Association of Post-Stroke Shoulder Pain with Diabetes Mellitus and Hyperlipidemia

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Abstract
Background: Shoulder pain is one of the most common complications after stroke. However, sufficient information about its risk factors and prevalence is not available. Surveying the association of shoulder pain with diabetes mellitus (DM), hypertriglyceridemia, and hypercholesterolemia was the aim of this study.
Methods: This cross-sectional study was carried out at clinics affiliated to Shiraz University of Medical Sciences, Iran. From among the 191 referred patients, 152 patients were enrolled in the study. Within a year, once every 2 months, shoulder pain was assessed among the participants. In addition, DM, hypertriglyceridemia, and hypercholesterolemia were assessed in these patients.
Results: Among 152 patients with stroke, 103 patients did not develop shoulder pain and 49 developed it. Among the participants with shoulder pain, 41 patients had DM, 10 had hypertriglyceridemia, and 39 had hypercholesterolemia. The analysis of data with the logistic regression model showed the relationship between DM and shoulder pain to be significant. However, the relationship between shoulder pain and hyperlipidemia was not significant.
Conclusion: Shoulder pain is common after stroke and DM is a predictor.

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Introduction

Post-Stroke Shoulder Pain (PSSP) or hemiplegic shoulder pain (HSP) is one of the most common complications after stroke.[1,2] Due to the differences in the diagnosis of the disease and also the type and design of the studies, an incidence rate of 5% to 84% has been reported for HSP; however, its actual rate is unclear. Recent advances in the treatment of stroke have been focused on the organization of treatment through special wards of the stroke patients and the treatment of complications during rehabilitation. Shoulder pain is one of the stroke complications caused by delayed rehabilitation.[3] HSP prolongs the

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patients' rehabilitation period and may demoralize them.[4] Shoulder pain causing factors include paralysis, shoulder limitation of motion, spasticity, right hemisphere vascular lesions, left hemiplegia, sensory impairment, diabetes mellitus (DM), and inappropriate care during rehabilitation.[5]

A correlation has been observed between DM and PSSP in previous studies;[6] however, relationship between hyperlipidemia and HSP is questionable.

The present study was carried out with the aim to investigate the relationship of DM and hyperlipidemia, including increase in triglyceride (TG) and cholesterol, with HSP.

Methods

This study was conducted on 191 patients who had experienced a stroke based on physical examination, having at least one positive image including computerized tomography scan (CT scan) or magnetic resonance imaging (MRI). Based on the definition presented by the World Health Organization (WHO), stroke is a local or generalized rapidly progressing disorder of the cerebral function with symptoms lasting more than 24 hours which has no cause other than vascular causes.

Patients of any age and sex referring to health centers of Shiraz University of Medical Sciences, Shiraz, Iran, due to stroke from 2004 to 2006 and admitted at any status of outpatient or hospitalized entered the study. Patients with other causes of hemiplegia, including brain tumors, traumatic brain injury (TBI), infectious diseases, cerebral palsy (CP), as well as patients with stroke and a profound cognitive problem were excluded from the study. During the study, 39 patients were excluded from the study due to death or follow-up problems. Then, the remaining 152 patients were examined for shoulder pain once every 2 months during 1 year and in a total of 6 sessions.

There was no standardized characteristic for the diagnosis of HSP and diagnosis was performed based on patient's history and examination. The characteristic feature considered in this study was a description of shoulder pain on the paralyzed side of the body examined with a 10-cm visual analog scale (VAS). The shoulder function impairment criterion was a reduction by at least 10 degrees (with goniometer) in the passive range of motion of the shoulder joint on the paralyzed side of the body compared to the opposite shoulder. This impairment was often observed simultaneously in the 3 motions of forward flexion, external rotation, and abduction.

In addition, the patients were asked about the history of DM and hyperlipidemia during the 6 months before their stroke. For DM, fasting blood sugar (FBS) and blood sugar 2 hours post prandial (2hpp), TG, and cholesterol were checked. In case of positive history of DM, an FBS of over 126, and 2hpp blood sugar over 200, or if these markers were positive in 2 tests, the patient was considered as diabetic. In case of only one positive test without previous history, the test was repeated, and if it was positive, the patient was considered as a patient with DM. If it was negative, the patient was considered to be without DM. The same procedure was also performed for TG and cholesterol; in each test, the normal values were considered and TG and cholesterol of, respectively, above 200 and 240 mg/dl were considered to be high.

The questionnaires were reviewed in successive visits, and the incidence of shoulder pain and its possible improvement were assessed. Informed consent was received from all patients participating in the study.

Finally, descriptive statistics including mean and standard deviation (SD) and logistic regression were used to analyze the data in SPSS software (SPSS Inc., Chicago, IL, USA).

Results

Of the 152 patients included in the study, 75 (49.3%) and 77 (50.7%) were men and women, respectively. In addition, 8 (5.3%), 18 (11.8%), 52 (34.2%), 39 (25.7%), and 35 (23.0%)

were below 40, 41-50, 51-60, 61-70, and above 70 years of age, respectively. During the study, 103 (67.8%) and 49 (32.2%) patients lacked and had shoulder pain in 1 year, respectively. Among the individuals suffering from shoulder pain, 41 (83.0%), 8 (17.0%), 10 (20.0%), 39 (80.0%), 14 (29.0%), and 35 (71.0%) had DM, did not have DM, had hypertriglyceridemia, had normal TG, had hypercholesterolemia, and had normal cholesterol, in the same order. Among the individuals lacking shoulder pain, 38 (36.80%), 65 (63.11%), 25 (24.00%), 78 (76.00%), 23 (22.00%), and 80 (78.00%) had DM, did not have DM, had hypertriglyceridemia, had normal TG, had hypercholesterolemia, and had normal cholesterol, respectively.

Using the logistic regression model, pain as a binary dependent variable, and TG, cholesterol, and DM as independent variables were entered into the model. According to the results, there was a significant relationship between HSP and DM (probability ratio: 31/472; P < 0.001); however, HSP did not have a significant relationship with high TG (probability ratio: 1/099; P = 0.572) or high cholesterol (probability ratio: 1/419; P = 0.492).

Discussion

The present study showed that there was a significant correlation between shoulder pain and DM among patients with cerebral stroke. There was no apparent association of this pain with hyperlipidemia in previous studies. However, in the present study, there was no significant relationship between HSP and hyperlipidemia (both TG and cholesterol). DM has been recognized as a risk factor for stroke.[7] This disease is associated with numerous complications, among which atherosclerosis in cardiovascular diseases (CVDs) and small artery complications, like ocular and renal involvement, have the highest incidence. Musculoskeletal complications, especially shoulder pain, have been less discussed.[8-10] Shoulder pain and its induced disability are common among patients with DM. DM is an important factor in shoulder pain, and high hemoglobin A1c levels are associated with exacerbations of the related pain and disability.[11]

In a study by Ratnasabapathy et al., the risk of HSP among patients with DM has been reported to be higher than that in healthy individuals. In this study, after 6 months of follow-up of patients with stroke, 23% of patients (23% and 24% of men and women, respectively) suffered from HSP. In terms of age, 20%, 28%, 25%, and 14% of individuals with stroke were 15-64, 65-74, 75-84, and over 85 years of age, in the same order. Moreover, 31% and 22% of respective individuals with shoulder pain, , did not suffer from DM.[6]

In another study based on hospital investigations, 75% of patients with hemiplegia suffered from shoulder pain during the first 12 months after cerebral stroke.[2] In other studies, the incidence of HSP has been reported as 5% to 85%.[3] This vast range may be due to the fact that most studies have been conducted in small communities.

In previous studies, the relationship of TG and cholesterol with HSP has been neglected, which was investigated in the present study. Although hypertriglyceridemia is a potentiating factor for stroke, in these patients, the risk of shoulder pain is not higher compared to the individuals with normal TG level and does not need further consideration. Regarding the potential for HSP among patients with DM, preventive training methods can be helpful in the avoidance of this post-stroke complication. Investigating the factors associated with shoulder pain makes it possible to identify individuals at risk and to take appropriate preventive measures. Follow up of patients, even after discharge, is also helpful in detecting and reducing the incidence of shoulder pain with delayed onset.

In these studies, effective treatments or preventive methods have not been investigated and further studies are required to examine shoulder pain prevention and

relief interventions. Whether blood glucose control is effective in reducing the risk of HSP among patients with DM should be considered in future studies.

Conclusion

Shoulder pain is common after stroke, and DM is one of the factors accompanying this disorder. Moreover, stroke is more common among patients with DM; in addition, shoulder pain is more common among these patients compared to healthy individuals. Furthermore, blood glucose control may prevent the onset of HSP. Thus, to prevent the occurrence of shoulder pain among patients with DM suffering from stroke, initially, necessary measures, like suitable positioning of the organ, taking care of the paralyzed shoulder while exercising, and exercising within the joint motion range, must be taken.

Acknowledgments

Conflict of Interest

Authors have no conflict of interest.

References

1. Langhorne P, Stott DJ, Robertson L, MacDonald J, Jones L, McAlpine C, et al. Medical complica-tions after stroke: a multicenter study. Stroke 2000; 31(6): 1223-9.
2. McLean DE. Medical complications experienced by a cohort of stroke survivors during inpatient, tertiary-level stroke rehabilitation. Arch Phys Med Rehabil 2004; 85(3): 466-9.
3. Gamble GE, Barberan E, Laasch HU, Bowsher D, Tyrrell PJ, Jones AK. Poststroke shoulder pain: a prospective study of the association and risk factors in 152 patients from a consecutive co-hort of 205 patients presenting with stroke. Eur J Pain 2002; 6(6): 467-74.
4. Roy CW, Sands M. The effect of shoulder pain on outcome of acute hemiplegia. Clin Rehabil 1995; 9(1): 21-7.
5. Lindgren I, Jonsson AC, Norrving B, Lindgren A. Shoulder pain after stroke: a prospective popula-tion-based study. Stroke 2007; 38(2): 343-8.
6. Ratnasabapathy Y, Broad J, Baskett J, Pledger M, Marshall J, Bonita R. Shoulder pain in people with a stroke: a population-based study. Clin Rehabil 2003; 17(3): 304-11.
7. Lukovits TG, Mazzone TM, Gorelick TM. Diabe-tes mellitus and cerebrovascular disease. Neu-roepidemiology 1999; 18(1): 1-14.
8. Garcia MJ, McNamara PM, Gordon T, Kannel WB. Morbidity and mortality in diabetics in the Framingham population. Sixteen year follow-up study. Diabetes 1974; 23(2): 105-11.
9. Perneger TV, Brancati FL, Whelton PK, Klag MJ. End-stage renal disease attributable to diabetes mellitus. Ann Intern Med 1994; 121(12): 912-8.
10. Turner RC, Millns H, Neil HA, Stratton IM, Man-ley SE, Matthews DR, et al. Risk factors for cor-onary artery disease in non-insulin dependent diabetes mellitus. United Kingdom prospective diabetes study. BMJ 1998; 316(7134): 825-8.
11. Laslett LL, Burnet SP, Redmond CL, McNeil JD. Predictors of shoulder pain and shoulder disabil-ity after one year in diabetic outpatients. Rheu-matology (Oxford) 2008; 47(10): 1583-6.