

RESEARCH ON PAIN SCORES FOR DIFFERENT ARTERIAL PUNCTURE SITES FOR BLOOD GAS ANALYSIS

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Abstract

INTRODUCTION: In emergency departments, it is important to have tests that give fast results especially in the diagnosis and treatment of critically ill patients. Blood gas analysis has an important role in the diagnosis and treatment of patients applying for emergency services. On the other hand, taking samples for blood gas may differ based on clinic properties of patients. Puncture of arteries in sampling is a painful procedure. It is aimed to evaluate the differences between visual analogue pain scales of patients based on different punctured veins.

METHODS: In this retrospective study, files of patients attempted to Ufuk University, Medical Faculty Dr Ridvan Ege Education and Research Hospital, Department of Emergency Medicine between 01.01.2015–31.12.2017 with the punctured veins process at the age of 18–65 were examined.

RESULTS: A total of 84 patient files, including 55 radial and 31 femoral punctured veins, were subjected to the research. 36.4% of patients in the radial group were female, and 63.6% of them were male. In the femoral group, 45.2% of patients were female and 54.8% were male. Gender differences between groups were found to be statistically insignificant ($p > 0.05$). BMI of groups was also statistically insignificant ($p > 0.05$). Chronic disease distribution was found to be statistically insignificant between the groups ($p > 0.05$). VA score of the femoral group (6.32 ± 1.70) was significantly higher than the radial group (5.15 ± 1.98) ($p < 0.05$). In the sampling difficulty groups, patients whose samplings were difficult were significantly higher than other groups ($p < 0.05$).

CONCLUSIONS: In conclusion, VA score for femoral arterial puncture is higher than a radial arterial puncture. In other words, taking blood gas with the radial arterial procedure is less painful than the femoral arterial procedure. In addition, hypertension is also an important factor affecting pain after arterial puncture with VAS.

KEY WORDS: arterial puncture, blood gas analysis, pain score

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INTRODUCTION

Arterial puncture for blood gas analysis is especially common in emergency departments [1]. Analysis of arterial blood gas is a gold standard for evaluation of acid-base equation of metabolism and respiration patients [2]. It is known as a painful procedure for many patients, and some physical relief methods such as ice bags are applied to reduce this pain [3]. In clinical applications,

the generally used arteries are radial, brachial and femoral arteries.

Radial arterial puncture is one of the most common procedures for blood gas analysis [4]. Another method for puncturing blood gas analysis is a femoral artery puncture [5, 6]. It is also known as a Common Femoral Artery puncture — CFA puncture [7]. In both femoral and radial artery punctures the malpractice issues have been reported [8–14].

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Patients suffering from chronic diseases led to hypoxemia and dyspnea such as COPD, pulmonary emboli, or heart failures are frequently subjected to arterial puncture. These patients are more frequently faced with the risk of complications. Pain experienced by a patient may be indicative of complication or patient's safety. In order to apply the correct methods effectively and accordingly with patient safety guidelines, less painful methods have become of vital importance. It was aimed to evaluate the differences between a visual analogue pain scales of patients based on different punctured veins.

MATERIALS AND METHODS

In this retrospective study, files of patients admitted to Ufuk University, Medical Faculty Dr Ridvan Ege Education and Research Hospital, Department of Emergency Medicine between 01.01.2015–31.12.2017 with the punctured artery process at the age between 18–65 were examined. A Total of 84 patient files, including 55 radial and 31 femoral punctured arteries, were subjected to the research.

In the statistical analysis, SPSS 17. for windows was used. Binary and nominal parameters were described with frequency analysis, whereas mean and standard deviations were used to describe scaled parameters. Chi-Square analysis and likelihood ratio were used for differences between categorical parameters. Before difference analysis of scale parameters, the Kolmogorov Smirnov test was used for normality of parameters. Since distributions were found to be non normal, Mann Whitney-U test was used for differences between two groups, and the Kruskal Wallis test was used for differences between more than two groups. Binary Logistic Regression analysis was used for multifactorial regression of binary parameters. All analyses

were performed at 95% CI with a 0.05 alpha significance level.

RESULTS

Baseline characteristics of patient groups were given in Table 1.

36.4% of patients in the radial group were female, and 63.6% of were male. In the femoral group, 45.2% of were female and 54.8% were male. Gender differences between groups were found to be statistically insignificant ($p > 0.05$). BMI of groups was also statistically insignificant ($p > 0.05$). Chronic and other disease rates of patient groups were given in Table 2.

Patients suffering of CHD, CKF, hypoxemia and apnea were higher in the radial group, whereas DM, hypertension, CHF, COPD and malignancy were higher in the femoral group. Chronic disease distribution was found to be statistically insignificant between the groups ($p > 0.05$). VAS differences of patient and difficulty groups were presented in Table 3.

VA score of the femoral group (6.32 ± 1.70) was significantly higher than in the radial group (5.15 ± 1.98) ($p < 0.05$). In sampling difficulty

Table 1. Baseline characteristics of patient groups

	Radial (n = 55)	Femoral (n = 31)	p
Gender			0.423 ^a
Female	20 (36.4)	14 (45.2)	
Male	35 (63.6)	17 (54.8)	
BMI			0.050 ^a
< 25	22 (40.0)	6 (19.4)	
> 25	33 (60.0)	25 (80.6)	

a. Chi-Square Test, b. Likelihood Ratio Test

Table 2. Chronic and other disease rates of patient groups

	Radial (n = 55)	Femoral (n = 31)	p
Diabetes Mellitus (DM)	19 (34.5)	12 (38.7)	0.699 ^a
Hypertension (HT)	28 (50.9)	21 (67.7)	0.130 ^a
Chronic Heart Disease (CHD)	17 (30.9)	7 (22.6)	0.408 ^a
Chronic Heart Failure (CHF)	13 (23.6)	10 (32.3)	0.386 ^a
Chronic Kidney Failure (CKF)	9 (16.4)	3 (9.7)	0.379 ^b
Chronic Obstructive Pulmonary Disease (COPD)	22 (40.0)	15 (48.4)	0.451 ^a
Malignancy	3 (5.5)	3 (9.7)	0.469 ^b
Hypoxemia	25 (45.5)	13 (41.9)	0.752 ^a

groups, patients whose sampling was difficult were significantly higher than other groups ($p < 0.05$). In order to analyze the isolated effects of VAS of patients based on different punctured veins, binary logistic regression analysis was performed, and results were given in Table 4.

According to the binary logistic regression analysis, HT (OR: 0.240; $p < 0.05$) and VA scores (OR: 1.559; $p < 0.05$) have statistically significant effects on different punctured veins.

DISCUSSION

Blood gas analysis is a common and a gold standard procedure for metabolic and respiratory-related health problems [1]. Radial, femoral and brachial arteries are the arteries most often used for blood gas analysis. During the arterial puncture process, complication risks and pain which drives down the quality of life of patients are especially faced by respiratory and COPD patients, who receive

blood gas procedure more frequently [15, 16]. The pain may be interpreted as a reaction of the body, and pain levels of patients are also part of this reaction. In literature, there has not been a consensus on a selection of arterial puncture artery in general procedure. Thus, it is important to compare arterial puncture procedures in terms of pains experienced by patients.

In literature, there have been researches arguing that gender and BMI level of patients affect the pain they perceive [15–19]. In our study, gender and BMI distribution of patient groups were not significantly different. Thus, it may be argued that the effects of gender and BMI had been eliminated by the gender distribution of our sample.

Chronic diseases have their own characteristics and pain patterns. In our study, CHD, CKF, hypoxemia and apnea were higher in the radial group. On the other hand, DM, hypertension, CHF, COPD and malignancy were higher in the femoral group. However, chronic diseases of patients in our sample were not significantly different. For this reason, it may be argued that possible effects of chronic diseases on the pain of the arterial puncture did not affect the results of the study. In other words, the reliability of results of the study in terms of chronic diseases is higher.

According to our results, VA score was significantly higher in the femoral group patients. As expected, patients whose sampling processes were difficult had higher VA scores. In binary logistic regression, VAS and HT were found to be effective factors for the groups. In other words, either femoral or radial arterial puncture has a statistically significant

Table 3. VAS differences between patient and difficulty groups

	f	VAS	p
Group			0.003 _a
Radial	55	5.15 ± 1.98	
Femoral	31	6.32 ± 1.70	
Sample taking difficulty			0.002 _b
Easy	46	4.93 ± 1.70	
Mild	25	5.84 ± 1.75	
Difficult	15	7.07 ± 2.22	

a — Mann Whitney-U Test, b — Kruskal Wallis Test

Table 4. Binary Logistic Regression results

	B	S.E.	Wald	df	Sig.	OR
BMI(1)	-0,714	0,805	0,787	1	0,375	0,490
DM(1)	0,151	0,702	0,046	1	0,829	1,163
HT(1)	-1,428	0,663	4,632	1	0,031	0,240
CHD(1)	0,217	0,698	0,096	1	0,756	1,242
CHF(1)	-0,104	0,729	0,020	1	0,886	0,901
CKF(1)	1,204	,897	1,800	1	0,180	3,332
COPD(1)	0,366	0,654	0,313	1	0,576	1,441
Malignancy (1)	-2,413	1,272	3,602	1	0,058	0,090
Hypoxemia(1)	0,099	0,719	0,019	1	0,890	1,105
Apnea(1)	0,494	0,737	0,449	1	0,503	1,639
VAS	0,444	0,216	4,217	1	0,040	1,559
Constant	-4,223	2,297	3,379	1	0,066	0,015

effect on the pain patients experienced, and HT is also a risk factor affecting pain for arterial blood gas sampling procedure. Thus, it may be recommended to select the femoral arterial puncture especially for patients with HT in order to minimize their pain for arterial puncture process.

CONCLUSIONS

Results of the study showed that the VA score for the femoral arterial puncture is higher than the radial arterial puncture. In other words, sampling blood gas with the radial arterial procedure is less painful than the femoral arterial procedure. In addition, hypertension is also an important factor affecting pain after arterial puncture with VAS.

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