

Analyses of ECGs in 271 Cases with Dental Fluorosis

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Our team performed investigations in Yuqing Village and Guanfang Village ⁽¹⁾ which were seriously affected by endemic fluorosis, from September to October 1985; those two villages are only 1,500 meters distant from Mangbu District of Zhenxiong County, and the life and production conditions in these two villages are similar to those in Mangbu District, only that these two villages are heavily polluted by coal smoke from daily use. We performed a total of 292 electrocardiograms (ECGs) on villagers during the investigations. Twenty-one patients with cardiovascular diseases and free of dental fluorosis were excluded; the remaining 271 patients with dental fluorosis of various types and degrees include 139 male cases and 132 female cases, with the male-to-female ratio being 1.05:1; the youngest case was 4 years old, and the eldest case was 86 years old. Now we report our analyses on those ECGs as follows.

I. Methods and Diagnostic Criteria

1. A portable AC/DC electrocardiograph manufactured in Japan was used in the field investigation, and it was operated (and electrocardiograms were analyzed) by special personnel. [The ECGs] were taken routinely at supine position at rest using 9 leads, and lead V₃R may be added if necessary.

2. Diagnostic criteria: The analysis of ECG was performed based on "Clinical Electrocardiography", HUANG Wan, editor-in-chief (People's Medical Publishing House, 1975); the diagnosis of dental fluorosis was based on the Criteria for Prevention and Control of Endemic Fluorosis issued by the Central Government Office of Endemic Diseases in 1981.

3. For abnormalities reflected in the ECGs, all other cardiovascular diseases could be ruled out.

II. ECG Findings

1. Of all 271 ECGs taken from patients with dental fluorosis, 153 ECGs were completely normal, accounting for 56.46%; 118 ECGs were abnormal and marginal, accounting for 43.54%, of which 20 ECGs had changes of 2 items, and 5 ECGs had changes of 3 items or more than 3 items.

2. Heart rate: 80 ECGs revealed abnormal rates, between 40–125 beats/min (for adults), accounting for 29.52%, of which 50 ECGs had sinus arrhythmia, 16 ECGs had sinus bradycardia, 13 ECGs had sinus bradycardia complicated by arrhythmia, and 1 ECG had sinus tachycardia

3. Rhythm: 270 ECGs showed sinus rhythm, accounting for 99.63%; one case showed cardiac arrhythmia (borderline premature systole), accounting for 0.37%.

4. P wave: One ECG showed hypertrophy of right atrium (accounting for 0.37%); the other ECGs were normal.

5. P-R interval: for all 271 cases, it was within the stipulated duration range.

6. Q-T interval: no abnormality was revealed.

7. ST segment: two ECGs showed deviation changes, accounting for 0.73%.

8. T wave: two ECGs showed low and flat T waves, accounting for 0.73%; six ECGs showed bidirectional T waves, accounting for 2.21%.

9. QRS syndrome:

(1) Voltage: 25 ECGs showed low voltage, accounting for 9.23%.

(2) Electrical axis: four ECGs showed moderate and remarkable rightward deviation, accounting for 1.48%; 11 ECGs showed mild and moderate leftward deviation, accounting for 4.06%.

(3) Ventricles: two ECGs showed hypertrophy of right ventricle, accounting for 0.73%; five ECGs showed right ventricular hypertension, accounting for 1.85%; one ECG showed left ventricular hypertension, accounting for 0.73%.

III. Discussion and Summary

The positive ratio of definite changes in the 271 ECGs of patients with dental fluorosis was 43.54%, which approximated the report of Shanxi Province ⁽²⁾ and was higher than that of Jingyang, Shaanxi ⁽³⁾; wherein the foremost change was arrhythmia, accounting for 29.52%, followed by myocardial metabolism

disorder, accounting for 12.18%; the differences of ECG abnormalities were not related to age distribution, whereas mathematical statistics on the difference of ECG changes associated with types of dental fluorosis were processed, revealing $P < 0.05$ (see the following table).

The type [of dental fluorosis] is the different manifestation of the dental injury caused by excessive fluorine in the process of dental development ⁽⁴⁾; as to how to explain its difference reflected in ECG, it remains uncertain.

**Comparisons between Dental Fluorosis Type
and Positive ECG**

	Number of cases with positive ECG	Number of cases with negative ECG	Total	% of positive ECGs
Chalk teeth	58 (49.20)	55 (63.80)	113	51.33
Stained teeth	67 (63.13)	88 (81.87)	145	39.31
Teeth loss	3 (5.66)	10 (7.34)	13	23.08
Total	118	153	271	43.64

$X^2_{0.03(2)} = 5.99$; in the current study, $X^2 = 6.09 > 5.99$, $P < 0.05$

Note: Values in () are theoretical values

The incidence of deciduous dental fluorosis in Yuqing Village and Guanfang Village was 18.28% ⁽¹⁾. The current paper reported 16 cases with deciduous dental fluorosis, accounting for 5.90% of the 271 cases, demonstrating the severity of fluorosis in those villages, i.e., elemental fluorine passed through the placental barrier of mothers to enter fetuses when the mothers were pregnant, so that fluorosis may be detected in deciduous teeth ⁽⁴⁾; furthermore, of those 16 cases, 9 cases had positive ECG, accounting for 56.25% of cases whose deciduous teeth were examined; due attention should be paid to this phenomenon, which is worth our tracking and observing.

References

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