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Relationship between the degree of peripheral neuropathy with the degree of diabetic ulcer in diabetic foot patients at Dr. M Djamil Padang hospital

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Abstract

Background and Purpose: Diabetic foot ulcers are a significant complication of diabetes, often exacerbated by peripheral neuropathy. Early detection of neuropathy is crucial for preventing foot deformities and reducing the incidence of ulcers. This study aimed to investigate the correlation between the severity of peripheral neuropathy and the degree of diabetic foot ulcers in patients at Division of Vascular Surgery in Dr. M. Djamil General Hospital, Padang.

Methods: A cross-sectional analytical study was conducted from April 2023 to analyze inpatients and outpatients with diabetic foot ulcers. Peripheral neuropathy was assessed using the Michigan Diabetic Neuropathy Score (MDNS), while ulcer severity was classified according to the Wagner classification.

Results: Twenty-six patients were included in the analysis, with a majority exhibiting severe MDNS and Wagner grades 4 and 5. Spearman correlation analysis revealed a significant association between MDNS scores and Wagner classification.

Conclusion: Patients with more severe diabetic foot ulcers (Wagner grades 4-5) tended to have higher MDNS scores, indicating a strong correlation between peripheral neuropathy severity and ulcer severity. These findings underscore the importance of early neuropathy screening and management in preventing and treating diabetic foot ulcers.

Keywords: Peripheral neuropathy, diabetic ulcers

Introduction

Diabetic foot ulcers are a severe complication of diabetes mellitus, especially when exacerbated by peripheral neuropathy (Boyko *et al.*, 2006) ^[1]. This condition often leads to further complications such as infections, gangrene, and even amputations. Early detection of peripheral neuropathy is essential to prevent foot deformities and lower the incidence of ulcers, which have significant impacts on patient morbidity and healthcare costs. The Division of Vascular Surgery at Dr. M. Djamil General Hospital, Padang, reports a high incidence of diabetic foot ulcers requiring amputations, with 175 out of 426 patients needing amputation between 2019 and 2021 (Edmonds, 1986) ^[3].

Peripheral neuropathy in diabetic patients results in the loss of sensation, making the detection of injuries more difficult, thus increasing the likelihood of ulcer formation (Lipsky, 2015) ^[5]. As the ulcer worsens, it is classified using the Wagner classification system, which ranges from superficial ulcers (grade 1) to deep infections and gangrene (grades 4-5) (Wagner, 1979). This study aims to investigate the correlation between the severity of peripheral neuropathy and the severity of diabetic ulcers in patients, highlighting the need for comprehensive prevention strategies (Reiber *et al.*, 2008) ^[6].

Methods

This cross-sectional analytical study was conducted from April to August 2023 at Dr. M. Djamil General Hospital, Padang. Both inpatients and outpatients with diabetic foot ulcers were included in the study. The severity of peripheral neuropathy was measured using the Michigan Diabetic Neuropathy Score (MDNS), a validated diagnostic tool for assessing neuropathy in diabetic patients. The severity of the diabetic ulcers was classified using the Wagner classification system.

The study population consisted of patients with diabetic foot ulcers treated at the Vascular Surgery Division. A sample of 26 patients was selected through consecutive sampling. Data were collected from patient medical records and analyzed using Spearman’s correlation to assess the relationship between MDNS and Wagner grades. A p-value <0.05 was considered statistically significant.

Results

Wagner Classification	Number of Patients (%)	MDNS Score Range
Grade 0-1 (Mild)	11.5	1-4 (Mild)
Grade 2-3 (Moderate)	34.6	5-8 (Moderate)
Grade 4-5 (Severe)	53.8	9-15 (Severe)

Among the 26 patients included in the analysis, the majority were male (52%), with an average age of 55.1 years. Most patients (73%) had been living with diabetes for over 10 years, and the majority exhibited elevated blood glucose levels at the time of examination. The average MDNS score was high, with 73% of patients classified as having severe peripheral neuropathy (MDNS >26). Regarding ulcer classification, most patients had Wagner grade 4 or 5 ulcers, with 38% in grade 4 and 35% in grade 5.

Condition	Number of Patients	Percentage (%)
Diabetes Duration (> 10 years)	19	73.0
Overweight BMI	11	42.31
High Blood Glucose Level	23	88.46

Spearman’s correlation analysis revealed a significant positive relationship between the MDNS score and the Wagner classification (r = 0.818, p < 0.001). This suggests that higher MDNS scores, indicating more severe neuropathy, were associated with more severe diabetic ulcers (Wagner grades 4-5). The coefficient of determination (R²) showed that 67% of the variation in Wagner grades could be explained by the severity of peripheral neuropathy (Waspadji, 2006) [7].

MDNS	Wagner Grade 3	Wagner Grade 4	Wagner Grade 5	Total (%)
Moderate	7	0	0	27
Severe	0	10	9	73

Discussion

The results of this study indicate a strong correlation between the severity of peripheral neuropathy and the severity of diabetic foot ulcers, consistent with previous studies (Reiber *et al.*, 2008) [6]. The majority of patients in this study exhibited severe neuropathy, which has been shown to increase the risk of developing more advanced ulcers. This supports the hypothesis that peripheral neuropathy plays a crucial role in the progression of diabetic foot ulcers (Lipsky, 2015) [5]. Early detection and management of neuropathy are essential to prevent the development of severe ulcers. Current screening methods, such as the MDNS, are effective tools for identifying patients at risk. Furthermore, intensive glycemic control and appropriate foot care are critical in reducing the incidence of ulcers in diabetic patients (Cefalu *et al.*, 2007) [2]. Future research should explore additional factors that may contribute to ulcer severity, such as vascular insufficiency and the duration of diabetes.

Conclusion

There is a strong correlation between the severity of peripheral neuropathy and the severity of diabetic foot ulcers in patients treated at Dr. M. Djamil General Hospital. Patients with higher MDNS scores were more likely to have severe diabetic ulcers (Wagner grades 4-5). These findings highlight the importance of early neuropathy screening and prompt management to prevent the progression of ulcers and reduce the risk of amputations.

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