

Effects of chelation therapy in patients affected from heavy metal toxicity from gold mining in Loei Province: A case study of arsenic toxicity

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Abstract

The purpose of this descriptive study (case series) was to determine various clinical signs and symptoms of health effects associated with arsenic exposure from gold mining with chelation therapy. The population that formed the sample were 14 patients at the outpatient department of Wang Saphung Hospital, Loei Province. These patients were admitted during August–December 2015, and were effected by arsenic exposure. They had various clinical signs and symptoms especially arsenical keratosis. The target patients had received chelation therapy 20 times in total at a rate of once a week. The outcome measures of this study were patients' general health, arsenical keratosis condition and quality of life. The data was analyzed using descriptive statistics and t-test.

The results of this study showed that 14 patients (6 males and 8 females) who had received chelation therapy, showed improvements in their health and well being. In addition, the arsenical keratosis faded until it was almost invisible in 86% of patients (n=12) and was faded but to a lesser degree in the remaining 14% of patients (n=2). Nevertheless, the pre-test and post test score of quality of life was not statistically significant (\bar{x} of the pre-test = 93.78 and the post-test = 99.21).

Keywords: chelation therapy, arsenical keratosis, heavy metal toxicity

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1. Introduction

Data from the Department of Mineral Resources reveals that there are 10 major gold deposits in Thailand. 8 gold deposits are in 6 provinces of the northern region (1 deposit in, Phetchabun, Sukhothai, Phrae and Chiang Rai, 2 deposits in Phichit and Lampang), 1 deposit in the north eastern region (Loei) and 1 deposit in the southern region (Prachuap Khiri Khan). Currently, Chatree gold deposit in Phichits province and Phu Thap Pha gold deposit in Loei province are being explored and are being developed into gold mines. The population in Tambol Hhao Luang, Wangsapung district, in Loei Province were considered to be affected from heavy metals toxicity [4] as a result of the mining. The Regional Environmental Office 9, Udon Thani Province, has summarized the results of monitoring the environmental impact of gold mining project during the year 2004-2006. Their report indicated that the water of Huay Stream and Puk Stream had relatively high level of cyanide and manganese contamination. In 1990 the Loei Provincial Health Office had issued an announcement No. 1/2010 (B.E. 2553) that River Snails

which were collected from Lek Stream were contaminated with arsenic at levels exceeding the standard for public consumption and warned people to not consume river snails. In 2011, the Pollution Control Department, Department of Ground Water Resources and Department of Primary Industries and Mines monitored the quality of surface water around neighboring villages of the gold mine (public water resources) in Tambon khao Luang. The results of the monitoring found that water in the Huaylek Stream had arsenic levels over on the maximum stated in the water standard and that cyanide concentration exceeded the standard in the year 2007 (B.E. 2550). Wangsapung Hospital conducted blood tests for 279 people in 6 villages for cyanide examination (examined by Ramathibodi Hospital). The results of the blood tests found that 54 people had cyanide in their blood and that 20 people had levels of cyanide in their blood above the acceptable limit. After these test Loei Provincial Health Office and Wangsapung Hospital conducted a blood test for 758 at risk people. The results showed that 124 of the 758 cases had cyanide in their blood above

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Table 1 Pre-post general health and areas and number of arsenical keratosis after chelation therapy

| No | Sex/Age | Important general health | | Location and amount Arsenical keratosis | |
|----|----------------------|--|--|---|---|
| | | Pre-test | Post-test | Pre-test | Post-test |
| 1 | Female / 56 years | Knee pain | -release knee pain - weight has increased - better visibility - good appetite - sufficient sleep | Left palms /Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 2 | Female / 59 years | -Hx. Hypertension -frequent Headaches | -no headache -normal blood pressure | Left palms /Arsenical keratosis 2 points | Faded until almost invisible of arsenical keratosis |
| 3 | Female / 43 years | numbness and joint pain | -release joint pain -release numbness | Left middle Finger/ Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 4 | Female / 49 years | not feel refreshed | -stronger - weight has increased | -Left palms /Arsenical keratosis 1 point -right palms / Arsenical keratosis 1 point | - Faded until almost invisible of right palms arsenical keratosis -faded of left palms arsenical keratosis 1 point |
| 5 | Female / 47 years | irritability | clam down | -Left palms /Arsenical keratosis 1 point -right palms / Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 6 | Female / 57 years | -blurry vision - pain in both knee | -weight has increased -good appetite -release joint pain - bright and fleshy | Left palms /Arsenical keratosis 1 point -right palms / Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 7 | Female / 60 years | Hx. Diabetic 3 years.Hypertension1 4years depression 7 years - Sleepless | -Normal blood pressure - Sleep better | Left palms /Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 8 | Female / 42 years | normal health | - Unaltered -normal health | Left palms /Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 9 | Male / 54 years | - After the bath, the body is itching without a rash -knee joint pain | -After chelation 2 times, rash disappear - release joint pain | right palms / Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 10 | Male / 43 years | Hx. Kidney disease -normal health | -Unaltered -normal health | -Left first finger /Arsenical keratosis 1 point - left forefinger / Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 11 | Male / 49 years | Left knee pain | -stronger - weight has increased -bright - release knee pain | Left palms /Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |
| 12 | Male / 63 years | normal health | -stronger -weight has increased | Left palms /Arsenical keratosis 2 points | Faded until almost invisible of arsenical keratosis 1point but Still 1 faded of arsenical keratosis |
| 13 | Male / 70 years | pain in both knee | -stronger -weight has increased -still mild pain | Left palms /Arsenical keratosis 2 points | Faded until almost invisible of arsenical keratosis |
| 14 | Male / 47 years | normal health | -stronger -weight has increased | right palms /Arsenical keratosis 1 point | Faded until almost invisible of arsenical keratosis |

Table 2 Pre-post Quality of life after chelation therapy

| QOL | N | \bar{X} | S.D | t | p-value |
|-------------------------|----|-----------|-------|-------|---------|
| Pre-chelation therapy | 14 | 93.78 | 11.02 | 1.323 | 0.209 |
| Post- chelation therapy | 14 | 99.21 | 14.22 | | |

**Figure 1** (left-right) compare arsenical keratosis on the palm before and after receiving chelation therapy

acceptable levels (according to Department of Medicine report) and found that 21 people had the arsenical keratosis condition.

From these risk findings public health agencies focused their attention of solving these problem. At the beginning, the Ministry of Public Health assigned related departments i.e. Department of Medicine and Department of Disease Control to look after and treat people who had been affected by heavy metal toxicity. People at risk still requested for more health care as well as the blood tests. The Ministry of Public Health, therefore, tried to seek solution for this problem. The Ministry assigned The Department for Development of Thai Traditional and Alternative Medicine to use Thai Traditional and Alternative Medicine as an alternative way to help people at risk. The Bureau of Alternative Medicine, Department for Development of Thai Traditional and Alternative Medicine, found that the complementary and alternative medicine was an appropriate method to solve health condition of people who have been affected by heavy metal toxicity. The method they found most effective was chelation therapy. This could eliminate heavy metals from the body in order to treat chronic disorders of health in relation to the accumulation of heavy metals and residues. This study aimed to determine the various clinical signs and symptoms with chelation therapy and

the health effects associated with exposures to arsenic from gold mining.

2. Materials and Methods

The patients selected for this descriptive study (case series) were patients affected by heavy metal toxicity from gold mining in Khao Luang, Wang Saphung district, Loei during August – December 2015. The study samples were 14 patients who were effected with arsenic exposure. They displayed various clinical signs and symptoms, especially arsenical keratosis. They were being treated with chelation therapy once per week for a total of 20 weeks at the outpatient department, Wang Saphung Hospital. The Calcium Di-Sodium EDTA 1500 mg was the main chelating agents used in chelation treatment. This was administered through intravenous injection. The outcome measures that were used for the study were general health, arsenical keratosis and quality of life (WHOQOL – BREF – THAI). Data were analyzed by using descriptive statistics, t-test.

3. Results and Discussion

A total of 14 patients participated in this study, data was collected by interview. It was found that their health conditions were improved as a result of the treatment. Effects included sound sleeping at night, eating better and increase weight, knee pain reduction,



Figure 2 (left-right) compare arsenical keratosis on the palm before and after receiving chelation therapy

feeling fresh, brighter skin, and better vision. After chelation therapy, clinical symptoms were also found to improve. These include a fading of the symptoms of arsenical keratosis in 12 patients until they were almost invisible and a fading of symptoms to a lesser degree in the remaining two patients. The \bar{x} score of quality of life before receiving the chelation therapy was 93.78 and after receiving the chelation therapy was 99.2. This was not found to be a statistically significant difference. These results indicated that chelation therapy could decrease arsenic levels in patients' bodies and could cause skin disorders to fade more quickly than usual. This study confirmed the finding from other research about the use of chelate compounds for treating arsenic exposure. These compounds are calcium disodium ethylenediamine tetra acetic acid (CaNa (2) EDTA), British Anti Lewisite (BAL), sodium 2, 3-dimercaptopropane 1-sulfonate (DMPS) and meso 2, 3-dimercaptosuccinic acid (DMSA). Studies have found that they can eliminate heavy metals such as arsenic, lead, cadmium and mercury. In addition, chelation therapy also helps to decrease oxidative stress that has been shown to cause chronic degenerative diseases [5-7].

In addition to this the study showed that most of patients were satisfied with chelation therapy. They felt this because their health was improved before receiving the therapy. They stated, for example, that they had gained more weight, slept better at night, and that rashes had disappeared after receiving chelation therapy. These results may be due to the fact that chelation therapy it is a kind of detoxification method that can eliminate substances which cause illness out of human body. Chelation Therapy improves the immune system and also helps other systems to function normally [8].

4. Conclusions

Chelation therapy is a type of alternative medicine that can be used as a guide in conjunction with conventional medicine to treat patients with heavy metal toxicity that has accumulated in the body. The therapy was found to make the symptoms of arsenical keratosis fade and to lead to clear health improvement in most patients.

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