1. Medical Condition

DIABETES MELLITUS (INSULIN-DEPENDENT)

Introduction

This condition, also known as Type-1 Diabetes Mellitus (type-1 DM), characteristically occurs in childhood or adolescence and may therefore implicate athletes. Cases of elite athletes with type-1 DM are not uncommon and it behooves all physicians to enable these individuals to meet their full potential in sport.

The pathophysiology invokes a well-documented genetic susceptibility to the destruction of most insulin-secreting pancreatic islet cells resulting in insulin deficiency causing hyperglycaemia and the risk of ketoacidosis. Aside from the genetic, immune-mediated causes of type-1 DM, environmental influences including exposure to certain viruses, cow's milk albumin and even the geographic location of populations have been implicated.

Early diagnosis in athletes, in accordance with accepted methods of investigation enables timely recognition and application for Therapeutic Use Exemption. Most type-1 DM patients are diagnosed before the age of 30 years.

2. Diagnosis

- A. Medical history

Type-1 DM characteristically presents with a history of symptomatic hyperglycaemia. Polyuria, polydipsia and unexplained weight loss are common clinical associates. However a spectrum of vague symptoms including inappropriate lethargy, nausea, blurred vision and recalcitrant fungal or bacterial infections may be the first early clues. Astute clinicians will include undiagnosed, type-1 DM on their list of differential diagnoses in such young patients.

- B. Diagnostic criteria

Agencies such as the National Diabetes Data Working Group (Australia) and the American Diabetes Association have well-established diagnostic criteria that must be met before a patient is declared diabetic and in this instance, be labeled as insulin-dependant. These criteria identify specific fasting plasma glucose levels and should be referenced. The traditional oral glucose tolerance test may assist in identifying previously undeclared diabetics but this test may be influenced by aging and concurrent drug use. Specialist input is mandatory in most major medical communities where diabetic clinics investigate, monitor and educate affected patients.

- C. Relevant medical information

A relevant medical history as described previously, together with suggestions of a familial link should always alert the consulting physician. Where the patient happens to be an active adolescent involved in high performance sport, the diagnosis of type 1 DM should always be considered, appropriately investigated and referred for specialist opinion as necessary.

3. Medical best practice treatment

- A. Name of prohibited substance

Insulin in a variety of preparations ranging from rapid to long-acting forms is the standard treatment for type-1 DM. The dose of insulin is determined in accordance with such factors as food intake and energy expenditure and the goal of all insulin regimes is to control postprandial plasma glucose surges. Such regimes are individualized in accordance with monitored plasma glucose levels from fingertip blood samples.

- B. Route

Subcutaneous injection or infusion

- C. Frequency

The dosage and frequency of insulin administration is entirely dependent upon individual requirements. Plasma glucose levels provide an immediate indication of insulin need, whilst the determination of glycosylated haemoglobin provides an indication of plasma glucose control over the preceding 1 to 3 months.
Many active type-1 diabetics, including some high level athletes, may employ small indwelling pumps to achieve a continuous subcutaneous infusion of insulin. These enable a predetermined basal rate of insulin infusion to be augmented manually before meals. Continuous infusion is a costly option and has been associated with the potential for hypoglycaemia particularly where athletes are adapting to metabolic control.

- D. Recommended duration of treatment

The continuing need for insulin is self-evident in those with true type-1 DM. Given their review by diabetic specialist clinics it is prudent for those athletes requiring continued Therapeutic Use Exemption to reapply annually for this exemption.

4. Other non-prohibited alternative treatments?

Whilst the treatment of type-1 DM includes dietary control and patient education, insulin, for which there is no non-prohibited alternative, is the mainstay of therapeutic control. Oral antidiabetic agents have no place in the treatment of type-1 DM.

5. Consequences to health if no treatment

If an athlete with type-1 DM does not receive insulin regularly or in adequate amounts, there is an increased risk of diabetic keto-acidosis, a life-threatening event. Inadequate or irregular treatment will also increase the risk of longer-term comorbidities including retinopathy, nephropathy, various neuropathies, an increased risk of ischaemic heart disease.

6. Treatment monitoring

The monitoring of patients with type-1 DM rests with the various agencies currently available to manage this condition. The primary care physician, diabetic nurse educator and diabetes physician will all play a part.

7. TUE validity and recommended review process

As described, treatment is for life and demands review by appropriate specialist clinicians. Athletes competing at the elite level will be well-educated in the control of their diabetes and experienced in coping with acute crises. Their requirement for insulin is individualized and should be under automatic review by the agencies mentioned above. A commonsense approach to the annual review of TUE is recommended in these cases.
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8. Any appropriate cautionary matters

Prolonged periods of poor plasma glucose control carries well-documented clinical consequences and these have been discussed elsewhere.

9. References

1. THE MERCK MANUAL (17th Edition) Chapter 13, Disorders of Carbohydrate Metabolism

2. National Diabetes Data Working Group
www.aihw.gov.au/committees/nddwg/index.cfm

3. American Diabetes Association. Clinical Practice Guidelines (2006) care.diabetesjournals.org/content/vol29/suppl_1

4. Silverstein J, Klingensmith, Copeland GK, et al Care of Children and Adolescents With Type 1 Diabetes: A statement of the American Diabetes Association. Diabetes Care 2005 28: 186-212.