3. REVIEW OF LITERATURE

1675, Rene Descartes in his *Traite de l'homme et de la formation du foetus*, considered the human body as a material machine directed by a rationale soul [4, 5].

1680, Giovanni Alfonso Borellus' *De motu animalium* is the very first comprehensive treatise on Biomechanics, although at that time it was called Iatrophysics, meaning applied to medicine [6].

1836, Weber Brothers, probably stimulated by the contemporary invention of new machines, published a very extensive work on the mechanics of walking and running [7].

1838, Ward compared the proximal end of the femur with a crane and mentioned the compressive and tensile stresses developed in the bone by loading [8].

1867, Von Meyer described the anatomy of the cancellous trabeculae in most human bones and discussed the meaning of these trajectories with more insight [9].

1892, Wolff observed that the architecture of the cancellous bone indicated an organization of the trabeculae along the trajectories of the principal compressive and tensile stresses evoked in the bones by loading [10] Wolff wrote, "It is necessary to create functional orthopaedics" that is to find ways of transforming deformities into normal form and structure [11].

1895, Roux asserted that undifferentiated connective tissue, if subjected to compression, would differentiate into bone. If it were subjected to tension, it would change into fibrous tissue; and if subjected to shear, would transform into cartilage. The three types of tissue in the locomotor apparatus would thus be dependent on their mechanical stressing [12].

1940, Pauwels arrived at the conclusion that the differentiation of connective tissue arises from changes in its shape and in its volume. Stretching of a tissue whether it is due to tension or to shear, or to compression, produces fibrous tissue. Hydrostatic pressure generates cartilage. Bone, he concluded, develops from either fibrous tissue or from cartilage in pre-existing stressed scaffolding, under certain conditions of relative immobility. Moreover, bone, once formed, reacts to increased stress, both tensile and compressive, by making more bone and to decreased stress by resorption, both phenomena being restricts to certain limits [13].

1951, Ilizarov's Law of tension stress- Gradual traction on living tissues creates stresses that can stimulate and maintain the regeneration of active growth of certain tissues. Slow, steady traction of tissues causes them to become metabolically activated, resulting in an increase in the proliferative and biosynthetic functions. These processes are dependent upon the adequacy of the blood supply to the tissues being elongated and stimulating effect of weight bearing and functional use [14].

Finite element analysis - A method for solving an equation by approximating continuous quantities as a set of quantities at discrete points, often regularly spaced into a so-called grid or mesh. Because finite element methods can be adapted to problems of great complexity and unusual geometry, they are an extremely powerful tool in the solution of important problems in heat transfer, fluid mechanics, and mechanical systems. Furthermore, the availability of fast and inexpensive computers allows problems, which are intractable using analytic methods to be solved in a straightforward manner using finite element methods [15].

1983, Makushin et al., proposed "Apparatus Limb" concept. In cases of large segmental defects, during distraction osteogenesis and fibular transport the construct of the apparatus completely supports the limb [16]. The ring assembly should provide stable fixation of bone fragments in conditions of complete static and dynamic weight bearing on the limb [17].