



GENERAL MEDICAL EMERGENCIES

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NO FINANCIAL DISCLOSURES



DIABETES MELLITUS



- **Diabetes Mellitus-** The most common metabolic disease characterized by hyperglycemia resulting from deficits in insulin secretion, insulin action or both

TYPES OF DIABETES

- Type 1- due to autoimmune B-cell destruction, usually leading to absolute insulin deficiency
- Type 2- due to progressive loss of adequate B-cell secretion frequently associated with insulin resistance
- Gestational – diagnosed in the 2nd or 3rd trimester, in women not diabetic prior to pregnancy
- Prediabetes – intermediate state of hyperglycemia with glycemic parameters above normal but below diabetes threshold

NEW DESIGNATION

- MATURITY ONSET DIABETES OF THE YOUNG (MODY)
- Type 1 only in children, Type 2 only in adults is no longer accurate
- A younger onset than Type 2, obesity in childhood and adolescents
- Monogenic single gene defect mutation that leads to a deficit in Beta cell insulin secretion in response to glucose stimulation
- Type 1 and Type 2 polygenic mutations
- Also seeing a Type 1 presentation in older, mid 20's, patients with DKA

DIAGNOSTIC CRITERIA OF DIABETES



- FPG \geq 126 mg/dL. No caloric intake for at least 8 hours or
- 2-hour PG \geq 200 mg/dL. Tested with a 75 g glucose load or
- A1C \geq 6.5% or
- Patient with classic symptoms of hyperglycemia or hyperglycemic crisis, or a random plasma glucose \geq 200 mg/ dL

PREDIABETES

- WHO – Impaired glucose tolerance, 2 hr glucose 140-200 mg/dL after a 75 gm glucose load.
- Impaired fasting plasma glucose 110-125 mg/dL
- ADA – IGT 140-200 mg/ dL
- Impaired fasting glucose 100-125 mg/dL
- A1C 5.7 %-6.4 %

GENERAL BLOOD SUGAR GUIDELINES

- Know your athletes, their history in terms of time and presentation at diagnosis
- Know their control, knowledge of their disease, and compliance to therapy
- Pre-exercise < 100 mg/dL supplement with carbohydrate
- > 180 mg/dL athlete should consume a non-carbohydrate fluid to prevent dehydration and monitor glucose levels to avoid hyperglycemia and ketosis
- Pre-exercise 100-250 mg/dL generally safe to exercise
- Avoid exercise if > 250 mg/dL and ketosis is present
- Glucose > 300 mg/dL with no ketosis monitor closely
- Glucose < 100 mg/dL add carbohydrate

INSULIN DURING EXERCISE

- Exercise increases absorption rates of some (rapid, short, intermediate), but not all forms of insulin which can exacerbate the risk of hypoglycemia
- During exercise carbohydrate requirements depend on the use of insulin and other medications, exercise timing, activity undertaken and starting blood glucose levels

HYPOGLYCEMIA



HYPOGLYCEMIA

- The primary concern is for all insulin users
- Manipulating the athlete's insulin regimen and carbohydrate should be undertaken to prevent exercise related hypoglycemia
- No dose adjustments for Metformin, thiazolidinediones (TZD's), dipeptidyl peptidase 4 inhibitors (DPP-4 inhibitors)
- If insulin is used with sulfonylureas and meglitinides the dose of insulin may need to be lowered

HYPOGLYCEMIA EMERGENCIES

- The counterregulatory hormones are inhibited by exogenous insulin, enhancing glucose uptake and insulin sensitivity predisposing for up to 12-24 hours
- Immediate is during or shortly after exercise
- Symptoms-pallor, diaphoresis, confusion, headache, shakiness, sweating, irritability and change in mental status
- With longstanding diabetes, athletes may have a blunted stress response and may not exhibit these symptoms which are the result of sympathetic activation. Fatigue or irritability may be the only clues

TREATMENT

- Immediate-if alert treat with 15 gm of oral glucose, repeat blood sugar measurements every 15 minutes
- If obtundent administer Glucagon 1 mg IM/SC if > 100 lb., or 0.5 mg if < 100 lb.
Or, 1-3 ampules of D50
- Glucagon has a short half life and should be continuously supplemented with additional carbohydrates until sugar normalizes
- IV access/ fluids
- Monitor for transport for the persistent unresponsive patient

HYPOGLYCEMIA EMERGENCIES (CONT.)

- Delayed-usually 6-12 hours later
- Seizures, cardiac arrhythmias, unconsciousness, death
- Depleted glycogen stores
- Athlete may not have help around

AVOIDING HYPOGLYCEMIA

- Avoid injection of insulin into exercising muscle
- Best management is taking steps to avoid hypoglycemia
- Eating a meal within 30 minutes of finishing the activity
- Hydration
- Medications increasing risk: Insulin, Sulfonylureas, Glucagon-like peptide 1 receptor agonists (GLP-1 receptor agonists) the “glutides”, Sodium-glucose cotransporter 2 inhibitors (SGLT 2 inhibitors) the “flozins”. The later 2 are emerging as they have been shown to lower cardiovascular risk also

HYPERGLYCEMIA



HYPERGLYCEMIA

- Blood sugar > 200 mg/dL kidneys are no longer able to reabsorb glucose
- Insufficient insulin during exercise
- Counterregulatory hormones are activated, may lead to ketoacidosis
- Symptoms: nausea, dehydration, decreased cognitive function, fatigue, rapid breathing, increased thirst, increased urination

HYPERGLYCEMIA

- Treatment: Check urine for ketones with dipstick, and monitor.
- Administer water or non-carbohydrate beverage, push.
- When BG < 250 mg/dL may resume exercise
- If BG not going less than 250 mg/dL, and ketones persist transport to evaluate for possible DKA.
- Usually due to poor control, dietary noncompliance or both. Typical patient doesn't really comprehend the severity of their disease

INTERESTING FACT

- Female athletes with Type 1 diabetes may have unique glycemic responses to training and competition depending on the stage of their menstrual cycle they are in.
- May have a reduced risk of hypoglycemia compare to male athletes.

SEIZURES



SEIZURE

- Seizure- a sudden, uncontrolled electrical disturbance in the brain. It can cause a change in behavior, movement, feelings or levels of consciousness
- Generalized- affects both sides of the brain. Absence- Petit mal; Tonic-clonic (grand mal) LOC, falls, muscle jerks
- Focal- one area of the brain. Simple focal- twitching or changes of sensation (taste or smell); Complex focal- can become dazed and confused; Secondary generalized- starts in one area of the brain spreads to both; focal to generalized

- Around 65 million people worldwide have epilepsy
- 1968 the AMA Committee on Medical Aspects of Sports recommended restricting the physical activity of persons with epilepsy because of fear of inducing seizure activity or causing injury.
- 1974 the committee amended its stance, saying epileptics with reasonable control of seizures should be allowed to play any sport except activities in which chronic head trauma may occur

- 1983 the American Academy of Pediatrics allowed for further individual consideration and said, “Epilepsy per se should not exclude a child from hockey, football, basketball and wrestling.” They recommended avoidance of gymnastics.
- 1997 the International League Against Epilepsy (ILAE) recommended that the only absolutely prohibited sports for athletes with epilepsy are skydiving and scuba diving. Those involving heights, water sports, cycling activities should not be restricted but common sense precautions should be taken

SEIZURE ACTIVITY

- Multiple factors may precipitate seizures including fatigue, emotional stress, fever, hormonal changes of the menstrual cycle, alcohol, caffeine, heat, humidity and sleep deprivation.
- It is uncommon for seizures to be induced or exacerbated by exercise
- Slight but statistically insignificant decrease in seizure frequency is seen among persons with uncontrolled epilepsy who participated in a 4-wk intensive exercise program
- Persons with epilepsy had an improved mental state, self esteem, and became more sociable after a participation in a 4 wk exercise program

CLASSIFICATION OF SPORTS IN EPILEPTICS

- ILAE Task Force on Sports and Epilepsy updated in 2015 three categories based on potential risk of injury or death should a seizure occur
- Group 1: no significant risk sports on the ground- baseball, basketball, football, field hockey, dancing, racquet sports, wrestling, judo, golf, volleyball, rugby
- Group 2: sports involving a moderate risk of physical injury for person with epilepsy, but no risk to bystanders- swimming, gymnastics, cycling, horse riding, ice hockey, weightlifting, equestrian
- Group 3: sports carrying a high risk of injury or death for athletes with seizures as well as bystanders- aviation, diving, climbing, scuba diving, and surfing

CONCUSSIVE CONVULSIONS

- Initial brief period of tonic stiffening followed by myotonic jerks. Motor occurrences are usually bilateral but often asymmetrical
- Occur within seconds of impact and last for a short time lasting up to 3 minutes
- Mechanism has not been extensively explained, possibly a brief immediate cortical loss of cortical inhibitory function with possible reflex brainstem release similar to convulsive syncope
- Episodes not associated with structural or permanent brain injury and are **NONEPILEPTIC**
- They do not evolve to epilepsy

TREATING AN ATHLETE HAVING A SEIZURE

- Monitor for the “ABC’s”
- Remove from any dangerous settings
- Monitor activity as type of seizure
- Do NOT put hands near mouth
- Cushion head if possible
- Protect from self harm
- If the seizure lasts > 10 minutes it is status epilepticus
- If there is NO IV access- rectal or SL Diazepam 2-4 mg; Peds 0.05-0.15 mg/kg. May repeat in 10-15 minutes
- If there is IV access-Lorazepam 0.1 mg/kg at 2 mg/min; peds 0.05-0.1 mg/kg x1, second dose in 10-15 minutes. Diazepam 0.2 mg/ kg at 2 mg/min up to 20 mg
- Post ictal lay on side to avoid aspiration if vomiting

POST SEIZURE

- Verify the patient is taking their medicine as directed
- Check blood levels of drugs if appropriate
- Evaluate for concomitant illness, drugs

CONCLUSIONS



- Athletes can perform at the highest levels with diabetes or seizures
- The Sports Medicine Team can insure that the athletes can perform safely and successfully. It takes a team effort along with the athlete and their family who must be involved with treatment decisions and care
- Be prepared to respond to emergencies in this group of athletes, have a plan

THANK YOU !



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