

Target Audience: Emergency Medicine Residents

Primary Learning Objectives:

1. Demonstrate a general approach to a chemical burn and specifically to hydrofluoric acid exposure.
2. Anticipate the potential risks and complications of hydrofluoric acid toxicity.
3. Treat life-threatening complications of hydrofluoric acid toxicity.

Secondary Learning Objectives: detailed technical/behavioral goals, didactic points

1. Describe the importance of decontamination in the care of a patient with a chemical burn such as that sustained following hydrofluoric acid exposure.
2. Discuss the importance of obtaining a complete history regarding the exposure (type, amount, and concentration of the chemical).
3. Discuss the potential electrolyte abnormalities that can result from systemic effects of hydrofluoric acid exposure (hypocalcemia, hyperkalemia, and hypomagnesemia)
4. Describe the role of lab tests and ECG in the evaluation of patients with hydrofluoric acid toxicity.
5. Manage pain/local hydrofluoric acid toxicity with IV pain meds, topical calcium gluconate gel, and intra-arterial calcium gluconate.
6. Recognize the ECG changes seen with electrolyte imbalances associated with hydrofluoric acid toxicity.
7. Compare IV calcium gluconate with calcium chloride, noting the similarities and differences between the two.
8. Obtain appropriate consults.
9. Realize the severity of the systemic toxicity and admit the patient to the proper inpatient unit.

Critical actions checklist:

1. Decontaminate affected areas with soap and water
2. Obtain an ECG
3. Treat hyperkalemia
4. Treat other electrolyte abnormalities (hypocalcemia and hypomagnesemia)
5. Manage pain
6. Consult Poison Center or toxicologist
7. Consult Surgery (for burn management, for hand consultation)
8. Admit to the ICU

Environment:

- A- Room Set up: ED critical care area
- B- Manikin set up: High Fidelity simulator
- C- Drugs:
 - Calcium gluconate ampoules
 - Calcium chloride ampoules
 - Insulin
 - D50
 - Albuterol
 - Calcium hydroxide antacid (TUMS)
 - Sodium bicarbonate
 - Magnesium sulfate

- D- Lines: peripheral IV line, Central Line Kit, A- line kit.
- E- EMT on the phone giving the report.
- F- ED nurse at the bedside with the manikin.

For Examiner Only

CRITICAL ACTIONS

1. Decontaminate affected areas with soap and water

Order decontamination (hand washing) prior to moving the patient to the critical care area.

Cueing Guideline: The nurse will start developing symptoms and complain of hand pain as the evaluation begins.

2. Obtain an ECG

Obtain an ECG and correctly interpret findings.

Cueing Guideline: The nurse can ask if the doctor would like an ECG (this prompt can be delivered if the learner requests that the patient be placed on continuous telemetric monitoring).

3. Order appropriate labs

Order appropriate labs. These include: CBC, BMP, magnesium, calcium, and ECG

Cueing Guideline: Nurse asks if the doctor wants diagnostic serum tests.

4. Treat hyperkalemia

Treat hyperkalemia. This is accomplished with calcium gluconate or chloride, albuterol, insulin, and 50% dextrose.

Cueing Guideline: Nurse asks if the doctor is concerned about this patient's ECG changes.

5. Treat other electrolyte abnormalities (hypocalcemia and hypomagnesemia)

Treat other electrolyte abnormalities (hypocalcemia and hypomagnesemia). This is accomplished with calcium gluconate, magnesium sulfate, and calcium chloride after placement of central line.

Cueing Guideline: Nurse asks if the doctor is concerned about this patient's ECG changes.

6. Manage pain

Provide analgesia. This is accomplished with topical calcium slurry, intra-arterial calcium gluconate, and opioids as needed.

Cueing Guideline: The nurse or the patient can ask if the doctor would like to do anything about the severe pain.

7. Consult Toxicology

Consult Toxicology (either the Poison Center or a consultant in toxicology)

Cueing Guideline: RN can ask if the doctor has called the Toxicologist yet. Nurse may also ask if there is anything more we can do to help improve the patient's condition.

8. Admit to the ICU

Admit to the ICU. Patient will not be stable for any other destination.

Cueing Guideline: Nurse can ask if the doctor has called the intensivist to arrange for a definitive disposition decision.

Critical Actions Checklist¹

| Resident Name | | | | | | | | | |
|--|--------------------------|---|---------------------|---|-------------------|------------------|--------------------------|---|--|
| Case Description | | | | | | | | | |
| Skills measured <small>Core competencies: PC Patient care, MK Medical knowledge, IC Interpersonal and communication skills P Professionalism, PB Practice-based learning and improvement SB Systems-based practice</small> | Very Unacceptable | | Unacceptable | | Acceptable | | Very Acceptable | | |
| | | | | | | | | | |
| Data Acquisition (D) PC MK I | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Problem Solving (S) PC MK PB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Patient Management (M) PC MK IC P PB SB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Resource Utilization (R) PC PB SB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Health Care Provided (H) PC SB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Interpersonal Relations (I) IC P | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Comprehension of Pathophysiology (P) MK PB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Clinical Competence (C) PC MK IC P PB SB | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| Critical Actions | | | | | | | | | |
| | | | | | | Comments: | | | |
| Yes | No | | | | | | | | |
| | | Decontaminate affected areas with soap and water | | | | | | | |
| | | Obtain an ECG | | | | | | | |
| | | Order appropriate labs | | | | | | | |
| | | Treat hyperkalemia | | | | | | | |
| | | Treat other electrolyte abnormalities (give calcium IV) | | | | | | | |
| | | Manage pain | | | | | | | |
| | | Consult Toxicology | | | Yes | No | | | |
| | | Admit to the ICU | | | | | Dangerous actions | | |

For Examiner Only

¹ Modified ABEM Oral Certification Examination checklist and scoresheet

CASE SUMMARY

SYNOPSIS OF HISTORY/ Scenario Background

You are a resident in the ED in an urban area. EMS on the radio reports they are transporting to you a 35-year-old male who was working in a glass etching factory and spilled a chemical solution on his right upper extremity 15 minutes prior to the arrival of EMS. Airway is intact. Vital signs are HR 140/minute, BP155/90 mm Hg, RR 20/minute, and SpO₂ 99%. He is in severe pain secondary to mild redness in his right hand although he has no significant signs of a severe burn or injury. Estimated time of arrival is 5 minutes.

Onset of Symptoms: Today

Background Info: From EMS: If asked about the scene in the factory. There was a chemical solution spilled on the floor, no decontamination was done at the scene. EMS thinks that he is faking the pain because there is some mild redness in his right hand.

If the candidate asked about the container, the Material Safety Data Sheet (MSDS) shows **70% Hydrofluoric Acid.**

Chief Complaint: I have severe pain in my right hand.

HPI: Patient in pain: "Hey doc, can you help me please? I'm in severe pain. I was holding bottle of solution that has 'Fluoride' content. It spilled on my hand, and in a couple of minutes I started to have severe pain. It is killing me!"

Past Medical Hx: Hypertension

Past Surgical Hx: None

Family Med Hx: Hypertension, Diabetes mellitus

Social Hx: Drinks socially, smokes heavily, uses marijuana occasionally

Allergies: Morphine/Codeine (cause itching)

ROS: Severe, diffuse pain in the right hand

Vital Signs: BP: 165/92 mmHg P: 140/minute R: 25/minute T: 37C (98.6F) POx: 99%

Primary Survey

Primary Survey:

Airway – Patent

Breathing – Tachypnea and O2: 99%

Circulation – Tachycardia and hypertension

Disability – Patient is agitated, anxious in severe pain, holding his right hand, able to move all extremities

Exposure – No other signs of burn apart from the right hand

Required Actions

- Decontaminate right hand with soap and water before transfer into the ED care room
- A/B – Provide supplemental oxygen
- C – Place on cardiac monitor; place IV (in the contralateral extremity), and start IV fluids.
- D – Finger stick glucose = 100mg/dL
- E – Hydrofluoric acid toxicity should be recognized at this time; calcium gluconate gel (or equivalent) should be ordered and applied to the affected area (finger/hand).

Branch Point

- **IF THE PATIENT IS NOT DECONTAMINATED (e.g., AT LEAST CLOTHING REMOVAL) BEFORE ENTERING THE CRITICAL CARE AREA**, then the nurse who touches him will start to complain of pain in her hands.
- **IF AN ANALGESIC (e.g., OPIOIDS) IS PROVIDED FOR THE PATIENT'S PAIN**, then the patient will continue to experience severe and excruciating pain (until coupled with calcium gluconate gel or equivalent adjunct).
- **IF THE HYDROFLUORIC ACID TOXICITY IS NOT RECOGNIZED**, then the patient will complain of more severe and excruciating pain.
- **IF THE CALCIUM GLUCONATE GEL (OR EQUIVALENT THERAPY) IS NOT APPLIED**, then patient will complain of more severe and excruciating pain.
- **AT FACULTY DISCRETION**, The nurse will tell the candidate that it will take some time to get calcium gluconate topical cream from the inpatient pharmacy and will ask if there is anything else that can be done. **Calcium carbonate antacid paste can be prepared in the ED.**
- **TO MAKE THE PASTE:** Crush ten 10-gram tablets of calcium carbonate (TUMS®), mix with 20 ml of KY-Jelly, and apply using a glove on the affected hand to keep direct contact.

PHYSICAL EXAM

Vital Signs: BP: 140/85 mmHg P: 120/minute R: 20/minute T: 37C (98.6F) POx: 99%

HEENT: PERRLA, no signs of burn, normal throat exam

Lungs: Tachypnea, good air entry bilaterally.

Heart: Tachycardia, S1 S2, no murmurs

Back: Normal, no skin changes in this area.

Abdomen: Soft, non-tender, no signs of trauma or burn

Extremities: Right Hand: "pain out of proportion to exam." 4-5% mild erythema (first-degree burn) in the right hand extending to the volar forearm area, with dusky/whitening and blistering of the right index, middle and ring finger (see **STIMULUS #8**).

Neuro: Agitated in severe pain, moving all extremities. Non-focal exam.

CASE CONTINUATION

- The patient should be decontaminated by this time.
- The patient should be on the cardiac monitor and an IV catheter should be in place by this time.
- Calcium gluconate gel (or equivalent therapy) should be applied by this time.
- Serum electrolytes should be ordered by this time.
- An ECG should be considered at this time.
- Patient remains tachycardic and hypertensive secondary to severe pain (even if patient has received a dose of analgesic by this time).
- Intra-arterial calcium gluconate infusion should be considered at this time.

Branch Point:

- **IF AN ANALGESIC (e.g., OPIOIDS) IS PROVIDED FOR THE PATIENT'S PAIN**, then the patient will continue to experience severe and excruciating pain (until coupled with calcium gluconate gel or equivalent adjunct).
- **IF THE HYDROFLUORIC ACID TOXICITY IS NOT RECOGNIZED**, then the patient will complain of more severe and excruciating pain.
- **IF THE CALCIUM GLUCONATE GEL (OR EQUIVALENT THERAPY) IS NOT APPLIED**, then patient will complain of more severe and excruciating pain.
- **AT FACULTY DISCRETION**, The nurse will tell the candidate that it will take some time to get calcium gluconate topical cream from the inpatient pharmacy and will ask if there is anything else that can be done. **Calcium carbonate antacid paste can be prepared in the ED (see previous Branch Point box).**
- **IF AN ARTERIAL CATHETER IS INSERTED, THEN INTRA-ARTERIAL CALCIUM GLUCONATE MAY BE PROVIDED** (10-to-20 mL of 10% calcium gluconate in 50 mL D5W. Infuse over 4 hours via radial or brachial artery. The arterial catheter may be placed in normal position [not inverted]).
- **IF THE PAIN IS NOT MANAGED WITH INTRA-ARTERIAL CALCIUM GLUCONATE**, then the patient will continue to be agitated and complain of severe pain despite aggressive IV pain management.

CASE CONTINUATION

- Serum electrolytes results should be provided at this time.
- An ECG, if previously ordered, should be provided at this time. Alternatively, if the patient is on continuous cardiac monitoring, the rhythm strip should be made available at this time.
- Hyperkalemia and other electrolyte abnormalities should be recognized, with treatment initiated, by this time.
- Patient remains tachycardic and hypertensive secondary to severe pain (even if patient has received a dose of analgesic by this time) unless topical calcium gluconate or intra-arterial calcium gluconate has been administered.

Branch point:

- **IF AN ANALGESIC (e.g., OPIOIDS) IS PROVIDED FOR THE PATIENT'S PAIN**, then the patient will continue to experience severe and excruciating pain (until coupled with calcium gluconate gel or equivalent adjunct).
- **IF THE HYPERKALEMIA GOES UNRECOGNIZED AND UNTREATED, THEN THE PATIENT WILL DEVELOP DYSRHYTHMIA (VENTRICULAR TACHYCARDIA OR VENTRICULAR FIBRILLATION) AND DEVELOP CARDIAC ARREST.**
- **HYPERKALEMIA TREATMENT:** 1-2 grams calcium gluconate (peripheral IV), 1-2 ampules of sodium bicarbonate, 10 units of regular insulin IV with an ampule of 50% dextrose solution (25 grams) IV, and albuterol 10 mg by nebulizer.
- **IF TOPICAL OR INTRA-ARTERIAL CALCIUM GLUCONATE HAS NOT BEEN PROVIDED, THEN THE PATIENT WILL DEVELOP DYSRHYTHMIA (TORSADES DE POINTES) AND DEVELOP CARDIAC ARREST FROM HYPOCALCEMIA AND HYPOMAGNESEMIA.**
- **HYPOMAGNESEMIA TREATMENT:** 1-2 grams magnesium sulfate (peripheral IV) over 5-15 minutes.
- **HYPOCALCEMIA TREATMENT:** 1-3 grams calcium gluconate 10% (peripheral IV), started at 0.5 mg/kg/hr – OR – calcium chloride 10% 1 gram over 2-5 minutes (infusion: 0.6 mg/kg/hr)

CASE CONTINUATION

- Serum electrolytes results should be provided at this time.
- An ECG, if previously ordered, should be provided at this time. Alternatively, if the patient is on continuous cardiac monitoring, the rhythm strip should be made available at this time.
- Hyperkalemia and other electrolyte abnormalities should be recognized, with treatment initiated, by this time.
- Patient remains tachycardic and hypertensive secondary to severe pain (even if patient has received a dose of analgesic by this time) unless topical calcium gluconate or intra-arterial calcium gluconate has been administered.

Branch point:

- **IF THE HYPERKALEMIA GOES UNRECOGNIZED AND UNTREATED, THEN THE PATIENT WILL DEVELOP DYSRHYTHMIA (VENTRICULAR TACHYCARDIA OR VENTRICULAR FIBRILLATION) AND DEVELOP CARDIAC ARREST.**
- **IF THE HYPERKALEMIA HAS BEEN TREATED BUT THE HYPOCALCEMIA OR HYPOMAGNESEMIA HAVE NOT BEEN RECOGNIZED,** then the patient's ECG will show resolution of the signs of hyperkalemia but persistence of the prolonged QTc.
- **IF TOPICAL OR INTRA-ARTERIAL CALCIUM GLUCONATE HAS NOT BEEN PROVIDED, THEN THE PATIENT WILL DEVELOP DYSRHYTHMIA (TORSADES DE POINTES) AND DEVELOP CARDIAC ARREST FROM HYPOCALCEMIA AND HYPOMAGNESEMIA.** The patient will start to show severe signs of hypocalcemia (tetany, carpopedal spasm) and the nurse will ask the candidate if there is any other way that we can give more calcium since the patient improved earlier.
- **HYPOMAGNESEMIA TREATMENT:** 1-2 grams magnesium sulfate (peripheral IV) over 5-15 minutes.

CASE CONTINUATION

- Hyperkalemia and other electrolyte abnormalities should be recognized, with treatment initiated, by this time.
- **AT FACULTY DISCRETION:** The pain score will improve but the patient will still complain of pain underneath his nails. The nurse will ask if something else can be done to relieve this pain. Candidate should consider nail removal at this time
- Poison Center consultation should be made at this time.
- Hand Surgery consultation should be made at this time.
- ICU consultation for definitive disposition and placement should be made at this time.

Branch point:

- **AT FACULTY DISCRETION, IF THE NAIL IS NOT REMOVED,** then the patient will still complain of pain in his fingers/hand (under the nail) and the nurse will continue to ask if something more could be done. The patient's pain will relapse and continue to worsen.

Required Actions over the Remainder of the Case

- Hydrofluoric acid toxicity and all electrolyte-associated sequelae should be recognized and treated by this time
- Poison Center and Hand Surgery consultations should be completed by this time.
- Admission to the ICU should be completed by this time.

For Examiner Only

STIMULUS INVENTORY

- #1 Complete blood count
- #2 Basic metabolic panel
- #3 Liver function tests
- #4 Venous blood gas
- #5 ECG 1
- #6 ECG 2
- #7 ECG 3
- #8 Visual stimulus: hand

For Examiner Only

LAB DATA & IMAGING RESULTS

| Stimulus #1 | |
|-----------------------------------|-------------------------|
| Complete Blood Count (CBC) | |
| WBC | 12,000/mm ³ |
| Hemoglobin | 13.2 g/dL |
| Hematocrit | 40% |
| Platelets | 239,000/mm ³ |
| Differential | |
| PMNLs / Bands | 40% / 1% |
| Lymphocytes | 55% |
| Monocytes | 2% |
| Eosinophils | 1% |

| Stimulus #2 | |
|--------------------------------------|-----------|
| Basic Metabolic Profile (BMP) | |
| Sodium | 145 mEq/L |
| Potassium | 7.2 mEq/L |
| Chloride | 109 mEq/L |
| Bicarbonate | 23 mEq/L |
| Glucose | 100 mg/dL |
| BUN | 17 mg/dL |
| Creatinine | 1.1 mg/dL |
| Magnesium | 0.5 mEq/L |
| Total Calcium | 3.6 mEq/L |
| Ionized Calcium | 0.7 mEq/L |

| Stimulus #3 | |
|-----------------------------|-----------|
| Liver Function Tests | |
| AST | 49 U/L |
| ALT | 32 U/L |
| Alk Phos | 110 U/L |
| T. Bilirubin | 1 mg/dL |
| D. Bilirubin | 0.2 mg/dL |
| Albumin | 4.3 mg/dL |
| AST | 49 U/L |
| ALT | 32 U/L |
| Alk Phos | 110 U/L |
| T. Bilirubin | 1 mg/dL |
| D. Bilirubin | 0.2 mg/dL |

| Stimulus #4 | |
|-------------------------|---------------------------------|
| Venous Blood Gas | |
| pH | 7.39 |
| pCO ₂ | 39 mm Hg |
| pO ₂ | 40 mm Hg |
| HCO ₃ | 14 mEq/L base deficit 11 |

| Stimulus #5 | |
|--------------------|-----------------------------|
| ECG 1 | Peaked T waves and wide QRS |

| Stimulus #6 | |
|--------------------|---|
| ECG 2 | ECG after treatment for hyperkalemia, now with prolonged QTC interval |

| Stimulus #7 | |
|--------------------|---|
| ECG 3 | Torsades de Pointes, if the patient doesn't receive treatment for prolonged QTc |

| Stimulus #8 | |
|------------------------|---|
| Visual stimulus | Fingers with hydrofluoric acid exposure |

Stimulus #1**Complete Blood Count (CBC)**

| | |
|--------------|-------------------------|
| WBC | 12,000/mm ³ |
| Hemoglobin | 13.2 g/dL |
| Hematocrit | 40% |
| Platelets | 239,000/mm ³ |
| Differential | |
| PMNLs | 45% |
| Lymphocytes | 55% |
| Monocytes | 2% |
| Eosinophils | 1% |
| Bands | 1% |

Stimulus #2**Basic Metabolic Profile (BMP) with Calcium and Magnesium**

| | |
|-----------------|-----------|
| Sodium | 145 mEq/L |
| Potassium | 7.2 mEq/L |
| Chloride | 109 mEq/L |
| Bicarbonate | 23 mEq/L |
| Glucose | 100 mg/dL |
| BUN | 17 mg/dL |
| Creatinine | 1.1 mg/dL |
| Magnesium | 0.5 mEq/L |
| Total Calcium | 3.6 mEq/L |
| Ionized Calcium | 0.7 mEq/L |

Stimulus #3**Liver Function Tests**

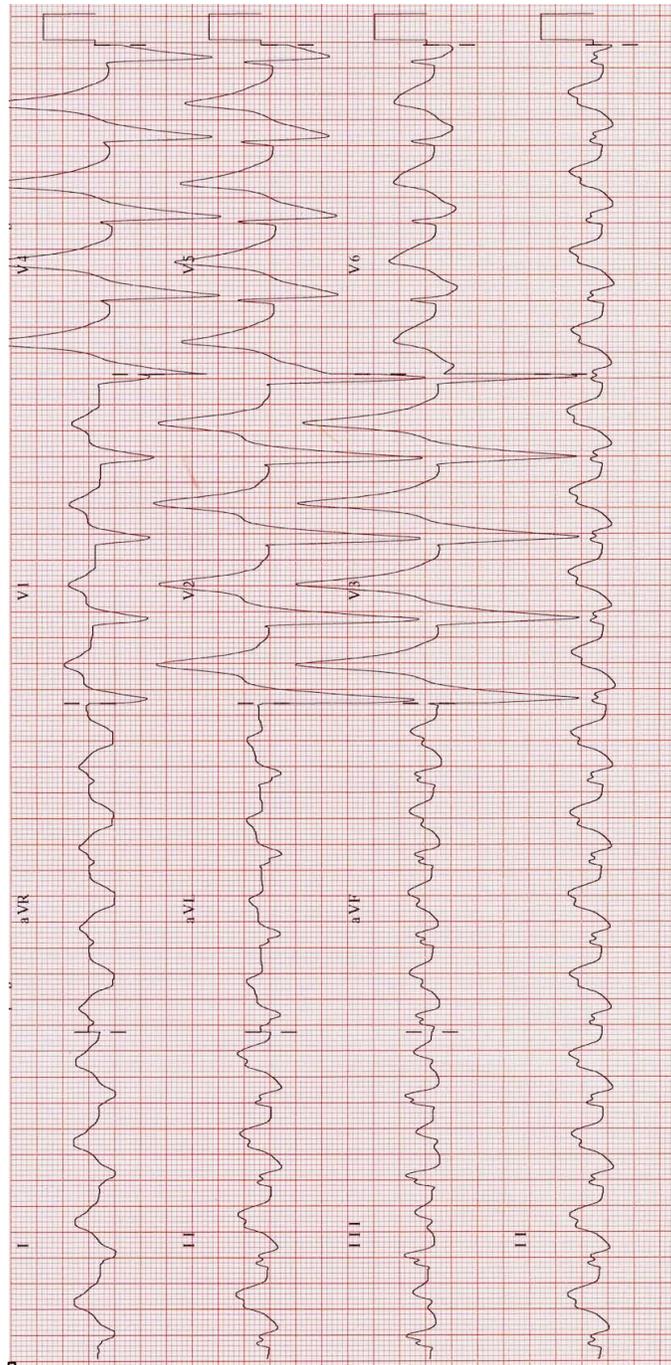
| | |
|--------------|-----------|
| AST | 49 U/L |
| ALT | 32 U/L |
| Alk Phos | 110 U/L |
| T. Bilirubin | 1 mg/dL |
| D. Bilirubin | 0.2 mg/dL |
| Albumin | 4.3 mg/dL |

Stimulus #4

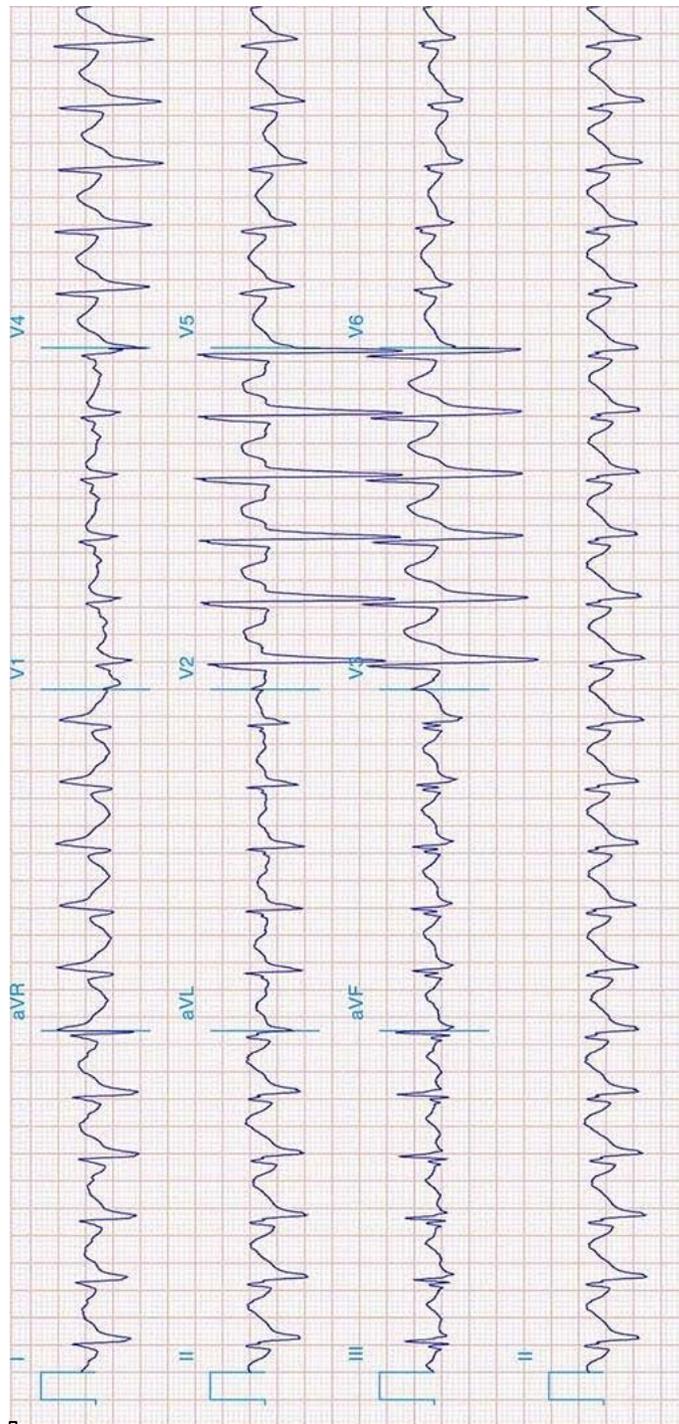
Venous Blood Gas

| | |
|------------------|---------------------------------|
| pH | 7.39 |
| pCO ₂ | 39 mm Hg |
| pO ₂ | 40 mm Hg |
| HCO ₃ | 14 mEq/L base deficit 11 |

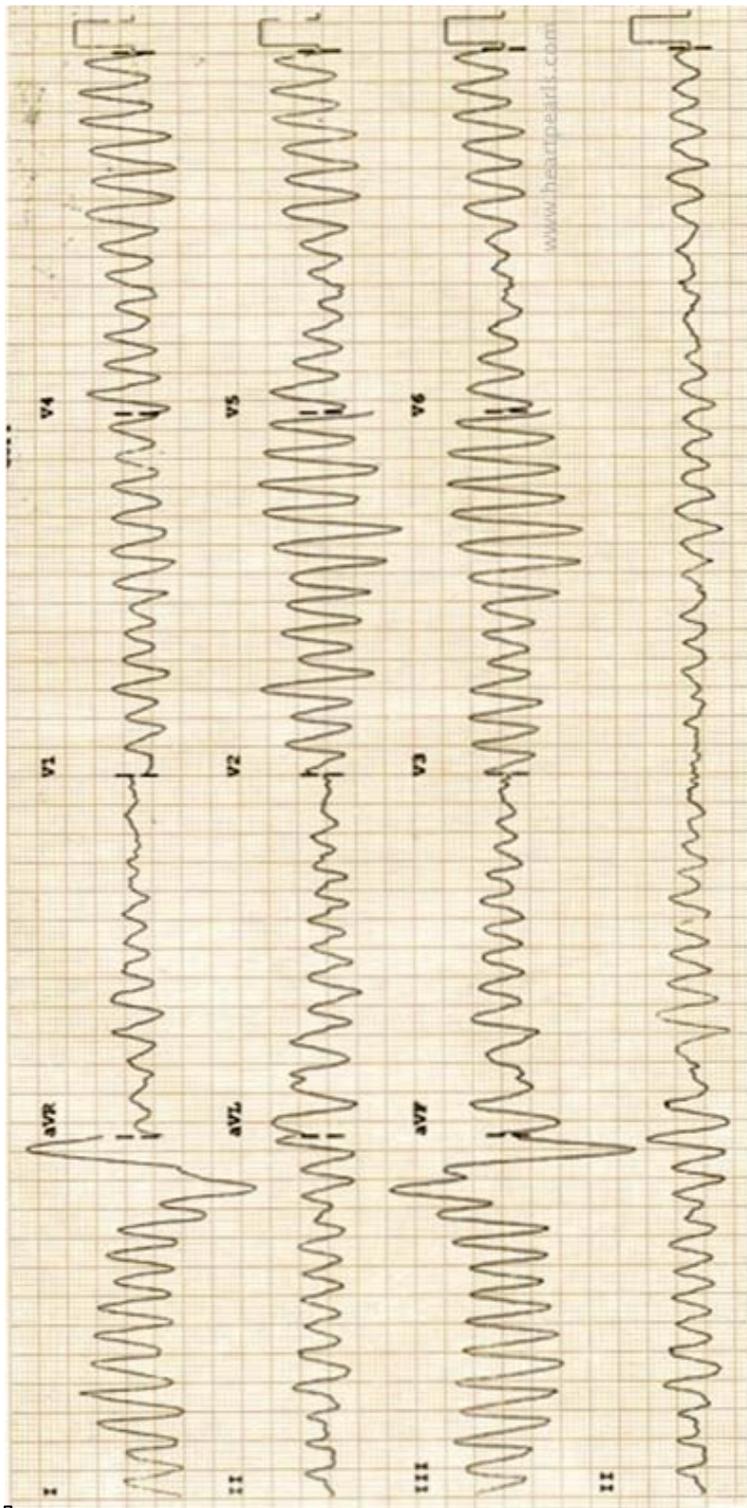
Stimulus #5
ECG



Stimulus #6
ECG



Stimulus #7
ECG



Stimulus #8



Debriefing Materials – Hydrofluoric acid toxicity

HF is a weak acid, with low dissociative coefficient and high penetration coefficient. It dissociates to hydrogen and fluoride ions. Fluoride is responsible for the major toxicity as it penetrates deeply to the tissue and causes local tissue destruction. It is also a highly reactive element that binds to the divalent cations and causes severe systemic toxicity. It is the most electronegative element and binds with high affinity.

Sources of Exposure:

Household product: low concentration (<10%) used as rust remover.

Factory: (20-90%) used in glass etching, metal cleaning, electronics manufacturing.

Refinery 90-100%, highly corrosive.

Pathophysiology:

Two mechanisms cause tissue damage:

- 1- Corrosive burn from the free hydrogen ions (if highly concentrated)
- 2- Chemical burn from tissue penetration of the fluoride ions which bind and chelate divalent cations (Ca^{+2} , Mg^{+2}) and cause severe hypocalcemia and hypomagnesaemia and eventually hyperkalemia.

Severity of exposure:

It depends on the concentration of the solution and the surface area involved. In general, the higher the concentration and the surface area exposed to burn, the earlier and worse are the symptoms.

Clinical presentation

Local Toxicity: from the penetrating fluoride ions that cause local tissue destruction and chelation of Ca^{+2} and Mg^{+2} .

Systemic Toxicity: secondary to hypocalcemia, hypomagnesaemia and hyperkalemia that predispose to cardiac arrhythmias.

Diagnostic Testing:

CMP: Ca total and ionized, Mg, K.

ECG

Coagulation profile

Treatment:

- Decontamination: Remove contaminated clothing that may prolong contact. Also, wash the patient with soap and water before getting the patient to the ED.
- Local treatment: Ca Gluconate Gel. If not available, make TUMS®-based paste.
- TUMS® paste: To make the paste get 10 gm (10 tabs) of Ca carbonate (TUM) and mix it with 20 ml of K-Y Jelly. Apply the paste on the affected area and place a glove on the affected hand to keep direct contact.
- Ca Gluconate through peripheral IV: 1-3 gm 10% Ca Gluconate.
 - Start a drip at 0.5 mg/kg/hr.
- Ca chloride through Central line: 1-2 gm 10% Ca Chloride over 2-5 min via central line.

- Start a drip 0.6 mg/kg/hr.

* Ca chloride has 3 times as much Ca as in Ca gluconate.

- Mg sulfate 2-6 gm IV over 5-15 min.
- For local pain management: Insert A-line on the affected limb and start 10 mL 10% Calcium Gluconate mixed with 40-50 mL D5W over 4 hours. Repeat as needed.
- Hyperkalemia treatment:
 - 1-2 gm Ca Gluconate through peripheral IV.
 - 1-2 Ampules of Na bicarb.
 - 10 units of regular insulin and an ampule of D50 IV.
 - Albuterol 10 mg nebulized.

Consultations:

Toxicology

Hand surgeon

ICU

Disposition:

ICU for cardiac and electrolyte monitoring.

Take-Home Points:

- 1- Demonstrate a general approach to chemical burn, specifically to HF burn.
- 2- Understand and anticipate the potential risks of HF toxicity.
- 3- Early recognition and treatment of life threatening complications.
- 4- Understand the importance of decontamination of chemical/HF burn patient.
- 5- Get a good history about the type and concentration of the chemical.
- 6- Recognize potential electrolyte imbalances (hypocalcemia, hyperkalemia and hypomagnesaemia) and order the appropriate lab tests and ECG.
- 7- Manage pain/local HF toxicity with IV pain meds, local Ca salt gel and intra-arterial Ca gluconate for better pain control.
- 8- Recognize the ECG changes secondary to electrolyte imbalance.
- 9- Manage severe systemic toxicity with IV Ca gluconate and/or chloride. Understand the difference between them.
- 10- Obtain appropriate consults.
- 11- Realize the severity of the systemic toxicity and admit the patient to the proper inpatient unit.