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EVALUATION OF ILIZAROV EXTERNAL FIXATION SYSTEM IN DIFFERENT ORTHOPAEDIC PROBLEMS

THESIS
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INDEX

INTRODUCTION

INTRODUCTION

External fixation for management of problems in orthopedics and traumatology has gained increasing popularity since first being introduced at the beginning of this century. Progressive improvement in equipment, principles, and operative technique has widened the indications for external fixation, a method that often permits a limited surgical exposure, and reduces the need for repeated operations.

The Ilizarov fixator and method of fracture fixation, limb lengthening, and correction of deformities have recently gained international recognition, although they have been used in the Soviet Union since 1950.

The Ilizarov system comprises a modular ring fixator that may be assembled in various configurations for specific clinical situations.

Unlike standard external fixators that use threaded pins 4, 5, or 6 mm in diameter, the Ilizarov fixator uses 1.5 or 1.8 mm Kirschner wires to hold the bone fragments in position. These wires are tensioned to 500 - 1300 N with tensioning device. This tension transforms these flexible wires into relatively stiff pins. The wires are secured to circular or semicircular rings, which in turn are fixed by threaded rods. Special olive or stop wires can be used in conjunction with the smooth Kirschner wires to restrict slippage of the bone fragments. A variety of hinges, telescoping rods, and spacers may also be incorporated into the system (Green, 1990).

Clinical and experimental studies by Ilizarov (1989) had led to the observation of the relationship of loading to blood supply, and the discovery of the principle of tension-stress that govern the response of tissues to elongation (i.e. living tissue, when subjected to slow steady traction, becomes metabolically activated in both the biosynthetic and proloferative pathways, a phenomenon dependent on vascularity, and functional use).

These two principles, when applied in combination with the Ilizarov circular fixator, and appropriate planned and managed surgery, as Ilizarov (1989) said, permit a physician to achieve the following:

- The percutaneous treatment of all closed metaphyseal and diaphyseal fractures, as well as many epiphyseal fractures.
- The repair of extensive defects of bone, nerve, vessel, and soft tissues without the need for grafting, and in one operative stage.
- Bone thickening for cosmetic, and functional reasons.
- The percutaneous one stage treatment of congenital or traumatic pseudarthrosis.
- Limb lengthening or growth retardation by distraction epiphysiolysis or other methods.
- The correction of long bone, and joint deformities including resistant, and relapsed club feet.

- The percutaneous elimination of joint contractures.
- The treatment of various arthrosis by osteotomy, and repositioning of the articular surfaces.
- Percutaneous joint arthrodesis.
- The filling in of solitary bone cysts, and other such of lesions.
- The treatment of septic nonunions.
- The filling of osteomyelitic cavities by gradual shifting of one cavity wall.
- The lengthening of amputation stumps.
- The correction of achondroplastic, and other forms of dwarfism.

The **work** will present a study on thirty four patients suffering from different orthopedic problems, treated according to the principles of Ilizarov and with the use of his ring fixator. The **aim** is to evaluate this system (of Ilizarov) in different orthopedic problems.

HISTORY AND CLASSIFICATION OF EXTERNAL FIXATION DEVICES

HISTORY OF EXTERNAL FIXATION DEVICES

In the past two centuries external fixation has enjoyed long periods of enthusiastic use alternating with intervals of total disrepute.

The first external fixator was developed by Malgaigne in 1843, who described a claw-like device used percutaneously to compress and immobilize the major fragments of fractured patellae (fig. 1).

Pin fixation started in 1893 by Keetley, who noticed the frequency of malunions in the femur and recommended the use of rigid pins be inserted percutaneously and help in a special external fixation device. He noted that rigidity of the pins was often more apparent than real, and that did not preclude the use of adjuvant forms of immobilization, e.g. splints or casts .

Parkhill in 1897 described the use of two half pins above, and two half pins below the fracture in long bones, externally joined by an ingenious clamp, for fracture reduction and immobilization (fig. 2).

Freeman published a series of papers from 1909 to 1919 advocating the use of external pins to secure anatomic alignment. However, Lombotte in 1912, and Humphry in 1917 were probably the first to advocate the use of threaded half pins, connected by an external frame, which was the forerunner of most modern external fixators (fig. 3).

Crile in 1919, advocated an external fixator particularly adapted for fractures of the femur associated with war wounds, but this technique gained very little popularity.

In 1930 Riedel attempted to use half pins connected to an external clamp to maintain the position in Shands-type osteotomy of hip.

Cann in 1931, modified the previously used external fixators (of Parkill and Lombotte), and described 15 excellent results in 20 patients, although he reported frequent problems with pin tract infections.

Pitkin and Blockfield in 1931 were the first to advocate pins inserted through both cortices and attached to two external fixation clamps.

Roger Anderson, Anderson and Burgess, during the period from 1933 to 1945, presented a series of papers concerning the use of half-pin, and whole-pin units attached with bars in one and two sides of the limb for the treatment of fractures of virtually all long bones, arthrodesis, and leg-lengthening procedures.

All of these methods fell into disrepute due to the lack of rigid fixation by the pins and external frames, and the frequent pin tract infections, although there were some published reports of good results.

In France, from 1938 to 1954, Raoul Hoffman presented a series of articles describing his external fixator which was the first to have a universal ball joint incorporated in the pin-gripping clamp, and numerous authors subsequently reported excellent results in their series using this fixator (fig. 4).

Charnley in 1948 popularized his compression device to facilitate arthrodesis of joints.