INTRODUCTION

Total knee arthroplasty is a major reconstructive procedure and therefore is subjected to the same postoperative local and systemic complication as may occur after other surgical procedures of similar magnitude [1].

Knee replacement began at the London hospital in 1969. Between then and 1975, 16 knees became infected and were treated by attempted arthrodesis. The results were poor. Bony fusion occurred in only 62.5% and even in them the prolonged duration of treatment and the resulting stiff knee, often in patient suffering from rheumatoid arthritis, left much to be desired [1].

The likelihood of local complication is increased by the implantation of large amount of foreign material in a superficial joint and by poor tissue tolerance to injury added to stress common to patients who are candidates for this type of surgery [2].

The most devastating local complication of total knee replacement is the development of deep wound infection. Infection after T.K.R. thought to be a prelude to failure of arthroplasty and the appropriate treatment remains problematic.

The incidence of acute postoperative infection, reported to be from 1% to 10% in earlier series, is now generally 1% or less. The decrease is the result of numerous factors including more widespread use of antibiotics, greater availability of laminar flow enclosure and body exhaust system in the operating room, more meticulous wound closure and an aggressive approach to the treatment of wound problem[3].

Periprosthetic joint infection may be either early or late. Around one third of infections occur in the 1st three months after surgery, and the other two third after 3 months, its diagnoses is usually straight forward unless antibiotic have previously been given [3].

Many options are available for management of infection at the site of total knee replacement.

Antibiotic suppression although rarely used alone, may be indicated for the patient who is a poor surgical candidate[2].

Open debridement is indicated for the patient with securely fixed implant and an acute haematogenous infection[11].

Arthroscopic lavage the only indication only in patient with fulminant sepsis and who is on D.V.T prophylaxis making open surgery difficult[6].

Resection arthroplasty is indicated for the patient with polyarticular disease and limited functional demands[13].

Revision surgery should be considered for the patient with good soft tissue, good bone stock and a susceptible microorganism [4].

The major advantage of **single-stage exchange** procedure is the avoidance of additional surgical procedure that is highly desirable for patients that have severe medical problems, for whom the risks of additional procedures are cumulative. The main disadvantage of single-stage exchange procedure is the lower rates of eradication of infection[8].

Two-stage exchange:

The most successful results for the treatment of late infection of T.K.R. are obtained by a technique of two-stage reimplantation of new total knee replacement, with success rates averaging 90%[7].

The main disadvantage of this procedure is the significant risk of exposure of the patient to two successive operations, especially in patients with medical conditions that dictate against a subsequent operation procedure[5].

Recently, the **prostalac functional spacer** which is made of antibiotic-loaded acrylic cement, is used as an interim spacer in two stage exchange arthroplasty for infected T.K.R[3].

Arthrodesis is indicated for a young patient with high activity demands and single joint disease. Recently Arthodesis can be done with using Elizarov ring fixator[9].

Amputation should be reserved for the patient with life threatening sepsis or sepsis combined with massive bone loss[4].

AIM OF THE WORK

The aim of the study is to highlight the recent opinions in the management of infected T.K.R. and the attempt to decrease this devastating complication.

TOTAL KNEE ARTHROPLASTY

Indications for Total Knee Arthroplasty

The primary indication for total knee arthroplasty is:

- To relieve pain caused by severe arthritis, with or without significant deformity. [14]

Other sources of knee and leg pain must be sought and systematically excluded. These include radicular pain from spinal disease, referred pain from the ipsilateral hip, peripheral vascular disease, meniscal pathology, and bursitis of the knee.[14]

Radiographic findings must correlate with a clear clinical impression of knee arthritis. Patients who do not have complete cartilage space loss before surgery tend to be less satisfied with their clinical result after total knee arthroplasty.[14]

Before surgery is considered, conservative treatment measures should be exhausted, including anti-inflammatory medications, activity modifications, and the use of a cane for ambulation.[14]

- It is also clearly indicated in younger patients who have limited function because of systemic arthritis with multiple joint involvements.[14]

- Severe pain from chondrocalcinosis and pseudogout in an elderly patient is an occasional indication for arthroplasty in the absence of complete cartilage space loss.[14]
- Rarely, severe patellofemoral arthritis in an elderly patient may justify arthroplasty because the expected outcome of arthroplasty is better than that of patellectomy in these patients.[14]
- Deformity can become the principal indication for arthroplasty in patients with moderate arthritis and variable levels of pain when the progression of deformity begins to threaten the expected outcome of an anticipated arthroplasty.[14]

Contraindications for Total Knee Arthroplasty

Absolute Contraindications to total knee arthroplasty include recent or current knee sepsis, a remote source of ongoing infection, extensor mechanism discontinuity or severe dysfunction, recurvatum deformity secondary to muscular weakness and the presence of a painless, well-functioning knee arthrodesis. [14]

Relative contraindications are numerous and debatable. These include medical conditions that compromise the patient's ability to withstand anesthesia, the metabolic demands of surgery and wound healing, and the significant rehabilitation necessary to ensure a favorable functional outcome. [14]

Other relative contraindications include significant atherosclerotic disease of the operative leg, skin conditions such as psoriasis within the operative field, venous stasis disease with recurrent cellulitis, neuropathic arthropathy, morbid obesity, recurrent urinary tract infections and a history of osteomyelitis in the proximity of the knee. This list is not all-inclusive, and any preoperative condition that can adversely affect the patient's outcome can be considered a relative contraindication. [14]

Preoperative Evaluation

The most important part of preoperative evaluation is determining that total knee replacement is clearly indicated.[14]

Preoperative knee radiographs should include a standing anteroposterior view, a lateral view and a skyline view of the patella. A long-leg standing anteroposterior radiograph can be beneficial in determining the mechanical axis of the limb particularly when deformity secondary to trauma or previous surgical procedure is present (Fig. 1).[14]

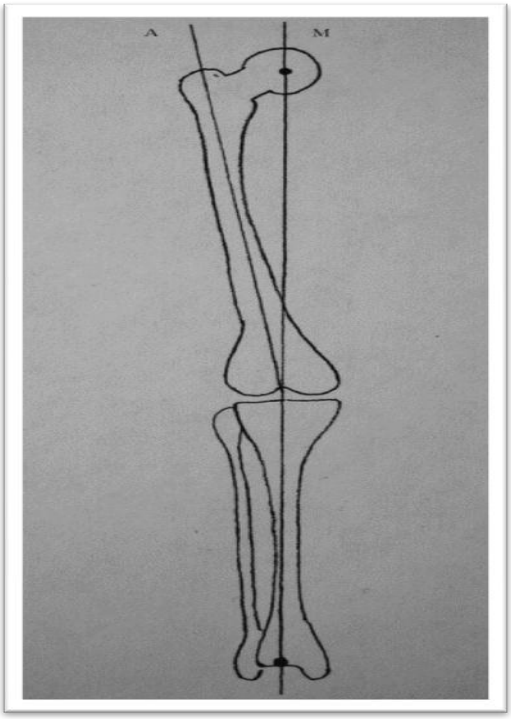

Figure (1): Diagram showing normal axial alignment. The mechanical axis (line M) connects the center of the femoral head to the center of the tibial plafond, and should intersect the middle of the knee joint. The anatomic axis (line A) is parallel to the long axis of the femoral shaft. The angle between the mechanical axis and anatomic axis is normally 5–8. [13]

The preoperative medical evaluation of candidates for TKA must be detailed to prevent potential complications that can be life threatening or limb threatening. Because most patients who undergo TKA are elderly, comorbid diseases must be considered. Patients with multiple medical risk factors have been shown to require longer hospital stays. Smokers, in particular, tend to have longer operative times and increased hospital charges after undergoing joint replacement.[14]

Patients must have adequate cardiopulmonary reserve to withstand general or epidural anesthesia and to withstand a blood loss of 1000 to 1500 ml over the perioperative period. A routine preoperative electrocardiogram should be obtained. Patients who have a history of coronary artery disease, mild congestive heart failure, chronic obstructive pulmonary disease, or restrictive pulmonary disease should be evaluated by appropriate medical consultants. Vascular supply to the operative leg also should be evaluated.[14]

Routine preoperative laboratory evaluation should include complete blood cell count, electrolytes, and urine analysis.[14]

Similarly, routine preoperative evaluation of coagulation studies is unnecessary except in patients with a history of bleeding or coagulopathy. Patients receiving anticoagulant medications must be managed appropriately to limit blood loss while ensuring medical stability in the perioperative period. [14]

COMPLICATONS OF TOTAL KNEE ARTHROPLASTY:

1. General complications

Despite the advanced age of most patients and the frequency of associated medical conditions such as arteriosclerotic heart disease, hypertension, diabetes mellitus, the general complications of knee arthroplasty are relatively few. [17]

2. Infection:

The incidence of deep infection has declined since the early years of joint replacement surgery. Currently, the infection rates are low, around 1% in primary knee replacements. [31-32]

However, even prospective surveillance programs may underestimate the infection rates; thus, the true incidence is probably higher. [33]

3. Thromboembolism

One of the most significant complications after TKA is the development of DVT, possibly resulting in life-threatening pulmonary embolism.[14]

4. Blood loss

There is little blood loss during the operation of total knee arthroplasty, most occurring postoperatively through suction drainage.[14]

5. Wound complications

Wound healing problems following TKA are infrequent but potentially devastating events that could cause loss of the prosthesis and of the limb. [17]

6. Neurovascular complications

Neurovascular complications are rare in patients who undergo TKA. [18-23]

7. Periprosthetic fractures

Supracondylar fractures of the femur occur infrequently after TKA (0.3% to 2%). [14]

Periprosthetic fractures of the tibia are uncommon complication of total knee arthroplasty in comparison to supracondylar femoral fractures.[14]

8. Patellofemoral complications

Patellofemoral complications, including: patellofemoral instability, patellar fracture, patellar component failure, patellar component loosening, patellar clunk syndrome, and extensor mechanism tendon rupture, have been cited as the most common reasons for reoperation. [14]

9. Component complications:

A- Component breakage

Breakage is manifested by instability, pain, and deformity, but does not necessarily call for immediate revision.

With modern high-strength alloys and good engineering design, even fewer instances of component breakage should occur in the future. [14]

B- Component wear and Periprosthetic osteolysis:

Osteolysis is a major problem with polyethylene and metal wear fragments. The pathology consists of a significant synovitis caused by wear particles in the synovial cavity. [22]

Severe osteolysis can also occur in pigmented villonodular synovitis and in patients with hemophilia. [21]

c- Joint stiffness:

Contributing factors are a poor preoperative range of motion, previous knee surgery, infection, chronic regional pain syndrome, severe postoperative pain as well as technical errors like component malpositioning,oversizing, patellofemoral overstuffing, ligament imbalance or joint line elevation. [25]

d- Component loosening:

Component loosening must be considered if the thickness of the radiolucency line is at least 2 mm.[14]

The further development of methods for detection of early micromotion like model-based roentgen stereophotogrammetric analysis might be helpful in this respect.[20]

10. Joint instability:

Postoperative joint instability, ranging from mild sublaxation to frank dislocation, has occurred in 1% to 6% of reported series of total knee arthroplasties.[14]

11. Unexplained pain:

A certain proportion of patients continue to complain of pain for which there is no obvious explanation. Sometimes the arthroplasty will objectively be functioning well and have a good range of motion. The pain may be present continuously or mainly at rest.[16]

12. Metal hypersensitivity:

Implantation of materials in humans as in the case of TKA may induce an immunological response, depending on the material and sensitivity of the patient.[19]

Ceramic implants present a solution in cases of hypersensitivity to metals. [19]

Delta ceramic is a composite matrix material containing alumina (Al2O3) and zirconia (ZrO2), with improved mechanical characteristics in terms of strength and resistance in comparison to pure alumina. [19]

ETIOLOGY AND PATHOGENESIS OF INFECTION IN TKR

Infection in the presence of joint prosthesis still remains one of the orthopedic surgeons' greatest challenges. [26]

In order to use an effective empirical therapy, it is vital to understand the microbiology of the infected knee arthroplasty.[26]

Coagulase-negative Staphylococcus remains the most common causative organism in infected knee arthroplasty (35.1%), and twice as common as Staphylococcus aureus (18.4%) staphylococcus epidermidis. However, each hospital must constantly review the types of organisms causing infection, as these may change over time. Staphylococcus organisms were responsible for infection in the majority of patients who had concurrent skin ulcerations.[27]

Staphylococcus epidermidis has a high rate of adhesion to polyethylene. The increasing frequency of infections caused by organisms such as methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant Enterococcus species, which are generally resistant to more than one antibiotic provides a dilemma with regard to prophylaxis and treatment (***28***).