss during delivery between a group of patients with epidural anesthesia and the control group without

any anesthesia. Fyneface-Ogan et al. [3] who compared patients with epidural anesthesia and patients anesthetized with parenteral administration of opioid analgesics also reported no significant differences in blood loss during delivery. In accordance with the foregoing observations Wang et al. [4], who compared patients with epidural anesthesia and the control group without any analgesia, did not observe an increased risk of postpartum hemorrhage. Magann et al. [5] don't confirm the above report. They include the epidural anesthesia as a risk factor for postpartum hemorrhage. In the literature, however, prevails the view that the epidural anesthesia does not belong to the risk factors of increased blood loss during delivery.

Conclusion

Analgesia of labor with pethidine results in a significant reduction of the number of red blood cells and reduction of hematocrit values after delivery, in comparison to patient-controlled epidural anesthesia or analgesia with the use of fentanyl, as well as in comparison to the patients without any analgesia.

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