ARTICULATIONS IN THE BODY

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SUMMARY

Arthrology (Greek a rqron joint –logy) is the science concerned with the anatomy, function, dysfunction and treatment of joints. Joints (articulations) are unions or junctions between two or more bones or rigid parts of the skeleton. It is the fact that, whether or not movement occurs between them, it is still called a joint. Some joints have no movement, others allow only slight movement, and some are freely movable.

Joints are classified according to the tissues that lie between the bones: fibrous joints, cartilaginous joints, and synovial joints.

FIBROUS JOINTS

The bones are united by fibrous tissue.

CARTILAGINOUS JOINTS

The bones are united by hyaline cartilage or fibrocartilage.

SYNOVIAL JOINTS

The bones are united by a joint (articular) capsule (composed of an outer fibrous layer lined by a serous synovial membrane) spanning and enclosing an articular cavity. Synovial joints are the most common type of joints and provide free movement between the bones they join; they are joints of locomotion, typical of nearly all limb joints. There are six types of synovial joints according to the shape of the articulating surfaces and/or the type of movement they permit.

JOINTS IN THE HEAD

The temporomandibular joint (TMJ) is a synovial joint, permitting gliding and a small degree of rotation in addition to flexion (elevation) and extension (depression) movements.

The joints of the vertebral column include the:
- Joints of the vertebral bodies.
- Joints of the vertebral arches.
- Craniovertebral (atlanto-axial and atlanto-occipital) joints.
- Costovertebral joints.
- Sacroiliac joints.

JOINTS OF THE UPPER LIMB

The sternal end of the clavicle articulates with the manubrium and the 1st costal cartilage. The articular surfaces are covered with fibrocartilage. The SC joint is the only articulation between the upper limb and the axial skeleton.

The acromioclavicular joint (AC joint) is a synovial joint. The acromial end of the clavicle articulates with the acromion of the scapula.

The glenohumeral (shoulder) joint permits a wide range of movement; however, its mobility makes the joint relatively unstable. The large, round humeral head articulates with the relatively shallow glenoid cavity of the scapula. The glenohumeral joint has more freedom of movement than any other joint in the body.

The elbow joint, a synovial joint, is located inferior to the epicondyles of the humerus. There are humeroulnar and humeroradial articulations.

The proximal (superior) radio-ulnar joint is a synovial joint that allows movement of the head of the radius on the ulna. The distal (inferior) radio-ulnar joint; the radius moves around the relatively fixed distal end of the ulna.

The wrist (radiocarpal) joint is a synovial joint. The ulna does not participate in the wrist joint.

JOINTS OF THE LOWER LIMB

The joints of the lower limb include the articulations of the pelvic girdle—lumbosacral joints, sacroiliac joints, and pubic symphysis. The remaining joints of the lower limb are the hip joints, knee joints, tibiofibular joints, ankle joints, and foot joints.

Pubic symphysis consists of an interpubic disc and surrounding ligaments. Lumbosacral joints; L5 and S1 vertebrae articulate. The other joint is the sacrococcygeal joint.

The hip joint forms the connection between the lower limb and the pelvic girdle. It is a strong and stable synovial joint. The head of the femur is the ball, and the acetabulum is the socket.

The knee joint is our largest and most superficial joint. It is a synovial joint, allowing flexion and extension; however, these movements are combined with gliding and rolling and with rotation.

The knee joint consists of three articulations:
• Two femorotibial articulations (lateral and medial) between the lateral and the medial femoral and tibial condyles.
• One intermediate femoropatellar articulation between the patella and the femur. The fibula is not involved in the knee joint.

The tibia and fibula are connected by two joints: the tibiofibular joint and the tibiofibular syndesmosis (inferior tibiofibular) joint. The ankle joint (talocrural articulation) is located between the distal ends of the tibia and the fibula and the superior part of the talus.

1. INTRODUCTION TO ARTHROLOGY

Arthrology (Greek a rqron joint –logy) is the science concerned with the anatomy, function, dysfunction and treatment of joints. Joints are also known as articulations. The joints are unions or junctions between two or more bones or rigid parts of the skeleton. Joints exhibit a variety of forms and functions. It is still a joint regardless of the existence of a function. Some joints have no movement. Others allow only slight movement. Som are freely movable, such as the glenohumeral (shoulder) joint.

1.1. CLASSIFICATION OF JOINTS

Joints are classified according to the tissues between the bones. The joint types are: fibrous joints, cartilaginous joints, and synovial joints.

1.1.1. FIBROUS JOINTS

The bones are united by fibrous tissue. The sutures of the cranium are examples of fibrous joints. These bones are close together, either interlocking along a wavy line or overlapping.

A **syndesmosis type of fibrous joint** unites the bones with a sheet of fibrous tissue, either a ligament or a fibrous membrane. Consequently, this type of joint is partially movable. The interosseous membrane in the forearm is a sheet of fibrous tissue that joins the radius and ulna in a syndesmosis.

1.1.2. CARTILAGINOUS JOINTS

The bones are united by hyaline cartilage or fibrocartilage.

In primary cartilaginous joints, or synchondroses, the bones are united by hyaline cartilage. This permits slight bending during early life. **Primary cartilaginous joints** permit growth in the length of a bone. When full growth is achieved, the epiphysial plate converts to bone. The epiphyses then fuse with the diaphysis. **Secondary cartilaginous joints** are also known as "symphyses". They are strong, slightly movable joints. They are united by fibrocartilage. The fibrocartilaginous intervertebral discs between the vertebrae have binding connective tissue that joins the vertebrae together.

1.1.3. SYNOVIAL JOINTS

The bones are united by a joint (articular) capsule enclosing an articular cavity. Synovial joints are the most common type of joints. They provide free movement between the bones they join. They are joints of locomotion, typical of nearly all limb joints.

This type of joints has three common features:

1) **Joint cavity:** The joint cavity of a synovial joint, like the knee, is a potential space. It contains a small amount of lubricating synovial fluid. This fluid is secreted by the synovial membrane.

2) **Articular cartilage:** The articular surfaces are covered by hyaline cartilage.

3) **Articular capsule:** surrounds the joint. It has two layers. The articular cartilage covers the articulating surfaces of the bones inside the capsule. All other internal surfaces are covered by synovial membrane.

a) *Fibrous capsule:* protects and gives firmness to the joint stability.

b) *Synovial membrane:* lines the inner surface of the fibrous membrane. It does not cover the articular cartilage. The synovial membrane secretes a fluid known as synovial fluid. This fluid helps to minimize the friction by articular sufaces.

Ligaments: A ligament is a cord or band of connective tissue uniting two structures. Articular capsules are usually strengthened by articular ligaments. These are formed by dense connective tissues. They connect the articulating bones to each other. Articular ligaments limit the undesired and/or excessive movements of the joints.

Articular disc: helps to hold the bones together.

Labrum: is a fibrocartilaginous ring which deepens the articular surface for one of the bones.

Bursae: Bursae are flattened sacs that contain synovial fluid to reduce friction. Its walls are separated by a film of viscous fluid. Bursae are found wherever tendons rub against bones, ligaments, or other tendons.

Types of synovial joints [1]
The 6 major types of synovial joints are classified according to the shape of the articulating surfaces and/or the type of movement they permit:

1. Plane joints (gliding joints) permit gliding or sliding movements. Their articular surfaces are almost flat. Most plane joints move in only one axis. They are called **uniaxial joints**. An example is the acromioclavicular joint between the acromion of the scapula and the clavicle.

2. Hinge joints are also uniaxial. They permit flexion and extension only, around the transverse axis. Bones are joined with strong collateral ligaments. e.g. elbow and knee joints. Cylindrical projections (condyles) fit into concave shapes.

3. Saddle joints permit abduction and adduction as well as flexion and extension. These movements occur around two axes at right angles to each other. Thus saddle joints are biaxial joints. They allow movement in two planes, sagittal and frontal. The articular surfaces resemble a saddle shape and are concave and convex respectively. The carpometacarpal joint at the base of the 1st digit (thumb) is a saddle joint.

4. Condyloid joints (ellipsoid type) joints permit flexion and extension as well as abduction and adduction. Thus condyloid joints are biaxial. The examples: metacarpophalangeal joints (knuckle joints) and radiocarpal joint (wrist).

5. Ball and socket joints (spheroidal joints) allow movement in multiple axes and planes: flexion and extension, abduction and adduction, medial and lateral rotation, and circumduction. Thus, ball and socket joints are multi-axial joints. The spheroidal surface of a bone articulates with the socket shaped articular surface of another bone. The hip joint and the shoulder joint are examples.

6. Pivot joints permit rotation around a central axis. Thus they are uniaxial. The rounded part of a bone rotates in a ring like osteofibrous structure. The rounded end of one bone fits into the sleeve of bone or ligaments. The median atlantoaxial joint is a pivot joint in which the atlas (C1 vertebra) rotates around a finger-like process, the dens of the axis (C2 vertebra), during rotation of the head. Proximal and distal radioulnar joints are also examples for a pivot joint.

Stability of Joints: The stability of a joint depends on four main factors: The negative pressure within the joint cavity, the shape, size, and arrangement of the articular surfaces; the ligaments; and the tone of the muscles around the joint.

Joint vasculature and innervation: Joints receive blood from articular arteries that arise from the vessels around the joint. Articular veins are communicating veins. As they accompany arteries (L. venae comitantes). Just like the arteries they are located in the joint capsule, mostly in the synovial membrane. Joints have a rich nerve supply provided by articular nerves with sensory nerve endings in the joint capsule.

2. JOINTS IN THE HEAD

2.1. SUTURA[E]
Sutura is a form of articulation where the contiguous margins of the bones are united by a thin layer of fibrous tissue. It is only in the skull. Parietal bones articulate with the frontal bone in their front. They form the coronal suture. Parietal bones articulate with the occipital in their behind. They form the lambdoid suture.
Parietal bone articulates with its the opposite side. It forms the sagittal suture. The coronal suture separates the frontal and parietal bones. The sagittal suture separates the parietal bones. The lambdoid suture separates the parietal and temporal bones from the occipital bone.

2.2. TEMPOROMANDIBULAR JOINT (TMJ)
The temporomandibular joint (TMJ) is a synovial joint. It permits gliding and a small degree of rotation. It is also related to flexion. The flexion is known as elevation of mandible. Another movement is extension. It means the depression of the mandible. The mandibular fossa and tubercle of the temporal bone form the superior articular surfaces. The inferior articular surface is the head of the mandible. The two bony articular

surfaces are completely separated by intervening fibrocartilage. This structure is called the articular disc of the TMJ.

3. JOINTS OF THE VERTEBRAL COLUMN

The vertebral column in an adult typically consists of 33 vertebrae. They are arranged in five regions: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral, and 4 coccygeal.

The joints of the vertebral column:

• Joints of the vertebral bodies.

symphyses (secondary cartilaginous joints) designed for weight-bearing and strength

• Joints of the vertebral arches (facet joints)

plane synovial joints between the superior and inferior articular processes (G. zygapophyses) of adjacent vertebrae

• Craniovertebral (atlanto-axial and atlanto-occipital) joints

• *Costovertebral joints*

• *Sacroiliac joints*

Joints of the vertebral bodies

The articulating surfaces of adjacent vertebrae are connected by intervertebral discs and ligaments. The intervertebral discs provide strong attachments between the vertebral bodies. The **anulus fibrosus** (L. anus, a ring) is a bulging fibrous ring forming the circumference of the intervertebral disc. The **anterior longitudinal ligament** is a strong, broad fibrous band. It covers and connects the anterolateral aspects of the vertebral bodies and discs. The **posterior longitudinal ligament** runs within the vertebral canal along the posterior aspect of the vertebral bodies.

Joints of the vertebral arches (facet joints)

The joints of the vertebral arches are between the superior and inferior articular processes of adjacent vertebrae. A thin articular capsule attached to the margins of the articlar facets encloses each joint. Those in the cervical region are especially thin and loose. This is for the wide range of movements. The adjacent vertebral arches are joined by broad, pale yellow bands of elastic tissue. These ligamenta are the **ligamenta flava** (L. flavus, yellow). The facet joints are plane type synovial joints.They permit gliding movements.

Movements of the vertebral column

The range of movement of the vertebral column varies according to the region and the individual. The mobility of the vertebral column results primarily from the compressibility and elasticity of the intervertebral discs. The normal range of movement possible in healthy young adults is typically reduced by 50% or more by aging. Movements by the vertebral column include flexion, extension, lateral flexion, rotation, and circumduction.

Craniovertebral joints

There are two sets of craniovertebral joints. The **atlanto-occipital joints** are formed between the atlas (C1 vertebra), and the occipital bone. The **atlanto-axial joints** are between the atlas and axis (C2 vertebra). The craniovertebral joints are synovial joints. They have no intervertebral discs. Their design gives a wider range of movement than in the rest of the vertebral column.

The atlanto-occipital joints permit nodding of the head. Flexion and extension of the head occurs when indicating approval (the "yes" movement). There are three atlanto-axial articulations: two (right and left) lateral atlantoaxial joints, one median atlantoaxial joint. Movement at all 3 atlanto-axial joints permits the head to be turned from side to side. It occurs when rotating the head to indicate disapproval ("no" movement).

4. JOINTS OF THE UPPER LIMB

4.1. STERNOCLAVICULAR JOINT

The sternoclavicular joint is a synovial joint. The sternal end of the clavicle articulates with the manubrium and the 1st costal cartilage. The articular surfaces are covered with fibrocartilage. This joint is the only articulation between the upper limb and the axial skeleton. Although it is extremely strong, it is significantly mobile to allow movements of the pectoral girdle and upper limb. During full elevation of the limb, the clavicle is raised to approximately a 60° angle.

4.2. ACROMIOCLAVICULAR JOINT

The acromioclavicular joint is a synovial joint. The acromial end of the clavicle articulates with the acromion of the scapula. The articular surfaces are covered with fibrocartilage. They are separated by an incomplete wedge-shaped articular disc.

Ligaments of the acromioclavicular joint :

- Intrinsic ligament of the acromioclavicular joint
- Acromioclavicular ligament
- Extrinsic ligament of the acromioclavicular joint
- Coracoclavicular ligament

The acromioclavicular ligament is a fibrous band. It extends from the acromion to the clavicle. It strengthens the acromioclavicular joint superiorly. However, the integrity of the joint is maintained by extrinsic ligaments, distant from the joint itself.

The coracoclavicular ligament is not directly related to the joint. However,it is an important strong accessory ligament. It provides much of the weightbearing support for the upper limb on the clavicle. It maintains the position of the clavicle on the acromion. It spans the distance between the coracoid process of the scapula and the inferior surface of the acromial end of the clavicle.

In addition to augmenting the acromioclavicular joint, the coracoclavicular ligament provides the means by which the scapula and free limb are (passively) suspended from the clavicular strut.

4.3. GLENOHUMERAL (SHOULDER) JOINT

The glenohumeral (shoulder) joint is a ball-and-socket type of synovial joint. It permits a wide range of movement. Its mobility, however, makes the joint relatively unstable. The large, round humeral head articulates with the relatively shallow glenoid cavity of the scapula. It is deepened slightly but effectively by the ring-like, fibrocartilaginous glenoid labrum (L., lip).

Ligaments of the glenohumeral joint:

- Glenohumeral ligaments
- Coracohumeral ligament
- Transverse humeral ligament
- Coracoacromial ligament

The coraco-acromial arch is an extrinsic, protective structure. It is formed by the smooth inferior aspect of the acromion and the coracoid process of the scapula. The coracoacromial ligament spans between them. This osseoligamentous structure forms a protective arch that overlies the humeral head, preventing its superior displacement from the glenoid cavity.

The glenohumeral joint has more freedom of movement than any other joint in the body. This freedom results from the laxity of its joint capsule and the large size of the humeral head compared with the small size of the glenoid cavity. The shoulder joint allows movements around three axes. It permits flexion-extension, abduction-adduction, rotation (medial and lateral) of the humerus, and circumduction.

4.4. ELBOW JOINT

The elbow joint is a hinge type synovial joint. It is located inferior to the epicondyles of the humerus.

It is a complex joint involving three separate articulations, which share a common synovial cavity. There are humeroulnar and humeroradial articulations.

The joints between the trochlear notch of the ulna and the trochlea of the humerus and between the head of the radius and the capitulum of the humerus are primarily involved with hinge-like flexion and extension of the forearm on the arm and, together, are the principal articulations of the elbow joint.

The joint between the head of the radius and the radial notch of the ulna, the proximal radio-ulnar joint, is involved with pronation and supination of the forearm.

The collateral ligaments of the elbow joint are strong triangular bands. They are medial and lateral thickenings of the fibrous layer of the joint capsule. These ligaments are the radial collateral ligament and the ulnar collateral ligament. Flexion and extension occur at the elbow joint. The joint has also bursae, some of which are clinically important.

4.5. PROXIMAL & DISTAL RADIOULNAR JOINTS

The proximal (superior) radio-ulnar joint is a synovial joint. It allows movement of the head of the radius on the ulna. The radial head is held in position by the anular ligament of the radius. The distal (inferior) radio-ulnar joint is a synovial joint. The radius moves around the relatively fixed distal end of the ulna.

4.6. WRIST (RADIOCARPAL) JOINT

The wrist (radiocarpal) joint is a synovial joint. The ulna does not participate in the wrist joint. There 8 carpal bones in two rows. The 4 bones are in the proximal row. There are also 4 bones in the distal row. The distal end of the radius and the articular disc of the distal radio-ulnar joint articulate with the proximal row of the carpal bones. The pisiform is the only carpal bone which does not contribute to the formation of the wrist joint. The movements are flexion—extension, abduction—adduction (radial deviation-ulnar deviation), and circumduction.

 The intercarpal joints interconnect the carpal bones. The carpometacarpal, intermetacarpal joints, metacarpophalangeal joints, and interphalangeal joints are other joints in the hand.

5. JOINTS OF THE LOWER LIMB

The joints of the lower limb are: joints of the pelvic girdle (pelvis), hip joints and of the free lower limb. Pelvis joints are lumbosacral joints, sacroiliac joints, and pubic symphysis. The remaining joints are the hip joints, knee joints, tibiofibular joints, ankle joints, and foot joints.

Pubic symphysis is a fibrocartilaginous joint. It has an interpubic disc. There are surrounding ligaments. The disc and ligaments unite the bodies of the pubic bones in the median plane.

Lumbosacral joints; L5 and S1 vertebrae articulate with each other.

The other joint in the pelvis is the **sacrococcygeal joint**.

5.1. HIP JOINT

The hip joint forms the connection between the lower limb and the pelvic girdle. It is a strong and stable synovial joint. The head of the femur is the ball, and the acetabulum is the socket. The hip joint is designed for stability over a wide range of movement. Next to the shoulder joint, it is the most movable of all joints. During standing, the entire weight of the upper body is transmitted through the hip bones to the heads and necks of the femora.

The round head of the femur articulates with the cup-like acetabulum of the hip bone. The acetabular labrum (L. lip) is lip-shaped. It is a fibrocartilaginous rim attached to the margin of the acetabulum. It increases the acetabular articular area by nearly 10%. The hip joints are enclosed within strong joint capsules. These capsules are formed by a loose external fibrous layer (fibrous capsule) and an internal synovial membrane.

Ligaments of the hip joint:

Transverse acetabular ligament is the continuation of acetabular labrum. The 3 intrincis ligaments of the hip joint are: iliofemoral ligament, pubofemoral ligament, and ischiofemoral ligament.

The iliofemoral ligament lies anteriorly and superiorly. It is the strongest ligament of the body. The pubofemoral ligament lies anteriorly and inferiorly. The ischiofemoral ligament lies posteriorly.

There is also the ligament of the head of the femur.

Hip movements are flexion-extension, abduction-adduction, medial-lateral rotation, and circumduction. The degree of flexion and extension possible at the hip joint depends on the position of the knee.

5.2. KNEE JOINT

The knee joint is our largest and most superficial joint. It is a synovial joint. It allows flexion and extension. These movements are combined with gliding and rolling and with rotation. Although the knee joint is well constructed, its function is commonly impaired when it is hyperextended (e.g., in body contact sports, such as judo).

The articular surfaces of the knee joint are characterized by their large size and their complicated and incongruent shapes. The knee joint consists of three articulations:

• Two **femorotibial articulations** (lateral and medial) are between the lateral and the medial femoral and tibial condyles. The femoral condyles articulate with menisci (crescentic plates of cartilage) and tibial condyles to form the knee joint. The menisci and tibial condyles glide as a unit across the inferior and posterior aspects of the femoral condyles during flexion and extension.

• One intermediate femoropatellar articulation is between the patella and the femur.

The fibula is not involved in the knee joint.

The stability of the knee joint relies on the strength and actions of the surrounding muscles and their tendons. It also relies on the ligaments that connect the femur and tibia. Of these supports, the muscles are most important. The most important muscle in stabilizing the knee joint is the large **quadriceps femoris**.

The joint capsule is strengthened by 5 extracapsular or capsular (intrinsic) ligaments. The intra-articular ligaments within the knee joint consist of the **cruciate ligaments** and **menisci**.

Extracapsular (external) ligaments of the knee joint

The joint capsule is strengthened by five extracapsular or capsular (intrinsic) ligaments: patellar ligament, fibular collateral ligament, tibial collateral ligament, oblique popliteal ligament, and arcuate popliteal ligament. They are sometimes called external ligaments to differentiate them from internal ligaments, such as the cruciate ligaments.

Intracapsular (internal) ligaments of the knee joint

The intra-articular ligaments within the knee joint consist of the cruciate ligaments and menisci. Cruciate ligaments (L. crux, a cross) are located in the center of the joint and cross each other obliquely, like the letter X. Anterior cruciate ligament (ACL) is the weaker of the two cruciate ligaments. The ACL attaches to the medial side of the lateral condyle of the femur. It limits posterior rolling (turning and traveling) of the femoral condyles on the tibial plateau during flexion. Posterior cruciate ligament (PCL) is the stronger of the two cruciate ligaments. The PCL prevents anterior displacement of the femur on the tibia or posterior displacement of the tibia on the femur and helps prevent hyperflexion of the knee joint. In the weight-bearing flexed knee, the PCL is the main stabilizing factor for the femur (e.g., when walking downhill).

Menisci of the knee joint (G. meniskos, crescent) are crescentic plates of fibrocartilage on the articular surface of the tibia that deepen the surface and play a role in shock absorption. Their external margins attach to the joint capsule of the knee. Medial meniscus is C shaped, broader posteriorly than anteriorly. Its anterior end (horn) is attached to the anterior intercondylar area of the tibia, anterior to the attachment of the ACL. Because of its widespread attachments laterally to the tibial intercondylar area and medially to the TCL, the medial meniscus is less mobile on the tibial plateau than is the lateral meniscus. Lateral meniscus is nearly circular, smaller, and more freely movable than the medial meniscus.

There are at least 12 bursae around the knee joint because most tendons run parallel to the bones and pull lengthwise across the joint during knee movements. Flexion and extension are the main knee movements; some rotation occurs when the knee is flexed.

5.3. JOINTS BETWEEN TIBIA & FIBULA

The tibia and fibula are connected by two joints: the tibiofibular joint and the tibiofibular syndesmosis (inferior tibiofibular) joint. In addition, an interosseous membrane joins the shafts of the two bones. The tibiofibular joint (superior tibiofibular joint) is a synovial joint. It is between the flat facet on the fibula and a similar articular facet on the lateral side of the tibia distally.

The integrity of the inferior tibiofibular joint is essential for the stability of the ankle joint as it keeps the lateral malleolus firmly against the lateral surface of the talus.

5.4. ANKLE JOINT [Talocrural joint]

The ankle joint is a hinge type synovial joint. It is located between the distal ends of the tibia and the fibula and the superior part of the talus. The ankle joint is reinforced laterally by the lateral ligaments of the ankle. These ligaments attach to the fibula. The medial ligament of the ankle is also called the **deltoid ligament**. The ankle joint is one of the most commonly injured joints in the body. The lateral ankle sprain is the most frequent type of sprain.

The many joints of the foot involve the tarsals, metatarsals, and phalanges. Inversion and eversion of the foot are the main movements involving these joints.

ARCHES OF THE FOOT

The foot is composed of numerous bones connected by ligaments. So it has considerable flexibility. This that allows it to deform with each ground contact. As a result it absorbs much of the shock.

Furthermore, the tarsal and metatarsal bones are arranged in longitudinal and transverse arches. These arches are streghtened by the ligaments of the foot and the tendons passing over the foot. The arches add to the weight-bearing capabilities and resiliency of the foot. Thus much smaller forces of longer duration are transmitted through the skeletal system.

The arches distribute weight over the pedal platform (foot), acting not only as shock absorbers but also as springboards for propelling it during walking, running, and jumping. The resilient arches add to the foot's ability to adapt to changes in surface contour.

The arches of the foot include:
- Medial longitudinal arch of the foot
- Lateral longitudinal arch of the foot
- Transverse arch of the foot runs from side to side.

The medial and lateral parts of the longitudinal arch serve as pillars for the transverse arch. The integrity of the bony arches of the foot is maintained by both passive factors and dynamic supports.