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Avascular Necrosis - A Conceptual Interpretation in Ayurveda

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ABSTRACT

Avascular Necrosis is a major health problem which results in the complete collapse of a Bone which may end up in permanent disabilities in the patient. *Ayurveda* with its vast concept of effective analysis and treatment aspects can be much fruitful in Avascular Necrosis cases without hampering other systems of the body. Here in this article an attempt is made to understand Avascular Necrosis by the concepts of *Vatarakta* in understanding its pathogenesis and its Treatment.

Key words: Avascular Necrosis, Vatarakta

INTRODUCTION

Avascular Necrosis, also called osteonecrosis is the death of Bone tissue due to a lack of Blood supply. It can lead to tiny breaks in the Bone and the Bone's eventual collapse. As the condition worsens, the affected joint might hurt only when you put weight on it but eventually, patient might feel the pain even when they lie down. Pain can be mild or severe and usually develops gradually. Pain associated with Avascular Necrosis of the hip might center on the groin, thigh or buttock. Besides the Hip, the areas likely to be affected are the Shoulder, Knee, Hand and Foot. Some people develop Avascular Necrosis on both sides (bilaterally) - such as in both Hips or in both Knees.

Causes

Avascular Necrosis occurs when Blood flow to a Bone is interrupted or reduced. Reduced Blood supply can be

caused by **Joint or Bone Trauma** - An injury, such as a dislocated joint, might damage nearby Blood vessels. Cancer treatments involving radiation also can weaken Bone and harm Blood vessels. **Fatty deposits in Blood vessels** - The fat (lipids) can block small Blood vessels, reducing the Blood flow that feeds Bones. **Certain diseases** - Pancreatitis, Diabetes, Gaucher's disease, HIV/AIDS, Systemic lupus erythematosus, Sickle cell anemia etc. Other Risk factors for developing Avascular Necrosis include: **Trauma** - Injuries, such as hip dislocation or fracture, can damage nearby Blood vessels and reduce Blood flow to Bones, **Steroid use** - Use of high-dose corticosteroids, such as prednisone, is a common cause of Avascular Necrosis. The reason is unknown, but one hypothesis is that corticosteroids can increase lipid levels in your Blood, reducing Blood flow. **Excessive alcohol use** - Consuming several alcoholic drinks a day for several years also can cause fatty deposits to form in your Blood vessels. **Bisphosphonate use** - Long-term use of medications to increase Bone density might contribute to developing Osteonecrosis of the Jaw.

This rare complication has occurred in some people treated with high doses of these Medications for Cancers, such as multiple Myeloma and Metastatic Breast Cancer. **Certain medical treatments** - Radiation Therapy for Cancer can weaken Bone. Organ Transplantation, Especially kidney Transplant, also is associated with Avascular Necrosis.

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Complications

Untreated Avascular Necrosis worsens with time. Eventually, the Bone can collapse. Avascular Necrosis also causes Bone to lose its smooth shape, potentially leading to severe osteoporosis, osteomyelitis, osteoarthritis, collapse of the Bone.^[1]

Source of Collection of Data

For the present Article, data was collected from Post Graduate library, Department of Kayachikitsa Ayurveda Mahavidyalaya and Hospital Hubli, Ayurvedic classics like Ashtanga Hridaya, Charaka Samhita & Modern available texts, Authentic Research Journals, M.D Dissertations, Research papers & Websites.

Conceptual Analysis in Ayurveda

Before we start let's see the details of *Dhatu* which is having the main function to carry out the proper functioning and they co-exist in the *Sharira* by nourishing each other which is explained in *Ayurveda* on the basis of various *Nyayas* "*Sareeradharakataya Dhatwantaraposhakataya Cha Dhatu Sabenochyante*" and *Dhatwagni*, which governs metabolic – enzymatic reactions in the body; food transformation producing *Saara Bhaga* (Proper *Dhatu*) and *Upadhatu* and *Kitta* forming various *Malas*/ metabolic waste. So, in the case of *Asthi Dhatu* proper *Poshana* is done by *Dhatu Parinama* from *Rasa—Rakta—Mamsa—Medo—Asthi—Majja—Sukra* where the *Poshaka Medo Dhatu* is transformed into *Asthi Dhatu* by the *Prithvi, Vayu, and Medasagni*.^[2]

Asthi Dhatu / Bone tissue

Bone tissue consists of Osteoblasts, Osteoclasts and Matrix in which Mineral Salts are present. Bone cavity consists of Bone Marrow which is rich of Lipids, mostly Triglycerides. Matrix contains group of Proteins and Minerals which are of Cations, Calcium, Sodium, Potassium, Magnesium and Anions, Phosphate, Carbonate, Citrate, Chloride, Fluoride. The Osteoblasts are also rich in Glycolytic Enzymes. For the normal Activity of Osteoblast Vitamin C, A, D is required which is supplied mostly by *Jeeva Rakta*. So, the Major issue in AVN is the blockage of this Blood supply to a particular site that is *Rakta Marga Rodham* which in

turn affects the *Dhatu Parinama* resulting in *Kshaya* of consecutive *Dhatu*s as per *Ksheera Dadhi Nyaya, Kedari Kulya Nyaya* and *Khale Kapotha Nyayas*. Modern anatomy clearly clarifies this concept as we see to the function of Nutrient Artery - which is a *Srotas / Rakta Dhamani* that provides nutrition and oxygenated Blood to the Bone. So when a *Sankocha* is happening to this artery or its supplying arteries or its accessory arteries Disruption of Nutrient Artery occurs which results in necrosis of large portion of marrow & of inner two thirds of cortex; this cortical death does not occur in adult Bone because combined epiphyseal metaphyseal collateral circulation is developed enough to maintain these areas; loss of circulation in terminal vessels of nutrient artery of growing Bone will interfere endochondral ossification resulting in various inflammatory changes (*Dhatu Paka*) resulting in *Dhatu Kshaya* (slow necrosis)^[3]

Nidana vs Causes

- Traumatic Injury to the joint or Bone leading to reduced Blood flow : This can be taken as the *Abhighata* or *Marmaabhighata* as the *Marma* resides in such important vital points including *Mamsa, Siras, Asthi, Snayu, Dhamani* and *Sandhi etc.*; each *Marma* there is a dominancy of one of the above elements so any injury in these areas can result in clinical symptoms of that particular element as here in AVN an injury to a particular *Dhamani* can result in the *Srotho Vaigunyam* resulting in *Kshaya* or necrosis of the *Asthi Dhatu*.
- Some disorders like Sickle cell anemia - where the *Shudha /Jeeva Rakta* is not formed and there by the proper *Dhatu Parinama* doesn't happen and *Aposhaka Dhatu*s are formed. Other haemoglobinopathies also result in the same conditions.
- Gaucher's disease is a genetic disorder, which leads into the deficiency of an Enzyme Called Glucocerebrosidase, that results in the inability of the body to break down a chemical called Glucocerebricide These cells can accumulate in any part of the body such as the Liver, Spleen, Lungs, Lymphatic System and Bones. An enzyme can be

considered as an agent that carries out a *Parinama* /conversion which can be correlated with *Agni* which is the Biological Energy needed for any sort of process inside a *Dhatu Paramanus* or cells and its *Mandya* is *Agnimandya* at *Bhoothagni* /*Dhatwagni* level and as this chemical which is *Apakva Janya*, accumulates in the body parts it can also be considered as *Ama Dosha*.

- Other immune disorders like HIV, SLE, Anti Phospholipid Antibody - where the body cells deteriorate which result in the destruction of proper blood supply to the human body resulting in Necrosis where the concepts of “*Vyadhi Kshamathvam* - *Vyadhi Bala* can be taken.
- Some disorders like Caissons Disease - a condition arising from dissolved gases coming out of solution into bubbles inside the body on Depressurization which can cause obstruction to the Blood flow to a particular area and Hypercoagulable States or Thrombophilia (sometimes hypercoagulability or a prothrombotic state) is an abnormality of Blood Coagulation that increases the risk of Thrombosis (Blood clots in Blood vessels). Excessive Drinking, excess use of Cortico Steroids results in the increase of Lipids in the Body, Hyperlipidemia which gets deposited in the Blood vessels causing the obstruction of Blood flow to a particular area. Here in both these cases, we can take the concept of *Sanghatmaka Avarana* directly, which is causing obstruction to the flow of *Jeeva Rakta* to a particular area causing *Kshaya*.
- Excessive intake of biophosphonates, other Osteoporotic drugs during Cancer treatments, other Drugs like Steroids, Cancer treatment Drugs, Radiation therapy, Dialysis Drugs and Treatments, Organ Transplants and Heavy Lipid /Cholesterol increasing diet etc., can cause AVN which can all be included under “*Ahita Ahara Vihara*”.
- Other disorders like CLD (medicines of CLD /Vit D Deficiencies), Pancreatitis (lipid increase), TB causes improper *Agni* mechanisms resulting in various Malabsorption Symptoms, Improper

Metabolism, Excess production of *Ama Dosha* all resulting in *Dhatu Kshaya and Dosha Prakopa*.

So, the general *Samprapthi* can be taken as *Various Nidanas - Rakta Dushti - Rakthvaha Sroto Rodha - Dhatwagni Mandya - Dhatu Parinama Rodham/Apakva Dhatu - Asthi Dhatu Kshaya/Sleshaka Kapha Kshaya in Sandhi - Asthi Dhatu/ Sandhi Dourbalya - Complications*

Now let's try to understand the details of the concepts of *Samprapthi* of AVN in three stages adopting similar *Samprapthi Sthitis* from other *Vyadhis*

▪ **First Stage of Samprapthi**

In *Apabahuka*, *Susrutha Acharya* has quoted *Vayu* in *Amsa Desha* will cause *Shosha* on that region by “*Sirashcha Akunjanam*” or constricting the *Siras* - lack of proper *Jeeva Rakta Paribhramana* - Lack of formation of *Poshaka Dhatus - Dhatu Kshaya Kshaya* or *Shosha* of *Amsa Sandhi* which includes *Mamsa / Meda / Asthi / Majja* etc. which can be taken as first stage of *Samprapthi* in AVN.^[4]

▪ **Second Stage of Samprapthi**

Chakrapanidatta explains that in *Avarana* as the vitiation of *Vata* is the result of the Obstruction to spontaneous stimulation for movement. *Avarana* can also be considered as *Sanga*, as an obstruction, *Samsarga* the combination of two *Doshas*. So here when we explain the *Avarana Sidhantha*, *Vyana Vata* comes into the picture *Vyana Vata Sthana* is at ‘*Hridisthitaha*’ and is considered as ‘*Sarva Dehachari*’ - that moves all over the body. *Astanga Sangraha* explains in detail about the functions of *Vyana Vata* can be summarized under the headings *Gati* (all the movements), *Rasa- Rakta Paribhramana* (circulation of nutrients), *Sweda Srava* (excretion of sweat), *Anna Aswaadhana* (appreciate taste) and *Shukra Pratipadhana* (carrying semen), dividing food for absorption and excretion and gradually nourishing the *Dhatus* from the nutrient material. As per the *Asraya Asrayibhava*, *Vata* resides in *Asthi* and that *Vata* residing in the *Asthi* brings about the movements. The functions of somatic nervous system can also be ascribed to *Vyana Vata* as movements like Flexion,

Extension, Opening and Closure of Eyelids have said to be under its control. The function of *Asrk Sravana* is possible by the stimulation of the sympathetic supply to heart. This depends not only on the effective contraction of heart but also on the caliber of the Blood vessels.^[5]

- So, as we see to the condition of AVN, the blockage due to different causes ultimately resulting in the *Rodha of Vyana Vata* and its function of *Rasa Rakta Paribhraman* and resulting in further *Vata Kopa* and *Avarana Janya Dhatu Kshaya* and specifically blocking its functional aspects of *Gati*/movements of the joints which also gets hindered in AVN All these explains the concepts of second stage of *Samprapthi* in AVN.

Third Stage of *Samprapthi*

In the *Samprapthi* of *Prameha* /Diabetes – all the *Drava Roopi Dhatus* are affected first and finally the *Sthira Dhatu Asthi* is affected in the form of Osteoporosis and osteopathy. Here *Kapha* vitiating *Medas* /*Mamsa/Kleda* - all *Poshaka Amsha* is taken out through *Mutra - Dhatu Kshaya - Dhatwagni* is affected which result in demineralization of bones i.e.; *Asthi Kshaya*^[6]

The same pattern of *Asthi Dhatu Kshaya* happens in AVN where *Poshaka Amsha* is not reaching the *Dhatus* leading to *Kshaya* in final stage of *Samprapthi*, so in general all these will result in the Improper or Complete Cessation of the Nutrient supply to the Particular Joint - resulting in destruction of tissues with various Inflammatory Changes (*Dhatu Paka*) - Results in *Dosha Kshaya* - leads to complete death of the Tissues Necrosis / *Dhatu Kshayavat Ghnanthi* occurs.

Once the nourishment to the *Sandhi/Asthi* is occluded the proper maintenance of *Sleshaka Kapha* is also hampered which is predominately present within Synovial fluid of the Joints, nourishing the articular surface ensuring lubrication, Stability and Flexibility of the Joints. *Vata Kopa* in *Asthi* results in *Kshaya* of this *Sleshaka Kapha* leading to degenerative changes within the Skeletal System such as *Sandhi Dourbalyatha* /*Sandhi Saidhilyatha*.^[7]

Symptoms vs Lakshanas

Pain /*Ruk* is the main symptom which is presented by the Patient which increases day by day in different patterns / *Vedana* in *Sandhi Asthi Majjasu Lakshanas* like *Bhedo Asthi Parvanam* (breaking type of pain), *Sandhi Shoola* (Joint Pain), *Satata Ruk* (continuous pain), *Mamsa Bala Kshaya* (muscle weakness), *Asvapna* (loss of sleep) etc.

As the disease progresses, due to the avascularity / *Poshaka Dhatu Utpatti Kshaya* symptoms like Collapse of the joint / *Sandhi Dourbalya*, irregular structural formation of the Bone or Joint / *Vakri Karana* of *Sandhyasthi*, Osteoporotic Changes / *Asthi Majja Kshayam* – “*Asthanam Majjani Sousheeryam*” Results in collapse of the *Asthi* /*Sandhi - Bhagna* or Permanent Disability of the Joints like *Panguthvam*, *Khanjathvam*, *Sandhi Sosham* occurs.

Classical Interpretation

In *Ashtanga Hridaya Vataraktadhikara* Acharya has clearly mentioned,

“*Janu Janghoru Katyamsahasthapadanga Sandhishu
Kkandu Sphurana Nistodabheda Gourava Suptata
Bhutva Bhutva Pranashyanthi Muhuravirbhavanti Cha
Gambhire Adhika Poorva Ruk
Shayvadhurgradhita Paki Vayu Sandhyasthimajjasu
Chindanniva Charatyantharvakrikurvashcha Vegavan
Karothe Khanjam Pangu Va Shareere Sarvathascharan
//”^[8]*

Here *Acharya* has clearly mentioned the joints afflicted by *Vatarakta* and progressive nature of *Vatarakta*, same in the case of AVN, the Disease is very progressive where “*Vatae Adhikam Adhikam Shoolam*” (*Ca*) as the Avascularity Progress resulting in further aggravation of *Vata*, resulting in more *Ruk* and *Dhatu Kshaya* and the symptomatic similarities which we have already discussed can be seen in this classical verse. While mentioning the progressive nature of *Vatarakta*, *Acharya* has mentioned the ideology of *Anyonya Avarana* where *Vata* residing in *Rakta Marga*, *Sakha*, *Sandhi* will result in *Vividha* type of *Vedana* and while

mentioning *Vyana Vata*, as it is *Sarva Dehachari* its *Prakupitha Avastha* can result in *Sarvanga Rogas* according to the *Sthana* of *Prakopa* which explains the occurrence of Avascular Necrosis in different *Sthanas*.

In the context of *Ubhayasrita Vata Raktam*, *Acharya Charaka* mentions,

“*Twak Mamsa Asrayam Uthanam Gambhire Tvarantharasrayam*

Kandudaharukayamathodasphuranaakunjanaihi

Anvitha Shyavarakta Twak Dahe Thamra Thadheshyathe

Gambhire Shyavathu Sthabdha Kadino Antharbhisharthiman

Shyava Sthamro Adhava Daha Thoda Sphurana Pakavan

Ruk Vidahanvitho Abhikshnam Vayuhu Sandhyasthi Majjasu

Chindanniva Charathantharvakreerkurvashcgga Vegavan

Karothi Khanjam Pangu Va Shareere Sarvathscharan

Sarvalingaishcha Vijneyo Vatasrik Ubhyasrayam” [9]

Considering these two classical references where the symptoms of AVN can be clearly seen in both *Gambhira Vata Rakta* and *Ubhayasrita Vata Rakta* as all the *Lakshanas* of *Sandhi Asthi Majja Gata Vata Lakshanas* are mentioned. But AVN also shows some *Twak Mamsashraya Asrita Lakshanas* too, hence *Ubhayasrita Vatarakta* concept can be taken as perfect correlation explaining both *Samprapthi* and *Chikitsa*.

Why not Gata Vatam??

As per the *Lakshanas*, *Asthimajja Gata Vata* and *Sira Gata Vata Lakshanas* is having much resemblance but when we see to the *Samprapthi* in detail, the concept of *Avarana* with *Vata* and *Rakta* involvement is seen and *Ubhayasrita Vata Rakta* explains both *Avarana* and *Lakshanas* of “*Vayuhu Sandhyasthimajjagata*” better explaining concept can be adopted and here *Vata* is not getting vitiated by *Swanidanas* and as in *Gata Vata*, *Karma Vridhi* of *Vata* is not happening here

as *Vyana Vata Karma Hani* is seen in the *Samprapthi* concepts, So *Gata Vata* concept can be avoided.^[10]

Chikitsa Sidhantas

First line of treatment in Modern and *Ayurveda* is almost same i.e., “*Nidana Parivarjana*” avoiding the causes mentioned like *Abhigata*, *Ahita Ahara Vihara*, treating the Primary Disorders without triggering AVN.

Surgical Management includes Joint Preserving Procedures like Measures to allow better Blood supply, removal of the cortex of the Bone from the Head of the Affected Bone, Local Bone Grafting Procedures, Bone Resurfacing procedures, Non-steroidal Anti-Inflammatory drugs (NSAIDs) like Naproxen (Aleve) and ibuprofen (Motrin, Advil, or others), Osteoporosis drugs like Alendronate (Binosto, Fosamax), Cholesterol-lowering drugs like Statins and Fibrates, that can help to reduce Cholesterol or Fats (Lipids) from the Blood and reduce the propensity for Vessel Blockages, Blood Thinners like Warfarin (Coumadin, Jantoven), which can help patients who experience Blood clotting problems and Progressed stage - Total Joint Replacement Surgery.

- In *Ayurveda*, we have to treat this *Avarana Janya Vyadhi* with both *Vataraktavat Chikitsa* and *Dhatu Bhrimhana Chikitsa* procedures which includes *Udwarthana*, *Abhyanga*, *Mridu Swedana*, *Basti Chikitsa*, *Virechana Chikitsa*.
- Starting with *Amapachana*, External and internal administration of *Snehana* (Oleation) is the best treatment modality explained for this condition.
- External Oleation is performed by *Abhyanga* with medicated oils like *Madhuyashti Thailam*, *Pinda Thailam*, *Murivenna* and Internally it is administered in the form of *Paana* with *Guggulutikthaka Ghrita*, *Panchatikthaka Ghrita* etc. and *Basti* with *Balaguduchyadi Thailam*, *Guduchi Ghritam*, *Guduchyadi Ghritam* other *Tiktha Dravya Sadhita Ghritas*.
- *Virechana* can be done with *Gandharvahastadi Eranda*, *Nimbamrithadi Eranda*, *Gandharva Hareetaki*.

- For nourishing *Asthi Dhatu*, *Panchatikthaka Ksheera Basti*, *Ksheera Basti with Aswagandha Churna*, *Yashtimadhu Churna*, *Guduchi*, *Musta*, *Saghritha Ksheera Basti (Tikthaka Ghrita with Manjishta, Arjuna as Kalka)*, *Kukudanta Sweda*.
- For treating *Bala Mamsa Kshaya*, *Njavara Kizhi*, *Ksheera Dhooma* which are considered to possess best *Bhrimhana* action.
- Medicines like *Kokilaksham Kashayam*, *Guggulutikthakam Kashayam*, *Manjishtadi Kashayam*, *Balaguduchyadi Kashayam*.
- *Gutikas* like *Vatarakshasa*, *Punarnavadi Guggulu*, *Amrithadi Guggulu*, *Abha Guggulu*, *Ajaasthi Bhasma*, *Kaishora Guggulu*, *Shiva Gutika*, *Kukkutanda Twak Bhasma*, *Shilajithu Vati*.^[11]

Sadhyaasadyata

Prognosis depends on the area of the Bone that is affected, minor or major part of the area involved and how well the rebuilding of the Bone occurs.

However, AVN patients experience rapid break down of the Bone tissues which are not followed by quick repair. If the destruction / necrosis of Bone cells is rapid, prognosis is difficult but can be managed with surgical interventions. Patients may enjoy full recovery after treatment or experience permanent damage of the joints with progression of the disease.

And when we infer in *Ayurveda*.....

Since it is a *Asthi Sandhi Asrita Roga*, it's a *Madhyama Roga Marga* disease but as *Raktadi Dhatu* is also involved *Bahyaroga Marga* too should also be taken into account.

Considering these two factors it is to be considered as a *Krichra Sadhya Roga*.

CONCLUSION

Avascular Necrosis is a major disease affecting a large number of population due to different *Nidanas*. Modern Medical Science has a major role in the severe stages of AVN where there is a complete collapse / Fractural Abnormalities / Permanent Mal Formations, where surgical intervention is needed. But our

Acharyas has beautifully explained the Concept of *Avarana* by which we can break the Pathogenesis / *Samprapthi* in both its conceptual and treatment aspects. Moreover, Ayurvedic Formulations and Procedures can do *Sookshma Sthoola*, *Sroto Vishodhanam*, *Dhatu Brimhanam* and *Dosha Samshamanam* doing wonders in Avascular Necrosis.

By improving the Rakta Paribhramana - Avascular Defects can be resolved and hence arresting the Kshaya of Dhatus / Necrosis.

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