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REVIEW OF AYURVEDIC DOSAGE FORM: VATI KALPANA

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ABSTRACT

Bhaishajya Kalpana mainly deals with the preparation of different medicine which includes *Pancha vidha Kshaya Kalpana* (primary preparations) and its *Upkalpana* (secondary preparations). *Pancha vidha kashaya kalpanas* being the primary preparations and the most widely used formulations as a starting dosage form as well as a base for many different dosage forms. *Vati Kalpana* is a derived form of *Kalka Kalpana* and is one of the salient secondary preparations in Ayurveda Pharmaceutics. This is widely used in the pharmaceutical world of both Ayurveda and modern science. Acharya Sharangdhara has depicted various synonyms of *Vatikalpana* i.e *Gutika, Vati, Modaka, Vatika, Pindi, Guda, Varti etc.* On the basis of preparation, it is of two types of *Sagni and Niragni Vati.* For the preparation of Vati, three ingredients are necessary i.e., fine powder, binding substance and Bhavana Dravya. The general dose of *Vati* is one *Karsha* (12gm) and also depends upon *Kostha* and *Agni* of the patient. The

shelf life is 2 years for *Vati* which consist of herbal drugs and an indefinite time period for the pills made of minerals. In modern science, it can be compared with tablets, pills, capsules etc. which are solid dosage forms and can be easily administrated. For the formulation of tablets numerous additives are required such as diluents, Adsorbents, Binders (granulating agents), Disintegrating agents, Organoleptic additives, Glidants, anti-adhesives, lubricants. There are various analytical parameters to check the authenticity of Tablet such as disintegration time, hardness, dissolution time, uniformity of weight etc.

Keywords: *Vati*, Tablet, Ayurveda, *Upkalpana*

INTRODUCTION

Ayurveda is an ocean with thousands of Ayurvedic formulations and individualised protocols for disease management. The knowledge of herbal formulations is a key component in the success of credence of any Ayurvedic professional. The medicines in Ayurveda are present in a comprehensive dosage form i.e *Vati*, one of the most stable and potent of these. Medicines prepared in the form of pills are known as *Vati* and *Gutikas.* Such pills are small, spherical, solid dosage forms, incorporated with one or more drugs of plant, animal or mineral origin. Pills form a relevant way of administering bitter or unpleasant substances as medicament' in a pre-defined dose. In earlier days pills are made extemporaneously by the Vaidya-Pharmacist in the following manner: The drugs of the plant origin sources are dried and made into fine powders, separately. The minerals are made into *Bhasma* or *Sindura*, unless otherwise mentioned. In case where *Parada* and *Gandhaka* are mentioned, *Kajjali* is made first and other drugs are added, one by one, according to the formulation. These are poured into *khalva* and ground to a soft paste with the prescribed fluid. When more than one liquid is prescribed for grinding, they are used in succession. Here the mass of *Vati* is properly ground and kneaded to a bolus, then it is subjected in a condition to made into pills. 1

Synonyms of *Vati*

Acharya Sharangdhara has depicted various synonyms of *Vatikalpana* i.e., *Gutika, Vati, Modaka, Vatika, Pindi, Guda, Varti* (tablets, bolus, pills, dragees). These are the names given for *Vati Kalpana* on the basis of shape, dose, root of administration etc. 2.

Variation on the basis of shape:-

Vatak, Modaka, Pindi, Guda, Varti, Vati, Vatika, Gutika etc different names are mentioned because of their variation in size and shape.

Table 1. Variation on the basis of shape

Gutika	If the medicine is rolled into small circular shape masses, then it is known as *Gutika.* This can be compared with pills in modern pharmaceutics.
Vati	*Vati* is made in the shape of flat circular mass hence it is similar to tablet.
Guda	*Kasthausadhi Churna* is mixed with *Gudapaka* and prepared product is called *guda*.
Guggulu	*Kasthausadhi Churna* and *Bhasma* etc. are mixed with *Guggulu* and *Guti* / *Vati* is prepared then it is known as *Guggulu Kalpana.*
Vataka	If medicine is made into big circular mass form, then it is called *Vataka*.
Varti	If the *Gutika* or *Vati* medicine is modified into this long oval shaped solid form, then it is known as *Varti Kalpana*. This is commonly used for local administration of following routes viz. *Guda* (Anus), *Yoni* (Vagina), *Sisna* (Penis), *Netra* (Eye). As per specific route of drug administration, the length and diameter of the *Varti* will be modified.
Modaka	Is also a round shaped pill, but its size is bigger and its weight around 20g, 50g.
Pinda/ Pindi	Aushadhi churna is mixed with sugar and moulded like Pinda(circular mass) then it is called as Pinda or Pindi. The size of that of a single bolus of food.

Variation on the basis of size

Vati are small in size and whenever small quantity of medicine is supposed to be given then medicine should be moulded into *Vati* and *Gutika* form. While *Vataka, Modaka,* etc. are very big in size and difficult to swallow, hence they are advised to consume in the form of powder.

They are prepared either by adding the powder of drugs with jaggery, sugar, *Guggulu* or without adding i.e by macerating the powder with any liquid like honey or *Guggulu*, is to be rolled into pills. If the addition of sugar is required, then it is to be added four times to the quantity of powder. Other drugs like salt (*Saindhava Lavana*), *Ksara* (Alkalies), *Guggulu* and honey are to be added in equal proportion to that of powder. All these contents to be macerated, should be dried in shade and preserved properly. They are used in accordance with the strength of the patient**.**

Type of *Vati*

i. *Sagni Vati Nirmana*

ii. *Nirargani Vati Nirmana*

Table 2. *Sagni and Niragni Vati Nirmana*

Sagni Vati Nirmana 3	***Niragni Vati Nirmana*** 4
Vati is made with the help of *Agni*	*Vati* is made without the help of *Agni*
Guda, Guggulu, Sugar etc. are used along with water and proper *Paka* is done then fine powders are added to make *Vati*	*Gomutra, Swaras, Kwatha* or honey is mixed and triturated with fine powders to make *Vati*
E.g. *Yogaraja Guggulu, Chandraprabha Vati* etc.	E.g. *Eladi Gutika, Shilajatwadi Vati,Sanjeevani Vati* etc.

Ingredients used in *Vati*: In the preparation *Vati* three ingredients are necessary:-

i. Drugs in the form of fine powder.

ii. Binding substance.

iii. Drugs for *Bhavana.*

Drug in the form of fine powder:- *Churna* is a dry fine particle of drug. Fine powder of drugs are prepared by grinding in pulverizer or pounding in *Ulukhala Yantra* and passing through sieve number 85.

Binding Substance:- In the formation of pills, jaggary, *Sharkara* and honey are used they are called as binding substances. These substances avoid foul smell and bitterness of the drugs and increase the palatability of Vati.

Drug for *Bhavana*:- In formulation of *Vati*: *Swarasa, Kwatha* and *Gomutra* are used in double quantity and should be properly mixed with *Churna,* after proper *Mardana, Vati* should be made. In the *Vati* formation, *Kwatha* is used then *Bhavana* should be given to the churn. Here *Kwath* should be made with 8 times of water and reduced to 1/8th part and to be filtered through cloth.5

Method of preparation

The herbal ingredients should be dried and made into fine powders, separately. The minerals, metals and gems should be reduced to *Bhasma* or *Sindura,* unless otherwise mentioned and animal products should be purified if necessary. In cases where *Parada* and *Gandhaka* are described, *Kajjali* is to be made first then other drugs are added, one by one, according to the formulation. The requisite quantity of these drugs should be taken and mixed properly then this mixture is subjected to *Khalva* and ground to a soft paste with the prescribed liquids. If more than one fluid is prescribed for grinding, they are to be added one after another. In case no liquid is mentioned, water can be added. When the mass is properly ground and is in a condition of *Matrapaka,* is to be made into pills, *Sugandha Dravyas* like *Kasturi, Karpura* etc., if prescribed, are to be added in last and ground again. In cases where sugar or jaggery *(Guda)* is illustrated, *Paka* of these should be made on mild fire and removed from the oven. The powders of the ingredients are added to the mass and vigorously mixed, when it is in still warmed condition, after that *Vati/Gutikas* should be rolled and dried in shade. The criterion to determine the final stage before making pills is that on rolling, it should not stick to the fingers and should be of specific size. Pills may be dried in shade or under the sun in accordance with the textual directions. In contemporary times, pill-making machines

may be recommended for turning out larger batches by the pharmacies. In this method, the prepared mass may be expelled in the form of cylindrical threads of required size, which are cut at regular intervals to give units of a pre-set size and are rolled to a spherical form.

Some practical aspects of *Vati Kalpana*

Use of *Dugdha, Swarasa, Kwatha*: Medicinal drug is made into fine powder form and mixed with *Dugdha, Swarasa, Kwath, Madhu* etc. to make it into paste form and then this paste is moulded into *Gutika.* If *Dugdha, Swarasa, Kwatha* etc. are taken for *Bhavana,* these liquids should be taken in such a quantity by which total quantity of drug powder get completely immersed in *Khalva Yantra.*

Use of *Vanshlochana*: If *Vanslochana* is depicted in the *Vati* formula, here *Vanslochana* has to be grinded with a small amount of *Churna,* then rest of the *Churna* has to be incorporated one by one and mixed well.

Use of *Guduchi Satva* and *Daruharidra Satva*: If *Guduchi Satva* and *Daruharidra Satva* are supposed to be mixed, first of all these *Satva* are to be powdered and mixed in water. Then the rest of the medicinal drug powders are added by sprinkling them one by one and mixed together after that the total substance is grinded in *Khalva Yantra* and then this substance is moulded into *Vati* form.

Use of *Guggulu*: *Guggulu* can be used by making *Paka* with either *Kwath* or pounded with *Ghrita* and mixing with respected powders to make *Gutika Kalpana*. The quantity of *Guggulu* should be equal to that of drug powder. If less than 50% *Guggulu I*s used in the formulation it acts as a binding agent and if more than 50% than it acts as a main ingredient. Some of the *Vati* which are made with *Guggulu* does not disintegrate properly and sometimes they come out as it is with stool mass hence such *Vatis* has to be chewded properly before intake.

Use of *Sharkara* (Sugar) and jaggery: they are used by making them into syrup form (*Paka*) then drug powder is mixed by sprinkling method one after another to form a paste which is then moulded into *Vatis.*

Drying: Drying is an important procedure in pharmaceutical practice. The term drying usually infers the removal of relatively small amounts of water content from solid. In the drying process, the major emphasis is usually on the solid product. It is paramount that the remaining moisture content should be as low to prevent product deterioration. Some of the *Gutika* are advised to make dry under the sunlight after their preparation and some under the shade (*Chhaya Suska*). Drugs which can tolerate to sunlight, or which get more potency by exposing to sunlight are advised to dry in the sunlight.

Dose of *Vati*

The dose of *Vati* is prescribed as per the patient *Sara, Sanhanan, Bala* and disease etc. The general dose of *Vati* is one *Karsha* (12gm). It depends upon *Kostha* and *Agni* of the patient too.

Preservation and Shelf life

Pills made up of herbal drugs should be kept in air tight stainless steel containers and is used within two years. Pills made of minerals can be used for an indefinite period. *Gutikas* and *Vatis* should not lose their original colour, smell, taste and form. When sugar, salt or *Ksara* is an ingredient, the pills should be kept away from moisture.

Saveeryataavadhi* of *Vati- two years is the shelf life of pills prepared from herbal drugs and indefinite time period for the pills made of minerals.

Precautions during *Vati Nirman*

During *Vati* preparation, *Guggulu* should be used after purification. Fine *Churna* must be used which should pass through Mesh size no. 85. Drug used in the *Vati Nirmana* should be free from dust insects and worms etc. *Swarasa* and *Kwath* should be used according to their description.

Specifications has to be followed during administration of *Vati.*

Vati which are made up of Rasa drugs are having more strength. Whereas *Gutika* which are made up of herbal drugs are having smooth nature, hence they can be given safely to sensitive, strengthless and chronic patients. If the toxic drugs are mentioned under formulae of *Vati,* they should be mixed after their prescribed purification method of authentic test.

While consuming hard consistency *Gutika* e.g., *Dhatri Loha Gutika* etc, it has to be made into powder form and mixed with *Anupana* before administration so as to enhance its action. Hard consistency *Gutika* without getting disintegrated, they are expelled out with faecal matter. The *Vatis* which contain *Ahiphena* etc. narcotic drugs, should be specifically labelled with precautions while consuming.

Tablets

Solid dosage forms are the most popular category of pharmaceutical formulations. They are more convenient in comparison to liquid formulations because of their stability and accuracy in dose determination. Solid dosage forms include tablets, pills, capsules, cachets and wrapped powders etc.

Table 3. Classes of Tablets

Oral Tablets	These tablets are meant to be swallowed intact aided by some fluid. Most of such tablets are designed to disintegrate in the stomach and dissolve in the gastric fluids thus making the contained medicaments available for absorption.
Chewable tablets	These tablets are designed for use by children and such persons who may have difficulty in swallowing intact tablets. They should be chewed between teeth before ingestion of chewed particles.
Sublingual or buccal tablets	These tablets are designed for retention in the buccal cavity for an appreciable period of time. They carry medicaments meant for systemic action. The drug is absorbed directly through the oral mucosa thereby circumventing the GIT fluids and enzymes.
Lozenge tablets	These tablets are designed to dissolve slowly in the oral cavity affording a prolonged local action of the medicament. The time taken by most lozenge tablets to completely dissolve is about 30 minutes. The lozenge tablets should naturally contain no disintegrants. At the same time the proportion of binding agents should be increased to obtain a firmer structure.
Dental cones	Dental cones are compressed tablets meant for placement in the empty sockets after tooth extraction. They generally carry antimicrobial drugs with fillers like lactose, sodium bicarbonate, sodium chloride etc. The cones are meant to dissolve in 20-40 minutes and are formulated along the lines of buccal and sublingual tablets.
Solution tablets	These tablets are meant to dissolve completely in specified liquids to produce solutions of definite concentration for ingestion orally or for use as mouthwashes, gargles, skin lotions, douches etc.
Vaginal tablets	These tablets are substitutes for the traditional pessaries and are meant to dissolve slowly in the vaginal cavity releasing the drug over an appreciable period of time. Antimicrobial compounds or steroids are the general components of such tablets and are incorporated in soluble fillers like lactose or sodium bicarbonate.
Implants	Implants represent a novel approach in the use of solids as parenteral products and are inserted under the skin by cutting it open and stitching.
Effervescent tablets	These tablets contain ingredients which react in the presence of water to give effervescence. They are good substitutes for effervescent salts with the added advantage of dosage accuracy.

Various additives for tablets formulation

For the formulation of tablets numerous additives are required such as diluents, Adsorbents, Binders (granulating agents), Disintegrating agents, Organoleptic additives, Glidants, anti-adhesives, lubricants.

Diluents:

Diluents are added when the proportion of the medicament is small, and it is necessary to raise its bulk to a certain level. Tablets weighing less than 250mg are inconvenient to handle and swallow and hence, whenever the quantity of ingredients is short of this level, addition of a diluent or bulking agent may be necessary. The most commonly used tablet diluent is lactose which is marketed in several qualities, with well-defined physical properties, viz. 60 to 80 mesh or 80-100 mesh or 100-120 mesh spray dried lactose. Spray dried variety can be compressed directly without granulation.

Adsorbents:

Certain materials which can adsorb fluids like essential oils, ethereal solutions of oil soluble drugs, eutectic mixtures etc. and still remain dry are sometimes included in formulae of tablets where appreciable amounts of fluids are present.

Binding agents:

Binding agents such as microcrystalline cellulose, amylose, colloidal clays, finely powdered or spray dried acacia are used in dry granulation to afford adhesion of components in slugging operations. The proportions of binders vary from product to product, In lozenge tablets or implants, the proportion has to be high to keep the structures intact over long periods of time. In other cases where tablet structures are required to break up readily the binding agents have to be kept at low levels.

Disintegrating agents:

Disintegrants are included in tablets to ensure their breakup into small fragments in the gastrointestinal tract soon after ingestion. Materials which are absorbed into tablet and swell up in gastric juice are best suited for the purpose. Corn starch (5 to 20%) is the most popular. The other disintegrants are mineral clays, guar gum, psyllium seed husk powder etc. The disintegrant, added after granulation, breaks the tablet into constituent granules and the portion added before granulation breaks the granules into fine particles. The disintegration time of a tablet depends upon the nature and quantities of diluents, binders, lubricants, surfactants etc and upon some physical qualities like granule size, size of distribution, compression pressure, coatings, method of storage and age of the tablets etc.

Organoleptic additives: Colours, flavouring agent and sweeteners are three categories of additives that may be incorporated in the tablets. Colours are comprised to make tablets look elegant and have to be necessarily off the permitted list. Flavours are embraced in practically all tablets which come in contact with oral mucosa, more especially in chewable and effervescent tablets. Flavours are generally incorporated by spraying them on to granules in the form of solutions in some volatile organic solvent. Flavours are now also accessible as spray dried beadlets and could be incorporated in this form. The usual proportion of flavours is limited to 0.5% because excessive quantities may interfere with the free flow of the granules or their cohesion. Artificial sweetening agents like cyclamates and saccharin are going out of vogue especially in view of mounting legal pressure against their use. Many tablets contain sugars which impart an acceptable taste obviating the need of inclusion of synthetic sweetening agents.

Glidants, anti-adhesive, lubricants:

In the manufacture of tablets, one faces the problem of flow of granules from the hopper into the die cavity, sticking of material to the punches and die walls and release and free movement of the compressed tablets from the die cavity. To overcome these difficulties lubricants are used. These lubricants serve three functions:

Expedites flow of granules from hopper to the die by reducing interparticle friction.

Counter adhesion of materials to the faces of punches and die walls.

Facilitates liberation of compressed tablets from dies.

Accordingly, they are known as glidants, anti-adhesives and lubricants. The functions are equivalent, that a single substance may be able to act in all the three capacities.

Properties of the tablets

Organoleptic qualities: There are no hard and fast quantitative tests for ascertaining these properties. The evaluation of organoleptic qualities is a subjective judgement and can be highly individualistic.

Uniformity of weight: It is essential that the individual tablets in a batch are uniform in weight and the weight variation, if any, remains within permissible limits. The weight variation is caused due to size and distribution of granules or due to their poor flow. Occasionally it may also be caused due to punches. One has to take care of these factors to ensure weight uniformity.

Hardness: Hardness is a property which is dependent on density and porosity of the material on one hand and pressure of the compression on the other. It could, in the ultimate analysis, mean resistance to attrition, abrasion, bending, breaking etc. or crushing

or impact strength. There are no hard and fast rules about the hardness of the tablets but from practical point of view degree of hardness that does not interfere with their disintegration time is considered suitable. Each manufacturer has to make his own decision on this.

Disintegration and dissolution time: Different classes of tablets may be required to disintegrate after various intervals of time. Oral tablets should disintegrate within small periods of time while lozenges should remain intact over extended periods. Similarly, after disintegration the smaller particles should dissolve within a short period of time. Soluble tablets should also dissolve readily. Hence, disintegration and dissolution times of tablets are paramount qualities, which need to be controlled accurately.

Site of dissolution: Some tablets are required to bypass the stomach and disintegrate and dissolve only in the intestines. As such, for these tablets this property is an important requirement. After manufacturing, enteric tablets have to be tested, first for their inability to dissolve in alkaline intestinal fluids.

Sustained action qualities: In sustained action formulation, the release rate of the drug from the dosage form is controlled and it has to be ascertained whether a given sustained action product fulfils the desired release pattern. Hence, before this action tablet to be marketed, the pattern of release of drug has to be tested.

Manufacture of tablets: Manufacture of tablets necessitates certain well-defined steps viz, Pulverisation and mixing, Granulation, Compression and coating.

In pulverisation, the different ingredients should preferably be reduced to the same particle size since particles of different sizes will have a tendency to get layered during mixing. Mixing powders is not difficult except that uniform mixing ought to be assured. The granulation is done by the wet or dry granulation techniques. In wet granulation, the powder mixture is suitably moistened with a liquid binder, lumped and then passed through sieves. The granules thus produced are subjected to drying. While in Dry granulation also known as slugging or double compression, involves preliminary compression of fine powders into rough tablets or slugs followed by grinding of slugs into granular particles. The granules are separated, mixed with lubricants and compressed. This granulating procedure is very suitable for moisture sensitive and thermolabile substances. Compression is achieved by taking granules volumetrically in a die and compressing them between a set of two punches. To make the process continuous the movements of punches are regulated to ensure die filling, tablet compression and removal of compressed tablet from the die. At one time single punch machines were used. But nowadays rotatory machines having as many as 70 sets of dies are available with a capacity of 12,000 tablets per minute or 5 million tablets in 8 hours a day. Strain gauges measure the compressive forces and provide data on the weight of tablet too. It can also provide data on ejection forces, machine malfunction and wear and tear of punches.6

DISCUSSION

The medicines in Ayurveda are present in a comprehensive dosage form i.e *Vati*, one of the most stable and potent of these. Acharya sharangdhar has included *Guda, Gutika, Vati, Pindi, Modaka, Guggulu* under *Vati Kalpana*. On the preparation basis, two types of *Vatis* are mentioned, one which is made with the help of *Agni* is *Sagni Vati* and other which is made without the help of *Agni* is *Niragni Vati*. Ingredients used in *Vati* preparation are *Guda* (jaggary), *Sita* (sugar), *Guggulu, Madhu* (honey), *Gomutra, Swarasa* and *Kwath* of various herbal drugs that acts as the binding agent. These substances avoid foul smell and bitterness of the drugs and increase the palatability of vati. There are various advantages of this popular dosage form as they are lighter, compact, cheap, easy to pack and strip, easy to swallow with the least tendency for hang up, sustained release product is possible by enteric coating, objectionable odour and bitter taste can be masked by coating technique, suitable for large scale production, greatest chemical and microbial stability overall oral dosage form. Though there are certain disadvantages also in case of children and unconscious patients, some drugs resist compression into dense compacts, owing to their amorphous na-

ture, low-density character, drugs with poor wetting slow dissolution properties, optimum absorption high in GIT may be difficult to formulate or manufacture as a tablet that will still provide adequate or full drug bioavailability, bitter tasting drugs. In such cases, capsules may offer the best and lowest cost adopted by newer scientific and technological innovations which are essential for the materialization of promising as well as versatile dosage forms with novel performance and characteristics.

CONCLUSION

Vati Kalpana is an essential component of Ayurvedic pharmaceutics because of benefits including ease of administration, more palatability and ease of dispensing and transportation. *Vati* as well as tablets or pills can be formulated in several manners. That has been scientifically documented by ancient scholars of Ayurveda and gradually embraced by newer scientific and technological innovations which are essential for the materialization of optimistic as well as versatile dosage form with noval performance and characteristics.

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