

Investigation of Risk Factors Involved in Adhesive Capsulitis in Diabetic Patients

Abstract

Introduction: Adhesive capsulitis, commonly known as frozen shoulder, is a prevalent and painful condition that limits shoulder mobility. A strong association exists between diabetes and this condition. This study aims to investigate the inflammatory risk factors involved in the development of adhesive capsulitis in diabetic patients.

Materials & Methods: In a descriptive-analytical study, individuals diagnosed with adhesive capsulitis were evaluated over three years. Among these patients, those with a confirmed diagnosis of diabetes who were undergoing treatment were identified and included in the study. They were compared to non-diabetic individuals. A pre-defined questionnaire was used to collect demographic data, diabetes duration, treatment type, and laboratory findings, which were then analyzed for associations with this condition.

Results & Discussion: A total of 53 patients were examined, with the prevalence of concurrent diabetes and adhesive capsulitis being 47%. Hyperlipidemia and hypercholesterolemia showed a significant association with the co-occurrence of diabetes and adhesive capsulitis. The mean duration of diabetes was 4.43 ± 2.22 years in patients receiving oral medication and 4.55 ± 2.60 years in those on insulin therapy ($P = 0.26$). The mean HbA1C level was 7.72 ± 1.01 in the oral medication group and 6.71 ± 0.48 in the insulin therapy group, indicating a significant association between treatment type, diabetes duration, and the development of adhesive capsulitis.

Conclusion: Based on the findings of this study, the coexistence of hyperlipidemia and hypercholesterolemia with diabetes plays a significant role in the development of adhesive capsulitis.

Keywords: Adhesive capsulitis, Diabetes Mellitus, Frozen shoulder.

Accepted: 43 days before printing

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Introduction

Adhesive capsulitis, also known as frozen shoulder, is a common and painful condition that limits shoulder movement⁽¹⁾. This condition is often self-limiting, and most patients do not report any history of trauma. It is characterized by a progressive painful course with restricted shoulder mobility, particularly in external rotation, more than abduction. This leads to severe functional disability in affected individuals. In 1934, Codman outlined diagnostic criteria, including restricted shoulder movement in the glenohumeral joint, with a greater limitation in flexion and external rotation, and normal radiographic findings⁽¹⁻³⁾.

Adhesive capsulitis is most common among women, peaking at around 50 years of age. Its exact etiology remains unclear, but multiple risk factors have been identified. Key risk factors include prior trauma, advanced age, female sex, dyslipidemia, hypertension, thyroid dysfunction, and diabetes⁽⁴⁾. In 2014, Sung et al. reported a significant association between hypercholesterolemia, lipoproteinemia, and adhesive capsulitis, highlighting the role of inflammatory factors in the development of this condition⁽⁵⁾.

Diabetes, which increases inflammatory factors, is a major contributor to painful restrictions in shoulder mobility. The prevalence of adhesive capsulitis in the general population is approximately 2%. Among diabetic patients, the reported prevalence varies widely, ranging from 4.4% to 22% in the literature. However, the strong association between diabetes and adhesive capsulitis is well-established⁽⁶⁻⁸⁾.

In Iran, a 2009 study in Kashan reported an 11.9% prevalence of adhesive capsulitis among patients attending a diabetes clinic⁽⁸⁾. The aim of this study is to investigate potential risk factors for the development of adhesive capsulitis in diabetic patients.

Materials & Methods

A descriptive-analytical study was conducted between 2020 and 2023 at Urmia University of Medical Sciences in collaboration with the Islamic Azad University of Medical Sciences, Tabriz. All patients diagnosed with adhesive capsulitis who attended the shoulder clinic were examined. A total of 53 patients were included, comprising 24 males (45.3%) and 29 females (54.7%). The mean age was 54.83 ± 8.98 years, with a median age of 55 years (range: 35–70 years).

Among the 53 patients, 25 (47.2%) had confirmed diabetes, while 28 (52.8%) did not. The patients were divided into two groups for comparison. Those with a confirmed diagnosis of diabetes undergoing treatment were identified and included in the study. A pre-designed questionnaire was used to collect demographic data, diabetes duration, treatment type, and laboratory findings. These variables were assessed for associations with adhesive capsulitis. Patients with a history of prior shoulder surgery, fractures, or major trauma were excluded from the study.

The study was conducted under the supervision of the ethics committee at the Islamic Azad University of Medical Sciences, Tabriz, adhering to all ethical guidelines. In this study, hyperlipidemia was defined as triglyceride levels above 150 mg/dl and HDL cholesterol below 60 mg/dl. Hypercholesterolemia was defined as total cholesterol levels exceeding 200 mg/dl.

Statistical analysis was performed using descriptive statistics, including frequency, percentage, and mean \pm standard deviation. The Chi-square test was used for qualitative data comparisons, while the independent T-test was employed for quantitative data after confirming the normality of distributions between the two treatment groups. Statistical analyses were conducted using SPSS version 17, and a p-value of less than 0.05 was considered statistically significant.

Results

In this study, 53 patients with adhesive capsulitis were evaluated. The demographic characteristics of the two groups (diabetic and non-diabetic patients) are presented in Table 1. The co-occurrence rate of diabetes with adhesive capsulitis was 47%. Significant statistical differences between the two groups are indicated by an asterisk (*).

Among diabetic patients, the mean age of those receiving oral treatment was 57.12 ± 8.80 years, while those on insulin therapy had a mean age of 55.55 ± 8.07 years ($p=0.66$). The mean duration of diabetes in patients receiving oral treatment was 3.43 ± 2.22 years, compared to 4.55 ± 2.60 years for those receiving insulin ($p=0.26$). The mean HbA1c levels were significantly different between the two groups. Patients on oral treatment had a mean HbA1c of 7.72 ± 1.01 , while those on insulin had a mean HbA1c of 6.71 ± 0.48 ($p=0.01$).

Discussion

Adhesive capsulitis, commonly referred to as frozen shoulder, is a prevalent and painful condition that limits shoulder movement.

Table 1: Comparison of Characteristics Between Diabetic and Non-Diabetic Patients

Characteristic	Total Patients (n=53)	Diabetic Patients (n=25)	Non-Diabetic Patients (n=28)	p-value
Gender				
Male	14 (56%)	10 (35.7%)	18 (64.3%)	0.2
Female	11 (44%)			
Age (years)	52.6 ± 10.2	53.2 ± 9.2		0.3
Hyperlipidemia	16 (64%)	10 (35.7%)		*0.03
Hypercholesterolemia	17 (68%)	11 (39.3%)		*0.02

Key risk factors for this condition include a history of trauma, advanced age, female gender, dyslipidemia, hypertension, thyroid dysfunction, and diabetes⁽⁴⁾. Diabetes, a condition associated with increased inflammatory factors, plays a significant role in painful shoulder movement restrictions.

This study aimed to investigate the risk factors associated with adhesive capsulitis by examining 53 patients referred to the Imam Khomeini Shoulder Clinic in Urmia. Among the patients, 47.2% had diabetes. While 56% of the diabetic patients were male, no significant association was found between gender and diabetes in this study.

No significant relationship was observed between the type of diabetes treatment (oral medication or insulin therapy) and the presence of adhesive capsulitis. These findings align with the study by Zreik et al.⁽²⁾, which also found no significant association between oral or insulin treatment and adhesive capsulitis.

In this study, a significant association was found between laboratory findings of hyperlipidemia ($p=0.04$) and hypercholesterolemia ($p=0.03$) with adhesive capsulitis. Similarly, in a study by Huang et al. in Taiwan (2013), involving 946 diabetic patients over three years, the annual risk of adhesive capsulitis was 1.2% among diabetic individuals compared to 0.9% in the general population. The relative risk was 1.3 times higher in diabetic patients, and significant associations were found with factors such as advanced age, female gender, and dyslipidemia⁽⁷⁾.

Unlike the findings of Kiani et al.⁽⁶⁾, who reported a significant association between the duration of diabetes and adhesive capsulitis, no such relationship was observed in this study. Additionally, while Kiani et al. identified female gender as a risk factor for adhesive capsulitis, no such link was found here.

The results of this study indicate no association between the duration of diabetes and adhesive capsulitis, aligning with findings from Zamani et al.⁽⁸⁾ and other studies, suggested that complications like adhesive capsulitis, sclerodactyly, and osteoarthritis are more likely to occur in older individuals and increase with the progression of diabetes⁽¹⁰⁻¹³⁾.

A significant association was found between HbA1c levels and adhesive capsulitis in this study. Patients on oral treatment had a mean HbA1c of 7.72 ± 1.01 , while those on insulin had 6.71 ± 0.48 ($p=0.01$). This finding corresponds with studies by Seneseker and Gautieri⁽⁹⁾, who demonstrated that increased connective tissue stiffness in diabetic patients might

result from non-enzymatic oxidative reactions between glucose and collagen, leading to the formation of advanced glycation end products (AGEs)⁽⁹⁻¹⁰⁾. Furthermore, Oliva et al.⁽¹¹⁾ highlighted how AGEs alter collagen fiber structure, potentially impacting the biomechanical properties of tendons.

Conclusion

Based on the findings of this study, hyperlipidemia and hypercholesterolemia in conjunction with diabetes play a significant role in the development of adhesive capsulitis.

Acknowledgments

We sincerely thank the Clinical Research Committee of Imam Khomeini Hospital, Urmia University of Medical Sciences, for their support in the preparation of this manuscript.

Ethics

This study was conducted at the Islamic Azad University of Medical Sciences, Tabriz, as part of an internship thesis, following approval from the Ethics Committee

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