Case Study on Single Bout of RET With PPBG on a Type II Diabetic Subject on Insulin Therapy.

Author Details: Dr.S.S.Subramanian

M.P.T (Orthopaedics), M.S (Education), M. Phil (Education), Ph.D (Physiotherapy). The Principal, Sree Balaji College Of physiotherapy, Chennai – 100. Affiliated To (Bharath) University, BIHER Chennai – 73.

Abstract:

Resisted exercises lowering PPBG with each session on a type II diabetic subject on insulin is demonstrated with an average drop of 21% of PPBG in every three sessions. With an improved glycemic control along with continued RET, quality of life of the subject, improves with lowering of associated complications such as peripheral neuropathy. **Keywords:** PPBG – Post Prandial Blood Glucose, FBG – Fasting Blood Sugar-RET – Resisted Exercise Training, IDF – International Diabetic Federation -ACSM – American College of Sports Medicine, ADA – American Diabetic Association

Introduction:

IDF claims an estimate of Type II diabetic mellitus as much as 7% of global population (IDF 2008). Clinical management of people with type II diabetic mellitus consists of medical, nutrition therapy, pharmacological therapy and exercises (Albright etal 2000). Efficacy of therapy focused on lowering PPBG is superior than FBG to optimize over all glycemic control (Edward etal 2000). Most people with type II diabetes mellitus are not active (Morto etal 2007) and regular physical activity may prevent or delay diabetes and its complication (Loimala etal 2003). Diabetes prevention study have demonstrated that PPBG was an in dependant risk factor for mortality in patients with type II diabetic mellitus than FBG (Hanefeld 1996). The objective of this study is to evaluate RET on PPBG in a type II diabetic mellitus subject on insulin.

Objective of the study:

Efficacy of Single bout resisted exercises on type II diabetic mellitus patients on insulin is not recorded earlier, hence this present case study is an innovative research study.

Background Information:

This case study subject with regular menstrual cycle, mother of two adult children, being a housewife with moderate level of activities was getting treated elsewhere for physical ailments with yoga, interferential therapy and traction intermittently. She is attending this centre for her physical ailments with only hands on exercise therapy, since 06-01-2016, with substantial improvement in neck and lowback pain, the focus was shifted on her diabetic management with physical activity using Physioball.

H/O

Mrs. XXX, Aged 46 Years, Endomorph, Vegetarian, Chemistry Graduate with her mother as known type II diabetic on insulin therapy.

C/O

Pain in the neck, low back region and knees since the past three years duration.

Drug H/O:

She is on 36 units of lantus insulin since 2014, along with T. Janumet after breakfast, T. Amren 3mg before breakfast, night only T. Almet 20 mg and T. Crestar 5 mg as duly prescribed by her diabetologist.

Her Blood Glucose Profile as on 15-05-2016

FBS: 161, PPG: 159, HBA₁C: 7.9%

http://www.casestudiesjournal.com/

Impact Factor 3.582 Case Studies Journal ISSN (2305-509X) – Volume 5, Issue 8-Aug-2016

Anthropometric Details: BMI: 44kg/m²

Waist Circumference: 97.5cm

On Physical Examination:

- > Obliterated cervical lordosis, anteverted scapula.
- > Mild painful and restricted end ranges of bilateral shoulder movements.
- > Obliterated lumbar lordosis, with abdominal muscles motor power grade III/ IV.
- > Flexion of lumbar spine restriction at end range with mild pain.
- > Left knee with mild degenerative change and end range of flexion restricted.
- Paraesthetic sensation of feet recorded with many weight bearing areas of feet being with grade I tenderness.
- > Ambulant with no gait deviation.
- Moderate exercise tolerance.

Materials and Methods:

The subject had her vegetarian lunch at 1.30 P.M and has undergone resisted exercises using Physioball in the Chennai Geriatric Center by 04.30 P.M her pre post PPG was measured and recorded using venous sample with Omron digital glucose monitor. Heart rate was manually palpated, before and after each session.

PPG and heart rate of the subject prior and after exercises were measured on three alternate days. She was treated with Physioball and manual resisted exercises in sitting on the ball, supine, side, prone lying postures to both upper, lower extremities and the trunk with a set of 15 exercises and five pepetitions with a duration of 35 minutes of each session.

Results:

Subjects pre and post exercise PPBG and, heart rate, were calibrated and recorded. She had sweating throughout the exercise, no hypoglycemia was recorded.

As the same timings and procedure, with vegetarian food were followed three such pre and post PPBG and, heart rate were recorded of the same subject are presented below enabling for discussion:

S.No				
1	Date	Parameter mg	Heart Rate / Minute	Intensity of Exercise % of Maximal Heart Rate
	16-05-2016	PPBG mg		
	Pre	186	96	
	Post	142 (24%) Decreases	147	85%
2	17-05-2016			
2	Pre	205	92	
	Post	168 (18%) Decreases	142	82%
3	19-05-2016 Pre	174	88	
	Post	134 (22%) Decreases	152	87%

Table results of pre and post PPBG, and heart rate

Discussion:

- 1. ACSM evidence statement on medication dosage adjustments to prevent exercise associated hypoglycemia may be required by individuals using insulin are adhered with prior to exercise and after exercises (Rosen Stack etal 2004) patients treated with fixed amounts of insulin, exercise reduced glycemia (Hubinger etal 1985).Moderate exercise may help to prevent the onset of peripheral neuropathy (Balducci etal 2006). ADA guidelines stated that persons with peripheral neuropathy should avoid weight bearing activities to reduce the risk of foot ulcerations (Vinik 1995). As up to 40% of diabetic individuals may experience peripheral neuropathy and 60% of lower extremity amputation in Americans are related to diabetes (Pham etal 2000). This case study subject having early signs of peripheral neuropathy as mentioned in the evaluation has partially improved with decreased pain and tenderness in the sole of the feet could be due to an improved glycemic control and improved regional blood flow in the feet.
- 2. A better correlation has been noted between hba₁c and mean PPBG (Avignon 1997 etal) PPBG was used as diagnosing criteria set by ADA (Rosediani etal 2006). A Japanese study using PPBG as predicting diabetes with higher specificity and sensitivity (Takashi etal 2006). Soon Thornpututal 1999 have recorded that PPBG, a good index of glycemic control in type II diabetic mellitus patients having near normal FBG. Postprandial glycemic level is the main marker than fasting glycemia (Bonora etal 2001) and postprandial glycemia has been more related to the development of macroangiopathy than fasting glycemia (Hanefield 1996).
- 3. Moderate intensity exercises in the post abortive state has been shown to decrease plasma glucose concentrations and is followed by an increase in insulin sensitivity (Martin etal 1995) but as during daily life physical exercises are mostly taken in the postprandial rather than in the post abortive state, many studies have studied the effect of exercises on PP glycemia in patient with insulin dependent diabetes (Develin etal 1987). The exercise induced enhancement of glucose clearance in the post exercise period is closely related to the depletion of muscle glycogen during exercise (Zorzon etal 1986). Acute exercises induce translocation of GLUT4 in skeletal muscles among type II diabetic subject (Kennedy etal 1999). With an average intensity of 84% of maximal heart rate, this case study subject having done resisted exercises using Physioball on three separate regime as shown in table, has a lowered PPBG.
- 4. PPBG hyper glycemia has been associated with increased risk of micro vascular (Deveciana etal 1995) and macro vascular complications Lowe etal 1997 have recorded the risk of CV disease and all-cause mortality increases with increasing PPBG. Also honolulu heart study have demonstrated an increased coronary heart disease events is independently associated with increased PPBGC (Donanne etal 1987). Resisted exercises were PPBG among type II diabetic patients (Subramanian 2016), With an average drop in PPBG of 21% each session of RET, apart from an improved glycemic control, the subject has benefited with decreased risk for micro and macro vascular complications in line with the above researches.

Conclusion:

Lowering of PPBG with RET with Physioball on this subject with insulin therapy provides confidence to the subject on the effectiveness of exercises in improving glycemic control with her effort. Also an improved blood flow with each session helps to overcome musculoskeletal ailments of this subject.

Acknowledgment:

- 1. Chennai Geriatrics Centre, No.32, II nd Main Road, Kasthuribai Nagar, Chennai-600020.
- 2. Sree Balaji College of Physiotherapy, Velachery Main Road, Narayanapuram, Chennai-600100.

References:

http://www.casestudiesjournal.com/

Impact Factor 3.582 Case Studies Journal ISSN (2305-509X) – Volume 5, Issue 8–Aug-2016

- 1. IDF (2008) Diabetes: A Global Threat Diabetes Atlas, 3rd edition, IDF, Brussels, PP: 1-5.
- 2. Al bright A, Franz M, Hornsby G etal. ACSM position Stand Exercises and Type II Diabetes Med Sci Sports Exerc: 2000: 32: 1345 1360.
- 3. Edward J Bastyr, Charles A, Stuart, Robert G. Brodows, Sherwyn Schwartz etal 2000. Therapy Focused on Lowering PP Glucose, Not Fasting Glucose, May be Superior for Lowering HBA₁C, Diabetes Care; Volume 23, Number -9.
- 4. Morrato EH, Hill JO, Wyatt HR, Ghushchyan V Sullivan PW. Physical Activity in US Adults with Diabetes and at Risk for Developing Diabetes 2003. Diabetes Care 2007; 30(2): 203-9.
- 5. Loimaala A, Huikuri HV, Koobi T, Rinne M, Nenonen A, Vuori L. Exercises Training Improves Baroreflex Sensitivity in Type II Diabetes. Diabetes: 2003 52(7) 1837-42.
- 6. Hanefeld M, Fischer S, Julius U, Schulze J, Schwanebeck U etal. Risk Factors for Myocardial Infarction and Death in Newly Detected NIDDM: The Diabetes Intervention Study 11 Year Follow up. Diabetologia 39:1577-1583, 1996.
- 7. Rosenstock J, Hassman DR, Madder RD etal. Repaglinide versus Nateglinide Monotherapy: A Randomized, Multicenter Study. Diabetes Care: 2004, 27 (6) 1265-70.
- 8. Hubinger A, Ridderskamp I, Lehman E, Gries FA (1985). Metabolic Response to Different Forms of Physical Exercise in Type I Diabetics and the Duration of the Glucose Lowering Effect. EURJ. Clinic Investi 15: 197-203.
- 9. Balucci S, Leonetti F, Di Mario u and Fallucca F. Is a Long Term Aerobic plus Resistance Program Feasible for and Effective on Metabolic Profile in Type II Diabetic Patients care 2004: 27: 841-842.
- 10. Vinik AI, Neuropathy. In the Health professionals Guide to Diabetes and Exercises. Alexandria (VA) ADA 1995, P: 183-97.
- 11. Pham H, Armstrong DG, Harvey C, Harkless LB, Giurini JM, Veves A. Screening Techniques to Identify People at High Risk for Diabetic Foot Ulceration: A prospective Multicenter Trial. Diabetes Care 2000, 3(5) 606-11.
- 12. Avignon A, Radauceanu A, Monnier L, Non Fasting Plasma Glucose as a Better Marker of Diabetic Control than Fasting Plasma Glucose in Type 2 Diabetes. Diabetes Care. 1997 Dec; 20(12):1822-6.
- 13. Rosediani M, Azidah AK, Mafauzy M. Correlation between Fasting Plasma Glucose, PP and hba₁c and fructosamine Med J Malaysia 2006: 61, 67-71.
- Takahashi K, Uchiyama H, Yanagisawa S, Kamae I. The Logistic Regression and ROC Analysis of Group Based Screening for Predicting Diabetes Incidence in Four Years. Kobe J Med Sci 2006: 52:171-80.
- 15. Soonthornpun S, Rattarasarn C, Rattarasarn, Leelawattana, Setasuban W. Postprandial Plasma Glucose: A Good Index of Glycemic Control in Type II Diabetic Patients having near Normal Fasting Glucose levels. Diabetes Res Cli Pract 1999: Oct, 46(1): 23-7
- 16. Bonora E, Francesco. C, Simonetta L. Plasma Glucose Levels Throughout the Day and the hba₁c Interrelationships in Type II Diabetes. Implications for Treatment and Monitoring of Metabolic Control. Diabetic Care; 2001, 20:1822-826.
- 17. Martin I K, A Katz T, Wahren (1995). Splanchnic and Muscle Metabolism during Exercise in NIDDM Patients. AMJ Physiology 269. E 583-5590.
- Delvin J T, Hirshman M, Horton ED, Horton ES (1987). Enhanced Peripheral and Splanchnic Insulin Sensitivity in NIDDM Men After Single Bout of Exercise Diabetes: 36, 434-439.
- 19. A. Zorzano, T. W. Balon, M. N. Goodman, N. B. Ruderman. Glycogen Depletion and Increased Insulin Sensitivity and Responsiveness in Muscle after Exercise. AMJ Physiol 251: E 664-E669.
- 20. Kennedy JW¹, Hirshman MF, Gervino EV, Ocel JV, Forse RA, Hoenig SJ, Aronson D, Goodyear LJ, Horton ES. Acute Exercise induces GLUT4 Translocation in Skeletal Muscle of Normal Human Subjects and Subjects with Type II Diabetes. Diabetes (1999) May: 48 (5): 1192-1197.

Impact Factor 3.582 Case Studies Journal ISSN (2305-509X) – Volume 5, Issue 8–Aug-2016

- 21. De Veciana M, Major C A, Morgan M A, Asrat T, Toohey JS, Lien JM, Evans AT. Postprandial Versus Pre-prandial Blood Glucose Monitoring In Women With Gestational Diabetes Mellitus Requiring Insulin Therapy. N Engl J Med. 1995 Nov 9; 333(19):1237-41.
- 22. Lowe LP, Liuk, Greenland P, Metzger BE, Dyer AR, Stamler. The Chicago Heart Association Detection Project in Industry Study. Diabetes Care 1997 Feb; 20(2): 163-169.
- 23. Donahue AP, Abbott RD, Reed DM, Yano k. Post challenge Glucose Concentration and Coronary Heart Disease in Men of Japanese Ancestry. Honolulu Heart Program. Diabetes. 1987 Jun;36(6):689-92.
- 24. Dr. S. S.Subramanian, 2016. Case Study of Single Bout Resisted Exercises of Arms versus Legs on PPBG in a Type II Diabetic Subject. Page 11791-11795.