Fluoride Toxicity Lec 10

Introduction

Ingestion of fluoride in excessive quantities can be toxic. The fluoride toxicity can be *chronic* or *acute*.

Chronic fluoride toxicity refers to long term ingestion of fluoride in amounts that exceed the approved therapeutic level.

Acute fluoride toxicity: Acute means rapid intake of an excess dose over a short period time.

Factors affecting fluoride toxicity:

The differences in toxic potential of different fluoride compounds are related to:

1. Solubility of the compound.
2. Content of the compound, e.g. stannous fluoride is slightly more toxic than sodium fluoride because high doses of tin ion. 3. route of administration
4. Age.
5. Rate of absorption.
6. Acid-base status.

1. Acute toxicity.

Acute fluoride poisoning is rarely seen. Symptoms of acute fluoride poisoning.

1. Salivation
2. Nausea
3. Vomiting
4. Abdominal pain
5. Diarrhea
6. Cramps
7. Cardiac arrhythmia
8. Coma

Management of fluoride acute toxicity:

Management based on the amount of fluoride ions ingested if < 5.0 mg/kg, **Initial Emergency Response in the Oral Care Setting**:

1. Induce vomiting by administering an emetic, to reduce the fluoride absorption (this should occur only if the client has a gag reflex, is conscious, and is not convulsing)

2. This is followed by the oral administration of 1% calcium chloride or calcium gluconate; if these are not available milk should be ingested.
3. Increasing fluoride excretion by increasing the alkalinity of the urine and fluid replacement.

If fluoride ingested level >5.0 mg/kg need induce vomiting ingested Milk, and 5% calcium gluconate, hospitalization.

Lethal and Safe doses of Fluoride

❖ **Certainly Lethal Dose (CLD)**

A lethal dose is the amount of drug likely to cause death if timely interception by antidote is not initiated.

In Adult: CLD is 5–10 gm of sodium fluoride taken at 1 time. The fluoride ion equivalent is 32–64 mg Fluoride (F) per kg body weight.

In Children: CLD is approximately 0.5–1.0 gm. It varies with size and weight of the child. children under 6 years of age, however 500 mg is lethal.

❖ **probably toxic dose (PTD).** The minimum dose that could cause toxic signs and symptoms, including death, and that should trigger immediate therapeutic intervention and hospitalization for fluoride intoxication has been set at 5 mg/kg body weight this is called probably toxic dose (PTD).

Recommendations for parents about use of fluoride agent by children:

- Parental supervision
- Child-proof containers (for fluoride tablets)
- Keep products out of reach of young children
- Supervise children when brushing / rinsing ,
- Small amount of tooth paste to be used
- Products with low fluoride level to be used
- Teaching children not to swallow paste or rinse
- Strict adherence to professional advice

2. Chronic Toxicity

The various forms of fluorosis arising due to excessive intake of fluoride over a prolonged period of time. It can cause dental and skeletal changes referred to as dental and skeletal fluorosis respectively.

Dental fluorosis

It is a hypoplasia or hypomineralization of tooth enamel or dentine produced by chronic ingestion of excessive amount of F during the period

when teeth are developing. In relation to the stage of tooth development and exposure to fluoride. The central incisor takes approximately 3 years to go through complete enamel mineralization figure (1).

Skeletal Fluorosis

Skeletal fluorosis affects the bones/skeleton of the body. Skeletal fluorosis affects children as well as adults. It does not easily manifest until the disease attains an advanced stage. Fluoride mainly gets deposited in the joints of neck, knee, pelvic and shoulder bones and makes it difficult to move or walk. The symptoms of skeletal fluorosis are similar to spondylitis or arthritis. Patients who consume large quantities of water or who have renal problems should avoid fluoridated water altogether figure (2).

Physicians should at least consider that some joint pain complaints may simply be the result of exposure to too much fluoride and develop a strategy to reduce the fluoride intake.

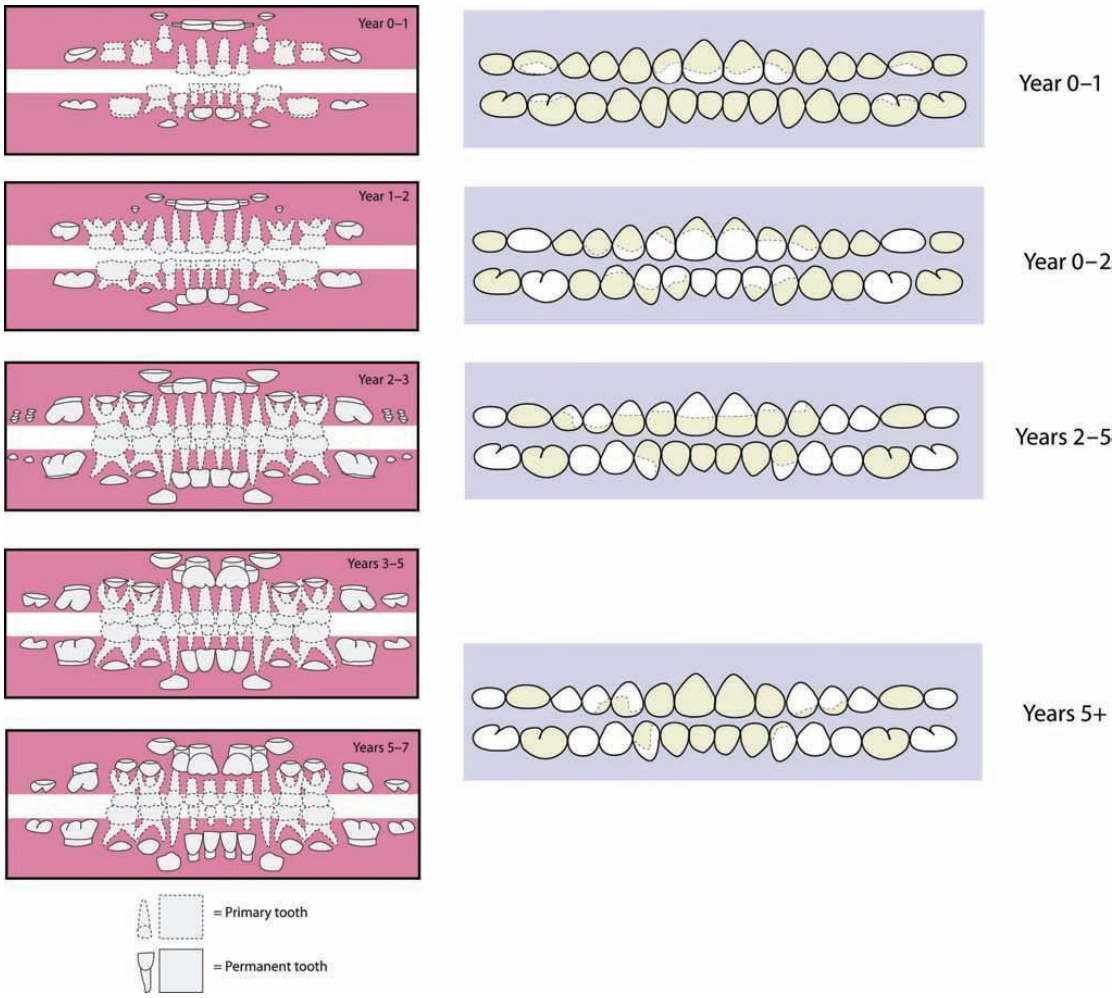

Figure (1) Dental Fluorosis. Identification of exposure periods to excess fluoride intake based on fluorosis patterns observed. The left panel

indicates the stages of tooth permanent tooth development in the human dentition. The right panel shows the pattern of fluorosis that one can expect with the exposure periods indicated on the right (white areas = fluorosis). Note that fluorosis can still occur after the age of 5 years, but only the posterior teeth, which develop later than the incisors, are affected.

Figure (2) Skeletal Fluorosis