American Medical Association

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Dear Bob,

Is this anything new and important? If so, will you please abstract it, write an editorial, or do whatever you think should be done?

With many thanks and kind regards,

Cordially,

Katharine

Katharine R. Boucot, M. D.

KRB:crt
Enc.: Sonkin, N.: Stippling of the Retina. A New Physical Sign in the Early Diagnosis of Lead Poisoning, New England J. Med. 269:779 (Oct. 10) 1963.

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STIPPLING OF THE RETINA

A New Physical Sign in the Early Diagnosis of Lead Poisoning

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LEAD poisoning was a subject of major importance during the first four decades of this century because of the absorption of lead from paint, especially among children and painters. Intoxication with lead products was also common among battery workers and those unfortunate enough to ingest it from the insecticide residues on fruits and vegetables. It is no longer as prevalent because of the safeguards that have been introduced in lead-free paints and the greater sophistication of industrial users of lead. Nevertheless, it is still an important problem in the wire and battery industries.

The classic physical findings and laboratory data such as a lead line in the mouth, chronic gastritis, encephalopathy and extensive basophilic stippling of erythrocytes are manifestations of advanced stages of heavy-metal intoxication. An early diagnostic sign would have merit from both an individual and a public-health standpoint. A physical finding of this nature has been observed in a small series of cases.

A grayish stippling of lead pigment that is circumferential around the optic disk has been observed in persons exposed to several lead compounds. Visualized through the ophthalmoscope, particles of lead appear as glistening, discrete, gray pigment concentrated in the retinal area around the optic disk. It should be noted that this pigment differs distinctly visually from that observed in the elderly and those of olive or swarthy complexions and in the Negro race. This sign is shown in Figure 1.

Deposition of lead pigment is not mentioned in ophthalmologic textbooks, which consider other eye manifestations in lead poisoning.[1,2] Optic neuritis, edema of the disk, ocular-muscle paralysis, ptosis and central-vision disturbance are described. These pathologic conditions are relatively rare and usually occur in association with generalized systemic disturbance in advanced plumbism.

Several textbooks do not even mention eye changes in lead intoxication.[3-6] A review of the literature did not disclose any recent periodicals dealing with this subject. There were, however, several articles in past decades on ocular changes in advanced lead intoxication.[7-13] These described findings of amblyopia, retinal edema, retrobulbar neuritis, scotomas, cataracts, extraocular-muscle paralysis, choked disks and either partial or total blindness.

The present study was made during a period of approximately a year. A total of 25 persons were exposed to lead compounds in their work for an industrial wire-manufacturing company through manual handling of bulk lead compounds and by inhalation of whatever lead dust contaminated the atmosphere of the working area. Seventeen members of this group worked for intervals of three months or less and did not give any clinical or laboratory evidence of lead absorption. The remaining group of 8 men worked for intervals of six months to a year and were followed medically. Their work consisted of mixing various industrial lead compounds in an enclosed area for the manufacture of wire insulation on a basis of forty hours a week.†

Several safeguards were instituted to protect these men. A large exhaust fan was installed in the mixing room to minimize inhalation of the powders. All employees were required to wear masks, gloves and coveralls during various phases of their work. Prior to leaving the work area they were also required to wash their hands. Despite these precautions lead intoxication occurred due to carelessness and prolonged exposure.

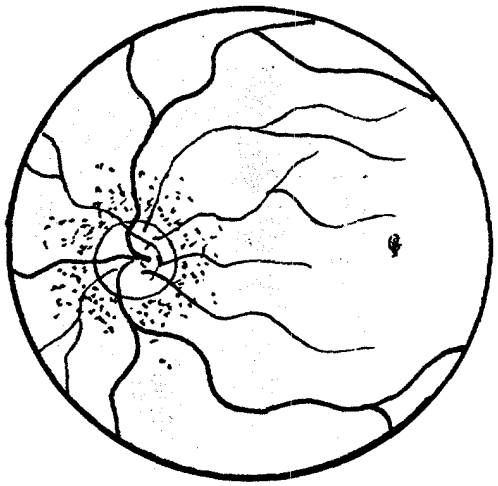

FIGURE 1. *Drawing, Showing Deposition of Lead Pigment in an Area Surrounding the Optic Disk.*

These workers were followed by blood counts, urinary lead determination and physical evaluations with especial attention to funduscopic and mouth examinations. Those who excreted abnormal amounts of lead in the urine frequently exhibited

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†*Lead compounds (lead vinyl stabilizers)* were as follows: basic lead silicate sulfate, 68.0 per cent total lead; dibasic lead phosphite, 90.8 per cent total lead; dibasic lead phthalate, 79.8 per cent total lead; lead chlorosilicate complex, 47.5 per cent lead; and dibasic lead stearate, 55.3 per cent total lead.

TABLE 1. *Summary of Findings.*

CASE NO.	EXPOSURE TO LEAD FOR >6 MO.	ERYTHROCYTE STIPPLING		LEAD IN URINE*		LEAD LINE ON GUMS		MOUTH HYGIENE		LEAD-PIGMENT DEPOSITION IN RETINA	
		ON INITIAL EXAMINATION	4 MO. AFTER REMOVAL FROM EXPOSURE	ON INITIAL EXAMINATION	4 MO. AFTER REMOVAL FROM EXPOSURE	ON INITIAL EXAMINATION	4 MO. AFTER REMOVAL FROM EXPOSURE	ON INITIAL EXAMINATION	4 MO. AFTER REMOVAL FROM EXPOSURE	ON INITIAL EXAMINATION	4 MO. AFTER REMOVAL FROM EXPOSURE
				mg./liter	*mg./liter*						
1	Yes	Rare	No	0.12†	0.04	None	None	Poor	Poor	Yes	No
2	Yes	Occasional	No	0.16‡	0.08	None	None	Poor	Poor	Yes	No
3	Yes	No	No	0.16§	0.08	None	None	Poor	Poor	Yes	No
4¶	Yes	Rare	No	0.24¶	0.04	None	None	Good	Good	Yes	No
5	Yes	Rare	No	0.08**	0.04	None	None	Poor	Poor	Yes	Decreased
6¶	Yes	Yes	No	1.56‖	0.08	None	None	Good	Good	Yes	No
7	Yes	No	No	0.12††	0.08	None	None	Poor	Poor	Yes	No
8	Yes	No	No	0.12**	0.08	None	None	Poor	Poor	Yes	Decreased

*Single sample; normal range, 0-0.15 mg./liter (determinations through courtesy of R. I. State Dept. of Public Health, Providence).
†7 mo. after exposure.
‡6 mo. after exposure.
§8 mo. after exposure.
¶Largest exposures in group — 12 mo.
‖12 mo. after exposure.
**11 mo. after exposure.
††11½ mo. after exposure.

rare basophilic erythrocyte stippling. No one had any evidence of a lead line. However, an abnormal urinary lead concentration showed some correlation with the retinal findings of grayish lead pigmentary deposits in the area peripheral to the disk margins. I was able to predict with good reliability which workers would excrete abnormal amounts of urinary lead by prior ophthalmoscopic examination.

Table 1 summarizes the findings in the series. Statistical analysis by application of the binomial test yields probability values equal to or less than 0.016, with one-tailed hypotheses that retinal pigmentation is a reliable sign.*

DISCUSSION

Deposition of pigment in the retina appears to be a reliable early sign of lead intoxication. Although the retinal stippling in this small series of cases could possibly have come from some other source, the most likely assumption would be that it was due to lead or to a lead compound. Retinal pigmentation is reversible within a period of months if the environmental exposure is eliminated. Positive laboratory data correlate somewhat with eye findings. There appears to be a relation between absorption of lead and cleanliness when oral hygiene is used as an index. Poor personal hygiene apparently serves as a predisposing factor in lead absorption. Retinal changes are visualized as a glistening deposition of grayish lead pigment surrounding the optic disk. This may be present before there is laboratory evidence of lead toxicity.

*Statistical analysis performed by Arthur Tamkin, Ph.D., of Cranston, Rhode Island.

SUMMARY AND CONCLUSIONS

A previously unrecorded physical sign in the diagnosis of incipient lead poisoning is described. Pigment deposition in the retinal area circumscribing the optic disk can be readily seen by any physician with an ophthalmoscope and a discerning eye.

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