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CLINICAL STUDY

Is obesity a significant risk factor of symptomatic spinal epidural hematoma after elective degenerative lumbar spine surgery?

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ABSTRACT

INTRODUCTION: The occurrence of symptomatic spinal epidural hematoma after spine surgery is a rare, but serious major complication whose incidence usually requires urgent surgical intervention. Obesity is currently considered to be one of the most common metabolic diseases.

METHODS: Prospective analysis of patients who underwent surgical treatment of degenerative lumbar spine disease from January 2016 to February 2018 with one-year follow-up. All patients underwent decompression of spinal cord and nerve roots. This study was conducted to determine an association between the incidence of spinal epidural hematoma (SEDH) requiring surgical treatment and obesity/body mass index (BMI).

RESULTS: In our study, data from 371 patients were assessed. SEDH requiring surgical intervention occurred totally in seven patients (1.89 %). An average BMI in patients with presence of SEDH was 30.67 kg/m^2. Our work showed a statistically significant difference between BMI in patients with SEDH compared to patients without SEDH (p = 0.0044). This study also showed a significant difference in incidence of symptomatic SEDH in obese patients compared to non-obese patients (p=0.0158).

CONCLUSION: In our study, we found out that obesity is a significant risk factor for the incidence of postoperative SEDH after degenerative lumbar spine surgery *(Tab. 1, Fig. 2, Ref. 18)*. Text in PDF *www.elis.sk*

KEY WORDS: degenerative spine disease, epidural hematoma, obesity, spine surgery.

Abbreviations: BMI – body mass index, CT – Computed tomography, HU – Hounsfield unit, SD – Standard deviation, SEDH – Spinal epidural hematoma, WHO – World Health Organization.

Introduction

Postoperative spinal epidural hematoma (SEDH) is defined as the accumulation of blood in the intraspinal epidural space, usually at the site of surgery (with possible expansion from the surgical treatment area). It usually results from continued bleeding from epidural veins. The incidence varies in the literature – 0.1–3.7 % (1–3). The presence of spinal symptomatic SEDH after degenerative lumbar spine surgery is relatively rare, but its occurrence can lead to serious neurological complications requiring urgent surgery. Clinical manifestations depend on the volume of epidural hematoma and the compressive effect on adjacent nerve structures. Patients are usually suffering from significant pain in the area of surgical wound, insufficiently compensated by standard analgesic treatment, which leads to rapid development of radicular symptomatology (often bilateral), which often worsens compared to preoperative condition and may lead to caudae equinae syndrome. Neurological status can be assessed using the American Spinal Injury Association examination scale or the simpler Frankel scale (4–6). Diagnosis consists of clinical examination and urgent imaging. The SEDH is shown as a hyperdense (50–70 HU) extradural mass in the image of the native CT (Computed tomography) scan. Magnetic resonance imaging verifies the presence of an epidural collection in the area of the treated spinal space causing the compression of nerve structures that is isointense or hyperintense in T1 weighting and heterogeneously hyperintense in T2 weighting. The finding of a symptomatic postoperative SEDH usually requires an urgent surgical intervention consisting of revision of the surgical wound with evacuation of the epidural collection (3, 6).

Obesity due to its negative effect on the musculoskeletal system is one of the most important causes (and worsening factor) of degenerative spine disease. Obesity is currently considered to be the most common metabolic disease, especially in developed countries. According to the WHO, obesity is often referred as a global epidemic. It is scientifically proven that obesity significantly increases morbidity and mortality and last but not least, worsens the quality of life. Obesity can negatively affect the course of surgical procedures due to the development of perioperative and postoperative complications (7, 8).

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Methods

Prospective analysis of patients who underwent surgical treatment of degenerative lumbar spine disease at the Clinic of Neurosurgery (University Hospital Martin) from January 2016 to February 2018 with one-year follow-up (according to regular outpatient examinations). All patients underwent surgical procedure including decompression of spinal cord and nerve roots due to degenerative spine disease. We assessed the incidence of postoperative symptomatic SEDH requiring surgical intervention. All patients underwent surgery from the posterior/postero-lateral approach. Suction drains with negative pressure were used in all patients (drains were placed as close as possible to the thecal sac). Low-molecular weight heparin was used as a deep-vein thrombosis prophylaxis in all cases. Chronic antithrombotic therapy was discontinued adequate time before elective surgical procedure according to recommendations of a specialist in internal medicine. Patients with pathological coagulation tests were excluded. Hemostasis was controlled by unipolar and bipolar coagulation and topical hemostatic agents. Obesity was monitored on the basis of Body mass index (BMI). A standardized formula was used to calculate BMI – body weight in kg/body height in m^2. Patients were categorized before surgery according to BMI into the following categories – underweight (< 18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), obese I (30.0–34.9 kg/m^2), and obese II (≥ 35.0 kg/m^2). Obtained results were analysed in relation to the occurrence of postoperative SEDH requiring surgical intervention. This study was conducted to determine an association between the incidence of SEDH and obesity/BMI. Results were statistically evaluated by descriptive statistical methods, unpaired t-test and Fisher's test with p values < 0.05 being considered statistically significant.

Results

In our study, the data from 371 patients were assessed. 187 patients (50.4 %) were males and 184 patients (49.6 %) were females. Postoperative symptomatic SEDH occurred totally in nine patients - two patients were treated conservatively, seven patients (1.89 %) required surgical intervention. Among these patients, 37 were under the age of 39 years, SEDH occurred in one patient (2.7 %). There were 164 patients aged from 40 to 59 years, SEDH occurred in three of them (1.83 %). The largest group consisted of patients at the age of 60 and older – 171 patients, SEDH requiring surgical intervention occurred in four cases (2.34 %). The mean level of BMI in our complete study cohort was 26.6 kg/m^2 (SD 3.8, 95% confidence interval 26.201–26.966). In this study, four of the patients were underweight (1.08 %), 120 patients were of normal weight (32.35 %), 186 patients were overweight (50.13 %), 61 patients were obese (16.44 %). The mean BMI in patients without SEDH was 26.51 kg/m^2 (SD 3.72, 95% confidence interval 26.122–26.888). An average BMI in patients with presence of symptomatic SEDH was 30.67 kg/m^2 (SD 3.37, 95% confidence interval 27.552–33.791) – mean BMI was higher in patients with the presence of postoperative SEDH. Out of the total cohort, almost 67% of patients belonged to one of two groups with an abnormal BMI (overweight and obese I/II). Highest incidence of SEDH requiring surgical intervention was present in the „obese I" group of patients. Our work showed a statistically significant difference between BMI in patients with symptomatic SEDH compared to patients without SEDH (p = 0.0044) (Tab. 1). Incidence of SEDH in non-obese patients was significantly lower compared to incidence of SEDH in obese (obese I and II) patients (Fig. 1). Our study showed a statistically significant difference in incidence of postoperative SEDH in obese patients compared to non-obese patients (p = 0.0158) (Fig. 2).

Tab. 1. Incidence of SEDH – patients divided according to age and BMI.

	Patients without SEDH No. of patients	Patients with SEDH No. of. patients
Age	364 (98.11%)	7 (1.89%)
≤39 years	36 (97.30%)	1 (2.70%)
40–59 years	161 (98.17%)	3 (1.83%)
≤60 years	167 (97.66)	4 (2.34%)
BMI (kg/m^2)		
<18.5 (underweight)	4 (100%)	None
18.5–24.9 (normal weight)	119 (99.17%)	1 (0.83%)
25–29.9 (overweight)	184 (98.92%)	2 (1.08%)
30–34.9 (obese I)	52 (92.86%)	4 (7.14%)
<35 (obese II)	5 (100%)	None
	BMI - patients without SEDH	BMI - patients with SEDH
Mean (SD)	26.51 kg/m^2 (3.72)	30.67 kg/m^2 (3.37)
p	0.0044	

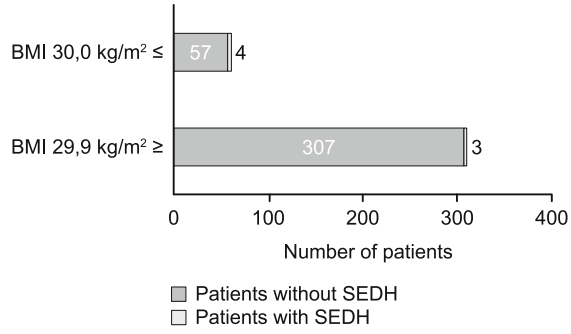

Fig. 1. Incidence of SEDH according to BMI (obese vs. non-obese patients).

Discussion

Symptomatic postoperative SEDH is a rare major complication after spinal decompression surgery, causing spinal canal compromise and nerve root compression. SEDH can result in serious morbidity, if not controlled appropriately. Asymptomatic small epidural hematoma almost always follows decompressive spine surgery. In our cohort of patients, we found out that obesity (abnormal level of BMI above 30 kg/m^2) is a significant risk factor for the incidence of postoperative symptomatic SEDH. Our

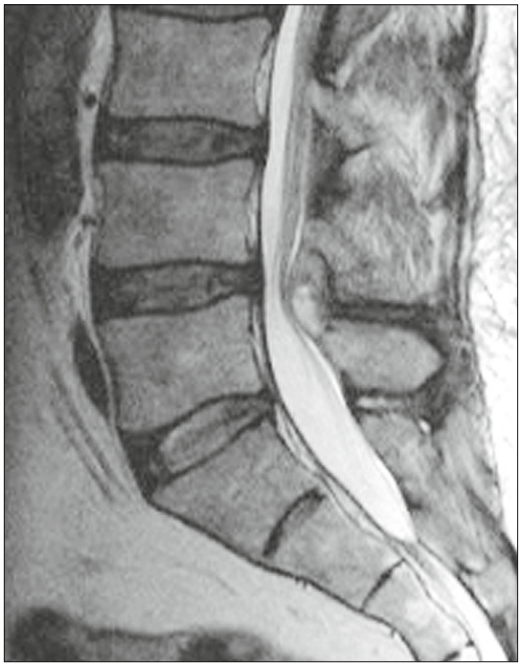

Fig. 2. Postoperative MRI in a representative patient with symptomatic SEDH after lumbar spine surgery (sagittal plane).

findings confirm previous studies - the incidence of symptomatic SEDH requiring evacuation ranges from 0.1 % to 3.7 % (3,9–11). Variability in the incidence may be caused by the difference in the criteria used to define SEDH. Most studies define postoperative symptomatic SEDH as a case involving evacuation surgery, in other studies the diagnosis was based on clinical symptoms and included also cases that were treated conservatively. Recent studies have confirmed risk factors for symptomatic SEDH, except advanced age and obesity, also performing multilevel surgical decompression procedures, preoperative coagulopathy, preoperative use of nonsteroidal antiinflammatory drugs, large intraoperative blood loss volumes, Rh-positive blood types, intraoperative hemoglobin values <10 g/dl and international normalized ratio values >2.0 (6.10–13). The obesity affects a patient and concerns a surgeon during the perioperative and postoperative time. Patients usually require special extensive surgical approach with more soft tissue retraction, leading to increased blood loss, prolonged duration of surgery and generally increased risk of complications. There is growing evidence that relates certain metabolic processes within the adipose tissue with a low-intensity chronic inflammatory state mediated by adipokines and other substances that favour disc disease and chronic low back pain. Obesity disturbs perioperative hemostasis due to abundant visceral fat – technical difficulty might increase the rate of SEDH occurrence in obese patients. The obesity may be also associated with decreased hemostasis through mechanisms such as malnutrition or altered physiology. In the postoperative period, there is an increased risk of impaired wound healing due to low regional perfusion and oxygen tension, infectious complications and last but not least, worsened and limited rehabilitation after surgical procedure (7, 8, 11, 12). From the perspective of spine surgery, if a patient after surgery does not follow an adequate regular rehabilitation and sufficient physical activity, obesity of the patient leads to a higher risk for recurrence of degenerative spine difficulties requiring revision surgery. Patients must be preoperatively educated about a rational lifestyle, which significantly increases the success of surgery. The obesity related health hazards require increased awareness of both the surgeon and the anaesthesiologist. In our study cohort, suction drains with negative pressure were used in all patients. Use of the suction drain facilitates the removal of an intrawound hematoma, however, several studies have reported that the suction drain does not prevent the development of such a complication. Study by Dong Ki Ahn et al showed, that suction drains function well before a coagulation nidus is formed. Drains should be placed as close as possible to the thecal sac, vacuum should be connected before the clotting of extravascular blood. It is recommended not to use any materials, that activate platelets and facilitate coagulation of extravascular blood to prevent dysfunction of suction drains, but the type of prevention depends mainly on a surgeon's experience. Several authors have reported that use of suction drainage is not necessary for single-level lumbar decompression surgery, and the incidence of hematoma evacuation was 0 %. Drains should be removed between the first and the third day after surgery. Prolonged use of drains is considered as a risk factor of postoperative surgical site infections (12, 14–16). Extra-meticulous hemostasis should be considered during the surgical procedure in obese patients, patients who require multilevel lumbar decompressions, patients with pre-existing coagulopathy and in general, in all patients at risk. This study has a few potential limitations – number of patients, obesity is usually accompanied with other factors we did not include/analysed in this study and we did not have a direct measurement of central (or visceral) adiposity, we used BMI as an indicator of adiposity, but the BMI is unable to distinguish between different kinds of body mass (17, 18). Symptomatic SEDH is a serious but curable postoperative complication after spine surgery, when treated properly. Knowledge of symptomatology, diagnosis, and risk factors of SEDH can help physicians in early detection with adequate timing of treatment. Knowledge and prevention of postoperative complications and their risk factors is undeniable in surgical treatment, because prevention of their occurrence can lead to shorter hospital stays, reduced financial costs associated with patient´s treatment and especially it can positively affect the patient satisfaction with surgical treatment.

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