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A Review on Basal Bolus Regimen in Type 1 and Type 2 Diabetes Mellitus.

Agatha mol Eldhoes*, Amurtha Antony P, Irene Jose, Aji Varghese, K Krishnakumar
St James college of Pharmaceutical Sciences, St James Hospital Trust Pharmaceutical Research Center (DSIR Recognized) Chalakudy, Kerala.

ABSTRACT

Diabetes mellitus is a disease that affects the way the body produces and uses insulin to control blood sugar. Basal bolus insulin therapy is a combination of short and long acting insulin. But, now a days there is a deadline in this therapy due to the use of automatic insulin pump and continuous glucose monitoring. It reduces A1C without any risk of hypoglycemia. This article review regarding role of basal bolus therapy in diabetes and in depth understanding of DDT including its dose calculation

Keywords: Basal bolus insulin, TDD

*Corresponding Author Email: drhemant45@gmail.com
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INTRODUCTION

Diabetes also called diabetes mellitus is a condition that affect the body's ability to produce or use insulin to control blood sugar. Insulin (is a hormone) produced by pancreas allows the body to use sugar from the food we eat and stores glucose for future needs. Insulin helps in maintaining the blood sugar level from getting too high or too low.

Basal bolus Insulin therapy is an option for the management of diabetes. Intensive therapy of taking combination of short and long acting insulin, this method of diabetes management mimics the role of insulin in a normal body. Basal bolus regimen is now known as intensive or flexible insulin therapy.

People without diabetes can eat at any time of the day without a dramatic change in the blood sugar level. But patients with diabetes cannot produce or use insulin effectively. So they can use insulin injections throughout the day to mimic the two types of insulin- basal & bolus. This type of therapy is becoming less frequent nowadays as automatic insulin pumps and continues glucose monitoring replace them. However basal bolus regimen remains the foundation for newer technologies.

Basal Insulin

A Basal Bolus insulin therapy involves taking basal insulin [long acting insulin] to keep blood sugar level stable during periods of fasting and bolus [short acting] insulin to prevent rise in blood sugar resulting from meals.

Basal insulin also known as background insulin is long acting insulin which is taken once / twice a day to keep blood sugar level consistent. This boost the activity and remains effective for 24 hours a day. Basal insulin provides a constant supply of insulin which brings down the high rating glucose level. Basal insulin ensures that the cells of our body are supplied with constant stream of glucose throughout the day.

Basal insulin is delivered in three types. They differ on their onset of action, duration and effectiveness.

1. Intermediate acting – NPH [Humulin N, Novolin N]. Onset of action within a hour/ two. It reaches its peak effect in 4-12 hours and remains in body up to 24 hours.
2. Long acting – Detemir [Levemir] & Glargine [Basaglar]. Onset of action within 2 hours. Effect last about 24 hours.
3. Ultra long acting – Degludec [Tresiba], Glargine u-300 [Toujeo]. Onset of action within 6 hours. They can last 36 hours or more. They doesn't reach peak.

Dosage of Insulin

TYPE 1 DM

Dose of insulin depends on TDD [Total Daily Dose]. Adults with Type 1 DM require TDD of 0.6 units/kg/day.

50/50 rule

50% of TDD given as basal dose and the remaining 50% given as bolus dose. For example: If a person who weighs 110 lb, TDD would be 30 units. Half of TDD [15 units] initiated as basal insulin and remaining 15 units given as bolus dose and given as follows.

A] Long acting insulin like Glargine and Detemir given as basal along with short or rapid acting insulin such as regular [NPH] which is given as bolus. From the above example 15 units of basal insulin given once daily and 5 units of bolus insulin given TID with meals.

B] NPH can be given twice daily as basal dose. Bolus dose should be decreased by 20% and given twice daily to prevent hypoglycemia.

Premixed Insulin

2/3 of TDD is given in the morning before breakfast and 1/3 in the evening prior to meals. For the same example mentioned above 20 units given in the morning prior to breakfast, 10 units given in the evening prior to meals. This is not generally used for individuals with Type 1 DM. Since it is difficult to adjust for changes in diet, sick condition and can lead to impaired glycemic control.

TYPE 2 DM

For average sized individual basal insulin alone given as 10 units once daily and for obese patients 0.1 – 0.2 units/kg/day. If this basal insulin is administered in the evening dose of insulin should be titrated to achieve fasting blood glucose level in expected range. If required, for pre and post meal blood glucose monitoring bolus insulin can be added.

Pre mixed insulin is initiated based on 0.2 units/kg/day of TDD. 2/3 given in the morning before breakfast and 1/3 given in the evening before last meal.

BOLUS INSULIN

Bolus insulin is being taken at meal times to bring blood sugar level under control after food. This insulin is also called rapid acting insulin. Actions starts in 15 minutes, peak in 1 hour and continue action for 2-4 hours.

Example: Aspart [Novolog]

Lispro [Humalog]

Glulisine [Apidra]

It is important that the patient should be known about the amount of carbohydrate that he taken so that it is easy to calculate amount of insulin they need. Insulin to carbohydrate ratio is important

for diabetic patients. Correction factor can be used to determine how much insulin to inject. For example: For a patient with TDD 30 units then 1 unit of insulin decreases blood glucose by 60mg/dl [1800/30] This is the correction factor that is 1800/TDD according to rule of 1800. If the blood glucose level is 250 mg/dl and we need to achieve 120 mg/dl then the individual should inject 2 units of rapid acting insulin.

That is

[Current blood glucose – Target blood glucose]/Correction Factor

[250-120]/60 =2 units

How many grams of carbohydrate is covered by 1 unit of insulin is found by rule of 500 that is 500/TDD= X grams of carbohydrates.

Advantages of Basal Bolus Insulin

- To keep blood sugar in healthy range as often as possible.
- Flexibility
- Reduces A1c or average blood sugar level over a more extended period.
- Immediate and long term glucose control, so it can be used in people who travel across time zones and can do shift works.

Basal bolus approach that includes Levemir or Lantus

- Overnight blood glycemic control;
- Do not cause hypoglycemia.
- More flexibility in meal and snack time.

Disadvantages

- People need to take 4 injections /day
- Emotional and social challenges.
- Difficult to maintain
- People must keep supply of both type of insulin with them.
- Uncomfortable for children.

CONCLUSION

Basal bolus insulin therapy include taking slow acting insulin to moderate blood glucose when fasting and short acting insulin around mealtimes to quickly reduce the impact of dietary glucose. We also confirmed that basal bolus insulin regimen is effective and safe. Thus basal bolus therapy might be offered to type 2 dm subjects inadequately controlled with other insulin strategies.

REFERENCES

1. Clement S, Braithwaite SS, Magee MF, et al; American Diabetes Association Diabetes in Hospitals Writing Committee. Management of diabetes and hyperglycemia in hospitals. Diabetes Care 2004;27:553–591
2. Smiley DD, Umpierrez GE. Perioperative glucose control in the diabetic or non-diabetic patient. South Med J 2006;99:580–591
3. Lazar HL, Chipkin SR, Fitzgerald CA, Bao Y, Cabral H, Apstein CS. Tight glycemic control in diabetic coronary artery bypass graft patients improves perioperative outcomes and decreases recurrent ischemic events. Circulation 2004;109:1497–1502
4. Ramos M, Khalpey Z, Lipsitz S, et al. Relationship of perioperative hyperglycemia and postoperative infections in patients who undergo general and vascular surgery. Ann Surg 2008;248:585–591
5. Risum O, Abdelnoor M, Svennevig JL, et al. Diabetes mellitus and morbidity and mortality risks after coronary artery bypass surgery. Scand J Thorac Cardiovasc Surg 1996;30:71–75
6. Umpierrez GE, Isaacs SD, Bazargan N, You X, Thaler LM, Kitabchi AE. Hyperglycemia: an independent marker of in-hospital mortality in patients with undiagnosed diabetes. J Clin Endocrinol Metab 2002;87:978–982
7. Furnary AP, Gao G, Grunkemeier GL, et al. Continuous insulin infusion reduces mortality in patients with diabetes undergoing coronary artery bypass grafting. J Thorac Cardiovasc Surg 2003;125:1007– 1021
8. Van den Berghe G, Wouters P, Weekers F, et al. Intensive insulin therapy in the critically ill patients. N Engl J Med 2001; 345:1359–1367
9. Inzucchi SE. Clinical practice. Management of hyperglycemia in the hospital setting. N Engl J Med 2006;355:1903–1911
10. Van den Berghe G, Wilmer A, Hermans G, et al. Intensive insulin therapy in the medical ICU. N Engl J Med 2006;354: 449–461
11. Kitabchi AE, Freire AX, Umpierrez GE. Evidence for strict inpatient blood glucose control: time to revise glycemic goals in hospitalized patients. Metabolism 2008; 57:116–120
12. Turnbull PJ, Sinclair AJ. Evaluation of nutritional status and its relationship with functional status in older citizens with diabetes mellitus using the mini nutritional assessment (MNA) tool—a preliminary investigation. J Nutr Health Aging 2002;6:185–189

13. Pomposelli JJ, Baxter JK 3rd, Babineau TJ, et al. Early postoperative glucose control predicts nosocomial infection rate in diabetic patients. JPEN J Parenter Enteral Nutr 1998;22:77–81
14. Noordzij PG, Boersma E, Schreiner F, et al. Increased preoperative glucose levels are associated with perioperative mortality in patients undergoing non-cardiac, nonvascular surgery. Eur J Endocrinol 2007;156:137–142
15. Malouf R, Brust JC. Hypoglycemia: causes, neurological manifestations, and outcome. Ann Neurol 1985;17:421–430
16. Gearhart JG, Duncan JL 3rd, Replogle WH, Forbes RC, Walley EJ. Efficacy of sliding-scale insulin therapy: a comparison with prospective regimens. Fam Pract Res J 1994;14:313–322
17. Hirsch IB. Sliding scale insulin - time to stop sliding. JAMA 2009;301:213– 214
18. Schnipper JL, Barsky EE, Shaykevich S, Fitzmaurice G, Pendergrass ML. Inpatient management of diabetes and hyperglycemia among general medicine patients at a large teaching hospital. J Hosp Med 2006; 1:145–150
19. Umpierrez GE, Hor T, Smiley D, et al. Comparison of inpatient insulin regimens with detemir plus aspart versus neutral protamine hagedorn plus regular in medical patients with type 2 diabetes. J Clin Endocrinol Metab 2009;94:564–569
20. Umpierrez GE, Smiley D, Zisman A, et al. Randomized study of basal-bolus insulin therapy in the inpatient management of patients with type 2 diabetes (RABBIT 2 trial). Diabetes Care 2007;30:2181–2186
21. Kitabchi AE, Umpierrez GE, Murphy MB, Kreisberg RA. Hyperglycemic crises in adult patients with diabetes: a consensus statement from the American Diabetes Association. Diabetes Care 2006;29:2739– 2748
22. Levetan CS, Magee MF. Hospital management of diabetes. Endocrinol Metab Clin North Am 2000;29:745–770
23. Umpierrez G, Maynard G. Glycemic chaos (not glycemic control) still the rule for inpatient care: how do we stop the insanity? J Hosp Med 2006;1:141–144
24. Boord JB, Greevy RA, Braithwaite SS, et al. Evaluation of hospital glycemic control at US academic medical centers. J Hosp Med 2009;4:35–44

25. Wysham C, Bhargava A, Chaykin L, et al Effect of insulin degludec vs insulin glargine U100 on hypoglycemia in patients with type 2 diabetes: the SWITCH 2 randomized clinical trial. JAMA 2017; 318:45–56pmid:28672317.