

SKELETAL CHANGE IN OSTEOFLUOROSIS PATIENTS AFTER DEFLUORIDATION OF DRINKING WATER

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SUMMARY: Serial X-ray studies of cases of osteofluorosis over 12 years following defluoridation of drinking water show that signs of reversion may be seen as early as 4 and 5 years, and are found in all cases after 12 years, with a significant percentage reverting to an apparently normal state. Changes are found predominantly in cancellous bone.

Key words: Defluoridation; Osteofluorosis; Skeletal change.

Introduction

Shandong Province is the chief area in China in which fluorosis associated with drinking water is endemic. For the past 12 years, defluoridation of water supplies had taken place for a population of 5.6 million people.

Fluoride concentrations in drinking water were decreased in Xi Liukou village, from 6.4-20.0 mg/L to 0.5-0.9 mg/L; and in Hou Zhu village from 2.4-7.6 mg/L to 0.71-0.75 mg/L. The prevalences of dental fluorosis and osteofluorosis had been, respectively, 100% and 57.3% in Xi Liukou; and 87.7% and 34.7% in Hou Zhu.

Method

Serial observations of skeletal changes over the 12-year period, by means of X-rays, were carried out annually for the first 3 years, and then on the 4th, 5th and 12th year after exposure to the low-fluoride drinking water.

The study sample was 200 cases (110 male, 90 female) in Xi Liukou and 51 cases (34 male 17 female) in Hou Zhu. Ages ranged from 42-72 years.

X-ray studies consisted of: posterior-anterior view of pelvis; right forearm, including elbow joint; and right leg, including knee joint.

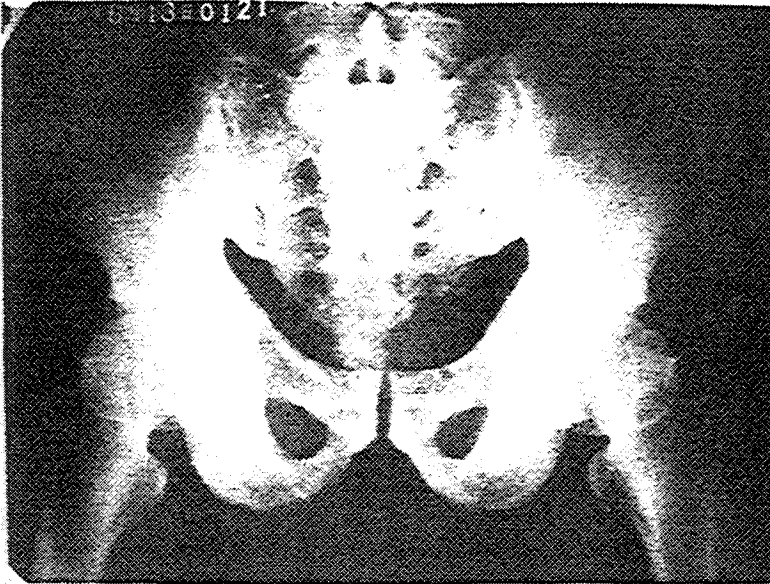
Results

During the first 3 years, (30 cases per year) no significant skeletal changes were found. In the 4th year (50 cases) 9 osteofluorosis patients showed some mitigation. In the 5th year (60 cases) 56 patients with osteofluorosis showed reversion of various degrees (Table 1). In the 12th year, 51 sclerotic osteofluorosis cases were re-examined and showed a reversion rate of 100% (Table 2).

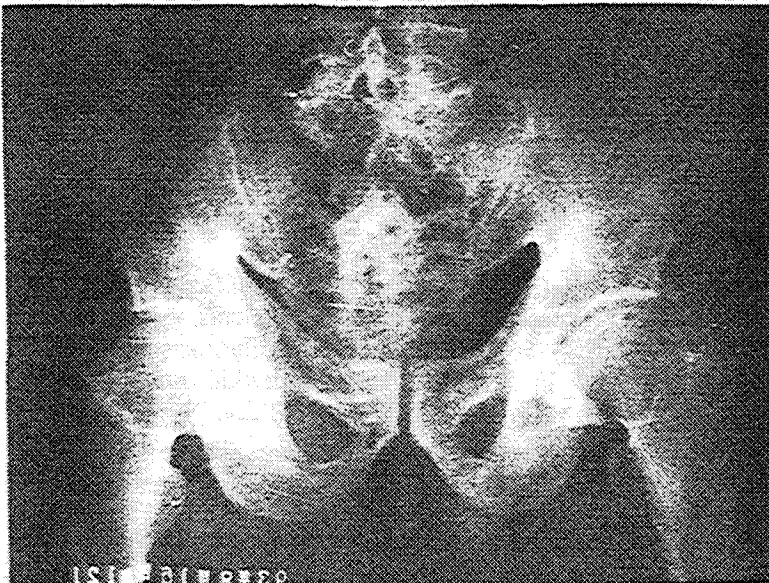
Apparent reversion was seen in cancellous bones in the 5th lumbar vertebra, sacrum, ilium, sacro-iliac joints, trochanters of the femur, and medial and lateral condyles of the femur and tibia.

In this group of patients, pelvic ligaments and the periosteum of the right forearm and leg showed ossification. There were no apparent changes in this finding on follow-up. Changes of joint degenerative diseases increased with age; but this was not thought to have any specific association with osteofluorosis.

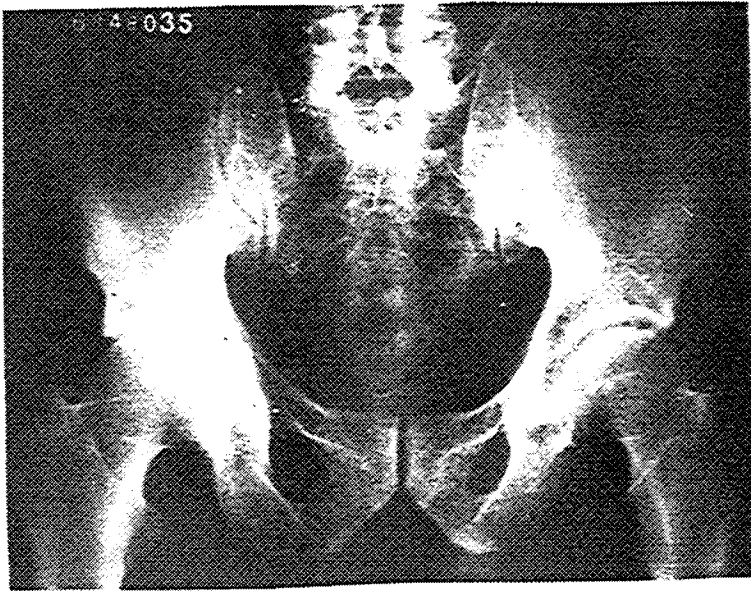
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1. Subject G X. Male, 64 years before defluoridation.
Note: Pelvis, III sclerotic osteofluorosis.



2. Same subject as in 1 twelve years post-defluoridation.
Note: almost normal. Reduced bone density, bone texture reappears, trabeculae thinning and improved distribution.



3. Subject C T. Male age 63, before defluoridation.
II degree osteofluorosis.



4. Same subject as in 3 12 years after defluoridation, reversed to normal. Note: bone density returning to normal, trabeculae thinning and better distributed.

TABLE 1. Skeletal changes in 56 patients in 5th year after defluoridation of drinking water

Degree	Cases	Normal	Early	Reversion			Unchanged
				I	II	III	
Early	8	4					4
I	28	9	16				3
II	15		2	12			1
III	5			4		1*	
Total	56	13	18	16		1*	8

* slight reversion, but no reduction in degree

TABLE 2. Skeletal changes in 51 osteofluorosis patients in the 12th year after defluoridation of drinking water

Degree	Cases	Normal	Early	Reversion			Unchanged
				I	II	III	
I	13	13					
II	20	12		8			
III	18	2		14	2		
Total	51	27		22	2		

Discussion

It has been considered, generally, that it takes more than 5 years to see any improvement in changes of osteofluorosis seen in plain X-ray films.¹ This study shows that some mitigation may be expected in 4 years. Other Chinese studies have shown even longer periods, up to 15 years, for reversion.^{2,3} This study shows a reversion rate of 86.6% after 5 years with a 21.6% reversion to normal. It shows, also, that after 12 years, the reversion rate was 100% with 52.9% of cases reverting to normal including 2 cases with III degree sclerotic fluorosis.

Bone damage caused by fluorosis is not irreversible. Exchange of minerals (calcium, phosphorus, magnesium, *etc* and fluoride) in bone can take place at any time. When body intake exceeds excretion, these accumulate.⁴

The higher metabolic rate of cancellous bone, compared to compact bone as well as ligaments and periosteum, probably accounts for this being the major site of reversion.

References

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