



Target pathology:

Metabolic

Student name:

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Case Description

A 48 year old woman presented herself to the exercise physiology (EP) clinic at the Canberra Hospital (TCH) as directed by her general practitioner (GP). She had developed late onset diabetes mellitus and was struggling to control her high blood sugar levels. She was taking daily medication to reduce her blood sugar levels. Her personal goal was to lose weight and be more active with her children. The patient has a small amount of peripheral neuropathy in the right foot; however this does not limit her exercise. She works part time and is able to exercise at least 4 days a week. She indicated that exercise could become part of her daily routine if she was instructed on what exercises to undertake.

Patient Assessment

Prior to starting an exercise program the patient was instructed to have some blood tests to determine her fasting blood glucose levels and cholesterol. These values are listed to the right. Within the EP clinic the patient had her vital signs measured and completed a Balke treadmill exercise test until exhaustion¹. Her blood glucose levels were measured before and after the test. These values are listed below and to the right.

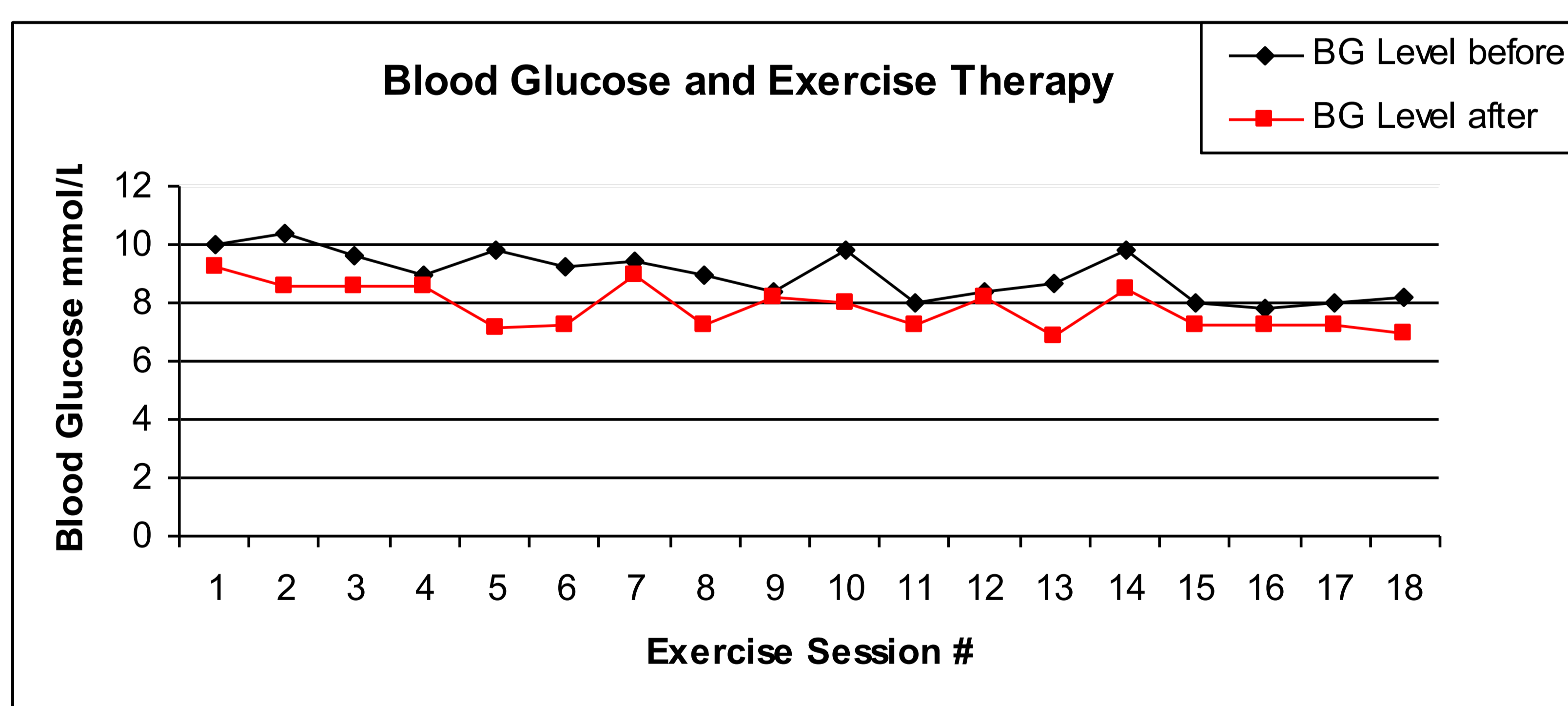
Lab Tests	Result	Norms
Fasting Glucose (mmol/L)	11	<6
HbA1c (%)	10.1%	<10%
Triglycerides (mmol/L)	11	<2
Total Cholesterol (mmol/L)	8	<4
HDL (mmol/L)	2	>1
LDL (mmol/L)	6	<2.5

Anthropometric/Vital Signs	Result	Healthy Range
Height (cm)	165	-
Weight (kg)	98	-
BMI (kg/m ²)	36.00	18.5 – 24.99
Waist (cm)	109	<90cm
WHR	1.03	<0.79
BP (mmHg)	139/91	110-125 / 65-80

Exercise test	Result	Healthy range
Balke Treadmill Test (ml/kg/min)	14.31	24-33
Glucose before test (mmol/L)	9.4	5-12
Glucose after test (mmol/L)	9.2	5-12

Exercise Therapy

Through consultation with the patient, it was determined that she would exercise 3 times a week for a period of three weeks, under the guidance of an exercise physiologist in a group setting². She was instructed to take her blood glucose reading just prior to the exercise session and then once again 30 minutes after the exercise session. All the exercise sessions were completed mid-morning with at least one rest day between each session. Her blood sugar levels were plotted graphically over the six week period, and are presented below.



The patient exercised on three different aerobic apparatus (bike, treadmill, cross trainer) each session. She started with 10min on each apparatus and increased the time by 1 minute each week. She monitored her rate of perceived exertion (RPE) which was to stay between 2-3/10 for each session. She combined strength training with her aerobic exercise, completing 3 sets of five different exercises, including leg press, lat pulldown, seated row, step up, and a squat curl. Initially she completed 10 repetitions of each exercise, increasing them each week until she reached 16 repetitions each set. She had to once again keep her RPE at 2-3/10.

Patient Outcome

Over the six week period the patient increased her V_{O2}max from 14.31 ml/kg/min to 16.81 ml/kg/min. Her fasting blood glucose level also improved from 11mmol/L to 8.6mmol/L. The patients BMI reduced from 36 to 34.53 and her body weight decreased by 4kg. All her cholesterol markers improved, however, they are still in the unhealthy range and she is now on prescribed medication to lower her lipid levels. The patient was enthusiastic about her exercise and it is anticipated that she will continue with her exercise program in the future.

Reflection

Diabetes affects large arteries, small blood vessels and capillaries. This patient's diabetes was poorly controlled which caused a reduction in her anaerobic threshold and peak V_{O2}³. Further to this, a poorly regulated diabetic patient will increase their use of fatty acids for energy instead of the normally preferred carbohydrate. This means the patient is required to utilise more O₂ for the same energy production, fatiguing them more rapidly. It was fortunate that this patient was very motivated to change her exercise habits. Someone with less motivation would not have had such positive outcomes.

References

1. Froelicher, V. F., Jr., Thompson, A. J., Jr., Davis, G., Stewart, A. J., & Triebwasser, J. H. (1975). Prediction of maximal oxygen consumption. Comparison of the Bruce and Balke treadmill protocols. *Chest*, 68(3), 331-336.
2. Durstine, J. L., & Thompson, P. D. (2001). Exercise in the treatment of lipid disorders. *Cardiol Clin*, 19(3), 471-488.
3. Wasserman, K., Hansen, J., Sue, D., Stringer, W., & Whipp, B. (2005). Principles of Exercise Testing and Interpretation. 4th Ed, LWW: Philadelphia.