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Sung ho Moon and [Daeseok Oh](#) *

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Article

Descriptive Analysis of Routine Laboratory Testing for Neuraxial Blocks: A Real-World Retrospective Study

Sung ho Moon and Daeseok Oh *

Department of anesthesia & pain medicine, Inje University Haeundae Paik Hospital, Busan, Republic of Korea

* Correspondence: h00508@paik.ac.kr; Tel: +82-51-797-0415; Fax: +82-51-797-2669

Abstract: Background/Objectives: The necessity and clinical utility of routine pre-procedural blood tests (PBTs) before neuraxial blockade remain controversial. This study evaluates the effectiveness of PBTs in identifying clinically significant conditions in an outpatient setting. **Methods:** This single-center retrospective study involved patients who received neuraxial blockade from January 2020 to August 2023. We extracted medical information and laboratory data from the electronic medical records during the pre-procedural period. Through multivariate regression analysis, we identified patient factors associated with abnormal laboratory results. **Results:** Advanced age (OR, 1.021; $p = 0.026$) and a history of cancer (OR, 2.359; $p = 0.016$) were significantly associated with elevated CRP levels (>0.30 mg/dL). Severe hyperglycemia (≥ 200 mg/dL) was found in 24 patients (3.88%), with a history of cancer being a strong predictor (OR, 6.764; $p < 0.001$). No significant abnormalities were observed in PT or PTT. Reduced eGFR (<60 mL/min/1.73m²) was detected in 8.62% of patients, despite no prior history of renal dysfunction. Multivariate analysis revealed that advanced age, hypertension, cancer, and coronary artery disease were significant predictors of abnormal PBT results, highlighting the importance of selective testing in high-risk patients. **Conclusions:** Routine PBTs are not universally required for all patients undergoing neuraxial blockade but can provide crucial information in high-risk populations. A selective testing approach based on individual risk factors is recommended to optimize patient safety and resource utilization. Future studies should aim to establish clear guidelines for targeted PBT use.

Keywords: neuraxial blockade; blood tests; comorbidity; preoperative; pain management; glucose

1. Introduction

Preoperative laboratory testing plays a critical role in diagnosing underlying conditions, assessing patient risk, and guiding perioperative management. However, routine testing in otherwise healthy individuals often provides limited clinical benefit and can lead to unnecessary healthcare costs and resource utilization. Despite guidelines advising against routine testing for ASA I or II patients undergoing low-risk, minimally invasive procedures, many clinicians continue to order these tests due to a lack of guideline awareness, concern about medico-legal issues, institutional mandates, and financial incentives [1,2]. While guidelines provide a framework for clinical practice, they do not replace the need for clinical judgment. A more effective approach would be to selectively conduct laboratory tests based on patient history, physical examination, and medical records, particularly when there are concerning findings or significant changes in the patient's condition [1].

Neuraxial blockade is increasingly used as an effective treatment for pain management, particularly in the aging population with a high prevalence of degenerative diseases. While this procedure is generally safe and can be performed on an outpatient basis, it carries potential risks such as bleeding, infection, and neurological complications, making pre-procedural evaluation crucial [3]. Despite the importance of pre-procedural blood tests (PBTs) in identifying risk factors and ensuring

patient safety [4,5], there is a lack of clear evidence and guidelines on their use specifically for neuraxial procedures in outpatient settings. This ambiguity in clinical practice may lead to both overuse and underuse of PBTs, potentially impacting patient outcomes. This study aims to address this gap by evaluating the necessity and utility of routine PBTs in patients undergoing neuraxial blockade. We conducted a retrospective analysis of pre-procedural blood tests performed at our outpatient pain clinic from January 2020 to August 2023. Our objective is to determine whether these tests provide significant clinical value in predicting and preventing complications associated with neuraxial procedures, and to identify patient factors that may be associated with abnormal test results.

Through this study, we seek to answer the following questions: Do routine PBTs offer substantial clinical value in the context of neuraxial blockade? Can specific patient factors predict abnormal test results that might alter clinical management? By addressing these questions, we hope to contribute to the development of more evidence-based guidelines for pre-procedural evaluation, ultimately reducing unnecessary testing and focusing resources on patients who would benefit most from targeted assessments. Our findings could play a crucial role in improving the safety and efficiency of neuraxial procedures.

2. Materials and Methods

2.1. Data Collection

After obtaining a waiver for the requirement of consent from our Institutional Review Board (HP IRB 2024-06-010), due to the retrospective nature of the study, we gathered data from the medical records of outpatients who visited a pain clinic between 2020.1 and 2023.8 and underwent blood tests for a neuraxial procedure. At our clinic, prior to conducting neuraxial procedures, blood tests are performed with patient consent to ensure the safety of the intervention. We reviewed patient records obtained through an initial electronic search, which included patient demographics, comorbidities, and pain-specific information from our electronic medical records. The patient demographics encompassed age, gender, height, weight, body mass index (BMI) and the presence of comorbidities such as a history of diabetes mellitus (DM), hypertension (HTN), coronary artery obstructive disease (CAOD) or arrhythmia, chronic renal insufficiency (CRI), or cancer. We excluded cases where patients were considered cured after five years of cancer treatment from the comorbidity list. We recorded pain-specific information as the underlying diagnosis for neuraxial blockade, classifying the underlying diagnoses into categories such as spinal disorders like stenosis and disc disease based on their location, herpes zoster, postherpetic neuralgia, and other pain conditions. Postherpetic neuralgia was defined as pain persisting for more than three months following the rash onset. In this study, PBTs were identified based on blood work performed within two weeks prior to the procedure. The laboratory parameters collected included hemoglobin, white blood cell count (WBC), platelets (PLT), erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), blood glucose, estimated glomerular filtration rate (eGFR), aspartate aminotransferase (AST), alanine aminotransferase (ALT), sodium, potassium, prothrombin time (PT), activated partial thromboplastin time (PTT), and international normalized ratio (INR). Abnormal results from the PBTs were identified, and factors associated with these abnormalities were determined.

2.2. Statistical Analysis

In Tables 1–3, continuous variables were represented as mean $\pm$ standard deviation. Categorical variables were expressed as frequencies (%). T-tests were applied to continuous variables that followed a normal distribution; otherwise, Mann-Whitney U tests were utilized. For categorical variables, analyses were conducted using either the Pearson chi-square test or Fisher's exact test, depending on the data's distribution. Univariate logistic regression was employed to analyze primary variables. The effects of patient variables on abnormal PBT results were assessed using multivariate regression with backward elimination ($p < 0.05$). The SPSS software (version 25.0, SPSS Inc., Chicago, IL, USA) was used to perform these analyses.

Table 1. Baseline Patient Characteristics.

Total no. of patients	N = 618
Age (years), mean	63.78 ± 13.45
Height	162.36 ± 9.20
Weight	63.87 ± 10.92
BMI	24.18 ± 3.26
Sex, M/F (%)	288/330 (46.6%)
Diagnosis for blocks	
Cervical pathology, n (%)	83 (13.4%)
Thoracic pathology, n (%)	15 (2.4%)
Lumbosacral pathology, n (%)	375 (60.7%)
Herpes zoster, n (%)	94 (15.2%)
Postherpetic neuralgia, n (%)	19 (3.1%)
Others, n (%)	32 (5.2%)
NRS	62.15 ± 18.26
Comorbidities	
None, n (%)	288 (46.6%)
HTN, n (%)	262 (42.4%)
DM, n (%)	96 (15.5%)
CAOD or arrhythmia, n (%)	65 (10.5%)
Cancer, n (%)	44 (7.1%)
CRI, n (%)	10 (1.6%)

Values are expressed either as mean ± standard deviation or as an absolute number (percentage). BMI, body mass index; M, male; F, female; NRS, numerical rating scale. The abbreviations DM, HTN, CAOD, and CRI represent diabetes mellitus, hypertension, coronary artery obstructive disease, and chronic renal insufficiency, respectively.

Table 2. Routine laboratory testing and abnormal results before performing neuraxial blockade (n=618).

Test type (normal value)	Number of abnormal results
Hemoglobin (13.0~17.0 g/dL)	
10.0 ~ 13.0	134
8.0 ~ 10.0	13
White blood cell (4.0~10.0 × 10 ⁹ /L)	
>10	43
< 4	19
Platelet (140~440 × 10 ⁹ /L)	
70~100	4
<70	1
ESR (0~20 mm/h)	
> 20	76
CRP (< 0.30 mg/dL)	
> 0.3~10	93
Glucose (70~110 mg/dL)	
≥ 140	96
≥ 200	25
eGFR (> 90 mL/min/1.73m ²)	
< 60	59 ^a
< 30	3 ^a
AST (~40 U/L)	
> 40	39
ALT (~41 U/L)	
> 41	80

Sodium (136~145 mmol/L)	
>145	5
Potassium (3.5~5.1 mmol/L)	
≥ 5.5	8
PT (10.0 ~ 13.5 sec)	
≥ 14	8
INR (0.80~1.20 %)	
1.2 ~ 1.4	6
> 1.4	0
aPTT (21~35 sec)	
> 35	2

Values are presented as absolute numbers. ^a (n = 608) patients. The acronyms DM, HTN, CAOD, and CRI refer to diabetes mellitus, hypertension, coronary artery obstructive disease, and chronic renal insufficiency, respectively. WBC, white blood cell; PLT, platelet; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; AST, aspartate aminotransferase; ALT, alanine aminotransferase; Na, sodium; K, potassium; PT, prothrombin time; aPTT, activated partial thromboplastin time; INR, international normalized ratio.

Table 3. A diagnosis confirmed after further evaluation following abnormal laboratory results.

	Past History	WBC	ESR	CRP	eGFR	AST	ALT	Glucose	Na	K	Diagnosis	Additional Diagnosis
M/82	None	6.88	20	10.20	>90	23	27	196	135	4.1	PHN	Pneumonia
F/56	Cancer	11.7	50	9.04	>90	19	12	136	127	3.6	L	Non-tuberculous mycobacterium
M/84	HTN DM	10.34	43	6.27	55	19	10	86	141	4.0	L	Polymyalgia rheumatica
F/72	HTN CAOD CRI	11.21	86	5.31	50	23	18	50	137	5.0	L	Acute pyelonephritis
M/47	None	11.47	36	13.23	>90	14	19	100	137	3.8	C	Infectious spondylitis
F/55	None	8.67	16	0.29	>90	152	301	99	137	4.4	Hz	Drug induced hepatitis
M/52	None	8.14	8	0.05	>90	14	27	452	134	5.0	L	Diabetic neuropathy
M/39	None	4.33	6	0.03	>90	17	20	504	129	5.1	L	Diabetic neuropathy
M/64	HTN DM	8.99	17	0.16	12	37	20	164	135	8.2	L	Chronic renal failure
F/85	HTN DM CAOD	7.08	26	0.21	27	31	20	125	140	5.0	L	CRI

Values are expressed as blood test results without units. M, male; F, female; DM, diabetes mellitus; HTN, hypertension; CAOD, coronary artery obstructive disease; CRI, chronic renal insufficiency; WBC, white blood cell (10⁹/L), ESR, erythrocyte sedimentation rate (mm/h); CRP, C-reactive protein (mg/dL); eGFR, estimated glomerular filtration rate (mL/min/1.73m²); AST, aspartate aminotransferase (U/L); ALT, alanine aminotransferase (U/L); Na, sodium (mmol/L); K, potassium (mmol/L); PHN, postherpetic neuralgia; Hz, herpes zoster; L, lumbar pathology; C, cervical pathology.

3. Results

In total, 769 patients were initially selected. Initially, 151 patients lacked height and weight data, resulting in 618 cases of patients who had received PBTs (Figure 1). Table 1 displays patient characteristics and clinical data. Table 2 provides a summary of cases that showed abnormal findings in blood tests. Ten patients were confirmed to have additional diagnoses related to abnormal results identified during the follow-up period (Table 3).

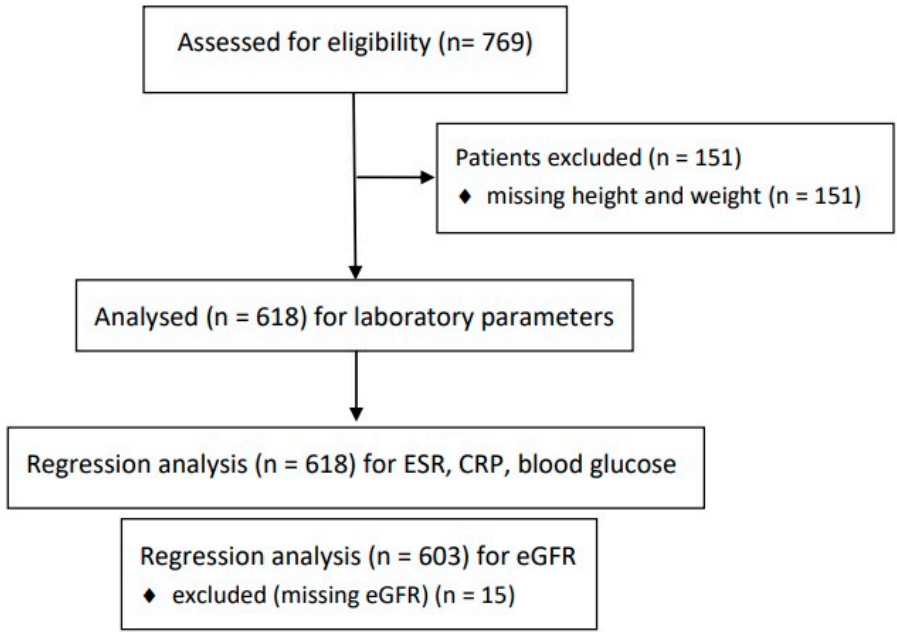


Figure 1. Flow diagram summarizing patient selection. ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate.

3.1. WBC, ESR, CRP

Forty-three patients exhibited $WBC > 10.0 \times 10^9/L$. Seventy-six patients showed an ESR increase exceeding 20 mm/h. Ninety-three patients presented with CRP levels beyond 0.30 mg/dL. No significant difference was observed among the groups with elevated WBC. In cases involving ESR and CRP, predictive factors associated with elevated levels were identified through multivariate regression analysis. Advanced age ($p = 0.001$) and a history of CRI ($p = 0.038$) correlated significantly with increased ESR (> 20 mm/h). Advanced age ($p = 0.026$) and a history of cancer ($p = 0.016$) were significantly correlated with heightened CRP levels (> 0.30 mg/dL) (Table 4).

Table 4. Summary of Multivariate Logistic Regression Analysis of Factors Predicting Abnormal Results on Pre-procedure Blood Testing.

	ESR		CRP		Glucose		eGFR	
	(> 20 mm/h)		(> 0.30 mg/dL)		(≥ 200 mg/dL)		(< 60 mL/min/1.73m ²)	
	OR	95 % CI	OR	95% CI	OR	95% CI	OR	95% CI
Advanced age	1.037	1.015-1.059	1.021	1.002-1.040			1.101	1.067-1.136
Comorbidities								
HTN							2.153	1.188-3.905
DM					14.352	5.446-37.825		
CAOD or arrhythmia							3.306	1.751-6.230
Cancer			2.359	1.174-4.739	6.764	2.261-20.213	2.917	1.194-7.122
CRI	4.013	1.083-14.875					*	*

Estimated odds ratio (OR). DM, diabetes mellitus; HTN, hypertension; CAOD, coronary artery obstructive disease; CRI, chronic renal insufficiency; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; eGFR, estimated glomerular filtration rate; CI, confidence interval. * Known CRI is excluded as a variable in the analysis for eGFR.

3.2. Glucose

Out of a total of 618 individuals, 96 were identified with high random blood glucose (≥ 140 mg/dL). Among these, 51 had no history of DM. Remarkably, 24 (3.88%) exhibited glucose levels (≥ 200 mg/dL), of whom eight had no prior diagnosis of DM, while sixteen were receiving treatment for known DM. Multivariate regression analysis revealed that a history of cancer ($p < 0.001$) was significantly associated with severe hyperglycemia (≥ 200 mg/dL) alongside DM history ($p < 0.001$) (Table 4). In univariable analyses, a cancer history was associated with elevated blood glucose (≥ 140 mg/dL) although it was not significant in multivariate analyses ($p = 0.052$). Additionally, two cases of previously unrecognized DM were diagnosed with diabetic neuropathy following incidentally discovered hyperglycemia (Table 3).

3.3. PLT, PT/PTT

Of the 618 individuals, five presented with PLT levels that decreased to below $100 \times 10^9/L$. One patient, specifically with a count of $51 \times 10^9/L$, had liver cirrhosis; additionally, among the other four with PLT counts ranging between 70 and $100 \times 10^9/L$, two had a history of liver disease (cirrhosis, had undergone liver transplantation). There were no significant findings or medical histories in the other cases, and other PBTs were unremarkable. No cases of abnormal INR or significant deviations in PT and aPTT were noted in patients without hereditary bleeding disorders or prior bleeding events (Table 2).

3.4. eGFR

Out of 618 patients, 603 were analyzed after excluding 15 patients with missing eGFR. Fifty-nine patients exhibited decreased eGFR ($< 60 \text{ mL/min/1.73m}^2$), among whom 52 (88.14%) had no history of CRI. While this was an isolated case, one male required emergency treatment due to severe unexpected hyperkalemia (Table 3). The multivariate regression analysis demonstrated that variables such as advanced age ($p < 0.001$), history of HTN ($p = 0.012$), cancer ($p = 0.019$), and CAOD or arrhythmia ($p < 0.001$) significantly predicted decreased eGFR (Table 4). Three patients were identified with severe kidney function loss (eGFR $< 30 \text{ mL/min/1.73m}^2$): A 64-year-old male and an 85-year-old female with no previous renal insufficiency (Table 3), while the other patient (eGFR = $11 \text{ mL/min/1.73m}^2$) had been previously treated for HTN and CRI.

This section may be divided by subheadings. It should provide a concise and precise description of the experimental results, their interpretation, as well as the experimental conclusions that can be drawn.

4. Discussion

The primary contraindications for neuraxial procedures include sepsis, fever, viral infections, coagulopathy, and preexisting central nervous system disorders [6]. The rationale for performing PBTs before neuraxial blockade is to detect systemic illnesses, assess coagulation status, evaluate thrombocytopenia, and check renal function, thereby ensuring safe and effective analgesia by identifying potential risk factors. We present significant findings from PBTs based on retrospective results. This population-based study of outpatients indicates that PBTs can selectively identify safety issues that may not be evident from patient history alone.

Do routine PBTs offer substantial clinical value in the context of neuraxial blockade?

This study suggests that routine PBTs before neuraxial blockade can provide significant clinical information in certain patient groups. Abnormalities in inflammatory markers such as ESR and CRP were found to help identify undiagnosed infectious conditions, and previously undiagnosed diabetes was discovered through abnormal glucose levels. This indicates that routine PBTs can enhance patient safety and optimize pre-procedural planning in specific situations. However, performing routine PBTs for all patients is not clinically justified, and a selective approach is necessary.

Can specific patient factors predict abnormal test results that might alter clinical management?

The study found that specific patient factors, such as advanced age, history of cancer, and diabetes, were significantly associated with abnormal blood test results, and these factors can have a substantial impact on clinical management. For example, elevated ESR and CRP levels were more likely in patients with advanced age or a history of cancer, indicating a higher risk of infection or inflammatory conditions. Additionally, patients with a history of diabetes often exhibited hyperglycemia, highlighting the need for careful glucose monitoring following steroid injections. These findings suggest that patient-specific factors are important considerations when deciding whether to perform routine PBTs.

4.1. WBC, ESR, CRP

Fulminant sepsis or massive site infection are absolute contraindications against neuraxial blockade [6]. Spinal infection can occur by entry into the epidural space from a contiguous infection (e.g., psoas abscess, osteomyelitis, skin infection), hematogenous spread, or through direct inoculation (e.g., steroid injection, surgery, nerve block, acupuncture) [7]. Hematogenous spread in bacteremic patients during spinal needle insertion can lead to bleeding into the subarachnoid space, thereby increasing the risk of meningitis [8]. Experts have advised against performing neuraxial procedures in patients with untreated systemic infection [9]. However, the level of systemic infection that constitutes a risk factor for infection via hematogenous spread remains undefined. Several markers are considered crucial for diagnosing infectious diseases [10]. Infections may present with leukocytosis and elevated ESR and CRP levels [7]. However, the limited sensitivity of the WBC count makes it the least informative [7]. ESR is a sensitive marker, but it has low specificity. A CRP level can rise dramatically in response to injury, infection, and inflammation, serving both as a marker and an active participant in the inflammatory process [11]. In previous research, infection was identified as the most frequent cause of elevated CRP levels (55.1%), followed by rheumatologic diseases, other inflammatory conditions, and malignancy [12]. Specially, CRP is a reliable indicator of spinal infections [7]. Although there are limitations in diagnosing infectious diseases based solely on blood test results, meticulous evaluation—such as tracking changes through additional tests or other thorough assessments—is often necessary when abnormalities are detected. In our study, various infectious disorders were identified through routine PBTs (Table 3). Infectious diseases often accompany pain syndromes: cellulitis near prosthetic leg in stump pain, diabetic foot in diabetic neuropathy, pneumonia in elderly and herpes zoster in immunocompromised patients, and septic arthritis or spondylodiscitis in degenerative disorders. As the interventional pain management grows, surgical site infections risks increase [13]. All identified diseases based on infection-related markers were not considered absolute contraindications for neuraxial blockade, yet the findings provided unexpected clinical insights that could guide the diagnosis and management of patients before procedures. There was a single case of infectious spondylodiscitis identified early based on inflammatory markers: A 47-year-old male with pain radiating to the upper limb presented for a cervical injection. A CT scan conducted two days before his visit showed foraminal stenosis, and laboratory tests indicated leukocytosis ($12.95 \times 10^9/L$) and elevated CRP (2.08 mg/dL). Subsequent tests on the day of his visit confirmed an escalation in inflammatory markers (Table 3). The patient had no underlying medical conditions but had undergone an invasive neck procedure at another clinic one week prior. An MRI scan confirmed infectious spondylodiscitis with phlegmon and abscess formation. Methicillin-resistant *Staphylococcus aureus* was isolated from the blood cultures. The patient recovered following antibiotic treatment.

4.2. Glucose

Preoperative blood glucose testing is considered reasonable in diabetic, obese patients, and those on long-term steroid therapy because there is a correlation between elevated blood glucose postoperative poor outcomes [14]. Specifically, elevated blood glucose levels have been associated with an increased risk of infections among patients scheduled for various orthopedic surgery [1]. Maintaining perioperative blood glucose levels below 200 mg/dL is crucial in preventing surgical site infections, regardless of diabetes status, as supported by strong recommendations [10]. Therefore,

pre-procedural glucose testing might be of critical importance, as the elderly population might also be prone to undiagnosed DM.

The most common side effect of steroids used in neuraxial analgesia is elevated blood glucose. Hyperglycemia after epidural injection has been observed in patients both with and without DM [15], although this glucose elevation has been shown to persist longer in DM than in non-DM patients [16]. DM patients experience pronounced systemic effects from glucocorticoids due to diminished clearance and extended exposure [15]. This typically results in an average increase of 125.96 ± 100.97 mg/dL in blood glucose after an epidural injection [17]. Therefore, DM patients can reasonably expect a temporary elevation of blood glucose by 100 mg/dL or more for approximately 48 to 72 hours following an epidural steroid injection [17]. This response also depends on the steroid dose used [18]. It is advisable to exercise caution when administering a neuraxial steroid injection to patients with DM, and frequent glucose monitoring is highly recommended [19]. If not assessed beforehand, patients with unrecognized hyperglycemia might experience reactions similar to those observed in diabetic patients after steroid injection.

In our study, some patients were not diagnosed with DM but exhibited confirmed hyperglycemia, and there were patients who, while undergoing treatment for DM, were confirmed to have elevated glucose levels. Notably, those with a history of cancer were found to have a risk of elevated blood glucose. Although the underlying mechanisms vary and require further investigation, the relationship between hyperglycemia and tumor development has been previously documented [20]. Patients who are candidates for neuraxial steroid injection should be informed that an increase in blood glucose may occur post-procedure [17]. There is no definitive evidence concerning the potential systemic effects of transient hyperglycemia on patients. However, awareness of the patient's blood glucose level prior to the procedure can reduce steroid use and complications such as hyperglycemia and infection. Effective pain control via neuraxial blockade can occur regardless of steroid administration in some cases [21]. Physicians should also recognize that, whether in cases of treated DM or undiagnosed DM, well-controlled blood glucose levels cannot always be ensured.

4.3. *PLT, PT/PTT*

A systematic review indicates that routine coagulation tests, such as PT and PTT, are not effective in predicting postoperative bleeding risk in unselected patients and are therefore not recommended [1]. These preoperative coagulation studies should be reserved for patients taking anticoagulants, those with a history of bleeding abnormalities, or those with conditions that predispose them to coagulopathy, such as liver disease or malnutrition.

Neuraxial blockade inherently carries some risk of inducing bleeding, especially in patients with pre-existing bleeding diatheses (e.g., thrombocytopenia, coagulation factor deficiencies, renal dysfunction), or those with medically induced coagulation dysfunction. Although bleeding complications are extremely rare with neuraxial procedures, certain bleeding types can lead to severe complications [22]. Specifically, bleeding within the vertebral column has the potential to cause permanent paralysis if not managed within 8 to 12 hours [22,23]. This concern may drive some physicians to routinely order coagulation screening prior to performing neuraxial blockade, although the efficacy and cost-effectiveness of this practice are debatable from the perspectives of evidence-based medicine. The American Society of Regional Anesthesia recommends evaluating the need for coagulation tests (complete blood count, PT, PTT) individually for each patient [24]. In our study, no patients exhibited abnormal PT or PTT that affected the procedure, even those with comorbidities. PT and PTT screening in low-risk patients was deemed unnecessary. A $PLT < 100 \times 10^9/L$ is generally considered a risk factor for spinal hematoma, but when there are indications for a neuraxial blockade, the risks and benefits to the patient must be weighed [25]. If the $PLT \geq 70 \times 10^9/L$, there is likely to be a low risk of neuraxial hematoma, allowing for a neuraxial procedure if clinically indicated [4]. Our results also indicate that patients without underlying disease may have hematologic and coagulation indices within an acceptable range for performing neuraxial blockade. Conducting routine coagulation studies before the blockade may be beneficial if a patient currently has a history

of taking anticoagulants (warfarin), suffers from coagulopathy, or has chronic liver disease [1]. Specifically, hepatic failure results in factor deficiencies and thrombocytopenia [26].

4.4. eGFR

Kidney function is widely recognized as a crucial determinant of prognosis in various surgical settings [1,27]. Several factors underscore the necessity of assessing renal function before administering neuraxial blockade. Firstly, renal dysfunction is identified as a risk factor for vertebral hematoma, along with preexisting coagulopathy, the use of anticoagulation medications, aging, gender, spinal abnormalities, the use of larger needles, and multiple needle attempts [23]. Uremia is linked to spontaneous hemorrhage, partly due to PLT dysfunction [5]. Moreover, renal impairment can influence drug metabolism and clearance. Patients with moderate renal impairment encounter an increased risk of spontaneous hemorrhage due to delayed excretion of anticoagulants [5]. Therefore, extended discontinuation times are recommended before neuraxial blockade. Spinal hematomas have occurred in individuals taking antiplatelet agents, despite adherence to discontinuation protocols [28]. Consequently, renal function could be considered a critical parameter when evaluating a patient's bleeding risk. Secondly, contrast media are used both to verify accurate tissue targeting and to confirm the exclusion of flow to non-target tissues in various neuraxial procedures. Assessing renal function beforehand is essential to prevent contrast-induced nephropathy [29]. Furthermore, although indirectly related to neuraxial blockade, measuring renal function provides valuable insights that can inform the appropriate dosages of gabapentinoids, commonly used as first-line treatments for neuropathic pain in pain clinics. Evaluating renal function might influence the selection and dosage of these medications.

eGFR is known to be effective as a predictor of renal dysfunction [1] and serves as a reliable test for detecting subclinical renal failure [27]. Low eGFR is associated with clinical risk factors such as DM, HTN, aging, malignancy, and obesity, yet fewer than 5% of early CRI patients are aware of their condition [30]. It is also noted that many patients with decreased eGFR demonstrated no prior history of renal dysfunction in this study.

Our study has several limitations. As a cross-sectional analysis, it does not assess the adverse effects of neuraxial blockade in patients with abnormal primary blood tests. Various cases involved additional diagnoses through follow-up tests, resulting in discontinued or improved outcomes. We did not evaluate whether abnormal test results influenced complications or outcomes. Clinical management was adjusted based on the findings, including postponing procedures, further evaluations, or modifying the injectate, as guided by clinical judgment. The absence of established guidelines makes proceeding with abnormal results controversial, necessitating large-scale studies to clarify the associated benefits and risks. Additionally, pre-existing medical information may not adequately explain a patient's condition in outpatient settings. PBTs can selectively provide valuable predictive information. The retrospective design of our study introduces additional limitations. Patient histories are often self-reported, reducing reliability, and we did not explore comorbidities beyond medical records. The timing of blood tests may not align perfectly with procedures, especially in cases where glucose levels are influenced by meals, as we used random plasma glucose levels.

5. Conclusions

PBTs can provide valuable clinical information that may not be identified through patient informatics and comorbidities prior to performing neuraxial blockade in an outpatient setting. Patient medical comorbidities can serve as a reference for selective blood test screening, although they may not fully account for the patient's condition.

Author Contributions: data curation, methodology, investigation, resources, writing—original draft; Sh.M. conceptualization, formal analysis, software, validation, supervision, writing—original draft, writing—review and editing; D.O. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement: This study was conducted according to the guidelines of the Declaration of Helsinki, and approved by the Institutional Ethics Committee of Inje University Haeundae Paik Hospital, Republic of Korea (Protocol code HP IRB 2024-06-010, date of approval 14 September 2024)

Informed Consent Statement: This retrospective study did not require informed consent by Institutional Review Board because patient recontact was not established.

Data Availability Statement: The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

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