

## ELECTROCARDIOGRAM ANALYSIS OF PATIENTS WITH SKELETAL FLUOROSIS

RuYi Xu and RuQi Xu  
Bao Tou, Inner Mongolia, China

**SUMMARY:** To investigate the degree of myocardial damage resulting from endemic fluorosis, electrocardiograms of 136 skeletal fluorosis patients from an endemic fluorosis area were compared with electrocardiograms of a control group of 40 normal patients from a non-endemic fluorosis area. The results show that fluoride in drinking water consumed over time is harmful not only to bones and teeth but also to the cardiovascular system, and confirm the urgent need to lower the fluoride content of drinking water in endemic fluorosis areas.

**Key words:** Electrocardiograms; Endemic fluorosis; Skeletal fluorosis.

### INTRODUCTION

In recent years many Chinese medical workers have realised that fluoride accumulates not only in bones and teeth but, to a lesser extent, in soft tissues especially the cardiovascular system. This knowledge has led to consideration of the possibility that fluorosis can be associated with reduced myocardial functions. A study of 271 electrocardiograms of dental fluorosis sufferers indicated that 29.5% had abnormal heart rhythms, and 12.8% had reduced myocardial function.<sup>1</sup> The purpose of the present study was to investigate the degree of myocardial damage in patients suffering from endemic skeletal fluorosis.

### MATERIALS AND METHODS

We chose for electrocardiogram (ECG) analysis 136 skeletal fluorosis patients, aged between 39 and 56 years, residing in the endemic fluorosis area Tuo Ke Tuo in Inner Mongolia, where fluoride content of drinking water is between 4.1 and 8.6 mg/L. We compared their electrocardiograms with those of a control group of 40 normal persons, of similar age range (36-52 yr) residing in a non-endemic fluorosis area (water fluoride content 0.1-0.6 mg/L).

### RESULTS

As shown in Table 1, 50.73% of patients with skeletal fluorosis had abnormal ECGs, compared with 20% in the control group.

**TABLE 1.** Cardiogram analysis of skeletal fluorosis and control

Group	No.	Abnormal ECG	Percent
Skeletal fluorosis	136	69	50.73%
Control	40	8	20.00%
Total	176	77	43.75%

A comparison of ECG changes in the two groups (Table 2) shows that skeletal fluorosis patients exhibit signs of myocardial damage which seriously interferes with cardiac function.

Bao Tou Railway Hospital, Bao Tou, and Hohhot Municipal Sanitary and Anti-epidemic Station, Hohhot, Inner Mongolia, 010020 China.

Presented at the XXth Conference of the International Society for Fluoride Research, Beijing, China, September 1994.

TABLE 2. Abnormal cardiogram analysis of skeletal fluorosis and control

Abnormal condition	Skeletal fluorosis		Control	
	No.	%	No.	%
Sinus irregularity	5	3.68	2	5.0
Sinus bradycardia	7	5.15	1	2.5
Sinus tachycardia	9	6.62	2	5.0
Low voltage	5	3.68	1	2.5
Left axis deviation	4	2.94	1	2.5
Right axis deviation	2	1.47		
Right ventricular high voltage	3	2.20	1	2.5
Left ventricular high voltage	6	4.41		
Left ventricular hypertrophy	11	8.08		
ST and T wave changes	9	6.62		
Complete right bundle branch block	7	5.15		
Complete left bundle branch block	1	0.74		

When the abnormal ECGs of skeletal fluorosis patients are arranged according to class (Table 3) it can be seen that the more severe the disease (*i.e.* the higher the class) the higher the percentage of abnormal ECGs.

TABLE 3. ECG analysis of skeletal fluorosis by class

Class (degree)	No.	Abnormal ECG	%
1	46	17	36.96
2	51	27	52.94
3	39	25	64.10
Control	40	8	20.00

## DISCUSSION

Our results are basically the same as those of Comrade Zhou QiHua, who studied dental fluorosis cases.<sup>1</sup> The increase in abnormal heart rhythm with fluoride intoxication is clearly demonstrated. Comrade Qin TehCheng<sup>2</sup> reported adverse effects of fluoride on cultured myocardial cells of mice, which included alterations to rate of throbbing. Soviet scholars have reported bradycardia (slowing of the heart beat) occurring among phosphate workers suffering from fluorosis.

High blood fluoride levels have an effect on body calcium. Calcification of the aorta and other arteries, resulting in arteriosclerosis including coronary arteriosclerosis, has been demonstrated in other studies in China.<sup>3,4</sup> Our results are consistent with such findings.

High fluoride concentrations in drinking water over time are harmful not only to bones and teeth, but also to the cardiovascular system. Our study shows that the severity of skeletal fluorosis is directly related to the severity of abnormal cardiac function, as demonstrated by the electrocardiograms. The findings lend further support to the urgent need to lower the fluoride content of drinking water in the endemic fluorosis areas.

## REFERENCES

(in Chinese)

- 1 Zhou QH, Zhang DC. Electrocardiogram analysis of 271 dental fluorosis cases. *Chinese Journal of Endemiology* 5 (4) 296-297 1988.
- 2 Qin CD, Wang JJ, Li XG, Liu CG. Effect of fluoride on spontaneous electrical activity of cultured myocardial cells. *Chinese Journal of Endemiology* 7 (5) 270-273 1988.
- 3 Song AH, Wang TY, Zhang ZB, Jiang CY. Observations on fluorotic aorta sclerosis by two-dimensional echo cardiography. *Endemic Diseases Bulletin* 5 (1) 91-93 1990.
- 4 Liang ZK. Investigation and analysis of cardiovascular disease in endemic and non-endemic fluorosis areas. *He Bei Province Journal of Endemiology* 12 44 1984.