ORIGINAL ARTICLE

DOES OBESITY AFFECT THE EFFICACY AND SAFETY OF EPIDURAL STEROID INJECTIONS IN OLDER ADULTS?

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Abstract

Introduction: Obesity is an increasing concern among older adults and may affect the clinical outcomes of epidural steroid injections. This study assesses the impact of obesity on the treatment outcomes of epidural steroid injections in geriatric patients.

Materials and Method: A retrospective analysis was conducted on 101 older adults who received epidural steroid injections. Patients were categorized into three groups based on their body mass index: normal weight (<25 kg/m²), overweight (25–29.9 kg/m²), or obese (≥30 kg/m²). Pain scores were documented before the procedure, one hour after the procedure, and one month after the procedure.

Results: The average age of the participants was 73.95 years (range: 65–89 years), and the mean body mass index was 29.44 ± 4.75 kg/m². The mean pre-procedural numeric rating scale score was 8.17 ± 1.21. Average pain scores at one hour (0.66) and one month (4.32) following the procedure were significantly lower than the pre-procedural scores ($P < 0.001$). Radiation time ($P = 0.044$) and radiation dose ($P = 0.047$) were significantly higher in the obese group. Nevertheless, no significant differences were observed between the groups concerning gender, age, symptom duration, procedure type, complications, pain scores, or treatment success.

Conclusions: Obesity does not adversely affect the treatment outcomes of epidural injections in older adults. Epidural steroid injections can be safely administered to obese elderly patients with a low complication rate.

Keywords: Aged; Low Back Pain; Injection, Epidural; Obesity; Body Mass Index.

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INTRODUCTION

Low back pain is a prevalent health issue affecting up to 75% of geriatric patients and significantly impairing quality of life and functional capacity (1). Obesity is a well-established risk factor for low back pain, and its rising prevalence among the aging population is contributing to increased rates of chronic pain and functional decline (2,3). In individuals aged 65 years or older, obesity is rapidly escalating due to factors such as sedentary lifestyles, poor diet quality, reduced basal metabolic rate, low socioeconomic status, urban stress, and gender-specific influences (4,5). Furthermore, age-related muscle loss (sarcopenia) combined with increased fat accumulation—a condition known as sarcopenic obesity—disrupts energy balance and further promotes weight gain (6).

Obesity not only places additional mechanical stress on the spine but also triggers systemic inflammation, which accelerates intervertebral disc degeneration and intensifies low back pain. The increased number of adipocytes elevates the release of pro-inflammatory cytokines, leading to neural tissue irritation and heightened pain perception (7,8). For low back pain patients who do not respond to conservative treatments, epidural steroid injection (ESI) has emerged as a preferred invasive option. ESI, administered via caudal, interlaminar, or transforaminal approaches, has demonstrated desirable short- and mid-term outcomes in selected cases based on clinical and radiological criteria (9). For instance, Cohen and colleagues observed significant improvements in pain and functionality over three months in older adults with lumbar spinal stenosis treated with lumbar ESI, while Curatolo et al. confirmed the long-term benefits of lumbar ESI in individuals aged 65 years and older (10,11). Another investigation reported that patients with disc herniation derived greater benefit from lumbar ESI compared to those with lumbar spinal stenosis or failed back surgery syndrome (12).

Nevertheless, the confluence of increasing obesity rates, age-related spinal degeneration, altered biomechanical properties, and chronic inflammation may complicate invasive procedures and potentially diminish treatment efficacy. Most available studies have focused on younger or mixed-age populations, leaving the specific influence of obesity on the outcomes of ESIs in older adults relatively under investigated (8,13,14). Unique age-related factors such as reduced muscle mass, altered fat distribution, and spinal degeneration are critical determinants of treatment response that limit the generalizability of current guidelines and raise concerns about the adequacy of treatment in obese elderly patients.

In order to address this research gap, our investigation explored how excess body weight influences both the outcomes and complications associated with ESIs in elderly patients. Participants were categorized into three groups based on their body mass index (BMI). To our knowledge, this is the first comprehensive study to specifically and comprehensively examine the influence of obesity—and its subcategories—on ESI outcomes in an elderly population.

MATERIALS AND METHOD

This investigation was carried out in accordance with the principles outlined in the Declaration of Helsinki, and written informed consent was secured from every participant. Following approval from the institutional ethics committee (27.02.2025/76), the cases were retrospectively reviewed from patients who underwent fluoroscopy-guided lumbar ESIs between June 2024 and January 2025 at the pain management center of a tertiary hospital. Data were retrieved from hospital records and comprised demographic information, numeric rating scale (NRS) scores, BMI, details of the procedure, radiation dose and duration, any complications, symptom duration, and specifics of medical treatment. Patients included were 65 years of age or over and had received an ESI using caudal, lumbar interlaminar, or lumbar transforaminal techniques

[see Figures 1 and 2]. Patients were excluded if they had a history of significant psychiatric disorders, a malignancy diagnosis, incomplete one-month follow-up data, or insufficient demographic or clinical data, or had undergone epidural steroid injection or spinal surgery within the past year.

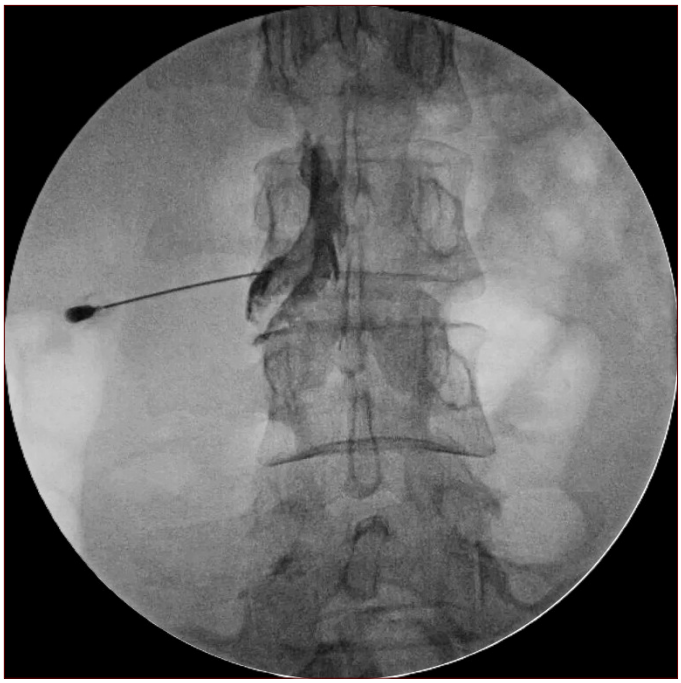

Figure 1. Anteroposterior view showing contrast distribution during a left L3 transforaminal epidural steroid injection

Figure 2. Lateral view showing contrast distribution during a left L3 transforaminal epidural steroid injection

All interventions were carried out by a pain medicine specialist with more than three years of clinical experience. A single fluoroscopy unit was used throughout, providing intermittent imaging. To minimize radiation exposure, both linear and circular collimation techniques were consistently employed in accordance with the ALARA (As Low As Reasonably Achievable) principle. For analytical purposes, patients were categorized into three groups according to BMI: obese (BMI ≥30 kg/m²), overweight (BMI 25–29.9 kg/m²), or normal weight (BMI <25 kg/m²). NRS scores were documented both before the procedure and at a one-month follow-up, with a decrease of 50% or more being defined as treatment success (8).

Statistical Analysis

Data analysis was conducted using SPSS version 27.0.1 (IBM Corp., Armonk, NY). Categorical variables are presented as frequencies and percentages, while continuous variables are expressed as the mean ± standard deviation along with their range (minimum–maximum). The normality of continuous data was assessed using the Shapiro-Wilk test. For comparisons between two independent groups with non-normally distributed data, the Mann-Whitney U test was utilized; the Kruskal-Wallis test was applied when comparing the three groups. For data that followed a normal distribution, within-group comparisons were conducted using the t-test, and for comparisons across multiple groups, one-way analysis of variance was conducted. Categorical variables were assessed using either the chi-square test or Fisher's exact test. A P-value below 0.05 was deemed statistically significant.

RESULTS

A total of 101 patients were included in the study, with a mean age of 73.95 ± 5.86 years (range: 65–89 years). The overall mean BMI was 29.44 ± 4.75 kg/m², with 20 patients (19.8%) classified as normal weight, 42 patients (41.6%) as overweight, and 39 patients (38.6%) as obese. The average duration of symptoms was 27.16 ± 22.35 months, and the pre-procedural NRS score was 8.17 ± 1.21, which decreased to 0.66 ± 1.43 at one hour and to 4.32 ± 2.79 at one month after the injection. The most frequently performed injection type was lumbar ESI via the interlaminar approach (ILESI) (42.6%), followed by transforaminal ESI (TFESI) (39.6%) and caudal ESI (CESI) (17.8%). Regarding medication, opioid usage was recorded in 12.9% of the patients,

Table 1. Demographic and Clinical Characteristics

Variable		Value (n:101)
Age (years)		73.95 (65-89)
BMI (kg/m2)		29.44 ± 4.75
Symptom duration (months)		27.16 ± 22.35
PreNRS		8.17 ± 1.21
First-hour NRS		0.66 ± 1.43
First-month NRS		4.32 ± 2.79
Radiation time (s)		32.67 ± 11.06
Radiation dose (mGy)		7.90 ± 5.83
Gender (n)	Male	48 (47.5 %)
	Female	53 (52.5 %)
Obesity	Normal weight	20 (19.8 %)
	Overweight	42 (41.6 %)
	Obese	39 (38.6 %)
Treatment success	Yes	61 (60.4 %)
	No	40 (39.6 %)
Type of approach	TFESI	40 (39.6 %)
	ILESI	43 (42.6 %)
	CESI	18 (17.8 %)
Medication (n)	Opioid use	13 (12.9 %)
	Pregabalin use	18 (17.8 %)
	Gabapentin use	27 (26.7 %)
	Duloxetine use	9 (8.9 %)

BMI: Body mass index, NRS: Numeric rating scale, TFESI: Transforaminal epidural steroid injection, ILESI: Interlaminar epidural steroid injection, CESI: Caudal epidural steroid injection

while gabapentin, pregabalin, and duloxetine were administered to 26.7%, 17.8%, and 8.9% of the patients, respectively. The mean radiation time was 32.67 ± 11.06 seconds, and the mean radiation dose was 7.90 ± 5.83 mGy (Table 1).

When stratified by BMI, no statistically significant differences were observed in age (P = 0.120), symptom duration (P = 0.109), gender distribution (P = 0.708), or the type of procedural approach (p = 0.884). The mean BMI was 23.22 ± 1.85 kg/m² in the normal weight group, 28.28 ± 1.11 kg/m² in the overweight group, and 33.87 ± 3.79 kg/m² in the obese group (P < 0.001). Pre-procedural NRS scores were similar among groups (P = 0.161); although the obese group showed the lowest NRS scores at one hour post-procedure, this difference was not statistically significant (P = 0.340). At one month, the NRS score in the obese group was slightly higher (4.89 ± 3.12) compared to the overweight (3.69 ± 2.58) and normal weight (4.55 ± 2.37) groups, yet this difference did not reach significance (P = 0.173). Both radiation time and dose were significantly higher in the obese group, with P-values of 0.044 and 0.047, respectively. No major complications were observed during the procedures. Minor complications occurred in two patients in the overweight group, two patients in the obese group, and one patient in the normal weight group, with no statistically significant difference among the groups (P = 0.997) (Table 2).

A significant reduction in NRS was observed across all BMI groups at both one hour and one month post-injection (P < 0.001 for all comparisons) (Table 3).

Table 2. Comparison of Demographic and Clinical Characteristics by Weight Group

		Normal weight (n=20)	Overweight (n=42)	Obese (n=39)	P value
Age (years)		76.30 ± 6.12	73.66 ± 6.20	73.05 ± 5.32	0.120
BMI (kg/m2)		23.22 ± 1.85	28.28 ± 1.11	33.87 ± 3.79	<0.001
Symptom duration (months)		25.45 ± 22.33	24.07 ± 22.31	31.38 ± 22.32	0.109
PreNRS		8.30 ± 1.34	7.90 ± 1.18	8.41 ± 1.14	0.161
First-hour NRS		1.15 ± 2.0	0.71 ± 1.56	0.35 ± 0.74	0.340
First-month NRS		4.55 ± 2.37	3.69 ± 2.58	4.89 ± 3.12	0.173
Radiation time (s)		28.84 ± 8.81	32.29 ± 13.48	35.04 ± 8.56	0.044
Radiation dose (mGy)		5.43 ± 2.72	6.84 ± 4.42	10.30 ± 7.37	0.047
Minor complication		1 (5%)	2 (4.8%)	2 (5.1%)	0.997
Gender	Male	11 (55%)	20 (47.6%)	17 (43.6%)	0.708
	Female	9 (45%)	22 (52.4%)	22 (56.4%)	
Treatment success	Yes	12 (60 %)	26 (61.9%)	23 (59 %)	0.964
	No	8 (40 %)	16 (38.1%)	16 (41 %)	
Procedure type	TFESI	7 (35%)	15 (35.7%)	18 (46.1%)	0.884
	ILESI	9 (45%)	19 (45.3%)	15 (38.5%)	
	CESI	4 (20%)	8 (19%)	6 (15.4%)	

BMI: Body mass index, NRS: Numeric rating scale, TFESI: Transforaminal epidural steroid injection, ILESI: Interlaminar epidural steroid injection, CESI: Caudal epidural steroid injection

Table 3. Changes in NRS Score (Preoperative vs. Postoperative 1 Hour and 1 Month) by Weight Group

		P value
Normal weight	NRS preop – postop 1st hour	<0.001
	NRS preop – postop 1st month	<0.001
Overweight	NRS preop – postop 1st hour	<0.001
	NRS preop – postop 1st month	<0.001
Obesity	NRS preop – postop 1st hour	<0.001
	NRS preop – postop 1st month	<0.001
Total	NRS preop – postop 1st hour	<0.001
	NRS preop – postop 1st month	<0.001

NRS: Numeric rating scale

DISCUSSION

Obesity, with its rising prevalence, constitutes a major public health concern by elevating the risk of low back pain among older adults. For elderly patients who do not experience sufficient relief from conservative treatments and are unsuitable or ineligible for surgery, lumbar ESIs are commonly performed to manage low back pain (9-12). However, when an individual is both elderly and obese, there is a common belief among clinicians that they will derive less benefit from ESI. Although several investigations have assessed the relationship between ESIs and obesity, many of these investigations either did not focus specifically on elderly individuals or did not differentiate outcomes based on BMI categories, which is a major limitation. In this study, elderly patients were stratified into three categories according to their BMI, and the effect of BMI on short-term treatment outcomes was investigated. Our findings indicate that obesity does not adversely affect treatment success in the elderly and that ESI can be safely administered in obese patients. Additionally, an increase in BMI was linked to longer radiation exposure times and higher doses of radiation.

Globally, as life expectancy increases and economic development progresses, the number of older adults is rising, and chronic pain is becoming more prevalent (15,16). In older individuals, pain is often multifactorial in that multiple pathologies contribute (17). This complex etiology limits treatment options and reduces the effectiveness of analgesics. Moreover, decreased liver and kidney function in the elderly population lowers drug tolerance and increases the incidence of analgesic-related side effects (18). Increased multimorbidity with age further restricts the suitability for surgical interventions (15-18). Therefore, ESI represents an important treatment option for elderly patients who do not benefit from conservative methods, are unsuitable for surgery, or carry high surgical risks (9-12). Our study demonstrated that ESI significantly reduced pain scores and that this effect was independent of BMI, thereby confirming its short-term efficacy in both normal-weight and obese elderly individuals.

ESIs can be administered via caudal, transforaminal, or interlaminar approaches. In our study, the interlaminar approach was most frequently used (42.6%), followed by the transforaminal and caudal approaches. However, the choice of injection route did not differ significantly between the BMI groups.

The link between obesity and low back pain remains controversial. Some studies suggest no association between the two, while others have established a potential causal connection (19-21). One review suggested that obesity is not the direct cause of low back pain but rather a risk factor (19). Two meta-analyses by Shiri et al. found that both obesity and being overweight are associated with a higher likelihood of developing low back pain. Conversely, they also noted the possibility of publication bias in studies reporting this association (20,21). In our study, no association was observed between obesity and pre-procedural low back pain scores.

The literature presents conflicting opinions on how obesity affects the effectiveness of ESI. Among clinicians, there is a belief that obese patients derive less benefit from epidural injections (8,14). In addition to perceived lower efficacy, technical procedural difficulties—such as difficult long needle maneuvering and reduced fluoroscopic image quality—also deter clinicians from performing ESIs in obese patients (8,22). However, the scientific evidence supporting this belief is not definitive. In our study, elderly patients were stratified into obese, overweight, and normal weight groups according to BMI. ESI was effective in controlling pain across all BMI groups, and obesity did not negatively impact treatment success. Therefore, a high BMI should not be regarded as a contraindication for administering ESIs in elderly patients.

Studies by Taşdoğan et al. reported the effectiveness of ESI in elderly patients over a 3-month follow-up (10), while Curatolo et al. demonstrated more pronounced pain and functional improvements over a 24-month follow-up compared to control groups (11). Similarly, Olgun et al. found that older individuals with disc herniation responded more favorably to treatment than those with lumbar spinal stenosis or failed back surgery syndrome (12). In our study, both one-hour and one-month post-injection pain scores were significantly lower than pre-procedural scores, further emphasizing the short-term effectiveness of ESI.

Furthermore, no major complications were observed in our study; only a minor complication rate of 4.9% (five patients) was noted, with a low incidence across all BMI groups and no statistically significant difference among them. This finding suggests that ESI is not only an effective treatment option for older adults but also a safe one.

Cushman et al. reported higher radiation time and dose in obese individuals in a study on lumbar TFESI in patients with a mean age of 56 years (23). Sencan et al. found that during L5 and S1 TFESI in a study of 83 patients aged 19-65 years, obese patients received a higher radiation dose (24). In 2025, Manchikanti et al. demonstrated that higher BMI was linked to increased radiation doses and longer procedure times in lumbar and caudal ESIs (25). However, none of these studies specifically examined elderly patients. Our study focused exclusively on the elderly and showed that as BMI increases, both radiation dose and procedure time increase. This can be attributed to reduced image quality due to increased adipose tissue and tissue thickness, which leads to higher radiation output from the automatic dose modulation system and to increased difficulty in needle positioning, necessitating longer fluoroscopy time to obtain optimal imaging.

This study has several limitations. First, obesity was assessed solely using BMI, which may have overlooked other important aspects of body composition. Metrics such as total body fat mass, subcutaneous fat index, and waist-to-hip ratio might yield different results. Second, our study is retrospective and single-centered, which limit the generalizability of the findings. Third, the Numeric Rating Scale (NRS) is a useful tool for assessing pain intensity but does not capture functional outcomes, quality of life, or psychological well-being. Relying on a single subjective pain score limits the ability to

understand the broader impact of the intervention. Prospective, randomized controlled studies with larger sample sizes are needed to validate our results.

CONCLUSION

This study demonstrated that the short-term efficacy of ESI in elderly adults is independent of BMI. Although higher radiation time and dose were observed in obese patients during the procedure, these factors did not adversely affect treatment success or increase complication rates. Therefore, high BMI should not be considered a contraindication for ESI, and this interventional treatment can be safely administered in obese elderly patients. Further prospective, comparative studies with larger sample sizes are warranted to more robustly support the findings.

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