

HUMAN GAIT IN *GRIDHRASI* (SCIATICA) AND ITS MODULATORY EFFECTS ON PLANTER PRESSURE MEASUREMENT: A REVIEW

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ABSTRACT

Ayurveda has well recognized and identified the problem of ‘*Gridhrasi*’ (sciatica). The word ‘*Gridhrasi*’ itself suggests the gait of the patient which is similar to *Gridhra* (vulture) due to pain. All the *Ayurvedic* classics including those written in medieval period have described the aetiopathogenesis and symptomatology of *Gridhrasi* in concise form. *Gridhrasi* is considered as *Shoola Pradhana Vatavyadhi*. The cardinal sign and symptoms of *Gridhrasi* are *Ruk* (Pain), *Toda* (Pricking sensation), *Sthambha* (Stiffness) and *Muhuspandanam* (tingling sensation) in the *Sphik*, *Kati*, *Uru*, *Janu*, *Jangha* and *Pada* in order and *Sakthishepan-Nigraha* i.e. restricted lifting of the legs. *Gridhrasi* is claimed to be a *Vata vyadhi*. Walking style of the person effected by this disease looks like, that of Vulture and hence the name. Pain, Stiffness and Tenderness, starting from hip region radiating to waist, thigh, knee and calf region with recurrent twitching sensation are its features. Drowsiness, Heaviness of lower limbs and Anorexia may be seen in some. In modern science, pain originating due to irritation of the roots of sciatic nerve is a group of symptoms which mimics this condition. *Gridhrasi* is associated with abnormal gait of the patient as putting abnormal pressure on the foot and leg, pain is felt on heel and leg while walking. Several studies on the foot biomechanics have reported that planter pressure variations are useful to determine the abnormal gait. There is potential of pressure measurement technology for the diagnosis and of various neuromuscular or musculoskeletal disorders, sciatica being one of them, can also be diagnosed and follow-up of the patient can be done by determining the planter pressure distribution on the affected leg and foot.

Keywords: *Gridhrasi*; planter pressure; gait; optical pedobarograph

INTRODUCTION

Ayurveda is the science of life if followed and practiced appropriately keeps an individual healthy and fit. Due to some factors like faulty life style, faulty food habits, jerking movement and exertion during long travelling produced pressure on spinal cord or nearer structure; physical as well as mental stress can aggravate the condition. the locomotors system is involved among these clinical condition., *Gridhrasi* (Sciatica) may also be produced where in a person feels difficulty in walking and if ignored it can lead towards damaging nerve of lower limb.

The Planter pressure has widely been accepted as a vital biomechanical parameter to evaluate human walking¹. Planter pressure measurements during standing, walking, and all other activities can demonstrate the pathomechanics of abnormal foot and yield objective measures to track disease progression². Human gaits are the various ways in which the human can move and are classified, both natural and trained. The evaluation of the gait is important in the study and assessment of various disorders of the limbs, one of which is sciatica or *Gridhrasi*. These various disorders are associated with an abnormal gait of the patient and putting abnormal pressure on the foot. Several studies on foot biomechanics have reported that planter pressure variation is useful to determine the abnormal gait. There is potential of pressure measurement technology for the diagnosis and treatment of various neuromuscular and musculoskeletal disorder³, *Gridhrasi* (sciatica) being one of them. Planter pressure instrumentation is used in the analysis of neurological disorders such as hemiparesis and parkinsonian gait⁴. Changing life style of modern human being has created several dis-

harmonies in his biological system as the advancement of busy, professional and social life, improper sitting posture in office, factories continuous and over exertion jerky movements during travelling and sports – all these factors creates an undue pressure to the spinal cord and play a chief role in producing lower backache and sciatica. Similar progressive disorders affecting the pelvis and nearer structure are also precipitating in this condition. In this way, this disease is now becoming a significant threat to the working population, improper sitting posture, jerky movement during travelling & sports may worsen the disease condition.^{5,6,7}

Now a day's most common disorder which effects the movements of leg particular in middle age is low backache out of which 40% are radiating pain which comes under sciatica syndrome which effects daily routine work.⁸ Sciatica is characterized by constant aching pain which felt in the lumber region may radiate to the buttock, thigh, calf and foot⁹. Sciatic pain radiates along the course of the sciatic nerve¹⁰. According to Stanlay J. Swierzewski, low backache affects 80-90% of people during their life time but sciatica occurs in about 5% of cases. It is common between 30-40 yrs of age and affects both the sexes (male and female) equally¹¹.

In *Gridhrasi*, *Nitamba* (gluteal region), *Kati* (lumber), *Prushtha* (posterior of thigh), *Uru* (knee), *Jangha* (calf) and *Pada* (foot) are affected respectively. *Sthambha* (stiffness), *Ruk* (pain), *Toda* (pricking sensation), and *Muhuspandanam* (tingling sensation) these found in *Vataja* type of *Gridhrasi* whereas in *Vata-Kaphaja* type of *Gridhrasi* *Tandra* (fatigue), *Gaurava* (heaviness) and *Arochaka* (aversion). On the basis of the symptoms, Sciati-

ca can be correlated with *Gridhrasi* in *Ayurveda*.¹²

Planter pressure studies have been undertaken by number of researchers on various disorders such as rheumatoid foot¹³ and diabetic neuropathy¹⁴.

The normal gait cycle is the time period or sequence of events and movement during locomotion in which one foot contacts the ground to when that same foot again contacts the grounds and involves forward propulsion of the center of gravity. The normal foot in bipedal standing exhibits the contact across the heel, forefoot and usually the lateral border on each foot, with toe contact being the most variable. The various gait analysis on normal subjects can be useful in determining the diagnosis, progression and hence treatment of disorders like *Gridhrasi*.

Aim and Objectives-

1. To study the *Gridhrasi* in different Ayurvedic classics w.r.t biomedical sciences.
2. The objective of studying gait in *Gridhrasi* and measuring the planter pressure using optical pedobarograph is to clinically establish the diagnosis of the disease *Gridhrasi* and various musculoskeletal disorders and interpret the various treatment modalities by removing the causative agents and correcting the abnormal gait.

ETIMOLOGY

Gridh' is the *dhatu* which makes the word '*Gridhra*' from which the word '*Gridhrasi*' is derived. The person, who desires to eat the meat greedily, is denoted as '*Gridhra*' and the disease which occurs commonly in these persons is called *Gridhrasi*.¹⁵

Sushruta:

The condition in which *Vata* invading the *Kandaras* of the ankles and toes produces

kshepan (decrease movement) in the thighs, this disease known as *Gridhrasi*.¹⁶

Charaka:

In *Gridhrasi*, *Nitamba* (gluteal region), *Kati* (lumber), *Prushtha* (posterior of thigh), *Uru* (knee), *Jangha* (calf) and *Pada* (foot) are affected respectively. *Sthambha* (stiffness), *Ruk* (pain), *Toda* (pricking sensation), and *Muhuspandanam* (tingling sensation) these found in *Vataja* type of *Gridhrasi* whereas in *Vata-Kaphaja* type of *Gridhrasi* *Tandra* (fatigue), *Gaurava* (heaviness) and *Arochaka* (aversion) in addition of *Vataja* type are found.¹⁷

Bhavaprakasha:

He explained *Dehpravakrata* (improper posture of body) in *Vataja* type of *Gridhrasi* and in *Vata-Kaphaja* type of *Gridhrasi* *Gaurava* (heaviness), *Agnimandha* (loss of appetite), *Tandra* (fatigue), *Mukhapraseka* (excessive salivation), *Bhaktadvesha* (anorexia) in addition of *Vataja* type *Gridhrasi*.¹⁸

Gait

Human gait refers to locomotion achieved through the movement of human limbs. It is defined as bipedal, biphasic forward propulsion of center of gravity of the human body, in which there are alternate sinuous movements of different segments of body with least expenditure of energy.¹⁹

Some of the abnormal gaits are antalgic gait, circumductin gait, waddling gait, high stepping gait, scissors gait etc

Pedunculopontine nucleus of the brainstem helps to control the planning and execution of gait. ppn nucleus together with spinal cord, cortex, and basal ganglia work together to plan, initiate and maintain gait.

Gridhrasi means, the pain experienced in *Gridhrasi* is similar to that of the pain felt dur-

ing the vulture piercing its beak deep onto the prey.²⁰ In *Gridhrasi* [sciatica], gait of the patient has been described like that of vulture as the patient puts more pressure on the forefoot as compared to heels similar to a vulture that puts pressure on its claws.

This difference in the pressure bearing areas of the foot can be measured with the help of optical pedobarograph.

Optical pedobarograph is major equipment in the field of foot pressure sensing. It provides foot images in which the light intensity is proportional to the applied pressure on the foot. With this device, the deformation of the thin

plastic sheet is viewed by the ccd camera through an edge illuminated glass plate. The mat experiences greatest compression in areas of high pressure and reflection from the patch of flattened sheet allows more light to escape internal reflection in the plate and travel to the camera. a computer will use the captured images and convert it to a color coded display based on earlier calibration of the equipment. The very high spatial resolution afforded by this technique is advantageous for the investigation of soft tissue problems in which peak pressure estimation and local spatial distribution of the pressure appear to be important clinical factors.

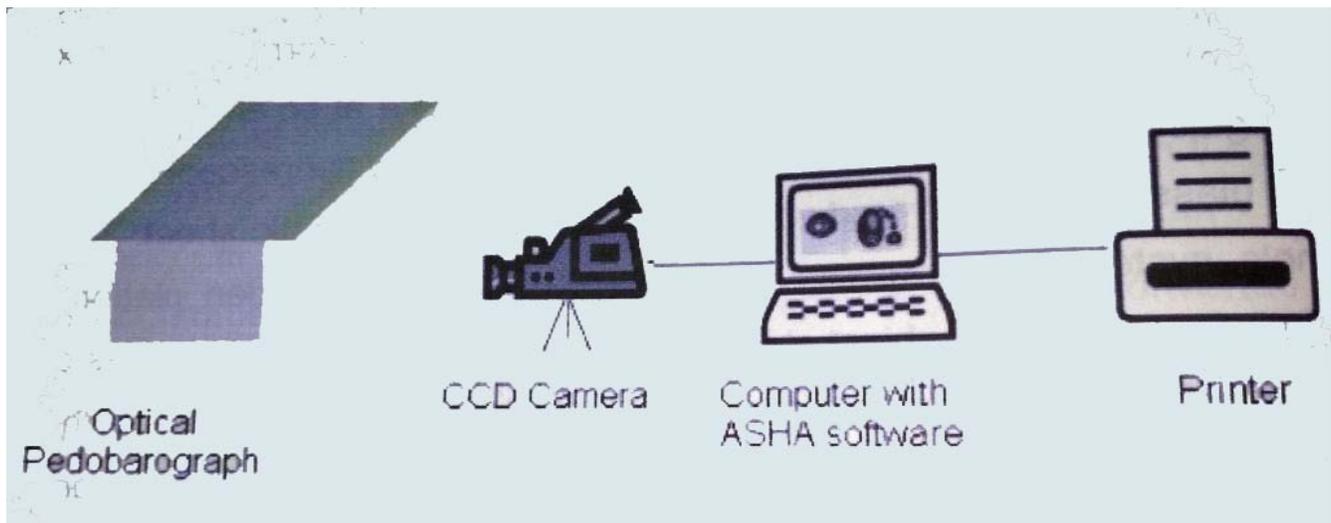


Figure 1: Schematic Diagram of Computerized Optical Pedobarograph²¹

DISCUSSION

Gridhrasi is *Vata Pradhana vyadhi*. The word '*Gridhrasi*' itself suggests the gait of the patient which is similar to *Gridhra* (vulture) due to pain. Walking style of the person effected by this disease looks like, that of Vulture and hence the name. Pain, Stiffness and Tenderness, Starting from hip region radiating to waist, thigh, knee calf region and foot with recurrent Twitching sensation are its features. *Gridhrasi* is dis-

ease related with *Vata*. *Vata vyadhi Nidana* is responsible for this disease. Planter pressure measurement is one of the tools of the examination of pathological leg and foot. That means the planter pressure is very useful method for diagnosis as well as therapeutics purposes but in this era, it is not used clinically. Modern technology like CT scan, MRI etc. is used for the diagnosis and therapeutics for all pathology. If the patient planter pressure of the foot is not normal with

abnormal gait, then patient is suffering from some pathology of leg and foot. These pathologies can be corrected by using gait analysis and optical pedobarograph measurement, with the help of various treatment modalities.

CONCLUSION

Gridhrasi is a *Vata vyadhi* and it makes the gait of the person deranged. Optical pedobarograph is an instrument which can be used for its diagnosis and treatment planning. Plantar pressure of the patient can be recorded and checked before and during the treatment to analyze the results and the improvement in the gait of the patient or the walking style of the patient. Plantar pressure can be recorded in normal individuals also to rule out any future development of musculoskeletal disorders like *Gridhrasi* and gait of the patient can be improved within normal limits. Abnormal gait is also an important causative factor for the development and progression of the disease and vice versa also so it should be corrected with the best possible way i.e. optical pedobarograph and plantar pressure analysis.

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