The Effect of Diabetic Disease, Smoking and Perioperative Blood Loss on the Occurrence of Dehiscence of Laparotomy

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Abstract
Background: The aim of this study was to determine the effect of diabetic disease, smoking and perioperative blood loss on the occurrence of dehiscence of laparotomy.

Methods and findings: The prospective study included 703 operated patients in the Clinic for General Surgery in Nis from January 1, 2018 to January 31, 2019. The effect of diabetic disease, smoking and perioperative blood loss on the occurrence of dehiscence of laparotomy was analyzed.

Results: Dehiscence of laparotomy occurred in 4.7% of patients. In patients with diabetic diseases and in patients with perioperative blood loss exist very significant correlation between dehiscence of laparotomy and both risk factors. In the patients-smokers dehiscence of laparotomy is common.

Conclusion: Good preoperative preparation reduces postoperative wound complications.

Keywords: Dehiscence of laparotomy; Diabetes; Smoking; Blood loss; Wound; Reintervention

Introduction
Dehiscence of laparotomy is a disorder of healing of the wound and can manifest in a different degree. Complete wound disruption with evisceration of abdominal organs requires urgent reintervention. It occurs most often during the first week after surgery. It occurs in 0.5 to 3% of operated patients [1]. Dehiscence of laparotomy is accompanied by high morbidity and mortality that ranges up to 40%.

The healing process of the wound is an extremely complex and dynamic set of cellular, biochemical and immunological processes, which depends on several factors.

Extension of the age limit of surgical patients leads to the emergence of new problems related to the altered response of the organism (burdened by homeostasis disorders and the function of all age-old systems) on the surgical procedure.

Diabetes is characterized by atherosclerosis, microangiopathy, disorder of Hb dissociation and decreased chemotaxis and phagocytosis.

Smoking, microvascular disease, and severe lung disease are known to cause peripheral tissue hypoxia which increases the risk of wound infection and dehiscence.

Collagen disease (Sy. Marphan, Sy. Oehler-Dunloss), although relatively rare, are characterized primarily by disorders in the fibroplasia phase [2]. Also, smoking and the use of corticosteroid therapy as part of these disorders reduces the healing of the epidermis and collagen biosynthesis. Preferably the dosage of steroids is reduced during a critical inflammatory phase of healing of the wound. Simultaneous administration of vitamin A and vitamin C can lead to a reduction in the harmful effects of steroids and smoking. Vitamin A accelerates the achievement of hardness of the wound, re-enteritis and steroid-inhibited wound healing [3].

Methods
Research is organized by type of prospective study that have analyzed the following data as risk factors: the influence of diabetic disease, smoking and perioperative blood loss on the occurrence of dehiscence of laparotomy of 703 operated patients at the Department of General Surgery in Nis in the period from January 1, 2018 to January 31, 2019. Complications-dehiscence of laparotomy was found in 33 patients. Statistical sample size is determined by the statistical methodology to meet the basic principle of representativeness was used to determine the optimal normogram sample. In this paper, results are presented in tables and grafically. The statistical analysis using the methods of descriptive statistics (mean, standard deviation), parametric tests (Student's t-test) and nonparametric Chi-square test. For statistical analysis we used the software package SPSS 14.0, and the imaging table and a Microsoft Office Word 2003.

Results
Dehiscence of laparotomy occurred in 4.7% of patients or 33 patients of the total 703 respondents (Figure 1).
Of the total 33 patients with dehiscence of laparotomy, 26 patients were male or 78.8%, while only 7 patients were female or 21.2%.

In the group of patients with dehiscence of laparotomy were 28 of them or 84.8% with diabetes and 5 patients or 15.2% without diabetes. In the group of patients without dehiscence of laparotomy were 438 patients with diabetes or 65.4% and 232 patients without diabetes or 34.6% (Figure 2). There is statistically very significant correlation between dehiscence of laparotomy and diabetes ($\chi^2=7.170; p<0.01$). Of the 703 patients examined, 135 were smokers or 19.2%. There is statistically significant correlation between dehiscence of laparotomy and smoking ($\chi^2=6.936; p<0.05$). 21 smokers had dehiscence of laparotomy or 15.6% and 114 smokers did not have dehiscence of laparotomy or 84.4%. Of the patients who did not have a dehiscence of laparotomy 114 patients were smokers or 20.1% and 454 patients without dehiscence of laparotomy were not smokers or 79.9% (Figure 3).

There is a statistically very significant relationship between dehiscence of laparotomy and blood loss ($\chi^2=19.988; p<0.01$). Blood loss (>100 ml) was significantly more prevalent in patients with dehiscence of laparotomy. Of 33 patients with dehiscence of laparotomy them 16 or 48% had a blood loss, and of the 670 patients without dehiscence, blood loss had only 73 of them, or 10.9% (Figure 4).

Discussion

Despite major advances in the understanding of the process of wound healing physiology, surgical techniques and the application of modern technologies and materials in surgery, the percentage of impaired healing laparotomy is still high. Dehiscence of laparotomy occurs in approximately 3% of patients. In a retrospective study by Rodriguez- Hermosa Ji and all from Spain, in 57 patients or 0.45% of the total 12622 patients with laparotomy, there was dehiscence of laparotomy. There were 45 male patients and 12 female patients [4]. In our study in relation with gender from 33 patients with dehiscence of laparotomy, 26 patients were a male gender and 7 females. The Cracow study Konig J, Richter P, Zurawska S. and associates with dehiscence of laparotomy occurred in 56 patients or 2.9% of their patients [5]. Our results show that dehiscence of laparotomy was present in 4.7% of patients or 33 patients of the total 703 respondents. Preoperative preparation is an important stage in the treatment of surgical patients and the adequacy of preoperative depends on result of the operation, the incidence of complications and mortality of patients. It is necessary that all the general condition of the patients preoperatively stabilized and carry a minimum of anesthesia and surgical preoperative whenever the patient’s condition allows [6].

In India’s study from Rajindra Hospital in Patiala only 4 (8%) of their wound dehiscenced patients were diabetics. These patients were given insulin [7]. Of all diabetics in our study does not receive any insulin therapy. The five year prospective observational study was
performed 7224 operations in 4197 patients in South Australia, 196 patients had diabetes (4.7%). The incidence of 2 patients with diabetes appeared [8] and do not different from those without dehiscence (p = 90), which is not concordant with our study. In our study in the group of patients with dehiscence of laparotomy diabetes had 28 of them, or 84.8% and without diabetes was 15.2% or 5 patients. 438 patients with diabetes were in the group of patients without dehiscence of laparotomy or 65.4% and 232 patients without diabetes or 34.6%. In patients with diabetes, dehiscence of laparotomy occurs more frequently and that is statistically very significant (p<0.01).

Smoking and comorbidity such as diabetes, cardiovascular disease, and lung disease were associated with surgical site infections and dehiscence of tissue and wounds, thus confirming previous reports [9,10]. Several pathogenetic mechanisms may be involved. Smoking, microvascular disease, and severe lung disease are known to cause peripheral tissue hypoxia which increases the risk of wound infection and dehiscence.

In addition, some studies suggest that hypoxia, smoking, and diabetes reduce collagen synthesis and oxidative killing mechanisms of neutrophils [11,12]. In our study is statistically significant correlation between dehiscence of laparotomy and smoking. 21 smokers had dehiscence of laparotomy or 15.6%.

Following elective operations, perioperative blood loss was a risk factor of postoperative tissue and wound complications in a dose-dependent manner, when adjusting for other risk factors and confounders. This findings confirms previous reports [13], and suggests that hypovolemia and reduction of tissue oxygenation by loss of red blood cells is detrimental to healing and increases the risk of infection and tissue dehiscence [14]. An immuno modulatory effect of allogenic blood transfusions to compensate for perioperative blood loss has been suggested as causative for postoperative wound infections [15]. In our study exist a statistically very significant relationship between dehiscence of laparotomy and blood loss (χ²=19.988; p<0.01). Blood loss (>100 ml) was significantly more prevalent in patients with dehiscence of laparotomy. 16 operated patients with dehiscence of laparotomy or 48% had a blood loss.

Comparing the results with the results of international studies in this paper we come to the conclusion that our results are not worse than the results of the world’s health task.

**Conclusion**

Dehiscence of laparotomy occurs in less than 5% of patients. In patients with diabetes and in patients with perioperative blood loss, dehiscence of laparotomy is very important correlation between of them. In patients- smokers dehiscence of laparotomy is common. By analyzing these three risk factors, the surgeon can identify patients with high risk and take all measures for prophylaxis. Healthy life and good preoperative preparation reduce postoperative wound complications.

**References**