Case study

Hyperglycemic Hyperosmolar Non-ketotic Syndrome (HHNS)

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History (Case Scenario)

A 65- years old female is rushed to the ER room by ambulance after being found comatose by her daughter in her dormitory room. She is known to non-insulin dependant diabetes mellitus (type 2 diabetes) that has been well controlled by diet, hypoglycemic agent (Daonil) and Insulin-assisting agent (Metformin).
History (Case Scenario)

Her daughter recalls that the patient has been complaining of intermittent fever and an "upset stomach" for 3 days, with some nausea, anorexia, mild diarrhea, dysuria and increasing abdominal pain. She seemed a bit dizzy that morning, and didn’t go shopping. She didn’t take her morning insulin because she was unable to eat breakfast. The daughter returned from a class at 3 pm and found the patient lying in the bed, breathing rapidly, and unresponsive to her questions.
General health assessment and detailed assessment of involved parts

On examination the patient is unresponsive, feverish with dry skin and mucus membranes and rapid deep respiration. Her blood pressure is 100/60 mm/Hg supine, falling to 80/50 when the bed is raised. The neck vein was collapsed when the patient is lying supine. Her pulse rate 120 b/min, her respiration 24 b/min, and her temp. 38°C. she has minimal movement when moderate pressure is applied to her abdomen. The deep tendon reflex is hypoactive.
Sign and symptoms

1- Flushed dry skin, dry mucus membranes, decreased skin turgor.
2- Depressed level of consciousness (lethargy and dizzy).
3- Tachypnia (24b/m), shallow breathing, no acetone odor to breath.
4- Nausea, vomiting, and abdominal pain.
5- Tachycardia (120b/m), hypotension (80/50 mm/hg).
6- Temp 38.5 c (Axillaries)
7- Dysuria and burning sensation during urination.
Diagnostics carried out or planned and their significance

Blood glucose by finger stick, determined soon after the patient's arrival in the ER, was greater than 400 mg/dl (900mg/dl). Urine testing is strongly positive for glucose and mildly for ketones.

Treatment is started with an intravenous infusion of normal saline 0.45 at rate 2000cc/hr. then giving 15 I.U regular Insulin bolus. Then patient transferred to SICU, Intravenous infusion of regular insulin is started at a rate of 8 I.U/hr.
Diagnostics carried out or planned and their significance

Lab result:

- WBC = 20,000/ mm3 (elevated)
- Serum glucose 850 mg/dl (elevated)
- Serum Osmolality 375 mOsm/L (elevated)
- Serum ketones minimal
- Urine acetone minimal
- Na = 155 meq/l (elevated)
- K = 3.3 meq/l (decreased)
- BUN (70) and Creatinine (1.5) are (slightly elevated).
- And normal PO4, Ca, and CL level.
- PH 7.37, HCO3 19, PaCO2 30
The elevated blood glucose levels and elevated serum Osmolality levels with mild serum and urine ketone levels confirm the diagnosis of Hyperglycemic Hyperosmolar Non-ketotic Syndrome (HHNS)
Lab result:
- Urine culture:
  - A microscopic bacterial count 100 CFU/mL (high positive predictive value for cystitis)
  - Microorganism is *Escherichia coli*

Diagnostics carried out or planned and their significance

*Ciprofloxacin (Cipro), 250 mg bid has been started for seven days*
Medical treatments and interventions with rational HHNS

HHNS occurs when the pancreas produce a relatively insufficient amount of insulin for the high levels of glucose and it looks that infection has triggered the extreme hyperglycemia of HHNS.

The patient once admitted to SICU started on broad spectrum antibiotics (Tienam) until blood and urine culture is ready. (aggressive treatment for underlying cause to prevent recurrence)
Medical treatments and interventions with rational

**HHNS**

(Start infusion of N/S 0.45 2L for 2hrs then CI @ rate 300ml/hr)
(to reverse dehydration and avoid the complication of thrombosis and hypotension)
Look for patient B.P and assess tissue perfusion

Given 15 I.U cryst. Insulin stat
Then CI @ 9 U/hr (0.1 U/Kg/hr)
(To reverse the insulin glucagons ratio)
Check glucose every 30 min
After 6 hrs, BS=260mg/dl
D/C (N/S 0.45)
Start (G/W5%) infusion
( to replenish glucose storage, to prevent hypoglycemia due to exogenous insulin and to prevent cerebral edema)

Check K, Na, PO4
Check Serum Osmolarity
Check ABGs
( those are checked Q 4 hrs )

K is low ( added KCL (10 meq/L) to formula)
Na is reduced to 150 meq/l and hypotonic fluid replacement is continuous
Serum Osmolarity is going back to normal (325 mosm/l) --- continuous assessment for the level of consciousness and infusion of hypotonic saline

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BS (200 mg/dl) after 12 hrs-------

D/C insulin C/I- & replaced by S/C injection.

BS is measured less frequently (Q 2 hrs)

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After 24 hrs--------

BS (198 mg/dl), No glucose in urine, No acetone in urine, No ketone in serum & Normal Osmolarity

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Patient is out of HHNS
Nursing Diagnosis

- Deficient fluid volume loss related to absolute loss.
- Decreased cardiac output related to alteration in preload.
- Anxiety related to threat to biologic, psychologic, and/or social integrity.
- Disturbed body image related to functional dependence on life sustaining technology.
Nursing Diagnosis

- Ineffective coping related to situational crises and personnel vulnerability.
- Powerlessness related to lack of control current situations and/or disease progression.
- Knowledge deficit related to management of glucose level.
Nursing Planning

- Restore fluid volume and electrolyte balance.
- Restore normal carbohydrate, fat, and protein metabolism.
- Identify and treat precipitating factors.
- Detect developing complications.
- Initiate self-care education to prevent recurrence of crisis.
- Prevent crisis from occurring in those highly stressed patients who are at risk.
Actual Interventions

- Administer intravenous fluids and electrolytes (initial fluids will be administered rapidly).
- Administering rapid acting insulin (Actrapid).
- Maintain flow sheet documenting laboratory and physiologic parameter.
- Monitor central and peripheral perfusion.
- Monitor fluid balance.
Actual Interventions

- Provide skin (especially foots) and oral care.
- Monitor heart rate and rhythm.
- Perform active or passive range of motion exercises.
- Institute seizures precautions.
- Prevent hypoglycemia by monitoring trend of lab data and changing the fluids to G/W 5% when Blood Sugar (250-300mg/dl).
- Initiate self-care education to prevent recurring crises including causes, sign and symptoms, treatment, and prevention of hyperglycemia. Include strategies for managing a minor illness.
Nursing Evaluation

- Plasma glucose < 250mg/dl.
- Other lab results within normal (plasma osmolality, BUN, electrolyte, PH, plasma and urine ketoacids, plasma bicarbonate).
- Alert and oriented
- Adequate hydration.
- Vital signs within normal patient's normal range.
- Able to tolerate oral liquid feedings.
- Patients and family are able to state causes, signs and symptoms, treatment, and prevention of hyperglycemia.
thank You