

## EVALUATION OF EFFICACY OF ABHA GUGGULU WITH PLACEBO CONTROLL GROUP IN THE MANAGEMENT OF ASTHI-BHAGNA W. S. R. LONG BONE FRACTURE

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### ABSTRACT

*Bhagna* is an epitome, where the bone or bones get interrupted. Investigators claim that about 1/3<sup>rd</sup> of the surgical OPD patients come for the treatment of fractures. Among the global burden of injury assessed at South-East Asia Region, morbidity rate is 30.3% <sup>[1]</sup>. Out of all complications of trauma, delayed or non-union of fractured bones, irrespective of their origin and aetiologies has always posed great problems. Due to the fact that post fracture complications are much prevalent in the society and lack of effective medicament and treatment procedure, the disease is being chosen for the study with hope to develop effective medications for it. The principal objective of the present study was to evaluate the comparative effects of *Abha Guggulu* & placebo in the management of *Asthi bhagna* (fracture). To prove the practical approach of mentioned *Asthi Bhagna Chikitsa* with '*Abha Guggulu*' in the management of *Asthi Bhagna*, a randomized clinical trial on 20 uncomplicated subjects of *Asthi Bhagna* (simple fracture and long bone fracture), was conducted at the Group A with *Abha Guggulu* in a dose of 2 Tabs BD with warm water and in Group B with 20 patients was kept in Placebo trial for 6 weeks. Though, out of 20 patients, 6 were LAMA from Group B in between the clinical trial. The response was encouraging with *Abha Guggulu* and has laid the scope for further studies.

**KEYWORDS:** Asthi bhagna, Bhagna, Fracture, Abha Guggul, Asthi sandhana

### INTRODUCTION

The healing of fractures is in many ways similar to the healing of soft-tissue wounds, except that the end result is mineralized mesenchymal tissue, i.e. bone<sup>[2]</sup>. In the past the aim of treatment was fracture union, but now it is rehabilitation of the limb to pre-injury status<sup>[2]</sup>.

While doing practical study and going through concerned literature, adds the knowledge when both are applied together. The references of trauma are as old as the beginning of a human being. Keeping these golden words of Sushrut, the following study is carried out. Acharya Sushruta has advocated the principles of reducing the fracture which is identical as in modern surgery. They are Anchana (Traction), Peedana (Manipulation), Sankshepana (Opposition), and Bandhana<sup>[3]</sup> (immobilization), which is practiced regularly even today. In modern orthopaedics, the simple fractures are managed by closed reduction followed by application of POP. The drug (*Abha Guggulu*) study has shown to reduce the duration of treatment.

## AIMS OF RESEARCH

- To study the etiopathogenesis, symptomatology and treatment of *Asthi Bhagna* according to both *Ayurveda* and modern science.
- To evaluate the efficacy of trial drug *Abha Guggulu* in the management *Asthi Bhagna* w.s.r.to Simple long bone fracture.
- To evaluate the real effect of *Abha Guggulu* on the symptoms of *Avrana Kandasthi Bhagna with other classical management*.

## MATERIAL AND METHOD

### Conceptual Study

Detailed study of available description on *Asthi Bhagna* was studied from various sources of *Ayurveda* and modern medical science.

### Plan of Study

The whole study was carried out on 60 patients, who were grouped into two.

- Group-A was managed by giving *ABHA GUGGULU* as oral medication after proper reduction (if required) and Plaster of Paris application to immobilize the fracture.
- Group-B was a PLACEBO controlled group and taken to manage similarly. In place of any medicine, gelatine capsules filled with rice powder were given to this group.

**Design:** The comparative study was undertaken.

### Selection of Patient

40 cases of *Asthi bhagna* were selected from the surgical outpatient and the indoor patient from Rishikul State Ayurved PG College and Hospital, Haridwar. Patients needing hospitalization were hospitalized for proper treatment. Patients were randomly selected irrespective of their sex, race, occupation, socioeconomic status.

### Criteria for Inclusion

- Male or female.
- Simple or closed fractures.
- Age group between 18 to 50 years.
- Fractures of Humerus, Radius, Ulna, Tibia, Fibula, which can be reduced by closed reduction method with or without general anaesthesia.
- Stable fractures i.e. fractures in which the alignment of bony ends can be maintained without internal fixation.

### Criteria for Exclusion

- Open or compound fractures.
- Simple fractures with wound were excluded.

- Pathological fractures, Stress fractures and complicated fractures, bones with osteo sarcoma and other growth were excluded.
- Fractures requiring open reduction and internal fixation.
- Fractures associated with other debilitating diseases like Diabetes, Tuberculosis, Leprosy, Asthma are excluded.
- Patients suggestive of Osteomyelitis and other bone diseases.
- Patients above the age of 50 years and below 18 years.

#### Constituents of Abha Guggulu <sup>[10]</sup>

S.No	Name	Latin Name	Family	Parts Used	Proportion
1	Babbul	Acacia arabica	Leguminoceae	Bark	01
2	Pippali	Piper longum	Piperaceae	Fruit	01
3	Marica	Piper nigrum	Piperaceae	Fruit	01
4	Sunthi	Zingiber officinale	Zingiberaceae	Tuber	01
5	Haritaki	Terminalia chebula	Combretaceae	Fruit	01
6	Vibhitaki	Terminalia bellirica	Combretaceae	Fruit	01
7	Amalki	Emblica officinalis	Euphorbiaceae	Fruit	01
8	Guggulu	Commiphora mukul	Burseraceae	Resin	07

#### Procedure

*Abha Guggulu* preparation has been completed in four stages <sup>[4]</sup>:

- Purification of Guggulu (Shodhana).
- Mixing of churna dravya in shodhita Guggulu.
- Processing of the mixture.
- Vati formation from mixed Guggulu yoga.

#### METHOD OF PREPARATION

All the given drugs are taken in powdered form in equal amounts each <sup>[5]</sup>. Thereafter, equal quantity of purified Guggulu is mixed with these powdered drugs <sup>[6]</sup>. The procedure needs many efforts to hurt Guggulu as much as possible. This results in a uniform mixture of drugs in the Guggulu, also results in better quality of medicine. Finally this made in to tablet form, each of 500 mg approx.

#### Drug Dose and Duration

Two tablets of 500 mg twice a day will be given to the patient with Luke warm water as anupaana, for the particular duration, depending upon the site of fracture. For example, in Colle's fracture up to 4 weeks, tibia-fibula fracture up to 6-8 weeks. Thus, until the required sign and symptoms of a clinical bony union appear, immobilization and oral medication will be continued.

### **Method of Drug Trial**

Immediately after bone fracture, drugs are to be continued for a particular time period, i.e. according to the site of fracture. After that time period, again x-ray investigation was advised to conclude the effect of the medicine.

### **CRITERIA FOR ASSESSMENT**

#### **Weekly Assessment of the Patient was Carried Out**

To assess the efficacy of the trial preparations or improvement in clinical symptoms of the *Asthi Bhagna*, different signs and symptoms were arbitrarily graded into four grade scale (0-3) on the basis of severity. The changes in the gradation of each symptom were as follows-

#### **Clinical Assessment**

The changes observed in the signs and symptoms were assessed by adopting a suitable scoring method and the objective signs by using appropriate clinical tools. The details of the scoring pattern adopted for assessment of clinical signs and symptoms are as follows:

#### **PAIN (Shoola)**

- Grade 0 – No pain
- Grade 1- Mild pain
- Grade 2 – Moderate pain
- Grade 3 – Severe pain

#### **SWELLING (Shotha)**

- Grade 0 – No swelling
- Grade 1 – At site
- Grade 2 – At related joint
- Grade 3 – At whole limb

#### **TENDERNESS (Sparsha Asahyata)**

- Grade 0 – No tenderness
- Grade 1 – Patient winces
- Grade 2 – Patient winces and withdraws affected part
- Grade 3 – Patient does not allows to touch the part

#### **MOVEMENT (Gati)**

- Grade 0 – Complete active movements
- Grade 1 – Complete active movements are painful
- Grade 2 – Complete, passive movements

- Grade 3 – No movement / Abnormal movements.

#### **DEFORMITY (Anga Vikriti)**

Deformities which were evident clinically, were observed and compared to their presence prior to treatment (considering the initial deformity as 100%) results were recorded in grades.

- Grade 0- No deformity seen.
- Grade 1- Residual deformity, 1-30% of that present initially.
- Grade 2 - 31-60% of residual deformity.
- Grade 3 - 61% and above residual deformity.

Along with the above parameters, X-ray examination was carried out before the initiation of the treatment, and then after POP removal to compare the radiological union of fracture.

Karmahani (loss of function), Anga vikriti (deformity), Avapidyamanesabdah (crepitus), Aprakrita gati (abnormal movements) all these signs were examined and denoted as positive or negative respectively for their presence and absence.

#### **Investigations**

To assess the objective improvement X-ray examination was carried out before the initiation of treatment, and then at the termination of the trial.

Tolerability was assessed by monitoring the baseline symptoms of the patient and reports of unwanted effects, complication, unwanted effects were assessed in each and every patient. The symptoms, which were looked for are as follows- Annanabhilasha, Arochak, Chardi, Malavibandha, Dravamala pravritti, Angagaurava, Clama,[9] etc.

#### **Assessment of Result**

The results of therapy were evaluated after completion of 4 weeks in trial group, and after 6 weeks in the standard group. They were categorized as under:

- Disappearance of pain
- Disappearance of swelling
- Re-establishment of normal movements
- General physical and mental condition
- Effect of drug
- Complications

The influence of the following factors was also studied, and the results were compared according to these variables.

- |                         |                             |
|-------------------------|-----------------------------|
| (i) Age of the patients | (ii) Degree of displacement |
| (iii) Prakriti          | (iv) Pain                   |
| (v) Swelling            | (vi) Tenderness             |
| (vii) Deformity         | (viii) Joint Movements      |

### Criteria of Union

Fractures were declared as united, when there was no pain and tenderness (Anavidham), no shortening (Aheenagam), no irregularity (Anulvanam) and have a full functional power (Sukhcheshtaprasaran) along with these the absence of abnormal mobility and crepitation, and range of movements of joints were also noted<sup>[7]</sup>.

Total assessment of the therapies was done on the basis of relief in the main signs and symptoms of *Bhagna*, *Agnidushti* and general signs and symptoms of disease. On the basis of these criteria, total patients were divided into five categories as below.

- Complete remission : 96 - 100%
- Marked improvement : 76 - 95%
- Moderate improvement : 51 - 75%
- Mild improvement : 26 - 50%
- Unchanged : 0 - 25%

### STATISTICAL ANALYSIS

The mean score (X), standard deviation (S.D), Standard error (SE), paired TDS test were carried out at the level of 0.05, 0.01 and 0.001 of p levels. Then after the results were interpreted as under-

- P > 0.05 : Insignificant
- P < 0.05 : Significant
- P < 0.01 : Highly Significant
- P < 0.001 : Extremely significant result

### OBSERVATION & RESULTS

**Table 1: Analysis for Assessment of Pain in Group A and B**

S.No	Groups	N	Mean B.T	Mean A.T	Mean Diff.	Mean %	S.D	S.E	t' Value	P' Value	Result
1	Group A	20	2.5	0.33	2.17	88%	0.82	0.18	7.94	P<0.001	HS
2	Group B	14	2.28	1.78	0.5	21.87%	0.82	0.22	0.005	p<0.01	Sig

**Table 2: Statistical Analysis for Assessment of Swelling in Group A and B**

S.No	Groups	N	Mean B.T	Mean A.T	Mean Diff.	Mean %	S.D	S.E	t' Value	P' Value	Result
1	GROUP A	20	1.80	0.00	1.8	100%	0	0	3.28	p<0.001	HS
2	GROUP B	14	1.78	1.21	0.57	32.00%	0.89	0.23	0.005	p<0.01	Sig

**Table 3: Statistical Analysis for Assessment of Tenderness in Group A and B**

S.No	Groups	N	Mean B.T	Mean A.T	Mean Diff.	Mean %	S.D	S.E	t' Value	P' Value	Result
1	GROUP A	20	2.60	0.40	2.2	88.46%	0.5	0.11	1.79	p<0.001	HS
2	GROUP B	14	2.00	1.71	0.29	14.28%	0.53	0.14	0.16	NS	NS

**Table 4: Statistical Analysis for Assessment of Loss of Function in Group A and B**

S.No	Groups	N	Mean B.T	Mean A.T	Mean DIFF.	Mean %	S.D	S.E	t' Value	P' Value	Result
1	GROUP A	20	2.20	0.40	1.8	81.81%	0.5	0.11	4.5	P<0.001	HS
2	GROUP B	14	2.50	1.92	0.58	22.85%	0.91	0.24	0.001	P<0.01	Sig

**Table 5: Statistical Analysis for Assessment of Bony Deformity in Group A and B**

S.No	Groups	N	Mean B.T	Mean A.T	Mean DIFF.	Mean %	S.D	S.E	t' Value	P' Value	Result
1	GROUP A	20	1.40	0.25	1.15	82%	0.55	0.12	1.16	p<0.001	HS
2	GROUP B	14	1.5	1	0.5	33.33%	1.1	0.29	0.003	p<0.01	Sig

**Table 6: Group -A: Comparative Results Before and After Treatment**

S.No	Symptoms	B.T	A.T
1	Pain	2.36	0.93
2	Swelling	1.8	0.53
3	Tenderness	2.416	1.183
4	Loss Of Function	2.283	0.933
5	Bony Deformity	1.4	0.25

**Table 7: Group- B: Comparative Results Before and After Treatment**

S.No	Symptoms	B.T	A.T
1	Pain	2.28	1.78
2	Swelling	1.78	1.21
3	Tenderness	2	1.71
4	Loss Of Function	2.5	1.92
5	Bony Deformity	1.5	1

**Table 8: Comparative Assessment of Percentage of Relief in Group A and B**

S.No	Symptoms	Group A	Group B
1	Pain	88%	21.87%
2	Swelling	100%	32.00%
3	Tenderness	88.46%	14.28%
4	Loss of Function	81.81%	22.85%
5	Bony Deformity	82%	33.33%

**Table 9: Comparative Effect of Test Drug on Overall Improvement in Patients of Asthibhagna (By Unpaired T Test.)**

Chief Complain	Mean ± SD		% Change (M <sub>A</sub> -M <sub>B</sub> /M <sub>A</sub> )*100	d <sub>f</sub> =n <sub>1</sub> +n <sub>2</sub> -2	t	p
	Group A	Group B				
Pain	2.15±0.587	0.5±0.519	76.74↑	32	8.449	<0.001
Swelling	1.800±0.696	0.571±0.514	68.27↑	32	5.612	<0.001
Tenderness	2.200±0.616	0.286±0.469	87↑	32	9.799	<0.001
Loss of function	1.800±0.696	0.571±0.514	61.33↑	32	5.612	<0.001
Bony deformity	1.150±0.745	0.500±0.519	56.52↑	32	2.815	= 0.008

In comparison of results, regarding pain in both the groups of unpaired 't' test, group A has shown 76.74% better result than group B, and it was statistically highly significant ( $P < 0.001$ ). In comparison of results, concerned with Swelling in both the groups by unpaired 't' test, group A has shown 68.27% better result than group B, and it was statistically highly significant ( $P < 0.001$ ). Group A has shown statistically highly significant result, 87% in case of Tenderness in comparison with group B ( $P < 0.001$ ). Result concerned with 'loss of function compared in both the groups by unpaired 't' test, group A has found 61.33% better result than group B, and it was statistically highly significant ( $P < 0.001$ ). In Both the groups of unpaired 't' test, group A has shown 56.52% better result than group B in case of Bony deformity & it was statistically significant ( $P = 0.008$ ).

The data pertaining to the effect of test drugs on improvement on *Pain, Swelling, Tenderness, and the Loss of function and Bony deformity* have been summarized in table no-9.

An apparent difference of improvement in all the cardinal symptoms is observed, and in this respect, treatment schedule of group A is proven to be better than the test drug of group B. Statistically, highly significant difference are found in improvement of *Pain, Swelling, Tenderness, Loss of function* by *Abha Guggulu* than *Placebo controlled group*, whereas insignificant difference is observed in the improvement of *Bony deformity*. So, from the obtained data, it may be inferred that the treatment schedule of group A is more effective than the test drug of group B, when overall improvement in cardinal symptoms are concerned.

On comparing the effect of therapy, it can be concluded that *Abha Guggulu* provided better relief in the management of *Asthi Bhagna*.

## DISCUSSIONS

### Probable Mode of Action of Abha Guggulu in Asthi Bhagna

Regarding the properties and analysis of 'Rasapanchaka', *Abha Guggulu* due to its contents can be considered as having an analgesic, antiseptic, anti-inflammatory, antimicrobial and bio-stimulator property. The sequence of history-morphological and bio-chemical changes that occur in and around the fracture site may be grossly affected by the drug *Abha Guggulu*, thus we have received excellent results while managing fractures with it.

It is mainly considered as an anti - hyperlipidemia drug, which have proved as to decrease the lipids even from the bone marrow<sup>[8]</sup>. Thus, besides a lot of good properties, its best property is to provide the lipid free condition to promote the bone healing.

The contents of the drug probably effects through any one or more than one of the following mechanisms:-

- They may interfere with its analgesic and anti-inflammatory effect of Guggulu, as it is having ushna veerya, thus pacifies the vitiated vata & gradually reducing pain. Its rooksha, tikshna, sukshma & vishada property make it as anti-inflammatory, thus reduces swelling & also make the drug highly absorbable even in the capillaries and cell membranes. This can be made clearer, when we review the 'Cell Biology', in which there are 3 things (plasmodesmata, tight junction & synoptic button) which keep the cells interconnected & help in tight union of cells, as they hold the cells together. Yoga-vahitva of Guggulu is carried successfully, through these above said cellular things. Thus Guggulu carries all the required good properties with it, and spread it quickly through the above principle.



- As the quantity of Guggulu is highest in the formulation, its properties also work at maximum.
- It works with the proper nourishment of the site. As vipaka work on the level of dhatu, madhura vipaka of sunthi and triphala will nourishes and work as Rasayana to improve the immune system. In the bone metabolism, mast cells are bio-chemically closely related to histamine, hyaluronic acid, 5-hydroxy tryptamine & heparin. The granules of the mast cells contain Alkaline phosphatase, which is found during the fracture or osteoporosis in blood. Thus, mast cell, besides phagocytosis involves the osteogenesis. Alkaline phosphatase is nothing but 'Kshar', having Katu rasadhikya which have proved vatavardhaka (*Asthi* is the site of Vayu). In Building Bone Vitality, eating a low-acid diet is the secret to not only preserving bone health but calcium reserves as well. Finally, this will be pacified by Madhura vipaka. Therefore; these individual drugs have a greater role in fracture management in their Tridosahara, Rasayana & Dhatuvaradhaka effects. Thus, promoting the cell regeneration.
- They may interfere with the proper transportation of the required minerals and enzymes at the fracture site, by the 'Anulomak' property of Haritaki, as this makes the circulation of all the dosa, dhatu & mala to their most appropriate marga, thus it helps to carry raw material at the site of action & basically helps to slough out the debris & initiate the stage of remodelling in fracture healing & reduces swelling. Remodelling or bone turnover is the process of resorption followed by replacement of bone with little change in shape and occurs throughout a person's life. Osteoblasts and osteoclasts, coupled together via paracrine cell signalling, are referred to as bone remodeling units. Haritaki also pacifies tridosa and work as Rasayana.
- They interfere with the dhatvagni deepana, ama pachana & srotoshodhana property of sunthi, maricha, pippali & vibhitak. Thus, they help to prepare the raw material absorbable & functional and clean srotas to provide the raw material at the fracture site. Bone mineral (also called inorganic bone phase, bone salt or bone apatite) is the inorganic component of bone. Bone mineral is formed from carbonated hydroxyapatite with lower crystallinity. The matrix is initially laid down as unmineralised osteoid (manufactured by osteoblasts). Mineralization involves osteoblasts secreting vesicles containing alkaline phosphatase. This cleaves the phosphate groups and acts as the foci for calcium and phosphate deposition. The vesicles then rupture and act as a centre for crystals to grow on & distributed among the collagen fibrils of bone and forming yet larger structure. Here, the raw material is transformed to various enzymes and help to start the bio-chemical reactions, which is the initiation of new cell generation. Thus, Deepana, Pachana & Srotoshodhana are the most important steps required, prior to every therapy.
- It has been proved to promote healing at the fracture site, by the 'vishad' guna of babul, as vishadata checks the suppuration to make the site clean and free from extra wetness. This also involves in the remodelling of the fracture site and making the bone anatomically natural. The purpose of remodelling is to regulate calcium homeostasis, repair micro-damaged bones (from everyday stress) but also to shape and sculpture the skeleton during growth. Thus *Abha Guggulu* has each and every constituent having unique and very important property to complete the pharmacokinetic cycle required for an easy and early fracture healing with no residual deformity.

#### Probable Mode of Action of Placebo in Asthi Bhagna

Union of bone fracture by time is a natural phenomenon of the body. A health problem that improves on its own, can sometimes add to what's thought of as the placebo effect. Even in *Asthi Bhagna* some types appear to get better and

worse on their own, although they continue to heal up through calus over time. This is part of the effect of timing, noted above. As all the protocols of Asthi Bhagna was followed before starting the medication to both the groups, supports the fast and rapid recovery. Still, the cardinal sign and symptoms can't be reduced to optimum level with placebo. Patients, who are not getting better in the study, including those on placebo, are more likely to leave the study before it's over. This means that people who aren't helped are less likely to be counted in the final analysis. This may be the reason that out of 20 patients in Group –B, only 14 can be followed up to the end of the clinical trial. 6 patients were found LAMA.

## CONCLUSIONS

*Abha Guggulu* has shown statistically significant result on the Pain, Swelling, Tenderness, and Loss of function & Bony deformity over the placebo. Efficacy of *Abha Guggulu* is due to it Ushna virya, antiseptic, anti inflammatory, antimicrobial, analgesic, immune-enhancer and bio-stimulator action.

Guggulu by swabhava or nature is ushna veerya, Rasayana and Yogavahi. Its action is augmented upon addition of other medications dravya. Because of Sukshma, Laghu, Sara guna, it provides fast absorption in body through sukshma or minute srotas and owing to Snigdha, Pichhila guna, it also imparts prolonged drug action. So, it is highly effective in Shothaharana and Vedanaharana purposes in the management of fracture.

*Abha Guggulu* has proven to be an efficacious drug in the management of long bone simple fracture, conservatively with or without reduction. Though it was a preliminary study of small sample size, but it has paved the new land for research in the fracture management. In this study, *Abha Guggulu* is very potent and effective. During the clinical studies, it has been observed that *Abha Guggulu* was much more capable in managing the pain; swelling and stiffness.

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