2. INTRODUCTION

This work is an effort of contribution to the basic science of Ilizarov ring fixator system. It is a collaborative work of three Institutions, Sri Ramachandra Medical College and Research Institute, Central Leather Research Institute and Indian Institute of Technology, Chennai, India.

In clinical experience Ilizarov ring fixator system is useful in almost all Orthopaedic conditions. We have found its use mostly in open fractures of leg, infective non union, intra articular fractures if proximal tibia and filling of segmental defects. It is helpful in stabilisation of the fracture by stressed thin 'K' wires; make the patient ambulant next day itself, with early functional loading, leading on for early bone healing. The apparatus has got the advantages of applying in infected areas, osteoporotic bones and kept as long as the procedure is completed as a definite line of management. As this is useful in treating the fracture and distraction osteogenesis it fulfills the requirement of Pauwel's Theory, it made us to go in for understanding the biomechanics of the apparatus and hence this Finite element analysis study.

In the process of evolution the sustenance of life by man depends mainly on his mobility. The musculoskeletal system that contributes for this is a complex structure consisting of various materials, which are manipulated by environmental factors to remain constant within limits, regenerate during injury and stressful periods.

There are many factors involved in fracture healing and regeneration. There is always an urge for man to search for doing it better and faster. To find a solution he used various implantable materials and finally he is yet to find a material that will have suitable properties of the existing natural material. So he evolved in genetics and tissue engineering and cloned animals that can supply an isogenetic material, which can be utilized at his, will.

There are various factors, which are responsible for maintaining the normalcy of the musculoskeletal system. The ability of bone to repair and regenerate after injury and to remodel in response to physical stress is remarkable. Osteoblastic bone formation and osteoclastic bone resorption dictate the delicate balance that leads to a

homeostatically appropriate bone volume. Two fundamental mechanisms have been suggested for the regulation of this coupling (i.e., bone formation and resorption) [1]: Systemic regulation by hormones (e.g., calcitonin, parathyroid hormone) and regulation by local bone growth factors. It is believed that local bone growth factors act in an autocrine or paracrine manner on regional osteoblasts and osteoclasts, affecting cellular proliferation and biosynthetic activity. These biologic processes are essential in maintaining constant bone volume during physiologic as well as pathologic situations [2]. These regulatory mechanisms come into play during normal bone growth in childhood as well as during disease states, such as osteoporosis, or fracture healing [3].