

Impact of Sexual Activity on Glycated Hemoglobin Levels in Patients with Type 2 Diabetes Mellitus after Penile Prosthesis Implantation

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Purpose: To examine the benefits of sexual activity on glycated hemoglobin (HbA_{1c}) in penile prosthesis implanted patients with type 2 diabetes mellitus (DM).

Materials and Methods: Sixty-seven male subjects who had HbA_{1c} levels of $\geq 6.5\%$ before and could perform regular sexual activity after the implantations were enrolled. The contribution of sexual activity on glycemic control assessed by HbA_{1c} level as well as age, duration of DM and frequency of sexual activity were evaluated.

Results: Mean age and mean time from the surgery of the study patients was 59.9 years (range, 30-82) and 22.6 months (range, 10-63), respectively. The average of penile prosthesis usage for sexual activity was 9.9 times per month (range, 2-28). Compared with the preimplantation, the absolute mean change in HbA_{1c} after penile prosthesis implantation was found as -0.2% ($P > .05$). This study also revealed that more sexual activity was associated with more reduction in HbA_{1c}.

Conclusion: The present study demonstrated that sexual activity is associated with HbA_{1c} reduction, which is clinically important in patients with type 2 DM after penile prosthesis implantation.

Keywords: erectile dysfunction; surgery; penile implantation; diabetes complications; hemoglobin A, glycosylated; metabolism.

INTRODUCTION

Diabetes mellitus (DM) is one of and may be the most important risk factor for erectile dysfunction (ED). The current estimates suggest that as many as 85% of men with DM will develop some degree of ED at an earlier age.⁽¹⁾ Many of patients with ED have not had a normal erection in many months or years. Penile prosthesis (PP) implantation is the final and satisfying treatment option for patients who have ED and failed in the first and second line treatments. In different patient satisfaction studies it was shown that, of the PP implanted men more than 90% stated they were still using the PP for sexual intercourse with an average frequency of coitus of 5 times monthly.⁽²⁻⁴⁾ Nearly thirty years ago, it was shown that the metabolic expenditures during stimulation and orgasm were about 3.3 METS (METS are a measurement of the body's capacity to utilize oxygen for a given workload, 3.5 mL/kg/min = 1 MET).⁽⁵⁾ Another study also demonstrated that the heart rate and blood pressure responses to both sexual activity and stair climbing were similar.⁽⁶⁾ In general, glycated hemoglobin (HbA_{1c}) is used to monitor blood glucose levels for the last 3 months' average. Recent studies provided convincing evidence that structured exercise training that consists of aerobic exercise, resistance training, or both combined is associated with HbA_{1c} reduction in diabetic patients.^(7,8) In agreement with the findings of single controlled studies, meta-analyses also confirmed that regular exercise improves glucose control and reduction in HbA_{1c} obviously seen in DM.^(9,10)

Although evidence supports the concept that average sexual activity ranks as mild to moderate in terms of exercise intensity,⁽¹¹⁾ the association of sexual activity on serum HbA_{1c} levels after PP implantation is unclear. The aim of this study was to examine the influence of sexual activity on HbA_{1c} levels after PP implantation in type 2 DM patients.

MATERIALS AND METHODS

We retrospectively analyzed medical records from computer files of patients that underwent PP implantation surgery from January 2010 through January 2013. Enrollment and data collection were conducted at follow-up visits at least 6 months and up to 3 years after implantation. Sixty-seven male subjects who had HbA_{1c} levels of $\geq 6.5\%$ and active sexual life with aid of PP were enrolled in the study. Given the long duration of the sexual activity period in present study, changes in HbA_{1c} would be representative and were therefore chosen as an outcome measure.

The principal eligibility criteria included patients who had a regular sexual intercourse with his wife after PP implantation surgery. Any kind of cancer disease, myocardial infarction or stroke within 6 months, or congestive heart failure and severe renal or hepatic diseases comprised major exclusion criteria. Fasting blood samples were obtained between 7-9 am in the morning. Serum HbA_{1c} levels were measured by standard radioimmunoassay kits. We limited the usage of PP for intercourse at least 6 months, since our main outcome of interest, HbA_{1c}, reflects average blood glucose concentration from the previous

8-12 weeks. We asked Global Satisfaction Question (GSQ) "Did the implant permit you to experience satisfactory sexual relations?" and a frequency question "How many times do you use your PP for sexual activity each month?" to all participants at the time of their participations. Institutional review board approved this study and all the participants provided written informed consent before participation.

Statistical Analysis

Qualitative and quantitative data values were expressed as frequency (percentage) and mean \pm SD. Quantitative variables means between pre- and post-surgery groups were compared using paired *t*-test. Pearson correlation coefficient was used to examine and assess the linear relationship between the two quantitative variables. A two-sided *P*-value $< .05$ was considered to be statistically significant. All Statistical analyses were done using Statistical Package for the Social Science (SPSS Inc, Chicago, Illinois, USA) version 19.0.

RESULTS

Mean age of study patients was 59.9 ± 10.9 years (range, 30-82) (**Table**). Mean duration of DM and ED problem was 11.7 ± 3.4 years and 2.7 ± 1.9 years, respectively. The mean time from surgery was 22.6 months (range, 7-36). For GSQ, all 67 patients responded as 'yes'. For frequency question, 64 patients (95.5%) responded to use it frequently, while three (4.5%) declared they use it rarely because of partner related problems. The average of PP usage for sexual activity was 9.9 ± 5.7 times per month (range, 2-28). The average of sexual activity time was 22.5 ± 7.5 minutes (range, 10-40). Paired *t*-test revealed that mean HbA_{1c} at post-surgery was found to lowering of 2.5% (i.e. -0.2% in HbA_{1c}) compared to pre-surgery ($8.3 \pm 1.7\%$ vs. $8.5 \pm 1.9\%$). However, this difference was not statistically significant ($P = .479$). On the other hand, higher baseline levels of HbA_{1c} were associated with greater HbA_{1c} reductions after sexual activity ($r = -0.52$, $P < .05$). Further, Pearson's correlation analysis revealed that variable monthly intercourse were inversely or negatively related to HbA_{1c} and age (correlation coefficient $r = -0.08$; $r = -0.185$, respectively), again this correlation coefficient values were not statistically significant ($P = .626$; $P = .260$). There were also no significant changes in patients' medications for DM (insulin or other oral medications) in the last two years.

DISCUSSION

In this study, we found that sexual activity produced a reduction of 2.5% in HbA_{1c} level after PP usage in patients with type 2 DM. Although the decrease in HbA_{1c} was low compared to different exercise types that were analyzed in previous meta-analysis studies,^(7,12,13) the clinical implications might be actually more than that according to studies investigating natural history of DM after exercise.^(14,15) According to the United Kingdom Prospective Diabetes Study,⁽¹⁴⁾ exercise therapy can cause a HbA_{1c} lowering of -0.9% and may reduce retinopathy, nephropathy, and neuropathy in type 2 DM patients. Moreover, the overall microvascular complication rate was decreased by 25%, and there was a 25% reduction in DM related deaths, a 7% reduction

in all-cause mortality, and an 18% reduction in combined fatal and non-fatal myocardial infarction.⁽¹⁴⁾ In a meta-analysis study, investigators confirmed that exercise training reduces HbA_{1c} (-0.66%), an amount that would be expected to reduce the risk of diabetic complications significantly.⁽¹³⁾ A previous study reported that long term aerobic exercise training can modify the natural history of peripheral diabetic neuropathy or even prevent its onset.⁽¹⁵⁾ It is noteworthy that in the latter study by Balducci and colleagues the difference in HbA_{1c} values between two groups through the 4 years of the study was only -0.4%.⁽¹⁵⁾ Earlier studies provide convincing evidence that all forms of exercise training produce less or more benefits in the main measure of glucose control.⁽¹²⁾ Although it is well known that exercise is good for type 2 DM patients, which type exercise, aerobic or resistance, is better not known exactly. In a 2006 meta-analysis in which 27 controlled trials were evaluated, Snowling and Hopkins found that there were clear reductions (overall -0.8%; range, -0.1%-3.1%) in HbA_{1c} with different (aerobic, resistance and combined training) exercise models.⁽¹²⁾ The decrease in HbA_{1c} levels is sometimes much more than the average calculated in meta-analysis studies. For example, in a single randomized controlled study with a younger age group, it was shown that there could be up to 29% decrease (-3.1 ± 1.0%) in HbA_{1c} levels after aerobic exercise in DM patients.⁽¹⁶⁾ Although Boudou and colleagues showed highest decrease in HbA_{1c} in literature, limitation of their study was small population in that they had just ten patients in each arm of study and control groups.⁽¹⁶⁾

Although sexual activity might not be as intense as other exercises, it can be accepted as a kind of aerobic activity. Fascinatingly, it was shown that peak heart rate could increase nearly to 140 per minute during sexual activity in healthy adults.⁽¹¹⁾ Recently, a review of 26 randomized clinical trials confirmed that aerobic training and exercise volume (represented by frequency of sessions) was associated with changes in HbA_{1c}, while no variables were correlated with glycemic control induced by resistance training.⁽⁹⁾ Reduction in HbA_{1c} is associated with exercise frequency in supervised aerobic training, and with weekly volume of resistance exercise in supervised combined training.⁽⁹⁾ It was confirmed that reduction in HbA_{1c} is associated with exercise frequency in supervised aerobic training, and with weekly volume of resistance exercise in supervised combined training.⁽⁹⁾ In agreement with the findings of other studies sought for change in HbA_{1c} with exercise training, our findings showed that there was a reduction in HbA_{1c} level after sexual activity with PP usage in patients with type 2 DM. An important observation of our study was that monthly intercourse frequency was inversely related to HbA_{1c} reduction. Although the correlation was statistically insignificant, the clinical relevance of this correlation should not be underestimated.

Pioneer studies on effects of exercise frequency on glucose control and related physiological parameters have been extensively studied in patients with type 2 DM.^(9,14) In a systematic review article, it was shown that structured exercise durations of > 150 min per week were associated with HbA_{1c} reductions (-0.89%), while structured exercise

Table. Baseline demographics and clinical characteristics of study subjects.

Variables	Mean ± SD
Age (years)	59.9 ± 10.9
History of DM (years)	11.7 ± 3.4
History of ED (years)	2.7 ± 1.9
Mean time from surgery (months)	22.6 ± 6.8
PP usage for sexual activity (months)	9.9 ± 5.7
Average of sexual activity time (min)	22.5 ± 7.5
HbA _{1c} ; before PP usage (%)	8.5 ± 1.9
HbA _{1c} ; after PP usage (%)	8.3 ± 1.7

Abbreviations: SD, standard deviation; DM, diabetes mellitus; ED, erectile dysfunction; PP; penile prosthesis implantation; HbA_{1c}; glycated hemoglobin.

durations of ≤ 150 minutes per week were associated with less HbA_{1c} reductions (-0.36%).⁽¹⁰⁾ More recently, Umpierre and colleagues found that each aerobic exercise session added within a week might produce an additional reduction (-0.39%) in HbA_{1c} level.⁽⁹⁾ Moreover, it has been suggested that aerobic training at a higher intensity results in a larger improvement in endothelial function.⁽⁸⁾ In 2001, Boule and colleagues published a meta-analysis showing beneficial effects of exercise training on one aspect of glucose control in diabetic patients, the percent of HbA_{1c} in blood.⁽¹³⁾ In that meta-analysis, investigators demonstrated that post-intervention HbA_{1c} values were significantly reduced in the exercise groups compared with control groups while body mass was not.⁽¹³⁾

We reported here for the first time the clinical correlates of HbA_{1c} level after PP usage in type 2 DM. Despite its practical value, our study has limitations. First, because of the observational nature of our cohort, our findings must be interpreted within the context of the limitations applicable to observational, retrospective data. A further limitation is the lack of objective data on daily physical activity and diet of patients. It should be pointed out that information on general daily activity and diet was subjective. Although the study patients mentioned that their lifestyle did not change, they did not have any diary for activities and diet.

It is obvious that sexual activity requires mild to moderate effort compared with daily activities. In this study, we demonstrated that sexual activity and intercourse by the aid of PP is associated with improved glycemic control in type 2 DM patients in this study. From a useful standpoint, our findings also implied that more sexual activity was associated with more reduction in HbA_{1c}. The results of previous literature findings suggested that even small decrease in HbA_{1c} could make invaluable decrease in microvascular complication rates, retinopathy, nephropathy, and neuropathy in type 2 DM patients in long term.

CONCLUSION

We believe that our study using HbA_{1c} added support to the hypothesis that sexual activity helps to decrease HbA_{1c} in type 2 DM patients with PP. However, future researches are warranted with larger prospective design on different parameters of body composition changes.

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CONFLICT OF INTEREST

None declared.

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