Neurological Manifestation of chronic Mercuralism.

Abass Al- Sharifi
Medical College , Babylon University

Abstract

2gourps of patients included in this study the group A was workers with a history of long term exposure to mercury both by handling and inhalation. High level of mercury in the blood was detected in all patients of group A.

Group B was taken as controlled group, those had history of mild exposure to mercury and had mercury level in their blood within the acceptable level.

Long term exposure to mercury affect the central nervous system by causing degenerative changes in the cereblellum and the occipital lobe of the cortex.

Tremor was present in the majority of patients which was mainly of postural type followed by intention tremor, while resting tremor was not recorded in those patients.

47% of group A had impairement in the memory both types (recent and remote memory).

10% of group A had urine incontence and weakness of upper and lower limb. Only few patients of group B had the above clinical neurological manifestation.

For the best of my knowledge this is the first study in Iraq about the neurological manifestation and longterm low mercury vapour exposure.

Introduction

Mercury (Hg) is present either in an inorganic (elemental or mercuric salt) or an organic (usually methyl) form.

Toxicity usually occur from inhalation of Hg vapour during industrial exposure.

Inorganic Hg is absorbed mainly as vapour through the lung, where 80-100% of inhaled Hg enters the blood stream through the alveoli. Gastrointestinal absorption of inorganic Hg is low.

Absorbed Hg vapour is lipid soluble and readily cross the blood brain barrier[1].

Degenerative changes with a striking focal distribution, affecting

mainly the granular layer in the cerebellum and the occipital lobes of the cortex, have followed the absorption of alkyl Hg compounds[2].

Exposure to inorganic mercury vapour produuces a very different clinical picture, the neurological features consisting of tremor of the hands, eyelids and tongue and a combination of behavioural and personality changes know as erethism and in sever cases frank psychosis may develop[2,3].

Neurological manifestation including tremor, memory disturbances had been reported due to exposure to inorganic mercury[4,11,12,9].

Large out break of organomercurial poisoning in Iraq due to ingestion of seeds treated by fungicides containing methl mercury-2-3 dihydroxyproplmercaptide and methl mercury acetate[8,9].

The study which done at that time was due acute poisoning by organic mercury.

Up to my knowledge no study done in Iraq on health hazard of chronic mercuralisim.

Normal blood mercury level ranged between (2-20 ng/cc or < 0.005 ppm)[1,3,13].

Thus blood Hg level above 35ng/cc and urine Hg level above 150 ug/L are abnormal.

Neuromuscular toxicity occurs at blood level of inorganic Hg below 0.1 ug/m1 = 100ng/cc = 0.02ppm[3]

An average urinary Hg excretiion rate above 0.1mg/24h in a group of Hg workers indicate the need for corrective measures for the work situation[3]. An individual who shows over 0.2mg/24h in urine should be removed from further exposure if urinary excretion of Hg goes above 0.05mg/24h[3].

Material And Method

60 male workers working in afactory using inorganic Hg in the industery were refered to Marjan Teaching Hospital in the period between 1:11 : 1994 - 20 :1 :1995 to check the health hazard from long term exposure to mercury.

Total mercury level in blood had already been measured in Baghdad by the method of atomic absorption. Urinary mercury level was not done because we lack such a test.

Each worker was thoroughly interrogated with special emphasis on contact with material containing mercury by handling during work or by inhalation of the dust, and the approximate period of exposure in hours and years.

Each one was carefully examined clinically and investigations were done as following:-

1- Investigations for all workers like

G.U.E; B. urea; S. creatinine, SGOT, SGPT; CBP + ESR, BLOOD film.

2- Special investigations like 24h urine for proten for certain group who has proteinurea.

The workers divided into 2 groups. Group A(30) with high Hg level, group B(30) with acceptable Hg level.

Aim of The Study

To know the health hazard of the mercury on the nervous system.

Statistical analysis

The statistical significance of observed difference was assessed by chi-square and t-test.

Results

The acceptable level of mercury in the blood of industrial worker should be < 0.005 ppm(14).

Table I

Shows Hg level in both groups. group A had high Hg level in their blood ranging from 0.005-0.08 ppm, that is to say it is 1-16 times higher than acceptable level. While group B had mercury level <0.005 ppm. Statistically it is significant p<0.01.

Table II

(73%) had mercury level range 8-16 times higher than the acceptable level. Those had been exposed to this material for a time ranging from 5-29 years, while those who had aperiod of exposure of 5 years and below had a lower level of mercury (27%).

Table III

Showed neurological manifestation in both groups.

Tremor was present in 67% of group A whiles only in 10% of group B, which is statistically significant (P<0.001).

Memory impairement was present in 74% of group A and 6.6% of group B. Which is also statisitically significant (P value <0.001)

Urine incontence and weakness of upper and lower limb were present in group A but not in group B.

Delrium was not present in both groups.

Table IV

Showed that those workers who had been exposed to mercury for more than 5 years were more liable to get tremor, memory disturbance, urine incontence and weakness in upper or lower limb.

The earliest clinical feature of the chronic mercuralisim was tremor while urine incontence and weakness of upper and lower limb need longer period (> 15 years) of exposure to develop. This is consistent with what is mentioned in the book[2,3].

Insomnia was recorded in 2 pa-

tients it was not common in the contrary to what is mentioned in the booke[1,2,3].

The explaination is that those workers had overtimes to get extrasalary so when they came to their home they are already exhausted so they got sleep easily.

3:30 (10%) had weaknees in upper and lower limb grade 3-4.

3:30 (10%) had some sort of the urine incontence, their age were 40-45 years who were free of urinary tract infection; Diabetes melletus and prostatic hyertrophy.

This sort of urine incontence is called paradoxical incontence[1] which due to neurological damage. Such cases were reported in Iraq during mercury poisoning by eating the treated seeds with mecury in 1971-1972[8].

Delrium and fecal incontence had not been recorded in this study which is not consistent with study done in 1973 in Iraq[8,9].

Table V

It is known that chronic exposure to mercury can cause various types of tremor including intention, postual, and rest tremor)[1,2,3,4,7,8].

60% of these tremor were postural tremor which is defined as (Tremor more than 10 Hz of the outstretched hand)[7]. It was the commonest tremor in those workers while intention tremor was the second type in the incidence (40%) this is inconsistent to what is mentioned that intention tremor is charactristic of the chronic mercuralism[1].

The intention tremor is defined as oscillatory movement which tend to affect distal parts and the movements are more rythmic and tend to be in one plane)[1]. All these intention tremor were perpheral.

The intention tremor result from aleison affecting the superior cerebellar peduncle, but there was no cerebellar signs in those workers which could appear in the future.

No resting tremor recorded in those workers.

Table VI

22:30 of workers in group A had some sort of memory impairement.

This was detected clincally by testing of immediate recall, recent memory and remote memory which roughly correspond to registration, storage and retrieval respectively.

16:22 (72%) had impairment in the recent (storage) memory while 12:22 (54%) had impairment in remote (retrieval) memory. No body had defect in the immediate recall (registration) memory.

I think that sort of aminesia was

not wholly organic (due to mercury) but there was also psychogenic element which was clear during the interview with those workers 3:30 (10%) of group B had some sort of amnesia, which was mostly psychogenic as shown in group B.

Those workers who had ammesia had high Hg level in their blood 8-16 time more than acceptable value. as shown in Table IV.

Discussion And Conclusion

Mercury poisoning is either:

(I) Acute (II) chronic

Acute poisoning is either due to ingestion of mercuric salt which may cause various symptoms which could be simple like abdominal pain, vomiting bloody diarrhea. or may be so sever that can lead to death, or could be due to inhalation which can cause dysponea, fever, salivation which may resolove or lead to pneumonitis, pulmnory edema or preumothorax[2,3].

Chronic poisoning is either due to inhalation or ingestion and this was the subject of this study.

This study had been conducted to give physcican a reliable out look for people who expose to mercury and the health hazard of this material and the importance of the occupational medicine as part of internal medicine.

47% of group A worker had memory impairement. 67% had tremor both intention and postural tremor. These two clinical neurological manifestation were the commonest clinical features. This was related to:

1- High concentration of Hg in their blood.

2- Long time of exposure more than 5 years.

3- Those workers were carless in using the protective measures which were available in their factory like gloves, airmask, gas mask and the protective clothes.

This study gave us clue that postural tremor not the intention tremor is charactrictic of chronic mercuralisim (60% versus 40).

The study proved that chronic exposure to Hg is additional cause of urine incontence and weakcness of upper and lower limb espically in young age.

This study is consistent with study done by Dr. AL-Damaluji et al in 1972[8,9] in which hundreds of patients with neurological manifetation had been hospitilized all over the Iraq due to ingestion of seeds treated with fungicides containing mercury, also my study is consistent with study done by Tamir *et al* [11] who showed that various neurological manifestation had been reported after industerial exposure to inorganic mercury.

As long as there is arisk from the long term exposure to mercury so:

1- Workers should be trained to understand the hazard involed and to avoid exposure by proper use of safety equipment.

2- Those people should be educated by medical personeal about the importance of the protective measures in preventing hazard of chronic exposure to mercury.

3- Those workers need to be examined frequently and those with very high level of Hg need to be removed from further exposure until they improve.

4- dimercapol should be given to those who have high Hg level as long as these symptoms is mild in severity because if brain damage occur is more likely to be permenent and improvement require 1-2 years.

5- Patient with tremor and memory disturbance make the physician think that mercury could be acause.

Table I : Mercry Level In Blood In Both Groups

Group	Number	Hg level in blood (PPM)
A	30	> 0.005-0.08
B	30	< 0.005

group A versus group B (P value < 0.01)

Table II : Relation Of Mercry Level To The Duration Of Exposure In Group A.

Number of workers	%	Hg level in blood (PPM)	Duration of exposure in years
22:30	73	0.04-0.08	> 5 years
8:30	27	0.005-0.03	< 5 years

Table III : Neurological Manifestation of Both Groups

	Tremor	Merory Impairement	Insomnia	Delrium	Urine incontence	Weakness of upper &Lower limb
group (A)	20:30 67%	22:30 74%	2:30 6.6%	Nil	3:30	3
group (B)	3:30 10%	2:30 6.6%	Zero	Nil	Nil	Nil

group A versus group B (P value = (0.001)).

Table IV: Neurological Manifestation Of Chronic Mercurialism Group A.

Clinical munifestation	No	%	Duration of exposure	Level of Hg in blood
Tremor	20:30	67	5-29y	0.04 - 0.08
Memory impairement	22:30	74	5-29y	0.04 - 0.08
Insomnia	2:30	6	> 10y	0.05 - 0.07
Delirium	Nil			
Urine incontence	3:30	10	25 y	0.08
Fecal incontence	Nil			
Weakness of upper &lower limb	3	10	15 y	0.06 - 0.08

Table V : Tremor of Hg Poisoning

Type of tremor	No	%
Postural	12	60
Intention	8	40
Rest	Zero	Zero

Table VI : Memory Disturbance in Hg Poisoning

Type of Memory	No.	%
Registration (immediat recall)	Zero	Zero
Storge (Recent)	16 : 22	72
Retrieval (Remote)	12 : 22	54

References

1-Harison's principles of internal Medicine part I chapter 172 p. 853. chapter 16 p. 90

2- J. A Vale Poisoning Diagnosis and treatment p. 173.

3- Robert H. Handbook of Poisning chapter 15 p. 238-240.

4- Mucklow. Es Lancet 1989 Feb, 25.

5- Plikivi.L.; Ruokonen. A.Arch. Environ. health 1989 May-Jun. 146-9.

6- Swinehart-Lt. Pediatrics. 1988, May.81-(5) 743-4.

7- Roger p. simon, Michael J, David A. clinical neurology 1989 chapter 1 p. 6-7.

8- Washifi Muhmood, Iraqi Medical Journal part 3.4 chapter 21 December 1973.

9- Iraqi Medical Jounal part 1,3.4 December. 1994-1995.

10 - Al-Damluji S.F 1972 Iraqi-Med. J.22.1

11- Dah'ham. S.S and Drfali 11 1962 J. Fac. Med. Bag. 4. 104.

12- Tamir M. Barnstein B, Behar, M. and chwat, M., 1964 British J. indust. Med 21, 299.

13- Poisaning. Medicine internation.September 9, 1984.

14- J.A. Parrot Trace element, medicine and biology.

15- Wayne W. Daniel Biostatistics A Foundation for analysis in the health science Third Edition.