Intramembranous ossification and endochondral ossification

Intramembranous ossification occurs at some point in growth of the human body, inside the womb and is the course by which flat bones such as bones of the skull and the collarbones are shaped from connective tissue. Endochondral ossification occurs in the growth of long bones such as the arms and legs. In Intramembranous ossification the bones build up from other connective tissues instead. It is the procedure in which spoilt bones mend and occurs when bones are broken or damaged in order to rebuild the bone.

Also occurring for the duration of embryonic development is Endochondral ossification, a method in which bones are formed from cartilage.

The route of Intramembranous ossification starts with stem cells, which are cells that have yet to be differentiated into a particular cell type. Stem cells are made into osteoblasts, cells that create bone tissue, both the spongy inner of the marrow and the mineralised compact bone tissue. Stem cells are special cells in multicellular organisms which are capable of changing into a wide range of cells as needed. In other words, the cells themselves are not specific blood cells and nerve cells but they can make specialised cells to form an embryo or repair damage to an adult organism. This asset has shows that stem cells could be really useful in medical treatment.

Several steps occur during Intramembranous ossification as the stem cells change and turn into specific types of bone cells. A similar method happens to restore broken bones. The bone tissue developing from membranous or connective tissue in much the same way that it develops within the womb.

In the basic process, the stem cells form layers of connective tissue, and others develop into bone-producing cells. The bone-producing cells then create a bone surrounding substance of calcium that in the end collects into bone spicules. Bones grow in size as more of the bone fluid is released, ultimately forming the trabeculae. These structures continue the process, some building on others and eventually forming woven bone, and other trabeculae stay as a spongy tissue that turns into bone marrow. Bones that are developed during Intramembranous ossification are collarbones; the patella or kneecap, the parietal, frontal, occipital and temporal bones in the skull; and the upper and lower jawbones.

Endochondral ossification is the replacement of cartilage by bone during development. This is responsible for development of most of the human skeleton. This process that divides bone forming cells in regions of cartilage is the ossification centres. The osteoblasts is then made into osteocytes, these are older bone cells dug into the hard part of the bone known as the matrix.

Most bones come from a combination of Intramembranous and Endochondral ossification. The Chondroblasts enlarge and excrete a matrix which hardens due to presence of inorganic minerals. Inorganic mineral are once that are from food or drink consumed by the body. Your body is unable to create the minerals buy itself. Then, chambers form into the matrix and osteoblasts and blood-forming cells enter these chambers. The matrix is then secreted.

Mature hardened bone is living tissue made up of of an organic component and a mineral component. The organic part mainly consists of proteins such as collagen fibers, an extracellular matrix, and fibroblasts, which have the living cells that produce the collagen and matrix. The organic minerals are ones made by the body. During a person's life, osteoblasts continually secrete minerals while Osteoclasts continually reabsorb the minerals.

Bedridden hospital patients show loss of bone because re-absorption by Osteoclasts exceeds synthesis by osteoblasts. Bones become more brittle as a person becomes older because the mineral part of the bones decreases.

The epiphysis is at the distal ends of bones that are responsible for lengthening of the bones. Under the epiphyses and before the diaphysis is the epiphyseal plate. This is normally present during puberty and early adulthood and is the location of bone growth. When the epiphyseal plate completely ossifies and closes, only a thin line is still there and the bones can no longer grow in length.

Bone development continues all through adulthood. Even after you have grown to your full height, bone growth continues for mending of fractures and for reconstructing to meet varying lifestyles. Osteoblasts, osteocytes and osteoclasts are the three cell types caught up in the development, growth and remodelling of bones. Osteoblasts are bone-forming cells, osteocytes are grown-up bone cells and osteoclasts split and reabsorb bone.

Bones grow in length at the Epiphyseal plate by a method that is like Endochondral ossification. The Chondrocytes, in the region next to the Diaphysis, age and degenerate. Osteoblasts shift in and ossify the matrix to form bone. This progression continues all the way through childhood and the adolescent years until the cartilage growth slows and finally stops. When cartilage growth ceases, usually in the early twenties, the Epiphyseal plate completely ossifies so that only a thin Epiphyseal line stays and the bones can no longer grow in length. Bone growth is under the force of growth hormone from the pituitary gland and sex hormones from the ovaries and testes. Even though bones stop growing in length early in life, they can get thicker according to what you eat, exercise and the strain you put on your body. The increase in diameter is called appositional growth. Osteoblasts in the periosteum form compact bone around outside bone. At the same time, osteoclasts in the endosteum, vascular membrane that lines the inner surface of long bones, break down bone on the internal bone surface, around the medullar cavity. These two processes mutually increase the width of the bone and keep the bone from becoming too thick.

The spine is made up of three different sections these are called cervical, thoracic and lumbar. The thoracic spine has twelve bones that make up the spine. These structures have very little movement because they are attached to the ribs and breastbone. There is little motion so this can result in back pain, although the junction between the spine and the ribs can be a source of pain. The lumbar curve has five bones that extend from the lower thoracic spine to the sacrum which is the bottom of the spine. The bones of the lower back are the largest of the spine because they take most of the body’s weight. The paired joints on the back of the vertebral pieces are aligned so that they allow flexibility and extension but not a lot of rotation.

Most causes of back pain come from the lumbar spine. The thick segment of bone forming the front of the vertebral segment is the vertebral body. Each piece of the lumbar spine is made of the five structures.

A number of factors influence bone development, growth, and repair. These include nutrition, exposure to sunlight, hormonal secretions, and physical exercise. For example, vitamin D is necessary for proper absorption of calcium in the small intestine. In the absence of this vitamin, calcium is poorly absorbed, and the inorganic salt portion of bone matrix lacks calcium, softening and deforming bones. This condition is called rickets.

Hormones secreted by the pituitary gland, thyroid gland, ovaries or testes affect bone growth. In the absence of this hormone, the long bones of the limbs fail to develop normally and the child may have pituitary dwarfism. If a person is very short, but has normal body proportions. If excess growth hormone is released before the epiphyseal disks ossify, height may exceed 8 feet-a conduction called pituitary gigantism. In an adult, secretion of excess growth hormone causes a condition which the hands, feet, and jaw enlarge.

Deficiency of thyroid hormone may stunt growth, because without its stimulation, the pituitary gland does not secrete enough growth hormone. In contrast to the bone-forming activity of thyroid hormone, parathyroid hormone makes them increase in the number and activity of osteoclasts.

Both male and female sex hormones from the testes, ovaries, and adrenal glands encourage arrangement of bone tissue. The start at puberty, these hormones are abundant, causing the long bones to grow considerably. However, sex hormones also stimulate ossification of the epiphyseal disks, and consequently they stop bone lengthening at a relatively early age. The effect of estrogens on the disks is somewhat stronger than that of androgens. For this reason, females typically reach their maximum heights earlier than males.

Physical stress also makes bones grow. For example, when skeletal muscles contract, they pull at their attachments on bones, and the resulting stress stimulates the bone tissue to thicken and strengthen on the other hand, with lack of exercise, the same bone tissue wastes, becoming thinner and weaker. This is why the bones of athletes are usually stronger and heavier than those of nonathletic lifestyle. It is also why fractured bones immobilized in casts may shorten.