ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Research Article

A PHARMACOLOGICAL STUDY ON AYURVEDA MANAGEMENT ON HEALING PROCESS OF TIBIA OF RATS WITH SPECIAL REFERENCE TO *ARJUNA KSHEERA PAKA*

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ABSTRACT

The present study was under taken to evaluate the effect of *Terminalia arjuna Linn* on the healing process of experimentally fractured tibia of rats. 12 Adult male wistar rats were grouped into I, II and III groups. *Arjuna*, a *Bhagna Sandhanakara* drug, mentioned in *Vrindamaddhava* is taken for the study.

The solution of test drugs for Group I is 2mg of *Terminalia arjuna* powder TAP boiled with milk and Group II by 8mg of *Terminalia arjuna Ksheera paka* powder TAKP (*Arjuna* powder boiled with milk and heated till it is semisolid and after cooling it is made into fine powder) and Group III with 2mg Placebo (PG) rice powder with milk. The test solution was introduced into the oral cavity of male wister rats by rat feeding needle.

On observing the radiological images, Group I and Group II shows improvement in healing process of tibia by 30th day after treatment due to *Jeevaniya* and *Sandhaniya karma* of milk which causes synergetic action of *Arjuna karmas* than Group III. Group II shows early healing capacity of calcification than Group 1 by 20th day compared in between group I and Group III. Based on all the observed results it can be concluded that Group 2 (*Terminalia arjuna ksheerapaka* powder (TAKP) is highly significant in calcification between the three groups.

KEYWORDS: *Arjuna ksheerapaka, Arjuna* powder, *Terminalia arjuna* powder (TAP), *Terminalia arjuna Ksheerapaka* powder (TAKP).

INTRODUCTION

Terminalia arjuna is a tree of the genus *Terminalia*. It is commonly known as *Arjuna* in English, *Thella Maddi* in Telugu, *Kumbak* in *Sinhala* and *Marudha* Maram in Tamil. *Arjuna* plant has not only commercial importance i.e. produces Tassar silk but also widely used in the preparation of important Ayurvedic formulations like *Arjunarishtam*, *Lakshaguggulu*. [1]

In 7th century *Arjuna* plant was introduced into Ayurveda as a treatment for heart diseases by Vagbhata. It has a capability to reduce heart failure and has nickname "Guardian of the heart" [2]. In the writings of Vagbhata mentioned in the treatment of wounds, Hemorrhages and ulcers[3].

The bark of *Arjuna* plant has much medicinal importance in hypolipidemic activity, anti-ulcer activity, antimutagenic activity, antidiabetic effect and has Fracture healing property[4].

The bark contains calcium carbonate 34%, other calcium salts 9% and tannin 16%. It also contains aluminium, magnesium, organic acid, colouring matter, sugar, tannins, triterpenoid saponins, flavonoids, Gallic acid, ellagic acid, oligomeric proanthocyanidins (OPCs), phytosterols, zinc, and copper. [5]

The effect of ethanolic extract of *Terminalia arjuna* Linn (AT) on the healing process of experimentally fractured tibia of rats

Ethanolic extract of *Terminalia arjuna* produce beneficial effect in tibial fracture healing due to presence of Tannin, Saponins and Tripenoid contents of *Terminalia arjuna* which have definite action on bone regeneration. Calcium, phosphorus and alkaline phosphatase metabolism plays important role in osteoblastic activity. [5]

MATERIALS AND METHODS:

Drug Material:

The test drugs 2 mg of *Terminalia arjuna* powder boiled with milk (TAP) and 8 mg of *Terminalia arjuna* Ksheera paka powder milk (TAKP) and Placebo group (PG) 2mg are used for experimental purpose and administered to the experimental animals according to the dose required.

In the study of Tilak JC et. al. anticipated that the *Terminalia arjuna* when given with honey or sugar known to promote union of fractures. [6]

Method Of Preparation of *Arjuna Ksheera Paka* (Fig 1)

The form of drug is *Arjuna* bark powder boiled with milk was taken for the study (*Bhagna pibeth tvak payasarjunasya*).[7] 500gms of *Arjuna twak Yavakuta churna* is mixed in 4 liters of *Gokshira* and 16 liters of water in a stainless steel vessel and boiled it in *Madhyamagni* till the water portion is totally evaporated and portion of milk is left. It should be collected and filtered through clean cloth. The filtered material is again boiled on *Mandagni* upto semi solid state and dried in shade for 7 to 8 hrs and made into fine powder by using *Khalwa Yantra.*[8]

Fig.1 PREPARATION OF *ARJUNA KSHEERAPAKA*

Dose of the formulations

After taking the experts opinion in the department of Dravyaguna, S.V.Ayurvedic College, and the dose was decided as follows (based on the standard dose of the drug)→

- for a 50kg person 50,000mg → 500mg *Arjuna* powder(TAP) is the dose

  (Animal Dose = $\frac{AW \times HD}{50 \times 1000}$) (AW=Animal weight; HD=Human dose)

  i.e. for 200gm lab animal →2mg is the dose
- for a 50kg person 50,000mg → 2gm *Arjuna ksheerapaka* powder (TAKP) is the dose

  (Animal Dose = $\frac{AW \times HD}{50 \times 1000}$) (AW=Animal weight; HD=Human dose)

  i.e. for 200gm lab animal →8mg is the dose
- for a 50kg person 50,000mg → 500mg Rice powder(PG) is the dose

  (Animal Dose = $\frac{AW \times HD}{50 \times 1000}$) (AW=Animal weight; HD=Human dose)

  i.e. for 200gm lab animal →2mg is the dose

- Formulation 1 TAP dose→ 2 mg
- Formulation 2 TAKP dose→8mg
- Formulation 3 PG dose→2mg

Adult male wistar rats having weight around 150-200 g were maintained at 25 ± 2°C, kept in well ventilated animal house under photoperiodic condition in large polypropylene cages with standard food and water and libitum. The experiment was carried out in accordance to the guidelines mentioned in the CPCSEA.

The radiological pictures of rats were taken before treatment and 15th, 20th, 30th day after treatment for all the three groups in a time interval of 30 days.

Instruments Used

1. Rat Feeding Needles (No.18 & 20)
2. Syringe (Tuberculin)
3. Plastic jars
4. Bandage
5. X-Ray machine

Groups

1. Group I - *Terminalia arjuna* powder with milk (TAP)
2. Group II - *Terminalia arjuna Ksheera paka* powder with milk (TAKP)
3. Group III - Placebo group(PG)

Procedure

Before fracture is created, X-ray photograph is taken for every subject and later tibia fracture is created by giving ketamine as anesthesia (40mg/kg.IP). Then closed transverse fracture of the mid-diaphysis of right tibia were created in all three groups by three point bending method. The bone was positioned horizontally with the anterior surface upwards. The pressing force was

directed vertically to the mid-shaft of the bone. Each bone was compressed with a constant speed and compression force. These fractured limbs were stabilized with splints after reduction and animals were allowed to move freely after recovering from anesthesia. [9]

The solution of test drug was introduced into the oral cavity by rat feeding needle with 3ml syringe to the left side of incisor teeth in the midline and transmits the needle into esophagus then plunger is pushed down the syringe by emptying its content into the esophagus en-route to the stomach.

Results

The radiological pictures of rats were taken before treatment and 15th, 20th, 30th day after treatment for all the three groups in a time interval of 30 days.(Fig 2)

Observations on 15th day

X-ray shows beginning of callus formation and bridging of gap in the fractured bone in Group I and Group II where as Group III does not shows any bridging. The fragments were freely mobile and broken ends were visible on x-ray.

Observations on 20th day

The X-ray showed greater amount of calcification of callus in Group II and slighter amount in group I were identified, where as mobility of fractured ends were still visible in Group III.

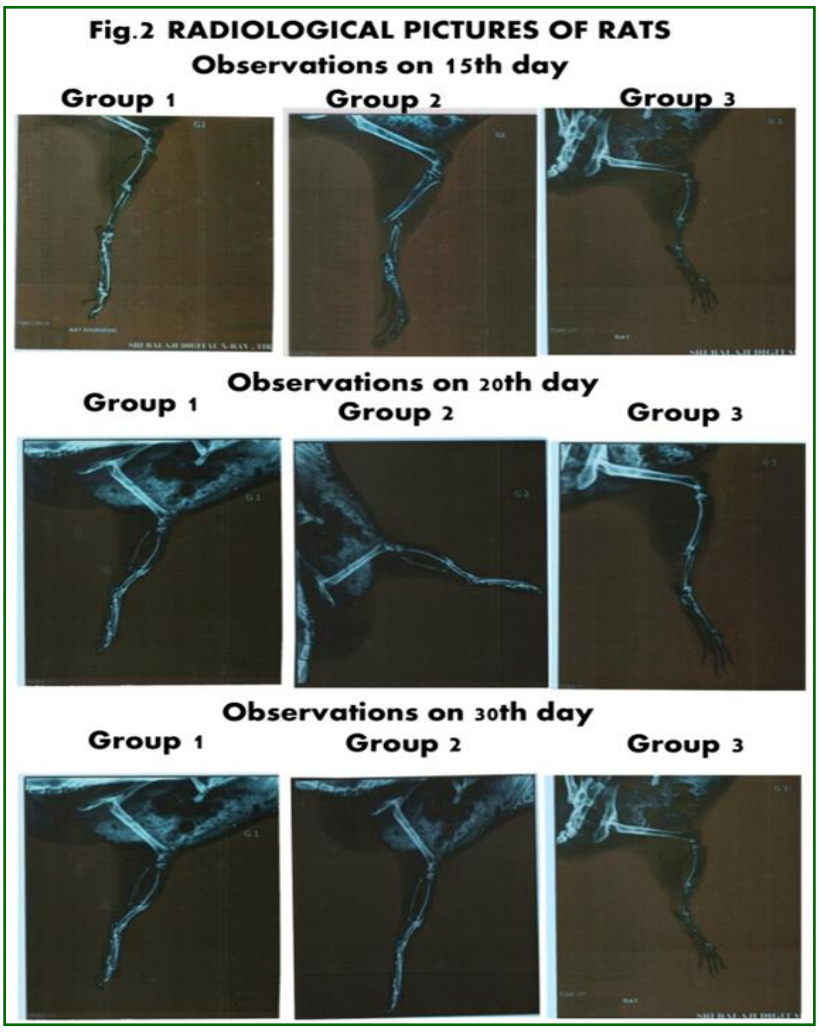
Observations on 30th day

X-ray Shows an evidence of union at fractured ends of tibia in both group I and Group II. Almost complete bridging of fractured ends with extensive bony deposition is seen where as the fragments were still visible in group III.

Based on above results obtained macroscopically, indicates that the Group I (*Terminalia arjuna* powder) and Group II (*Terminalia arjuna Ksheerapaka* powder) produced beneficial effect in fracture healing property than Group III.

Based on the observed results it can be concluded that Group II has showed early healing property at fractured ends of rats when compared in between Group I and Group III.

Fig.2 RADIOLOGICAL PICTURES OF RATS



CONCLUSION

- The modern researches already proved the Fracture healing activity of *Arjuna*.
- The present results indicate that the ethanolic extract of *Terminalia arjuna* produce beneficial effect in fracture healing and support the claims of its traditional wages as traditional healer.
- Each group of drugs were studied experimentally using Fracture model and by taking X-Ray of wistar

albino rats before and after treatment by 15th, 20th and 30th day.

- The experimental study proved the effectiveness of *Arjuna ksheerapaka* which gave good results than that of *Arjuna* powder and Placebo.
- *Sandhaniya* action of *Arjuna* along with its *Kashaya* rasa and *Sita virya* quality and also may be due to the presence of calcium, phosphorous crystals in *Arjuna*.
- The milk which is said to be rich source in calcium, proteins and also *Jeevaniya, Sandhaniya karma* of milk and also it may be due to the 10 qualities mentioned for the *Ksheera* helped in regeneration of callus.
- The synergetic action of *Arjuna* and *Dugdha* plays an important role in the healing process of fracture due to the *Guna Karma* of both the drugs.

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Cite this article as:
K.Suguna, Renu Dixit, K.V.Vijaya Bhaskar Reddy. A Pharmacological Study on Ayurveda Management on Healing Process of Tibia of Rats with special reference to Arjuna Ksheera Paka. International Journal of Ayurveda and Pharma Research. 2017;5(4):16-19.

Source of support: Nil, Conflict of interest: None Declared

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