



Do Diabetes and Hypertension Precede the Development of Adhesive Capsulitis?

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Introduction

Previous studies show a convincing association between adhesive capsulitis and diabetes mellitus.¹⁻⁶ The prevalence of diabetes or pre-diabetes in adhesive capsulitis patients has been reported to approach 72%.⁷ Data suggests that metabolic syndrome accounts for 30-52% of people who later develop type II diabetes.⁸ Metabolic syndrome is defined by the World Health Organization as a group of metabolic abnormalities including evidence of insulin resistance as well as at least two of the following: obesity, hypertension, dyslipidemia, and hypertriglyceridemia.⁹

There is limited evidence to date regarding the possible association between the metabolic syndrome and adhesive capsulitis. One study reported no association between hypertension or Body Mass Index (BMI) and adhesive capsulitis,³ while another reported that hypercholesterolemia and hypertriglyceridemia were associated with the condition.¹⁰ These trends were observed exclusively in diabetic patients, and neither study formally looked at the association of metabolic syndrome and adhesive capsulitis. The goal of the present study was to evaluate possible associations between metabolic syndrome and adhesive capsulitis by comparing the prevalence of metabolic syndrome medications and obesity rates in a series of patients with adhesive capsulitis to previously reported nationwide data.

Methods

We completed a retrospective review of 150 consecutive patients, age 18-71, who were diagnosed with adhesive capsulitis at our sports medicine clinic. We evaluated the BMI and medication list for each patient to determine which metabolic syndrome indications were present. Based upon the proportion of patients taking medications for each component, a prevalence rate with a 95% confidence interval was calculated using the Wilson procedure.¹¹

We compared the prevalence of medication use and obesity in our series of adhesive capsulitis patients with previously reported data from The National Health and Nutrition

Examination Surveys (NHANES).¹²⁻¹⁵ From this data we calculated the prevalence of anti-hypertensive and lipid-lowering medications nationwide. Direct statistical comparison of the prevalence of metabolic syndrome medications in our adhesive capsulitis population to the prevalence in the general population using chi-square testing was not possible. However, 95% confidence intervals allowed the prevalence values from the two groups to be effectively compared.

Results

Two-hundred-and-seven patient charts were queried; 54 were incomplete and 3 were excluded due to patient age. The average age was 51.3 (\pm 10) in the group, and 59.3% of patients were female. Overall, 27.1% [95% CI 17.4-39.6] of male group members aged 20 and above were obese; a prevalence similar to the 32.2% [95% CI 29.5-35.0] rate reported for this group in the NHANES.¹² In the subcategory of females 20 years or older with adhesive capsulitis, the overall prevalence of obesity was 27.2% [95% CI 18.7-37.7]. This value is similar to the overall 35.5% [95% CI 33.2-37.7] prevalence of obesity observed in the NHANES.¹² All age-group specific analyses also showed obesity rates similar to the general population.

The overall rate of hypertensive medication use by patients aged 18 and older in our adhesive capsulitis group was 33.1% [95% CI 25.9-41.2], a number notably higher than the 21.6% [95% CI 19.8-23.4] observed within the NHANES (Table 1).¹³ In the 40-64 year old age-group comparison, the prevalence of hypertensive medications was also notably higher than nationwide rates. The overall prevalence of cholesterol-lowering medication use by patients aged 20 and older in the adhesive capsulitis patients was 20.6% [95% CI 14.7-20.8], a number similar to the 16.1% [95% CI 13.7-18.8] observed nationwide (Table 1).¹⁴ Age group-specific comparisons also showed similar rates of cholesterol medication use between the adhesive capsulitis group and the general population.

The observed rate of diabetic medications in adhesive capsulitis patients ages 20 and above

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Table 1. The prevalence of obesity and medications used to treat diabetes, hypercholesterolemia and hypertension in the NHANES cohort as compared to our cohort of patients with adhesive capsulitis. *Notable differences where 95% confidence intervals do not overlap.

Metabolic Syndrome Component	Prevalence of Disease or Calculated Prevalence of Medication Use for Disease	
	NHANES Overall Cohort	Adhesive Capsulitis Cohort
Obesity in Females Age 20 and Above ¹²	35.5% (33.2-37.7)	27.2% (18.7-37.7)
Obesity in Males Age 20 and Above ¹²	32.3% (29.5-35.0)	17.4% (7.0-37.1)
Hypertension Medication in Adults Age 18 and Above ¹³	21.6% (19.8-23.4)*	33.1% (25.9-41.2)*
Hypercholesterolemia Medication in Adults Age 20 and Above ¹⁴	16.1% (13.7-18.8)	20.6% (14.7-28.0)
Diabetic Medications in Adults Age 20 and Above ¹⁵	7.6% (6.7-8.5)*	18.4% (12.9-25.7)*

was 18.4% [95% CI 12.9-25.7], a number notably above the national rate of diagnosed diabetes in the NHANES¹⁵ of 7.6% [95% CI 6.7-8.5] (Table 1). In the 20-39 year old age group analysis of adhesive capsulitis patients, 26.3% [95% CI 11.8-48.8] were taking diabetic medications while only 2.1% [95% CI 1.5-2.8] were diagnosed nationwide. Higher rates of diabetes were also observed in the 40-59 year old adhesive capsulitis group.

Discussion

Studies looking for a connection between the degree of hyperglycemia or the duration of diabetes and the risk of developing adhesive capsulitis have produced conflicting results.^{3,5,6} Authors have suggested that a period of hyperglycemia before a diabetes diagnosis, estimated at 9-12 years,¹⁶ may be necessary before the occurrence of shoulder damage.^{3,17} Metabolic syndrome is a constellation of abnormalities that often precedes a diagnosis of type II diabetes. In this study, we explored the possible associations between metabolic syndrome elements and adhesive capsulitis.

We observed an overall prevalence of diabetic medication use in adhesive capsulitis patients that was more than twice the national prevalence of diagnosed diabetes, as well as a prevalence in the 20-39 year-old age group that was 10 times greater in adhesive capsulitis patients.¹⁵ These increased rates are consistent with past studies showing a clear association between diabetes and adhesive capsulitis,¹⁶ and suggest that the diagnosis of diabetes should be considered in all patients presenting with adhesive capsulitis. The overall rate of antihypertensive use in patients with adhesive capsulitis was also approximately 50% greater than the prevalence observed in the general population;¹³ an association that has not been reported previously. In our study, 72% of patients diagnosed with hypertension did not carry a concurrent diagnosis of diabetes, indicating that hypertension may be independently associated with adhesive capsulitis. While we were able to compare our patients to the nationwide population, the

prevalence of metabolic syndrome in the United States is over 30%,¹⁸ and it is possible that this high rate may have masked relatively higher rates of metabolic syndrome risk factors in the adhesive capsulitis patients.

Conclusion

Our results continue to highlight the role that diabetes plays in the development of adhesive capsulitis. Interestingly, the rate of antihypertensive medication usage was also notably higher in our cohort, lending support to the idea that hypertension may be an additional factor in the development of adhesive capsulitis. Further studies investigating the role of metabolic syndrome in the development of adhesive capsulitis are warranted.

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