

A CRITICAL REVIEW OF PARADA (MERCURY) AND ITS TOXICITY**Dr. Arti¹, Dr. Prashant Singh Bhadauria^{2*} and Dr. Prafulla³**^{1,2}M.D. Scholar, Dept.of Agad Tantra, Rani Dullaiya Smriti Ayurveda P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).³Reader, Dept.of Agad Tantra, Rani Dullaiya Smriti Ayurveda P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).***Corresponding Author: Dr. Prashant Singh Bhadauria**

M.D. Scholar, Dept.of Agad Tantra, Rani Dullaiya Smriti Ayurveda P.G. Mahavidhyalaya Evam Chikitsalaya, Bhopal (M.P.).

Article Received on 01/02/2018

Article Revised on 22/02/2018

Article Accepted on 15/03/2018

ABSTRACT

In Ayurveda, ousadhi comprises of three categories of ingredients viz, 1-herbal origin, 2- animal origin, 3-metal origin to attain the happy and healthy life. Herbal products were extensively used in the classic age in all branches of Ayurveda. Metal and minerals were also used as a part of therapeutic agent but less frequently as compared to herbal drug because they have toxicity. India have much more metal such as – Arsenic, lead, zinc, copper etc, which are used for treatment for various diseases, Parada is one of them . Most of the metals are present in solid form but parada are in semi-liquid form, it is exceptional. Parada is movable and silvery like white shiny metal. It is called Rasa as it is the physical essence of lord Shiva and also as it swallows other metals. Parada is the metal that is used most frequently in various Ayurvedic medicine specially Rasayoga in the form of its bhasma. In Ayurveda various doshas are mentioned for Parada in Rasagranthas which is seen in ashodit Parad. It is also mentioned that shudha Parad is not toxic and shows Rognashak property and act as medicine. So in the present era the toxicity of parada is produced by Ashudh form of parada. This article compiles all the information related to Parada and parada such as Introduction, appearance, origin, historical review, fatal dose, fatal period, sign and symptoms of its toxicity, management, postmortem appearance, medico legal aspects.

KEYWORDS: Parada, Parad, Chronic toxicity, Rasagranthas.**INTRODUCTION**

According to Vedas, parad or parada is a unique gift from nature. It is one of the pure and auspicious metal. it has not only spiritual and religious significance, but has extensive healing properties also. Ayurvedic medicines are prepared from parad. Medical science acknowledge the power of parad for controlling hyper tension, asthma and enhance sexual ability.

When parada, which is impure is purified and consecrated by various processes, it become solid and is known as shuddha parad The classical test Rasaratna samuchchaya states that “Siddhae rase Karishyami Nirdraaridrayam agadam jagat”. In other words, if parada is consecrated and converted in to purified form, then all ailments and poverty of the world can be vanished.

**(Fig-1).****Ayurvedic Literature on Parada**

Rasashastra dravyas include minerals and metal which are mainly Bhumij in origin, Parada is also one among them. In rasashastra, the extra ordinary importance of Parada is easily seen as the whole branch is named after Parada (synonym –rasa). It is believed to be devine origin and as per the mythology it is considered to be Shiv – veerya.

According to references available in rasa classical texts, initially Parada was used for lohavada (a process of converting lower metals in to higher one) but as time passed its use for dehavada (treating disease) was brought into picture and was successfully seen Thus evolved its use in treatment. The form of parada used indicates its toxicity and utility.

In *Rasashastra* maximum times parada is used along with sulphur. Thus forms parada sulphide which is safest. But still in whichever form parada is used it should be handled carefully as its misuse may lead to toxicity.^[1]

Synonyms And Vernacular Names Of Parada^[1]

Sanskrit- Parada

Hindi- Para

Marathi- Para

English- Parada

Latin- Hydrargyrum (Hg)

Shuddha Paradaswaroop^[1]

The parad having blue tinge inside and bright outside, and having lusture of sun as seen as noon, is said to be best, whereas, the Parada which has smoky grayish or dull white color or strange mixed color should not be used in different rasa karmas.

In modern chemistry a similar explanation regarding parada states that parada is a silver white liquid metal, with slight bluish tinge. In thin films, it emits violet light.

Types Of Parada^[1]

According to the origin of Parada. It is classified in to 5 types viz- Rasa, Rasendra, Suta, Parada and Mishraka.

PARAD GATI

Parada has 5 types of gati which is considered to be the main cause of loss of parada while manufacturing parada containing kalpas or while doing parada shodhna. They are-

- 1) Jala Gati
- 2) Hansa Gati
- 3) Mala Gati
- 4) Dhooma gati
- 5) Jeeva Gati or Adrushya Gati

Doshas of Parada

There are mainly 3 doshas in Parada-
Naisargika – Visha, Vahni, Mala
Yogika- Naga, Vanga
Aupadhik – Parpati (Bhumij), Patni (Girij), Bhedi (Varij), Dravi, Malkari (Naga), Andhkari, Dhwanakshi (vang)

Ayurvedic Pharmacological and Therapeutic Properties of Parada^[1]

Rasa- shadarasa

Guna – snigdha, sara, guru

Virya – Ushna

Vipak – Madhura

Prabhava- Yogavahai

KARMA- Yogavahi, Rasayana, Balya, Vrisya etc.

If parada is free from all doshas, it is capable of eradicating death and senility.

Vyadhi Prabhava

Kushtahar, Rasayana, Amruta, Sarvarogahara, Vataroga

In **Bhavprakash**, important properties of parada are described as-

- It has a soothing effect upon the human system (Snigdha)
- It corrects the imbalance of three Doshas (Tridoshaghna)
- It is efficacious in preventing diseases and arrival of premature old age (Rasayana)
- It serves to heighten the medicinal properties of anything with which it is compounded (Yogavahi)
- It is best aphrodisiac (Mahavrishtya)
- It always increases the strength of the eyes (Sadadrishtibala Parada)
- It cures all sorts of diseases especially skin diseases.

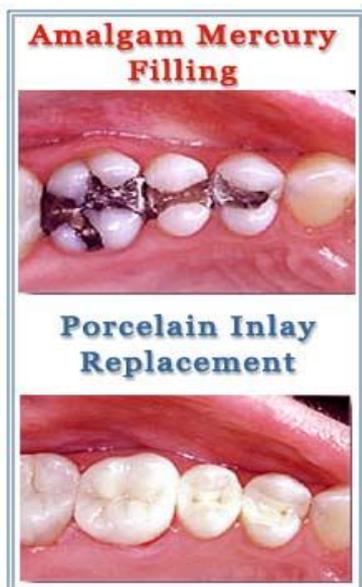
In **Rasendra Sara Sangraha** it has been mentioned that- Parada increases Budhi (intelligence), Smiriti (memory power), Prabha, kanti (lusture), Bala (strength of the body). These properties of Rasa are only obtained when it is used in processed form.

According To Modern View^[2]

Mercury has three forms

- 1- **Elemental Mercury** is heavy, silver liquid and volatile at room temperature. It is non-poisonous, if swallowed, since it is poorly absorbed from the GIT. But vapor can give rise to acute toxicity.
- 2- **Inorganic salts** toxicity occurs in several forms; metallic Mercury (Hg), mercurous Mercury (Hg¹⁺), or mercuric parada (Hg²⁺).
- 3- **Organic compound** are found in three forms: aryl and shorts- and long –chain alkyl compounds. Organic salts are better absorbed from the GIT than the inorganic salts because of intrinsic properties, such as lipid solubility. It can cross the blood- brain barrier to accumulate in the brain, hence CNS effects are more predominant. In contrast, the kidney is the main storage organ for inorganic compounds.

Mercury exposures occur chiefly through inhalation of elemental mercury vapor via occupational or dental amalgam (silver filling because of its color)



(Fig- 2)



(Fig- 3)

Mercurialism is poisoning resulting from the ingestion or inhalation of mercury or its compounds. It can be acute or chronic.

Uses^[3]

Medicine: Disinfectant, dental amalgam, purgative and diuretic, and earlier used in the treatment of syphilis. A controversial source of organic parada exposure is *thimerosal*, a preservative used in vaccines (DTP and hepatitis B) to prevent bacterial contamination.

Industry: Manufacture of thermometer, barometer, calibration instruments, fluorescent and parada vapor lamp, electrical equipment, explosives and fireworks.

Miscellaneous: Electroplating, photography, insecticide, germicide, fingerprint powder, paints and embalming fluid.

Action^[4]

- Mercury binds with sulfhydryl groups resulting in enzyme inhibition and pathological alteration of cellular membranes.
- Elemental mercury and methyl mercury are toxic to the CNS. Metallic mercury vapor is also a pulmonary irritant. Inorganic mercury salts are corrosive to the skin, eyes, and GIT, and nephrotoxic. Inorganic and organic forms may cause contact dermatitis.

Absorption and Excretion

It is absorbed through the GIT and respiratory tract.

After absorption, mercury get deposited in all tissue, particularly in the liver, kidney, spleen and bones. When inhaled, the maximum concentration occurs in the brain. Mainly excreted through the kidney (urine), liver (bile) and colonic mucous membrane (feces) It passes rapidly to the fetus through placental circulation.

Acute poisoning

Sign and symptoms

- GIT-** Metallic taste, feeling of constriction in the throat, hoarse voice.
- Mouth, tongue and faces become corroded, swollen, and mucous membrane appears grayish white.
- Hot burning pain from the mouth to the stomach, and pain radiating over the abdomen followed by nausea, retching and vomiting.
- RENAL-** Oliguria, albuminuria and hematuria ending in renal failure or nephritic syndrome.
- CVS-** Hypertension, tachycardia, difficulty in breathing and circulatory collapse.
- FATAL DOSE-** 1-4g of mercuric chloride, 10-60mg/kg of methyl mercury and 10mg/m³ of mercury vapor.

Fatal Period 3-5 days.

Diagnosis- Acute mercury poisoning can be detected by measuring blood levels, whereas urine and hair analysis help confirming chronic exposure.

Urine and blood mercury levels are assessed by atomic absorption spectrophotometer. Mercury concentration of hair is best assessed by neutron activation.

Treatment

- In case of inhalation, the victim is immediately removed from source of exposure and supplemental oxygen is given, and observed for the development of acute pneumonitis and pulmonary edema.
- Eggs whites, milk or animal charcoal to precipitate mercury. Emesis is not induced because of the risk of serious corrosive injury.
- Gastric lavage with 250ml of 5% sodium formaldehyde sulfoxylate. About 100 ml of this solution is left in the stomach. Lavage can be done

with egg-white solution or 2-5% solution of sodium bicarbonate.

- High colonic lavage with 1:1000 solution of sulphoxylate twice daily. Whole bowel irrigation may be done.
- BAL is the traditional chelator of choice (10% solution in oil, 3-5 mg/kg IM every 4 h for 2 days, tapered to 6 hourly for 1 days and then 12 hourly for 7 days), but oral agents are preferable.
- There is no role for dialysis, hemoperfusion or repeat dose charcoal in removing metallic parada or inorganic salts. However, hemodialysis/ peritoneal dialysis may be required in case of renal failure.
- Maintain electrolyte and fluid balance.
- Symptomatic treatment.

Postmortem Findings^[3]

- Body looks emaciated.
- **GIT**- Mucosa shows inflammation, congestion and grayish corrosion. Ulceration or even gangrene of large intestine may be seen.
- **KIDNEY**- Acute proximal tubular damage and glomerular degeneration or glomerular nephritis may be seen.
- **LIVER**- Congested and shows cloudy swelling or fatty change.
- **HEART**- Fatty degeneration and sub endocardial hemorrhage.

Chronic Parada Poisoning^[3]

- Chronic poisoning results from:
- Continuous accidental absorption by workers.
- Excessive therapeutic use.
- Recovery from large dose.
- If an ointment is used as an external application for a long time.

Sign and Symptoms

- Chronic intoxication from inhalation of mercury vapor produces- Tremor, neuropsychiatric disturbances and gingivostomatitis.
- Chronic poisoning with inorganic mercury compounds is characterized by non-specific early symptoms such as anorexia, insomnia, abnormal sweating, headache, lassitude, tremor, gingivitis, hypersalivation, loosening of teeth with blue line in the gum, jaundice, increased urination.

Specific Features/Diseases

Danbury Tremors/ Shaking Palsy- It occur first in the hand, then progresses to the lips and tongue, and finally involves the arms and legs. Tremor is moderately coarse and is interspersed by jerky movements.

In the advanced stage, the person is unable to dress himself, write legibly or walk properly. They are also called **hatter's shakes or glass blower' shakes**, as they are common in person working with mercury in glass-blowing and hat industries.

Acrodynia or Pink Disease- It is seen mostly in children due to idiosyncratic hypersensitivity reaction to repeated ingestion or contact with mercury.

Sign and symptoms- There is pinkish morbilliform/ acral rashes, desquamation of palms and soles, pain in the extremities, flushing, itching, swelling, tachycardia, hypertension, excessive salivation or perspiration, weakness, irritability, photophobia, anorexia, insomnia, and constipation or diarrhea.

Mercury Poisoning

Exposure : High toxicity: **mercurialism**



Acrodynia ('Pink Disease')
-Pain
-Pink discoloration



Minamata Disease
-Ataxia
-Impairment of speech & hearing



Treatment

- Remove the patients from the source of exposure.
- Oral hygiene.
- Demulcent drinks.
- Saline purgatives.

Postmortem Findings

External- Emaciated body with pale skin. Erosion of oral mucosa, gum of lower jaw may show bluish gray lines of pigment deposition, along with loosening of teeth.

Internal

Inorganic mercury poisoning may cause cerebral infarctions, pneumonia, renal cortical necrosis and disseminated intravascular coagulopathy.

Medico-Legal Aspects^[5]

Suicidal and homicidal poisoning is rare. However, cases of deliberate intravenous or subcutaneous metallic mercury injection have been reported.

- Accidental ingestion may occur from broken thermometers.
- Accidental ingestion of antiseptic solutions containing mercuric chloride/ cyanide.
- Soluble salts as vaginal douches.
- Absorption of mercurial preparation applied to the skin.
- Intravenous administration of organic mercurial's, such as diuretics.

CONCLUSION

Parada or mercury an inorganic metallic poison has fascinated people for millennia, as a heavy liquid metal. It is always found in combined form in nature. It has no

known biological role, but is present in everything and widespread in the environment. Every mouth full of food we eat contains a minute of mercury. The diseases causing effect of Mercury is due to the intake of impure mercury present in soil, water and air. Its consumption in impure form causes various ailments as discussed above. But various Sanskar conducted on it render it poison less and hence various preparation of Ayurvedic medicines utilize it. However many uses of mercury are being phased out by modern scientists and are under review.

REFERENCE

1. Text Book of Agad Tantra edited by Dr. Nitin Urmaliya Published by Chaukhambha publisher, Varanasi.
2. Text book of Forensic Medicine and Medical Jurisprudence and Toxicology edited by Ajay Kumar, 2nd edition, Published by Avichal Publishing Company.
3. The Essential of forensic medicine and toxicology edited by Dr. O.P. Murty, 33rd edition, The Health Science Publishers, New Delhi, 2014.
4. Parikh's Text Book of Medical Jurisprudence Forensic Medicine and Toxicology edited by B.V. Subrahmanyam CBS Publishers And Distributors Pvt Ltd.
5. Anil Aggrawal Text Book of Forensic Medicine and Toxicology Avichal Publishing Company 8, Industrial Area, First Edition, 2014.