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SCIENTIFIC ARTICLE

Effects of smoking on venous cannulation pain: a randomized prospective trial

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KEYWORDS
Smoking;
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Abstract
Background and objectives: It has been demonstrated that smoking increases pain perception; however the effect of smoking on perception of pain during venous cannulation is not known. The purpose of this study is to determine whether or not smoking has an effect on pain perception due to peripheral venous cannulation.
Methods: 220 patients scheduled to have elective surgery were enrolled in the study and were divided into two groups (Group S and C, $n = 110$ for each) according to their smoking habits. Numerical rating scale was introduced to the patients and then peripheral venous cannulation at the dorsum of the hand was made with a 20 G intracath. Pain perception of the patients was scored by subsequent numerical rating scale questioning.
Results: The demographic characteristics of the groups were identical. Numerical rating scale scores in Group S and C were 3.31 ± 1.56 and 1.65 ± 1.23, respectively ($p < 0.001$).
Conclusion: Pain perception due to peripheral venous cannulation is higher in smokers. Future studies on pain treatment should consider the smoking habits of patients.

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PALAVRAS-CHAVE
Hábito de Fumar;
Cateterismo periférico;
Dor

Efeitos do tabagismo sobre a dor durante o cateterismo venoso: um estudo prospectivo e randomizado

Resumo
Justificativa e objetivos: Sabe-se que o tabagismo aumenta a percepção de dor; porém, o efeito do tabagismo sobre a percepção da dor durante o cateterismo venoso não é conhecido. O objetivo deste estudo foi determinar se o tabagismo tem ou não algum efeito sobre a percepção da dor durante a punção venosa periférica.
Métodos: Foram incluídos no estudo 220 pacientes agendados para cirurgia eletiva randomicamente alocados em dois grupos: Grupo S (n = 110) e Grupo C (n = 110), de acordo com seus hábitos tabagísticos. Os pacientes foram instruídos sobre o uso da escala numérica de classificação da dor e, em seguida, a punção venosa periférica foi feita no dorso da mão com um cateter de calibre 20G (Intracath®). A percepção de dor dos pacientes foi posteriormente registrada de acordo com os escores da escala numérica.
Resultados: As características demográficas dos grupos eram idênticas. Os escores da escala numérica de dor dos grupos S e C foram 3,31 ± 1,56 e 1,65 ± 1,23, respectivamente (p < 0,001).
Conclusão: A percepção da dor por causa da punção venosa periférica é maior em fumantes. Estudos futuros sobre o tratamento da dor devem considerar os hábitos tabagísticos dos pacientes.

Introduction

Pain is defined by the International Association for the Study of Pain as actual or potential tissue damage accompanied by an unpleasant sensory and emotional experience, or it is defined in terms of such damage.[1,2] For this reason pain should not be evaluated as purely physiological or somatic. Severity of pain sensation is affected by environmental factors and subjective personal past experiences. As a result, pain of the same intensity may be perceived different under similar conditions.[3,4]

Cigarette use brings many health problems, such as heart and lung diseases, many different types of cancer and asthma. In addition smoking may change pain sensation and postoperative analgesic requirements.[4–7]

Intravenous (IV) catheterization is one of the most frequently used interventions for diagnostic and treatment applications. IV catheterization frequently causes pain and anxiety.[4] In the literature there are many studies on the relationship between venous catheterization and pain. However, most studies have not included the effect of smoking on venous cannulation pain.[8–11]

The hypothesis of this study is that an adult smoking habit will increase the pain of venous catheterization. To test this hypothesis the venous catheterization pain of smoking and non-smoking patients was evaluated. The primary outcome was pain score after cannulation.

Materials and methods

Canakkale Onsekiz Mart University Clinical Research Ethics Committee granted permission for this study (date: 16/05/2012, no: 89, chairman: H. Aksulu). Written informed consents were obtained from the patients who enrolled in the study and the study was completed at Canakkale Onsekiz Mart University between May 2012 and January 2013. A total of 220 male patients between 18 and 65 years of age were included in the study. Patients having any chronic diseases especially neurological or psychiatric, communication difficulty, analgesic use within the previous 24 h, or having a previous history of trauma or neurologic deficit at the hand were not included in the study. Patients included in the study were not administered premedication.

Patients taken into the operation room were informed about the 10 step numerical pain score. The smoking history of the patients was recorded. According to smoking habit cases were divided into 2 groups. The smoker group of patients had a history of 5 years of smoking for more than 5 cigarettes a day (Group S, $n = 110$). The non-smoking group consisted of cases who did not smoke or who had ceased smoking at least 1 year previously (Group C, $n = 110$). Venous cannulation for all cases was completed by placing a 20 G intracath in a vein on the back of the hand. The severity of pain during venous cannulation was questioned and the responses were recorded.

Statistical analysis

Statistical analysis of data was completed using SPSS version 15.0 (SPSS Inc.) software program. Data are given as mean ± standard deviation. For data analysis, the Student's t test was used. Significance was accepted as $p < 0.05$.

Results

The research was completed in 220 male patients. The characteristics of the patients are shown in Table 1.

The numerical rating scale (NRS) values after venous catheterization of Group S were significantly higher than the values of Group C ($p < 0.01$) (Table 1). When the correlation of demographic and smoking habits with venous catheterization pain scores of the cases was researched, there was a

Table 1 Characteristics of cases included in the study group.

Characteristic	Group C ($n = 110$)	Group S ($n = 110$)	p
Age (year)	40.82 ± 14.68	39.09 ± 13.00	0.354[a]
Height (m)	173.15 ± 6.82	173.86 ± 6.80	0.441[a]
Weight (kg)	78.40 ± 13.67	76.88 ± 12.96	0.396[a]
Number of cigarette packets per day[b]	–	1.25 ± 0.56	<0.001[a]
Duration of smoking habit (year)	–	22.37 ± 13.39	<0.001[a]
NRS	1.65 ± 1.23	3.31 ± 1.56	<0.001[a]

NRS, numerical rating scale.
[a] Student's t test.
[b] One packet contains 20 cigarettes.

Table 2 Correlation of venous cannulation pain scores with demographic characteristics and smoking habits of cases.

Factor	Correlation coefficient	p
Number of cigarettes per day (packet)	0.451	<0.001[a]
Duration of smoking habit (year)	0.481	<0.001[a]
Age	0.118	0.082[a]

[a] Pearson correlation test.

significant positive correlation between the NRS values during venous catheterization with duration of smoking habit and amount of cigarettes consumed ($p < 0.001$). No significant correlation was determined between age and pain after venous catheterization ($p = 0.082$) (Table 2).

Discussion

In our study evaluating the venous catheterization pain in smoker and non-smoker patients we determined that the pain scores due to venous catheterization were significantly higher in smokers than that of non-smokers.

Currently smoking is a common habit that causes the most serious public health problems. Smoking is known to be related to a wide range of serious diseases including heart and vein diseases, lung diseases and many types of cancer, especially lung cancer.[4–7]

There have been many studies researching the effect of smoking on pain perception. Previous studies have reported smoking to be a risk factor for development of chronic pain and related to high perception of pain.[6,12] It is emphasized that pain perception of smokers is higher than non-smokers,[13] however the mechanism behind the relationship between smoking and pain has not been clearly explained.[14] Studies reporting that chronic smoking changes the endogenous pain mechanisms affecting pain perception are available.[15] Another mechanism being debated is that chronic nicotine exposure due to smoking affects the central nervous system and as a result, changes in the pain perception of smokers occur.[14,16] Experimental studies have emphasized the analgesic properties of nicotine. In addition epidemiological studies support the idea that smoking is a risk factor for chronic and acute pain.[17]

Studies have emphasized that smoking increases the pain of propofol injection. Another study reported that nicotine replacement in smokers reduced the pain of propofol injection.[7]

Experimental studies support this data. In an incisional pain model of rats addicted to nicotine and deprived of it, thermal and mechanic stimuli increased the sensitivity to pain.[5]

Studies have emphasized that smoking is one of the predictors of severe pain in the postoperative period.[18] In another study of 520 tooth extractions smoking was reported among the factors related to increased pain levels after tooth extraction.[19] In smokers, deprived of nicotine in the postoperative period, there is an increase in opioid requirements for patient-controlled analgesia.[20]

Venous catheterization is a frequently used intervention in routine medical applications to take blood samples or to administer medications.[4,21] In addition during venous catheterization intervention pain occurs and previous untreated pain from venous catheterization increases anxiety during medical intervention, lowers the pain threshold and especially, may cause reluctance to medical interventions.[4,22]

To treat venous catheterization pain many different medications and methods may be used. Among these methods are dextrose solutions, lidocaine prilocaine creams, amethocaine cream, subcutaneous lidocaine injections, and use of different color lights.[8–11]

Additionally in studies evaluating the pain of venous catheterization, methodological factors affecting pain should be considered. For example, the menstrual cycle in women changes the pain threshold.[23,24] Gender differences may cause differences in pain perception.[25,26] For this reason we included only men in our study.

Previous studies have reported that age is one of the factors affecting pain sensation.[27–29] However in our study there was no correlation determined between age and venous intervention pain.

Conclusion

In conclusion, the results of this study show that smoking in adult males affects venous catheterization pain, and venous catheterization pain in smokers is greater than in non-smokers. Thus, it will be better for the future studies on pain to take into account that the smoking status of patients is an additional factor that could affect the results.

Conflicts of interest

The authors declare no conflicts of interest.

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