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Review of literature of *Janu Sandhi* (knee joint) and its clinical aspects.

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Abstract-

- The knee joint is the largest joint in our body. It is vulnerable to injury as it bears an enormous amount of pressure while providing flexible movement. Knee problems are very common, and they occur in people of all ages.

Knee problems can interfere with many things from participation in sports to simply getting up from a chair and walking. This can have a big impact on life. Hence we focused on the abnormalities seen in knee joint from both Ayurvedic and modern aspects.

Present study concludes that, abnormal conditions of knee joint stated in classical text can be co- related with modern aspect also. More over the knee join deformity effects the locomotion in less or much extent in patients. So it is very important to keep healthy condition of knee joint.

- **Keywards**- Janu sadhi, Janu sandhi vikruti, Knee joint, Knee joint abnormalities.

INTRODUCTION-

The knee joint is one of the most commonly injured joints, as an isolated injury or a frequent component in a multiple trauma patient. The knee is a complex joint, consisting of two condylar joints between the corresponding condyles of femur and tibia and a saddle joint between the patella and femur. The principal intra articular structures in knee are the two menisci, the two cruciate ligaments, and the two collateral ligaments.

The knee is a vulnerable joint that bears a great deal of stress from everyday activities, such as lifting and kneeling, and from high impact activities, such as load bearing. Humans having erect posture bearing the maximum weight on the knee joint which is commonest site where many disorders prevails.

Aim- To study structure of knee joint in detail & To co- relate abnormalities of knee joint stated in classical text with modern science.

Ayurvedic Concept of knee joint:

Janu- In general it is the junction that lie between Uru and Jangha. Sandhi is an anatomical part and vata is physiological aspect of the body. Janu sandhi-It means knee joint.[1]

Acharya sushruta explain Circumferance of janu sandhi is 14 angula[2]. Generally sandhi means the junction between two structures. In ayurveda sandhi is a technical word indicates that it is a two or more bone join together and joint formed, may be fixed or freely movable or with less.

Acharya Dalhana, sandhi means'' Asthi samyoga sthana", that is where two or more object join together in the body that is called sandhi.

Acharaya sushrut has described various types of sandhi that is snayusandhi, sira sandhi, peshi, asthi etc. but description given is only asthi sandhi.

Janu marma- lies between jangha and uru in sandhi sthana. It is vaikalykara marma.[3,4]

Panchamahabhautic composition of Sandhi[5] :

Each object in the universe is composed of five basic elements i.e. Panchamahabhuta

Even Sandhi Utpatti is based on the principle of Panchamahabhuta.

1. As the Sandhi is the meeting place of two Asthi, since Asthi are Prithviguna Pradhan so it indicates the involvement of PrithviMahabhoota.
2. The space which is seen in the Sandhi and in between articular surfaces indicates towards the presence of AkashaMahabhoota.

3. The synovial fluid which is present between the articular surfaces indicates the presence of JalaMahabhoota.
4. The rise of temperature which is seen in after articulation between bony ends indicates the presence of Agni Mahabhoota.
5. The various movements and functions of Sandhi are because of Vata. Thus indicates the presence of Vayu Mahabhoota.

Sandhi shareer –

- "Asthi samyoga sthanam "the union of two or more bone is called as sandhi.
- The asthi sandhi located at the region of janu is called janu sandhi. It can be classified under the group of chestvanta and kore sandhi according to features. They are two in number.
- The structures that constitute the sandhi are mentioned below.
- 1. Asthi
- 2. Snayu and kandara
- 3. Shleshmadhara kala
- 4. Peshi
- 5. Sira and dhamani.

Description of Knee joint as per modern science[6,7]

Joint Definition:

- An articulation (joint) is a point of contact between bones, between cartilage and bones. When we say that one bone articulates with another, we mean that one bone forms a joint with another bone. The scientific study of joint is called arthrology.
- (Arthro - joint, Logos = study of). Synonyms: Articulation, Arthroses, Junction ossium.
- Classification of the Joints:
- The joints may be categorized into structural, based on anatomical characteristic, or into functional classes, based on the type of movement they permit.

A) Anatomy of the Synovial Joints: All synovial joint have certain characteristic in common, which are as follows

- A) Capsular ligaments
- B) Articular cartilages
- c) Synovial membrane
- D) Synovial fluid

B) Common Movement of the Joint

- There are seven types of movement in the joint depending on the structure have been described by Gray:
- 1. Abduction
- 2. Adduction
- 3. Rotation
- 4. Circumduction
- 5. Angular movement

Bones of knee joint: There are four bones around the knee: the thigh bone (femur), the shin bone (tibia), knee cap (patella), and the fibula.

Ligaments in the knee:

- 1) Fibrous capsule 2) Ligamentum patellae
- 3) Tibial collateral or medial ligament 4) Fibular collateral or lateral ligament
- 5) Oblique popliteal ligament 6) Arcuate popliteal ligament
- 7) Anterior cruciate ligament 8) Posterior cruciate ligament
- 9) Medial meniscus10) Lateral meniscus 11) Transverse ligament
- Bursae around the knee:- 13 bursa described around the knee joints:
- Anterior-4 ,. Medial-5,. Lateral-4
- Relation
- Anteriorly : Ligamentum patellae, patellar plexus of nerve.
- Posteriorly :- Tibial nerve, popliteal vessels, semitendinosas, gracilis and plantaris.
- Medially:- Sartorius, gracilis, semitendinosas and great saphenous.
- Laterally :-Biceps femoris, tendon of origin of popliteus.
- Blood Supply- Popliteal artery, femoral artery, tibial artery.
- Nerve Supply –Popliteal nerve, femoral nerve and tibial nerve.
- Movements –The active movements of knee joint.
- 1.Flexion by biceps femoris, Sartorius, Semitendinosas, Poplites
- 2 Extension by Quadriceps femoris, Tensor fascia latae
- 3. Medial rotation by Popliteus, Semitendinosus, Semimembranosus.
- 4. Lateral rotation by Biceps femoris.

Disorders where in changes in the structural pattern of Janu Sandhi are seen according to Ayurveda-

- **Sandhivata**-In *sandhivata* patient suffer from severe pain and impairment.

Lakshana of Sandhivata[8]

Shandhishoola (Pain in joints),Sandhi shotha (Joint inflammation),Vatapooranadriti sparsha, Hatasandhi (Loss of movement), Prasaranakunchanayoh vedana ,Atopa (cracking sound) (crepitus) .

- **Amavata**

In Amavata patient suffer from sandhishoola, sandhishotha, sandhigraha, angamarda, aruchi, trishna, jwara, and gaurava.

Lakshana of Amavata[9]

Angamarda (Body ache), Aruchi (Anorexia), Trishna (Thirst), Malaise, Gourav (Feeling of heaviness), Jwara (Fever), Apaki (Indigestion), Inflammation of body parts (Mainly joints), Aalasya (Lethargy), Sandhi shotha (Swelling in multiple joints), Sandhi shoola (Pain in joints), Gatrastabdhata (Stiffness in the body).

- **Vatrakta**

Lakshana of GambhirVatrakta[10]

Sandhi shotha (Joint inflammation), Daha (Joint are warmth), Sthabdhata (Joint stiffness), Kathinyata (Limited joint movement), Shyavtamratwacha (Very red purplish skin), Abhyantara sandhi pida (Joint tenderness), Sandhi toda (Thrombing and crushing pain), Pakayukata (Infection in joint), Sphurana, Itching, burning sensation, Ache, extension, pricking pain, Throbbing sensation & contraction.

Pathological Conditions and Syndromes in the Knee according to Modern science –

- **Osteoarthritis-** The most common disease affecting the knee is osteoarthritis. The cartilage in the knee gradually wears away. Causing and swelling.

Signs and symptoms of Osteoarthritis (OA) include pain in joints throughout or movement, stiffness, tenderness when apply light pressure, loss of flexibility, grating sensation, bone spurs and swelling. Pain and swelling on major weight bearing joints, stiffness, crepitations, tenderness, enlargement of joint space .[11]

- **Rheumatoid Arthritis (RA)** – As per Allopath,

Rheumatoid Arthritis (RA) is a long lasting auto immune disorder that primarily effects joints. One of the main problems in RA is joint inflammation. The joints swell and the cartilage protecting the end of the bones in the joints get damaged. Rheumatoid arthritis (RA) is a chronic systemic inflammatory polyarthritis that primarily affects small arthrodial joints of the hands and feet in a symmetrical pattern. [12,13,14]

- **Gout -**

Gouty arthritis – Gouty arthritis is the condition which causes recurrent episodes of joint inflammation, tissue deposition of uric acid crystals and joint destruction, it is marked by transient painful attack of acute arthritis initiated by crystallization of urea about and within joint and then eventually leads to chronic gouty arthritis. The most commonly affect joints. There is peeling and itching of skin around joints.[15,16]

Discussion-

Parts of knee joint & its importance- Basic components of knee joint are

Bones- The femur (thigh bone), tibia (shin bone), and patella (kneecap) make up the bones of the knee. The knee joint keeps these bones in place.

The patella is a small, triangle shaped bone that sits at the front of the knee, within the quadriceps muscle. It is lined with the thickest layer of cartilage in the body because it endures a great deal of force.

Cartilage- There are two types of cartilage in the knee:

Meniscus: these are crescent-shaped discs that act as a cushion, or "shock absorber" so that the bones of the knee can move through their range of motion without rubbing directly against each other. The menisci also contain nerves that help improve balance and stability and ensure the correct weight distribution between the femur and tibia.

The knee has two menisci:

Medial - on the inner side of the knee, this is largest of the two

Lateral - on the outer side of the knee.

Articular cartilage: found on the femur, the top of the tibia, and the back of the patella; it is a thin, shiny layer of cartilage. It acts as a shock absorber and helps bones move smoothly over one another.

Ligaments- Ligaments are tough and fibrous tissues; they act like strong ropes to connect bones to other bones, preventing too much motion and promoting stability. The knee has four:

- ACL (anterior cruciate ligament) - prevents the femur from sliding backward on the tibia, and the tibia from sliding forward on the femur.
- PCL (posterior cruciate ligament) - prevents the femur from sliding forward on the tibia, or the tibia from sliding backward on the femur.
- MCL (medial collateral ligament) - prevents side to side movement of the femur.
- LCL (lateral collateral ligament) - prevents side to side movement of the femur.

Tendons- These tough bands of soft tissue provide stability to the joint. They are similar to ligaments, but instead of linking bone to bone, they connect bone to muscle. The largest tendon in the knee is the patellar tendon, which covers the kneecap, runs up the thigh, and attaches to the quadriceps.

Muscles- Although they are not technically part of the knee joint, the hamstrings and Quadriceps are the muscles that straighten the knee. The hamstrings are three muscles at the back of the thigh that bend the knee.

The gluteal muscles - gluteus medius and minimus - also known as the glutes are in the buttocks; these are also important in positioning the knee.

Joint capsule- The joint capsule is a membrane bag that surrounds the knee joint. It is filled with a liquid called synovial fluid, which lubricates and nourishes the joint.

Bursa- There are approximately 14 of these small fluid-filled sacs within the knee joint. They reduce friction between the tissues of the knee and prevent inflammation.

Abnormality of each part[17] -

Sprained or strained knee ligaments and/or muscles: A sprained or strained knee ligament or muscle is usually caused by a blow to the knee or a sudden twist of the knee. Symptoms often include pain, swelling, and difficulty in walking.

Torn Cartilage: Trauma to the knee can tear the menisci (pads of connective tissue that act as shock absorbers and also enhance stability). Cartilage tears can often occur with sprains.

Tendonitis: Inflammation of the tendons may result from overuse of a tendon during certain activities such as running, jumping, or cycling. Tendonitis of the patellar tendon is called jumper's knee. This often occurs with sports, such as basketball, where the force of hitting the ground after a jump strains the tendon.

Arthritis: Osteoarthritis is the most common type of arthritis that affects the knee. Osteoarthritis is a degenerative process where the cartilage in the joint gradually wears away. Bone exposed, cartilage to begin breaking down, eroding meniscus, bone spurs are found.

Rheumatoid arthritis can also affect the knees by causing the joint to become inflamed and by destroying the knee cartilage.

Osteochondritis Dissecans- Osteochondritis Dissecans lesion which commonly affects lower lateral part of medial femoral condyle of knee.

Gout- Uric acid crystals are formed in joints and connective tissue.

Plica Syndrome- Synovial membrane lined folds and become inflamed, common site is medial plica.

Internal derangement of the knee- (IDK) is an inclusive term used to indicate (alone or in combination) certain disorders of the joint including (alone or in combination) torn meniscus, loose bodies in the knee, and damaged collateral or cruciate ligaments.

Cruciate ligament Injury or Tear- Anterior cruciate ligament (ACL) Injury or Tear and Posterior Cruciate Ligament (PCL) Injury or Tear

Meniscus tear- Meniscal injury.

Collateral Ligament Injury- Lateral and Medial Collateral Ligament Injury

Patellofemoral syndrome (Runner's Knee)- Cartilage under the kneecap is injured, swelling and tenderness around patella.

Patellar Tendinitis (Jumper's Knee)- Quadricep tendinitis, Patellar Tendinitis and Pes anserine Tendinitis.

Iliotibial Band syndrome- Inflammation, tenderness over lateral femoral condyle.

Pes Bursitis- Pain, swelling and tenderness over area of bursitis. i.e. Supra Patellar Bursitis, Pre Patellar Bursitis, Infra Patellar Bursitis, Pes Anserinus Bursitis.

Abnormalities correlation-

Sandhivata- Osteoarthritis (OA) can be compared to sandhivata as per the description found in ayurvedic classics. In sandhivata leads to "Kshaya" (degeneration of tissue). Aacharya charaka described symptom of shotha (Swelling), shula on akunchana and prasarana (Pain on flexion and extention of joints). All the lakshana are similar so they can be compared.[18,19]

Amavata- Amavata is equated with Rheumatoid arthritis on the basis of sign and symptoms i.e. lakshana are ginen in classical texts.

Vatarakta- Vatarakta which is resembled as gout in allopath health system is elaborately described in samhitas. All the lakshana of gambhira vatarakta are similar to Gouty Arthritis so gambhir vatarakta is nothing but a joint arthritis.[11]

They can be correlated with each other.

Conclusion-

- As per above study it is conclude that Janu sandhi can be correlated with knee joint.
- Also, abnormalities stated in classical text like Sandhivata, Amvata & vatarakta can be correlated with abnormalities stated in modern science.

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