Complications Of Intramedullary Nailing

Essay

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Abstract

Gerhard Küntscher is credited with the first use of this device (**Intramedullary Nailing : IMN**) in 1939/1940 . When placed in a fractured long bone, IM nails act as internal splints with load-sharing characteristics. Various types of load act on an IM nail : torsion, compression, tension and bending. Physiologic loading is a combination of all these forces. Intramedullary nails have multiple indications and contraindications.

There are numerous types of complications such as: Infection and soft tissues complications. Deformity. Union defects . Thromboembolism, pulmonary embolism, fat embolism & DVT . Shock . Compartment syndrome . Neurovascular complications & Hematoma formation. Malalignment. Heterotropic ossification & excessive callus. Complication of fixation. Refracture & iatrogenic fracture . Plastic deformation & bending . Leg Length Discrepancy LLD. Contracture . Avascular Necrosis (AVN). Metal irritation & implant failure. Nail complications. Skin necrosis. Joint pain, stiffness & disturbances. Muscle atrophy. Reamer complications . General complications of any surgery Complications of some type of nails as: ESIN (nail prominence, loss of reduction & tendon injury) and Gamma nail (lag screw cutout, distal screw breakage & loss of reduction).

Key Words

Gerhard Küntscher , Intramedullary Nailing : IMN , Cephalomedullary nails , Stainless steel , Titanium alloy , Incarcerated nails , Slotted IMN , Locking screws , poller screws , blocking screws , Intramedullary Reaming , Interlocking IMN , Femoral Antegrade nails , Trochanteric nails , Recon nails , Hindfoot Fusion nails , Knee fusion nails , ENDER nails , Gamma nails , TRIGEN humeral nails system , Guide wire , varus , valgus, recurvatum & malrotation , Malalignment & 2ry malalignment , Heterotropic ossification & excessive callus formation , Leg Length Discrepancy LLD , Avascular Necrosis (AVN) , Metal irritation & implant failure , Locked and Unlocked nails , diastasis, incarceration, malrotation, breakage, migration, malposition , Reamer breakage, deviation & cortex splitting .

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IMN : Intramedullary Nailing .

ASA : American Society of Anaesthesiologist ……..…… 24

ESR : Erythrocyte Sedimentation Rate ……. 30

CRP : C- Reactive Protein …….30

WBCs : White Blood Cells ……30

MCS : Microscopy , Culuture and Sensitivity . ……..…37

TTA : Transtendinous Approach ……..……..54

PTA : Paratendinous Approach . ……54

PFN : Proximal Femoral Nail …….58

DFN : Distal Femoral Nail ……..58

DVT : Deep Venous Thrombosis . …….....60

ESIN : Elastc Stable IMN . …….67

TEN : Titanium Elastic Nail . ……....67

ISS : Injury Severity Score . ……70

BMP : Bone Morphogenitic Protein . …….73

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Aim of the work

Spot the lights on the main complications of **Intramedullary Nailing (IMN)** with special attention to their managements.

Chapter (1)

History , Rationale and Epidemiology of IMN

History, rationale and epidemiology Of IMN

History Of IMN

Origins and Evolution of Kuntscher Nailing:

Gerhard Küntscher first reported use of the intramedullary nail in 1940 and proposed the nail would act as an internal splint [(1)].

1940s: Usage of intramedullary reamers to increase the contact area between the nail and host bone for improving stability of the fracture [(2)] .

1950s: Application of interlocking screws to enhance stability of the construct.

1960s: Cephalomedullary nails were first introduced .

1970s and 1980s : Closed nailing techniques appeared. Reamed nails for treating tibial shaft fractures and reamed interlocking nails of both the femur and tibia also appeared [(3)].

1990s and the 21st Century: Introduction of new titanium nails and gamma nail . In addition, slotted designs were being replaced by non-slotted designs that provided greater rigidity [(4)].

Future Advancements:

While today's experience with intramedullary fixation for tibial and femur fractures has been quite good, there will most certainly be continued research to improve the technique. The most likely two areas of future research will revolve around different biomaterials and biologically active agents to promote bone healing.

Rationale and epidemiology Of IMN

Different Types of Intramedullary Nails: The Elastic and the Rigid Ones:

The alternative to what we call Küntscher nailing is the concept of intramedullary elastic fixation by a certain number of thin and elastic nails . Ender used the same method for proximal femoral fractures with stronger nails [(5)].

Basic Design and Characteristics of a Slotted Intramedullary Nail:

The development of interlocked nailing started with slotted nails. The slot turned from dorsal to lateral. Slotted nails have proven to be very unstable. With further evolution of interlocking nailing, the use of slotted intramedullary nails has widely been abandoned [(6)].

Thinner Nails Made of Stainless Steel or Titanium Alloy: Solid or Cannulated:

At first, hollow unslotted stainless steel nails were used and finally, the first generation of intramedullary titanium interlocking nails was introduced. The design changed from thick, slotted, stainless steel nail types to thinner, solid or cannulated, unslotted nails made of new material like stainless steel or new titanium alloys[(7)].

The Phenomenon of the Incarcerated Nail :

In rare cases, extraction of the nail was very hard. In that cases, the distal part of the nail could not pass the narrow isthmal zone . A similar effect can be noticed when thin slotted titanium nails have to be removed due to bony ingrowth into the slot [(8)] .

Entry Point and Shape of the Cavity Decisive for Shape of Nails:

Küntscher had started with straight nails. Later, the nails received specific bending designs in order to adapt to the anatomical needs of nail insertion and to the given shape of the cavity of the long bones .The standard proximal bending shape of the second generation of the Küntscher tibial nail is called the "Herzog bending" [(9)].