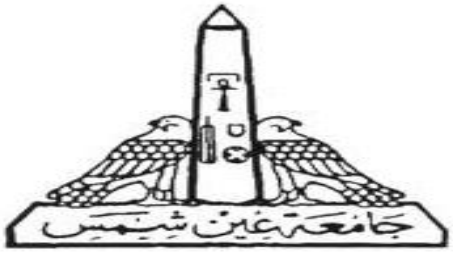

Effect of BMI on complications rate, reoperation and functional outcome after Total Knee Arthroplasty, A Systematic Review of Literature

A Systematic review and meta-analysis for partial fulfillment for the master degree in Orthopaedic Surgery

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Mohamed Magdi Ahmed soliman Al Bana

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List of abbreviations

WHO…….	World Health Organization
BMI……	Body Mass Index
OA…….	Osteoarthritis
TKA……..	Total Knee Arthroplasty
TKR……	Total Knee Replacement
DVT……	Deep Venous Thrombosis
KSS……	Knee Society Score
MeSH……	Medical Subject Headings
CI……..	Confidence Interval
SMD…….	Standardized Mean Difference
SE…….	Standard Error
FEM……..	Fixed Effects Method
REM…….	Random Effects Method

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Abstract

Aim of work The body mass index (BMI) is widely recognized as a prognostic factor in multiple operations; however, the relationship between the BMI and outcomes following total knee arthroplasty (TKA) is extensively debated. We aimed to evaluate the effect of the BMI at different cutoff values on the outcomes following primary TKA.

Methods Electronic databases (PubMed/Medline, Embase and Web of Science) were systematically searched for studies investigating the association between the BMI and outcomes following primary TKA. Two investigators independently reviewed studies for eligibility. A meta-analysis was performed using Review Manager 5.2 software from the Cochrane Collaboration.

Results Thirteen articles were identified. The postoperative Knee Society Score appeared to trend lower in obese (BMI $\geq$ 30 kg/ m^2) patients than in non-obese (BMI < 30 kg/m^2) patients. The meta-analysis showed that revision with follow-up $\geq$2 years, any infection, superficial infection and deep vein thrombosis occurred statistically more frequently in obese patients.

Conclusion Patients with a BMI $\geq$ 30 kg/m^2 are at a higher risk of lower functional scores and developing complications following primary TKA. It appears reasonable to encourage obese patients to lose weight before selective TKA.

INTRODUCTION

According to the World Health Organization (WHO) Guidelines, a body mass index (BMI) of ≥30 kg/m^2 is defined as obese, ≥35 kg/m^2 as highly obese and ≥40 kg/m^2 as morbidly obese [(1)].

The effect of obesity on many elective procedures has become an important consideration, as it has been estimated that approximately 30% of adults worldwide have a body mass index (BMI) of ≥30 kg/m^2 [(2)].

Many studies have indicated that obesity is a well-documented risk factor for the pathogenesis and progression of knee osteoarthritis (OA). Conservative treatment is used initially to treat knee OA; however, total knee arthroplasty (TKA) becomes necessary as the disease progresses [(3,4)].

It has been estimated that more than one-half of patients undergoing a total knee arthroplasty have a BMI of ≥30 kg/m^2, many of them at a younger age than their non-obese counterparts [(5,6)].

With the demand for total knee arthroplasties projected to increase through 2021, it has become even more critical for patients and surgeons to understand the association between BMI and the risk of complications and implant survivorship when making decisions prior to elective procedures [(7)].

INTRODUCTION

Morbid obesity has been linked to many early surgical complications after total joint arthroplasty, such as infection. Patients with a BMI of $\geq$ 30kg/m^2 had more infections compared with patients with a BMI of <30kg/m^2.Infection that may occur may be superficial infection, deep infection or periprosthetic joint infection [8].

BMI is associated with a higher risk of revision for mechanical failure, including aseptic loosening and polyethylene wear. So, increasing BMI was associated with increasing risk of reoperation, implant revision or removal [9].

Generally speaking, obesity has a negative influence on the outcome of patients treated with total knee arthroplasty and patients with BMI ≥30 kg/m2 are at higher risk for development of complication compared with non-obese patients [10].

Thus, defining the relationship between BMI and TKA outcomes has become increasingly important, and evidence-based findings might be helpful for orthopaedic surgeons in evaluating the risk of postoperative complications and determining whether losing weight should be encouraged before selective TKA in obese patients.

AIM OF THE WORK

The aim of this study is to identify effect of patient BMI on the risk of complications, reoperation, implant revision or removal after TKA and to determine whether obesity has negative influence on patient outcome after primary TKA.

REVIEW OF LITERATURE

Chapter Ⅰ

Anatomy

Bony Anatomy:

The knee is a tri-arthrodial joint consisting of the tibiofemoral and patellofemoral joints. The tibiofemoral joint is divided into medial and lateral compartments [11].

The osseous portions of the knee are the femur, tibia, patella and fibula. The distal end of the femur has a medial and a lateral condyle, each of which has a distinct shape that corresponds to the shape of the tibial plateau [12]. (Fig.1) [13]

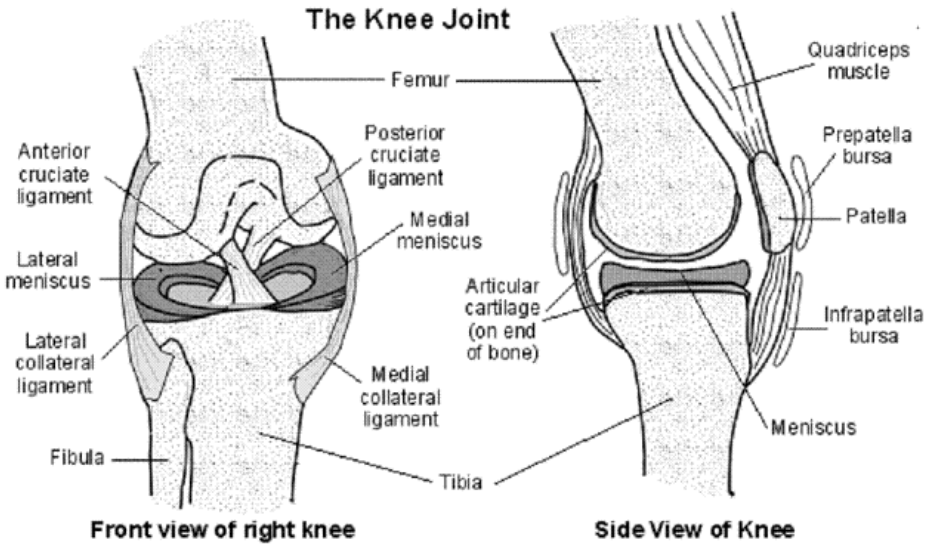

Figure (1): Schematic Representation of the anatomy of the knee joint [13].

The proximal end of the tibia flares to create a plateau with medial and lateral sections divided by the tibial spine [12].

The menisci deepen the contour of these plateaus to provide a good "seat" for the corresponding femoral condyles. This added depth is extremely important because the lateral femoral condyle and lateral tibial plateau are both somewhat convex [12].

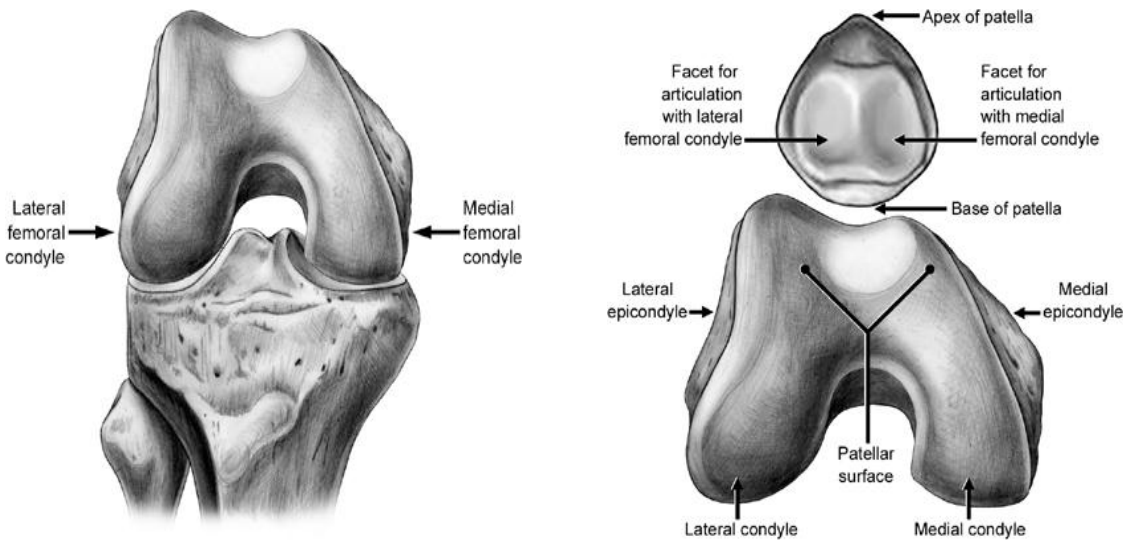

Figure (2): Osseous anatomy of the knee [11].

Being the largest sesamoid bone of the body, the patella lies within the fascia lata and the fibers of the quadriceps tendon. The shape of the patella is triangular, with the base proximal and the apex directed distally [14].

The upper three fourths of the posterior surface of the patella is covered with articular cartilage. The articular cartilage is divided into major medial and lateral facets, which articulate with the femoral sulcus or anterior articular surface of the distal femur, which is a coalescence of the medial and lateral femoral condyles

Articulations

The knee joint complex consists of three articulations between the femur and the tibia, the femur and the patella and the tibia and the fibula [(11)].

Soft Tissue Anatomy:

The patella is firmly invested in a strong facial structure formed by the coalition of the quadriceps tendon, fascia lata, and iliotibial band. These structures join to form the cascade and the strong expansions known as the medial and lateral retinacula [(15)].

The patellar tendon originates at the apex of the patella and inserts onto the tibial tubercle. Proximal to the tubercle it is separated from the underlying tibia by the infrapatellar tendon bursa.

The quadriceps tendon with its associated soft tissues, the patella, and the patellar tendon are collectively known as the extensor mechanism [(14)].

Quadriceps

The quadriceps muscle is composed of four major separate muscles: the rectus femoris, vastus medialis, vastus lateralis, and vastus intermedius. The quadriceps muscle group forms the primary motor unit of the extensor mechanism.

The vastus intermedius originates broadly on the anterior surface of the femoral shaft. Its distal tendon inserts directly into the superior pole of the patella. It lies deep to the other major elements of the quadriceps complex.

The rectus femoris parallels the vastus intermedius. It originates on the anteroinferior iliac spine of the pelvis.

The vastus lateralis makes up approximately 50% of the bulk of the entire quadriceps muscle group. It originates from the anterolateral aspect of the femur and lateral intermuscular septum beginning proximally at the level of the greater trochanter.

The vastus medialis originates from the anteromedial aspect of the femur and medial intermuscular septum medially. It consists of the vastus medialis longus and the vastus medialis obliquus that inserts more distally on the patella. The vastus medialis obliquus originates from the abductor tubercle and distal medial intermuscular septum [(16)].