PARADOXICAL HYPERGLYCEMIA FROM OVERINSULINIZATION

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PARKLAND MEMORIAL HOSPITAL

GRAND ROUNDS

THOUGHTS ON THE TREATMENT OF DIABETES MELLITUS

H. F. ROOT

Hypoglycemic reaction due to the administration of insulin in diabetic patients is a frequent occurrence and is, in mild form, usually harmless. It is even considered by some to be an indication of good control.

FREDERICK M. ALLEN

A superstitious fear of hypoglycemia has been widely disseminated. It is not true that well controlled patients must live under a constant danger of hypoglycemic attacks and their imagined consequences.

- - A considerable part of the bad record (development of complications or concomitants) is ascribable to careless, weak-willed or disobedient patients - -

T. S. DANOWSKI

- - the doctor - - must take but little credit for the favorable outcome and forbear punitive attitudes towards the patient -- when complications or concomitants develop.

P. H. LAVIETES AND J. P. PETERS

- - It must be recalled that overinsulinization may be followed by excessive hyperglycemia; the blood sugar must be interpreted in the light of clinical conditions lest this lead to an increase in insulin dose when reduction is in order- -

- - Attempts to insist on a normal blood sugar at any special times of day are neither practical nor necessarily desirable - -

- - Even in the best regulated cases blood sugar will, at times of the day, rise to excessive heights if, at other times hypoglycemia is to be avoided.

H. P. HIMSWORTH

I suggest that a diabetic may be considered to have achieved satisfactory physical and mental health when he has satisfied the three following standards. He must have sufficient energy for his needs; he must maintain his weight about the accepted normal figure; AND HE MUST NOT BE SUBJECT TO HYPOGLYCEMIC SYMPTOMS.

- - It is unfortunate, but it is necessary that the absence of symptoms from overdosage with insulin must be included as one of the standards of successful treatment of diabetes. TO SATISFY CHEMICAL CRITERIA AT THE PRICE OF OVERTREATMENT (HYPOGLYCEMIA) IS THE ANTITHESIS OF RATIONAL THERAPEUTICS.

J. I. GOODMAN

- - Lest the treatment become worse than the disease, avoidance of hypoglycemia is the physicians chief responsibility - -

LEO P. KRALL

- - Many diabetic patients have insulin reactions that are undetected - - Is it because there is less awareness of insulin reactions; have the symptoms changed or are the symptoms so mild that they are hard to recognize and thus of little importance?

- - All these questions may be answered "yes" except that <u>all insulin reactions must be considered important</u>.

AIMS IN TREATMENT OF DIABETES

I. Immediate Goals

(1) Prevention of ketoacidosis
(2) Prevention of obligatory polyuria (osmotic diuresis)
(3) Prevention of hypoglycemia
(4) Normalization of the blood glucose - but never buy "chemical control" at the price of hypoglycemic episodes

II. Distant Goals

(1) Prevention of the complications or amelioration of the genetic concomitants of the diabetic state i.e. micro-angiopathy (retinopathy, K-W, neuropathy, gangrene)
(2) Prevention of accelerated atherosclerosis

DANGERS OF HYPOGLYCEMIA

1. Permanent cerebral damage
2. Death of patient
3. Death of others - auto accidents, etc.
4. Precipitation of angina, myocardial infaction or arrhythmia
5. Worsening of the diabetic state
   a. Precipitation of paradoxical hyperglycemia
   b. Precipitation of ketoacidosis

Case 1 - J.K. - This 56 year old man with diabetes of 3 years duration had been followed in Diabetes Clinic since onset of his diabetes and was well controlled on 40 u of NPH insulin a day. The head nurse in the Diabetes Clinic called attention to the patient because she was suspicious that he was obtaining insulin for non-clinic patients. Apparently he had been returning to clinic at frequent intervals for refill of his prescription. When seen by a physician it was discovered that he was using a 5 cc syringe instead of a 1 cc insulin syringe. He had broken his syringe while visiting his daughter in a nearby city. She gave him the 5 cc syringe that was left in her home years before by a visiting physician. Instead of taking 50 u a day the patient had been taking 200 u a day. A 16 lb. weight gain was documented over the past month. He had no symptoms of hypoglycemia except for excessive driven hunger and occassional nervousness and tremulousness relieved by eating.

Case 2 - L.C.S. - This 37 year old woman from Waco, Texas with known diabetes of 2 years duration was referred to PMH because of worsening of her diabetes over a 6 month period. During this time her insulin requirements increased progressively from 50 u to 110 u of NPH insulin per day. When previously well controlled her FBS ranged between 90-120 mg%. In the past 6 months excessive glycosuria was associated with increasing hyperglycemia. During the past month FBS were in the range of 100-340 mg%. Careful history disclosed that the patient suffered from occassional nightmares and frequent mid-morning headaches relieved by eating lunch. In addition her family noted marked personality changes in the late afternoon characterized by temper tantrums, aggressive and at times belligerent behavior. According to her daughter this improved markedly following the evening meal. The patient responded promptly to alteration in the distrubtion of calories in her diet and reduction in insulin. Within 1 week insulin was reduced to 35 u a day which produced FBS in the range of 130-150.

PHYSIOLOGIC ACTIONS OF INSULIN

LIVER	1. Decreases Hepatic Glucose Output by Decreasing Glycogenolysis and Gluconeogenesis
	2. Converts the Liver from an Organ of Glucose Output to One of Glucose Uptake
	3. Increases Glycogen Synthesis
	4. Decreases Ketogenesis
MUSCLE	1. Increases Glucose Utilization
	2. Decreases Amino Acid Outflow
	3. Increases Protein Synthesis
ADIPOSE	1. Increases Glucose Utilization
	2. Increases Lipogenesis
	3. Decreases Lipolysis - reduces outflow of FFA to Liver and MM

SYMPTOMS AND SIGNS OF HYPOGLYCEMIA

I. SYMPATHETIC DISCHARGE - HYPEREPINEPHRINEMIA

Restlessness	Sweating
Anxiety	Tachycardia
Palpitations	Tremulousness

II. CNS - INADEQUATE CEREBRAL DELIVERY OF GLUCOSE

Mental Disturbances - Personality Changes

Slow cerebration	Bizarre behavior
Irritability	Disorders of speech
Aggressiveness	Disorders of gait
Negativism	Headaches - Nightmares

Somnolent - Agitated States

Tumbling, writhing, eylling, monoplegias,
Hemiplegias, blindness
Incoorination of eye muscles
Positive Babinski

Deep Coma

Flaccidity or	Trismus
Decerebrate rigidity	Extensor rigidity
Hypothemia	convulsions

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