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Original Article

Comparison of obese and non-obese patients in terms of sharp object injuries: A retrospective evaluation

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Abstract

Aim: In our study, we aimed to investigate the effect of BMI on surgical treatments and general outcomes, as well as on the severity of the injury caused by the sharp object. From an anatomical point of view, increased body mass index (BMI) is expected to have a protective effect in limiting organ damage in the case of sharp object injuries.

Material and Methods: Data of the patients with penetrating abdominal injuries who applied to the emergency service of the University between January 2015 and January 2020 were analyzed retrospectively. Patients' ages, genders, body mass indexes (BMIs), needs for surgical intervention, injury severity scores (ISS) and mortality were evaluated. Patients were divided into 2 groups: obese patients (BMI>30; Group1) and non-obese patients (BMI<30; Group2).

Results: Seventy-eight patients whose data were available were included in the study. Thirty-three of the patients were determined to be obese (Group1) while 45 were determined to be non-obese (Group2). The mean age of the patients in group1 was significantly higher than the patients in group 2 (p=0.011). The mean ISS of the patients in group 1 was 11.03±8.24 while it was 16.93±13.68 in group 2. The ISS was significantly higher in group2 (p=0.031). Alcohol intoxication levels of the patients in Group 2 were significantly higher than Group 1 (p=0.006). A statistically significant difference was not present between the groups in terms of number of past surgical interventions (p=0.627); however, it was determined that 57% of the surgical interventions in Group 1 were performed for diagnostic purposes and that no pathologies were detected in 45% thereof.

Discussion: As a result, increased BMI is associated with lower injury severity scores and decreased need for operation in sharp object injuries. Slim patients are more likely to need surgery and be severely injured.

Keywords: Body mass index; obesity; sharp objects; trauma

INTRODUCTION

Trauma is the most common cause of death among young people (under the age of 40) who have a long life expectancy all over the world. Although penetrating traumas can reach 20%-45% in some cities, they account for approximately 15% of traumatic injuries when considered on a global spectrum (1).

Obesity is one of the most important health problems in developed and developing countries today. As is the case all over the world, obesity prevalence and, therefore, incidence of related chronic diseases are on the increase in our country, too. The prevalence of obesity in Turkey was found to be 36% among women, 21.5% among men and 25% in the population as a whole (2).

Current literature is inconsistent about the distribution of the injury mechanism in obese and non-obese cohorts - some studies have shown that the obese population is more likely to present with penetrating trauma , while others have shown no difference in injury mechanisms (34.8% for obese patients and 22.5% for non-obese patients) (3,4).

Obese patients typically have such comorbidities as diabetes, hypertension, cardiovascular diseases, arrythemia, hepatic dysfunction, and chronic obstructive pulmonary disease. Obese patients incur disappointing results even in elective operations due to comorbidities (5). And for trauma patients, obesity was found to be an independent risk factor for post-injury organ dysfunction by leading to increased circulation of inflammatory mediators (6,7).

Blunt trauma is an independent risk factor for mortality due to obesity. Studies in the literature have shown that, when compared with non-obese patients and when the severity of injuries is matched, the short-term mortality rate increases in obese patients in blunt trauma (8).

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The specific injury caused by sharp objects results from the direct contact between the blade and the tissue without the diffusion effect of kinetic and thermal energies seen in firearm injuries. From an anatomical point of view, increased body mass index (BMI) is expected to have a protective effect in limiting organ damage caused by blade wounds in the anterior abdominal wall. In a study based on this hypothesis, Bloom, M. B et al. found increased BMI in patients with abdominal penetrating trauma to be associated with a lower incidence of serious injury and decreased need for surgery (9).

In this study, we aimed to investigate the effect of BMI on injury severity and surgical treatment mortality in penetrating stab wounds to the abdomen, based on the hypothesis that more subcutaneous tissue seen in patients with high BMI has a protective effect on penetrating trauma.

MATERIAL and METHODS

Patients who were referred to our clinic from the emergency service due to penetrating abdominal trauma between 2015 and 2020 were included in the study. Patients who had blunt trauma, who had in- or out-of-vehicle traffic accidents, who were under the age of 18 and had incomplete medical records and patients with additional body injuries and non-abdominal injuries were excluded from the study. A database was created using emergency observation cards, electronic files and forensic report records, and patient information from this database was analyzed retrospectively.

The patients were divided into two groups: obese (BMI> 30; Group 1) and non-obese (BMI <30; Group 2) according to their BMI. In these groups; patients' demographic data, hemoglobin (g/dl) and systolic blood pressure (mm Hg) values at the time of admission to the hospital, history of alcohol use, rate of surgical intervention, mortality during follow-ups and injury severity scores (ISS) were compared.

Statistical evaluation

SPSS (Statistical Package for the Social Sciences) 23.0 software was used in the statistical analysis of the data. Categorical measurements were summarized as numbers and percentages, and continuous measurements were summarized as mean and standard deviation. Pearson's Chi-squared test was used to compare categorical variables. The Shapiro-Wilk test was used to determine whether the parameters in the study displayed a normal distribution. Distributions in the comparison of continuous measurements between the groups were checked and the Mann Whitney U test was performed as the measurements did not show a normal distribution. The statistical significance level was accepted as 0.05 in all tests.

RESULTS

A total of 78 patients were included in our study. Group1 consisted of 33 and Group 2 consisted of 45 patients. The mean BMI was 32.40±1,89 in Group 1 and 23.77±2.50 in group 2. The mean age was higher in group1 (34.66 vs 28.17 years p:0.011). Male gender was dominant in both groups (90.9% vs. 88.9% p:0.771). Patients' mean hemoglobin values at the time of application were similar (13.40 g/dl vs. 13.02 g/dl, p:0.484). Their systolic blood pressure values at the time of application were 119 mm-Hg and 112 mm-Hg (p:0,246). Alcohol intoxication rate at the time of application was higher in Group 2 (15.2% vs 44.4% p:0.006). Surgical treatment application rates were similar (63.6% vs 68.9 p:0.627). Mortality rates were higher in Group 2 during follow-ups, but were not statistically significant (6.1% vs 17.8%), p:0.126). Mortality was observed in the perioperative period due to hemodynamic disorders caused by the hemorrhages at the time of application. The injury severity score was higher in Group2 (11.03 vs 16.93 p:0.031). Demographic and clinical characteristics of the patients are shown in Table 1.

Table 1. The demographic and clinical features

	Group 1 (BMI>30) (n = 33)	Group 2 (BMI<30) (n = 45)	p
Age	34.66±10.51	28.17±11.10	0.011
Gender Female/Male)	3/30	5/40	0.771
Hemoglobin (g/dl) when arrived	13.40±2.13	13.02±2.46	0.484
Systolic blood pressure (mm Hg) when arrived	119.57±30.09	112.73±21.91	0.246
Alcohol (+/-)	5/28	20/25	0.006
Surgery (+/-)	21/12	31/14	0.627
Mortality (+/-)	2/31	8/37	0.126
Injury Severity Score	11.03±8.24	16.93±13.68	0.031

BMI-Body Mass İndex ,MM-Milimetre

According to Pearson correlation analysis, the correlation between BMI and ISS was significant (r = - 0.237; p = 0.037) and is shown in Figure 1.

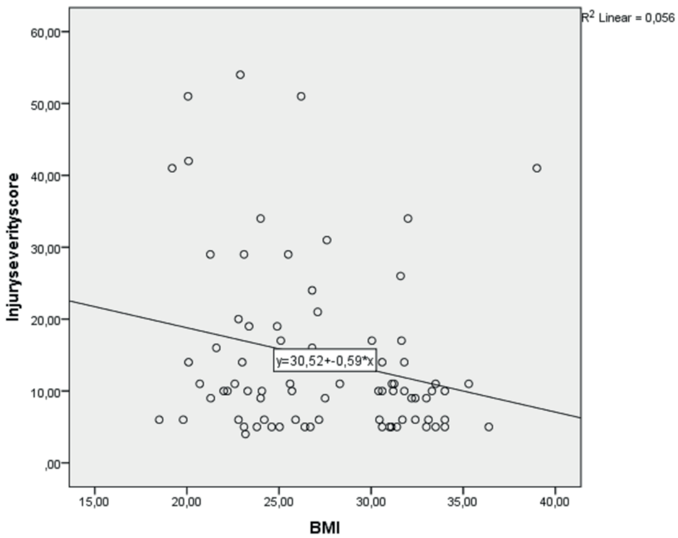

Figure 1. ISI correlation graph with BMI

DISCUSSION

Routine laparotomy is not applied anymore today. However, it is reported in the literature that the incidence of negative and non-therapeutic laparotomy reaches 50% in patients with sharp object injuries and postoperative complications (15%) are observed to a significant extent. In large series in the literature, it has been demonstrated that 50-70% of patients with penetrating trauma on the anterior abdominal wall can be followed up without the need for therapeutic surgery and it was revealed that the need for delayed surgery remained at 10-15% in patients who were initially decided to be followed up conservatively (10-13). Selection of the patients who will be followed up non-operatively still remains as a current problem to be solved in the literature. Various guidelines have been developed to reduce the negative laparotomy rate (14). Obesity has not been included in these guidelines yet but there is increasing evidence concerning the relationship between BMI and trauma.

Obesity is a disease associated with anatomical and physiological changes. Obesity, which physiologically restricts organ use reserves, accompanies various anatomical changes in the body. Obese patients typically have such comorbidities as diabetes, hypertension, cardiovascular diseases, arrhythmia, hepatic dysfunction, and chronic obstructive pulmonary disease. Obese patients incur disappointing results even in elective operations due to comorbidities (5). And for trauma patients, obesity was found to be an independent risk factor for post-injury organ dysfunction by leading to increased circulation of inflammatory mediators (6,7).

In the large cohort study involving 32,000 patients they carried out based on the hypothesis that morbid obesity renders trauma patients prone to worse results due to its physiological effects, Ditillo, M et al included only those with blunt trauma. They found that patients in the morbid obesity group were more likely to have in-hospital complications (OR, 1.8, 95% [CI], 1.6-1.9), longer hospital stays (OR, 1.2; 95% CI, 1.1-13), and longer intensive care periods (OR, 1.15; 95% CI, 1.09-1.2). In their study, they also found the total mortality rate at 2.8%. Mortality was higher in morbid obesity patients than in non-obese patients (3.0% vs. 2.2%; OR, 1.4; 95% CI, 1.1-1.5) (15). Our study was different from that of Ditillo et al in that it included penetrating traumas. Although mortality rate was higher among patients with low BMI in our study, a statistical significance was not available.

With regard to the anatomical effect of obesity, it is thought that an increased layer of subcutaneous fat can provide a protective barrier against penetrating stab wounds. In the studies in the literature, obesity has been associated with increased anterior abdominal fat content, which can protect against abdominal blunt and penetrating injuries, leading to lower rates of liver and head injury. There are also studies showing that obesity protects patients against abdominal blade wounds and reduces the need for surgery due to its “cushioned effect” (9,16). However, a consensus has not been reached on this issue in the literature and various results have been reported depending on the patient population included in the studies. In our study, there was not a relationship between BMI and reception of surgical treatment. However, it is not satisfactory to explain this situation with BMI alone and many parameters relating to surgical treatment are in effect.

When Osborne, Z. examined 132 penetrating trauma cases among 2196 patients who applied for traumatic injury, no difference was found in penetrating trauma patients in terms of BMI-related injury patterns, complications, length of hospital stay and mortality rates (17).

In the study carried out by Bloom et al. which included blade injuries only, the patients were divided into four groups (BMI <18.5 kg/m2, 18.5-29.9 kg/m2, 30-34.9 kg/m2 and >35 kg/m2). Increased BMI in their study led to a downward trend in general injury severity scores (ISS) (13.8- 11.3- 10.1- 8.6; p: 0.48). The percentage of seriously injured patients (ISS> 25) decreased significantly with increased BMI (17%, 8%, 3%, 0%; p: 0.045) (9). As the BMI of the patients increased, peritoneal violation rates decreased (100%, 84%, 77%, 75%; p: = 0.077). As the body mass index increased, organ injury rates (83%, 56%, 50%, 30% p: 0.022) and incidence of therapeutic operations which require serious injury (67%, 45%, 40%, 20% p: 0.034) decreased significantly. For all patients, patients in the slimmest group required 3.4 times more frequent surgery than those who have the highest level of obesity (67% vs. 20%). In addition, among the patients with a known peritoneal violation rate, the slimmest patients required surgery two times more frequently than the patients having the highest level of obesity (67% vs. 33%) (6). In our study, we have demonstrated that there is a correlation between BMI and ISS.

Serio F, et al. included firearm injury and blade injuries in their study. When they grouped the patients as obese and non-obese ones, there was no significant difference between obese and non-obese patients in terms of age (p: 0.400), gender (p: 0.900), ISS (p: 0.544), length of hospital stay (p: 0.273), length of stay in an intensive care unit (p: 0.729) or mortality (p: 0.855) in the firearm injury group. And for the stab wounded group, there was no difference between the obese and non-obese patients in terms of age (p: 0.900), gender (p: 0.900), ISS (p: 0.580), urgent surgery rate (p:0.970), length of hospital stay (p: 0.839), length of stay in an intensive care unit (p: 0.305) or mortality (p: 0.321). Serio, F et al found that the adiposity layer in obese patients is not sufficient to provide adequate protection from penetrating injuries for the body cavities (18). But unlike other studies, firearm injuries were also included in their work. We did not include firearm injuries in our study. Unlike the study by Serio, F et al, age difference between the groups was statistically significant in our study. Obese patients were older. We did not include the hospital stay parameter in our study.

There were aspects of our work that supported and opposed to literature. The trauma severity score was low in non-obese patients as shown in the study of Bloom et al and obesity had no significant effect on surgical treatment rates as shown in the study of Serio, F et al.

The most important limitation of our study was its retrospective nature and the restricted number of patients. Also, the injury severity score is a rough measurement method for injury severity, and it may not take individual severity and complications of relatively limited injuries into account. However, our study, which examines the effect of obesity in penetrating trauma patients, is one of the rare studies in the literature and we believe that it has contributed to the literature where limited amount of information is available on this subject.

CONCLUSION

In conclusion, in our study, BMI was associated with ISS. We found a lower ISS in obese patients, but obesity did not affect the rate of surgical treatment received by obese patients. Obesity has a limited effect on penetrating injuries. Our conclusion is that the slim patients should be carefully monitored with a high suspicion index and this fact can be added as a footnote to current practice guidelines.

Conflict of interest: The authors declare that they have no competing interest.
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Ethical approval: Approval numbered 2020/257 was obtained from the Ethics Committee of Erciyes University Faculty of Medicine.

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