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*Paper review*

## OBESITY AS A RISK FACTOR IN PRIMARY TOTAL HIP ARTHROPLASTY

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**ABSTRACT:** Hip arthroplasty or hip replacement is a surgical procedure by which damaged cartilage and bone are removed from the joint and replaced by implants. Hip replacement is performed in order to achieve painless and normal movements. Obesity is characterized by excessive accumulation of fat inside an organism and it affects occurrence of arthrosis. Obese people make up to 30% of the population in developed countries. A vast majority of recent research publications talk about obesity and its impact on the outcome of orthopedic surgical procedures.

**Key words:** obesity, risk factor, hip arthroplasty.

### INTRODUCTION

The terms artificial hip, endoprosthesis of the hip joint, arthroplasty or replacement of the hip joint all refer to a routine surgical undergoing that is today considered to be the best quality endoprosthetic orthopedic procedure in general. The risk factors for a bad outcome in total hip arthroplasty are: obesity, age, gender, comorbidity, insufficient or excessive physical activity as well as genetic factors.

In general, it can be said that changes in patients' requirements, their age and general condition impose a need for development of new implants, which differ by concept, way of fixation, relationship between the components and surgical philosophy. Advancements in surgical techniques (such as minimally invasive surgery, computer navigation), as well as antibiotic prophylaxis, thromboembolic prophylaxis, bleeding controls, post operative pain controls, development of rehabilitational procedures should also be pointed out. As a result, the installation of artificial hip joint is considered one of the most successful orthopedic procedures of our time.

Through replacement of an affected, painful and non-functional hip joint with an artificial hip, we aim to eliminate the pain of an affected ill person, secure the person with a stable hip with good mobility that would allow walking free from pain and without the need for walking aids. It is an imperative that the lengths of lower extremities are equalized in the primary hip arthroplasty to enable a balanced walk without the need for walking aids. The so called highly demanding patients want to return to a certain level of recreation and simpler sports activities. An arthroplasty can be claimed successful if we have accomplished a functioning, integrated and long lasting implant, and a patient satisfied with the quality of life with the new artificial hip.

It should be mentioned that previously, obesity was one of the reasons for delaying implantation of an artificial hip joint, therefore patients were directed to reduction diets and subjected to surgery only after regulating their body weights. This was a test of will to confirm the motivation of the patient for undergoing surgery and it was creating the so called positive transfer which is significant in the postoperative course of treatment. As obesity has had a huge increase in the past two decades while surgery and technological processes have advanced, moving away slowly from the mentioned request from patients was happening simultaneously. This work in detail examines obesity as the risk factor, while other factors are mentioned as accompanying or as factors considered in the preoperative evaluation of the patient.

## HIP ARTHROPLASTY

Total replacement of a joint, usually hip or knee is most often performed on patients who are over 50 years of age. Total hip replacement can be used in the treatment of osteoarthritis and severe rheumatoid arthritis, while total knee joint replacement is used in treatment of severe pains, joint contracture and damage to joint surface, conditions due to which total flexion and extension are limited. The indications for hip arthroplasty, apart from the already mentioned are: pain, functional limitations, stiffness, age, radiological changes and others. Contradictions for hip arthroplasty are: illnesses where the risks of operation outweigh the expected benefits, psychiatric patients, dementia, systemic infection etc. (Magdelinić & Magdelinić, 2019).

## OBESITY

The Body Mass Index (BMI) is one of the ways to estimate nutrition. Out of all known indices, it is most tightly related to the amount of excessive fat tissue in human body, and besides, it is relatively easy to calculate or read from a table. Calculation of the BMI is based on the relationship between body weight and the square of the height of an individual. For example: A patient with a body weight of 100 kg and height of 2 m, has the BMI of 25 kg/m<sup>2</sup> (BMI=100:2<sup>2</sup>=25).

The recommended BMI value is same for both sexes and is equal to 18,5-24,9 kg/m<sup>2</sup> according to the classification of the World Health Organization (WHO) for the European population.

Classification of WHO relative to BMI goes as follows:

- Up to 18,5-too small body weight
- From 18,5-24,9-normal body weight
- From 25-29,9-excessive body weight
- From 30-34,99-obesity, class I
- From 35-39,99-obesity, class II
- Above 40-obesity, class III (morbid obesity)

The BMI highlights the risk of developing some disease such as hypertension, diabetes, blood lipid disorder, cardiovascular disease including heart attack and stroke, gallstones, osteoarthritis, some types of tumors and other. The higher the BMI, the higher the risk of developing disease listed. As the body mass index of patients who were obese since childhood increased, their hip and knee arthrosis was also seen to progress (Grubor et al., 2015).

In a prospective clinical study (Jandrić et al 2005), on a 394 patient sample with coxarthrosis, the average BMI of 30,61 was concluded. This was seen as a degree of increased body weight (28,66) in men, whereas in women as a degree of obesity (31,49). Android obesity (the apple shape) is characterized by accumulation of fat in the belly section, upper part of the chest and neck. People affected by this type of obesity are inclined to developing heart disease, metabolic syndrome, gout and hypertension. Gynoid obesity is characterized by the presence of fat on hips and the upper legs. These people have a pear shaped body and are inclined to developing heart disease. It is technically by far more challenging to correctly implant an endoprosthesis in these patients (Sadr et al., 2008).

## THE INFLUENCE OF OBESITY ON HIP ARTHROPLASTY

As determined by Oliveira et al. (1999), degenerative changes to the hip joint occur 25% more often in obese people, also women with the BMI above 30 are at a five times greater risk of these changes. In obese people, hip arthrosis is more associated with clinical symptoms rather than radiological results. He also points out that obese people make up 30% of the population in developed countries. There is currently

a billion of obese people in the world and more than 300 million are very obese. The increased BMI leads to endoprosthetic treatment at earlier age and with poorer preoperative function (Guenther et al., 2015).

Welton et al. (2016) determined a significantly higher percentage of obese people from initial candidates for total hip arthroplasty in comparison to the percentage of obese people in general population. The ratio was 55%:35%. Also, obese patients had significantly higher comorbidity.

Grubor et al. (2015) conducted research on obesity as a risk factor on 136 patients subjected to total hip arthroplasty. The surgical procedure on these patients is technically more difficult and associated with more complications in comparison to patients with normal weight. Generally speaking, both objective and subjective results show lower success for obese patients.

Andrew et al. (2008) conducted a prospective study on 1,421 patients with implanted endoprostheses due to hip arthrosis in the period 1999 – 2007. The patients were sorted into three groups: non-obese patients – BMI below 30; obese patients – BMI between 30 and 40; and morbidly obese patients – BMI above 40. The study showed statistically significant difference between morbidly obese and non-obese patients in the form of increased frequency of bleeding, infection, DVT and pulmonary embolism and length of hospital recovery. Deep vein thrombosis and pulmonary embolism were by 50% greater in patients with the BMI above 40. Cases of heterotopic ossification were also more frequent in morbidly obese patients who were younger and required longer surgical work.

Obesity is of high proportions in the USA and it is expected that other countries will follow this trend. It is a well-documented risk factor for development of arthrosis, therefore increased necessity for joint arthroplasty in obese patients can be expected (Soballe et al., 1987).

Surgery on these patients takes longer time than is usual. Hospital recovery takes longer, complications occur more often, and some authors are even suggesting prosthesis rejection in these patients (Sturmer et al., 2000).

Lungu et al. 2015 gave a preliminary prediction algorithm for identification of patients with sub-optimal results after a total hip arthroplasty. It incorporates functional limitations, increased pain and inadequate perception following a total hip arthroplasty. One of the variables in this algorithm is the BMI.

Elings et al. (2016) developed a “risk stratification model for delayed inpatient recovery of physical activities in patients undergoing total hip replacement“. A multivariable modeling included a BMI of 25 or above as one of the factors. The BMI is a significant predictor of time duration of using an operating room in total hip arthroplasties, but not in primary knee arthroplasties. The time duration here refers to the time interval from beginning of anesthetic to transfer from the operating room (Sawalha et al., 2015).

On the basis of their research, Coutney et al. (2015) recommend postoperative intensive care for older patients with multiple comorbidities. One of the clinical predictors includes an increased BMI with values above 35. This enables the prediction of patients who are at high risks and require higher levels of monitoring and care following an elective THA. This risk stratification model helps hospitals to better accomplish the location precision of resources for the intensive care.

Elmallah et al. (2015) investigated reasons for readmission to hospital (Readmission Rate) on 232 total hip arthroplasties in 224 patients. There were no differences based on sex, age and the BMI. In meta-analysis of Zhiang et al. (2015) fourteen studies were involved. Out of the ten factors being investigated, three were significantly associated with venous thromboembolism: history of prior thrombosis, varicosity and heart congestion.

According to the research of Charn et al. (2013), risk factors that play significant roles in deep vein thrombosis (DVT) and pulmonary embolism (PE) are history of DVT, factor V disorder and general anesthesia. The BMI is not listed as a significant risk factor even though it was included in the study. Over 90%

of PE and 33,3%-75% of DVT cases were discovered in the first week after the operation. Dislocations complicate between 1% and 3% of primary total arthroplasties (Burne & Mehin, 2004).

Obesity of the patient, inexperience of the surgeon and minimally invasive approach are known risk factors linked to malpositioning of the acetabular component of hip prosthesis. The effect of obesity can be cancelled by an experienced surgeon only and with application of standard posterolateral approach (McArthur et al., 2014). There are also opposing opinions on the effect of obesity on errors in positioning of the acetabular component that did not determine this type of effect (Todkar, 2008). Patients with increased weight or obesity are at a higher risk of wound infection in hip and knee arthroplasty, abdominal hysterectomy, coronary artery bypass graft and colon surgery (Thelwall et al., 2015).

Surgical site infection (SSI) is a common complication in orthopedics. In his study, Fisichella et al. (2014) determined a correlation between diabetes, cigarette smoking and age as risk factors for surgical wound infection. Two other variables, the ASA score and the BMI were not relevant which is in contrary with quotes from the literature.

A meta-analysis by Ma et al. (2016), included 15 relevant studies. The prospective results show that the risk of periprosthetic infections is significantly increased by all degrees of obesity.

Monitoring of changes in body weight after joint arthroplasty gave conflicting and contradictory results. The study included 3,893 hip arthroplasty and 3,036 knee arthroplasty patients. After the operation, in 73% of the patients with hip endoprosthesis and 69% of the patients with knee endoprosthesis, no changes to their BMI values were seen. Significant predictors for weight loss after the operation were higher BMI, knee arthroplasty and female gender. More optimal functional status prior to the operation was related to lower probability of body weight change (Ast et al., 2015).

Obesity is known as a negative factor that affects life quality. Research studies suggest greater improvement in life quality for obese patients after total hip arthroplasty compared to non-obese patients. With this operation, obese patients gain multiple benefits of active lifestyle which are greater than for non-obese patients (Foster et al., 2015).

According to the research of Arande Villalobos & Navaro-Espioaros (2013), the BMI is a significant predictor of changes in life quality after total hip arthroplasty, as concluded. In obese people, a significant improvement in the general health condition arose after total hip arthroplasty.

One of the aims in total hip arthroplasty is to achieve the same lengths of the legs. Smaller differences in length of up to one centimeter are common and well tolerated. It often becomes necessary to extend the length of the neck of prosthesis for its stability, thus the leg gets extended. The preoperative preparation, experience of the operator and attention to detail minimise the risk of this complication. As much as this problem has been investigated, up to this point it has not been brought into relationship with obesity as a risk factor (Maloney & Keeney, 2004).

Based on research on the influence of BMI on complications after total hip arthroplasty, some authors gave recommendations for when and on who this surgery should be performed at all. Admicary as a cutoff point recommends the BMI of 45, above that value, the postoperative complications increase dramatically (Admicary et al., 2015).

On the other side, authors like Yeung et al. (2010) do not recommend rejection of obese people as candidates for total hip arthroplasty. The functional scores of obese people are lower, especially in regards to the range of motion, however they are satisfied with their operation as reflected by patient satisfaction scores.

The influence of BMI on postoperative pain (Motaghedi et al., 2014) and hidden blood loss (Sehat et al., 2004) was also a research topic. Their direct or indirect influence on the bad outcome of total hip arthroplasty seems plausible.

Increased body weight is associated with coxarthrosis and total hip arthroplasty as a consequence. Patients with coxarthrosis often state that the reason for their obesity is in fact restriction in their mobility, a factor that prevents them from being physically active and reducing their weight. There is evidence of increased physical activity motivated by hip arthroplasty, but no evidence is present about weight loss as well after the same operation.

Obesity and hypertension were investigated as potential risk factors for poor recovery. Apart from arthrosis, obesity is a risk factor for many other illnesses such as heart diseases, hypertension, diabetes, dyslipidemia and other. Obesity has bad influence on health and mobility and is associated with a higher incidence of surgical complications and mortality as well as higher treatment costs. Even though obesity is a risk factor for arthrosis, its role as an independent risk factor in the outcome of total hip arthroplasty is controversial. Some studies show that there is no difference in pain and functional results, complications and revisions, while other studies show differences. Obese patients have a tendency of being younger, having more surgical complications and require more revisions due to infections and dislocations. The presence of diabetes, hypertension and heart diseases is associated with longer hospital stay. Projected increase in obesity in the general population will have an influence on illnesses associated with it, as well as on arthroses and elective surgeries such as total hip arthroplasty. The literature seems inconclusive with regards to the influence of obesity as an independent factor in the outcomes of hip arthroplasties, separate from chronic conditions. Providing a better definition of the role of obesity could be of direct clinical significance during screening of suitable candidates for surgery and in the preoperative management of this potentially correctable state.

The prevalence of obesity is increasing, and obesity often leads to the hip joint degeneration and total hip arthroplasty. Obesity is a proinflammatory state associated with increased chronic inflammatory response. Augmentation of the postoperative inflammatory response is associated with the pain and complications after surgery (Huddleston et al., 2012).

Postoperative period is characterized by extended SIRS and depression in cell-mediated immunity which has an influence on the occurrence of organ and organ system failure, prolonged treatment and increased risks of infection. For example, systemic cytokine level increases after total hip arthroplasty and is associated with a negative outcome. Besides that, extension of SIRS correlates with increasing postoperative pain. Cytokines are mediators released from immune cells and they promote hemodynamic, metabolic and immunological changes after surgery. A balance between proinflammatory and anti-inflammatory cytokines is important for correct healing and prevention from infection after surgery. SIRS can lead to increased pain, hemodynamic instability and organ damage. Inflammatory cytokines are released from adipose tissue and macrophages in adipose tissue stroma. This observation suggests that obese patients are at risk of SIRS and preoperative stress. This risk is potentially correctable (Motaghedi et al., 2014).

Even though it is rare, an infection around prosthesis could have a devastating effect on the outcome of arthroplasty. It is even considered as a catastrophic event in terms of how it affects the functional status of the patient and difficulties in diagnostics and treatment. Some studies show a connection between obesity and increased infection rate after total hip arthroplasty, however, there is also the argument for coexistence of comorbidity which could be responsible for this complication to a higher degree than the obesity itself. Essential improvement in functioning and life quality of patients after total hip arthroplasty is sometimes compromised by complications to which obese people are more exposed. Many research studies showed evidence of higher incidences of periprosthetic infections in obese patients compared to non-obese patients. When periprosthetic infections among patients who do not suffer from diabetes and heart diseases were being compared, higher incidence of these complications was still confirmed in them.



A relationship between surgical approach and the infection rate was not confirmed. The operating time is significantly longer for morbidly obese patients than it is for non-obese patients. Operating time that takes longer than 2 hours is considered a risk factor for occurrence of an infection after total hip arthroplasty. A relationship between receiving blood transfusion and infection rate was not found (Ward et al., 2015).

A difference in infection rate was not found in cases with or without the use of suction drain. Deep infection after total hip arthroplasty is the most challenging and most difficult surgical complication as far as prevention and treatment are concerned. Even though successful eradication and suppression of infection is achieved in most cases, the treatment is associated with numerous difficulties and costs to the patient himself, but also to the healthcare system in general (Dowsey & Choong, 2008).

Very obese patients can expect physical improvement, but also lower efficiency and higher treatment costs compared to non-obese patients. Obese patients are often not suitable candidates for total hip arthroplasty due to higher risks of infection and limited mobility. They require extra blood transfusions, longer operating time as well as extra assistance from staff during transferring.

In the descriptive variables of a patient, age and sex are included. Primary aim of operation and rehabilitation is that the patient returns home and is able to take care of himself. Due to less physical activity after total hip arthroplasty, obese patients have a higher rate of prostheses loosening and leg pain. Research shows that obese patients in general have poorer functional results compared to non-obese patients. They have reduced abilities such as lower walking speed, shorter standing on one leg, etc. (Vincent et al., 2007).

The patient population in the last decades has become more obese and more complex. Obesity is linked to serious medical comorbidities including diabetes, hypertension, dyslipidemia, heart diseases, cerebrovascular diseases, obstructive sleep apnea, asthma and arthritis. In orthopedics specially, obesity is associated with total hip arthroplasty at a younger age. Obesity was classically a relative contradiction for total hip arthroplasty, in contrary to that, some more recent studies show excellent survival of hip prostheses in obese people.

Functional test results show that obese patients can too, expect more active lifestyle and better life quality after total hip arthroplasty. This is a reason to enable obese patients to have access to total hip arthroplasty (Foster et al., 2015).

Primary total arthroplasty is by number the second most common of arthroplasties in the USA. One of the marked changes in epidemiology of total hip arthroplasties is the expansion of indications for this operation towards younger and older patients. It is under investigation how important clinical characteristics (BMI, comorbidity, etc.) vary with time, while simultaneously changing characteristics of patients. These characteristics could have a significant influence on the solely outcome of the operation. The basic diagnosis made, was hip osteoarthritis, around 90%, others were inflammatory arthritis and other. In patients subjected to total hip arthroplasty, increased rates of obesity, physical and psychological comorbidity, as well as decrease in rheumatoid arthritis rate were confirmed. Younger patient group is the fastest growing group of recipients for total hip arthroplasty. Obesity prevention has been growing throughout the whole time within the past decades in all patient groups. The prevalences of obesity, anxiety, and depression are independent of age, sex and comorbidity. Psychological disorders are known predictors of poorer result of total hip arthroplasty. The rates of renal diseases, CV diseases and dementia are rapidly increasing. This is suggesting that surgeons and patients must be wary of these comorbidities related to a likely poorer operation outcome (Singh & Lewallen, 2014).

Some hospitals exclude obese patients from operational treatment of hip arthrosis until they achieve desired BMI. Such decisions are not widely accepted, as no consistent policy based on clinical and radiological criteria exists yet.

Many studies are investigating the outcomes of total hip arthroplasty in terms of function, complications and satisfaction of patients, aimed to determine whether obesity as an independent factor has influence on the outcome of operation (Michalka et al., 2012).

According to the data of Canadian Joint Replacement Registry, obesity represents a heavy risk factor when total hip arthroplasty is required. The relative risk for total hip arthroplasty is eight times higher in obese people with the BMI above 40. It has been confirmed as well that these candidates for total hip arthroplasty are younger than usual. Therefore in future, patients with hip arthrosis are going to be more obese and younger. Selection of candidates for total hip arthroplasty aimed at reducing the risk of complications is becoming important from clinical and financial aspects. Both logically and evidently, obese patients have a greater number of combined illnesses. Based on that, obesity increases the risk for deep vein thrombosis, pulmonary embolism, infection, heart disease, diabetes, hypertension, depression, and similar. An operation on such a patient is technically more difficult and longer in time. Operative field is reduced, force of retraction is higher. A larger number of assistants is needed in order to achieve adequate access and working field. The bleeding area is greater and there are more layers for closing up. Longer term studies will show if increased load on the artificial hip in obese patients reduces the survival of the implant.

The main etiological factor of interest is the BMI which is evaluated as a categorized variable (normal weight, obese) according to the definition of WHO. Preoperatively obese patients had significantly lower functional test scores compared to non-obese patients. Obese patients had lower HHS scores which corresponded with lower clinical differences.

WOMAC is a hip arthroses specific questionnaire for measuring the outcome after total hip arthroplasty. It examines the influence of obesity on physical functioning and life quality based on health. On the other hand, the influence of complications and comorbidity is important. Specially when combined, these variables can have significant influence on the outcome of total hip arthroplasty (Lubbeke et al., 2010). The effects of obesity on the outcome of THA, including all permutations, are acquiring more intensive focus in current orthopedic literature (Stevens et al., 2012).

Risks associated with this surgery are by far minimal compared to the benefits that a patient receives as far as function and life quality are concerned. The American association of hip and knee surgeons presented increased BMI and female gender as relative risk factors for total hip arthroplasty. These results are consistent with earlier literature. On the basis of age and sex stratification, the risk of revisions of younger patients is higher. The increase of elderly and obese in the population will have as a consequence increased necessity for hip arthroplasty at earlier age. In addition, there will be a greater number of revised operations resulting in great expenditures of healthcare resources (Hanly et al., 2016).

Readmission is a complication, also more common in obese than in non-obese patients. Obese patients have a higher infection rate and other complications associated with soft tissue. It is assumed that longer time for surgery, dead pockets in soft tissue, forces acting on a young scar and consequences of wound retraction influence the occurrence of complications after total hip arthroplasty. Increased rates of wound related complications, deep infections and dislocations in obese patients subjected to total hip arthroplasty are consistent with results from literature (Raphael et al., 2013).

Increase in the incidence of obesity is alarming. The percentage of obese americans has doubled in the past three decades. Obese patients are worse candidates for total hip arthroplasty. Among the reasons are a longer time period for treatment and a higher rate of complications. Surgeons have experienced higher degrees of technical difficulties in operations on obese patients. The operation duration was measured from the moment of incision to the moment of wound closure. A significant difference in duration of hospital bed to operating table transfer between obese and non-obese patients was evident. Analysis showed sig-

nificantly longer time required to administer spinal anesthesia to obese patients. With total hip arthroplasty, a significant statistical correlation between time length of operation and the BMI exists. Excellent rate of success of total hip arthroplasty leads towards high expectations of patients, many surgeons therefore refuse to operate obese patients due to possible complications and unfulfilled expectations of the patients. It is clear why many surgeons are avoiding to operate patients with greater body habitus. This sets up a question on where the boundry should be. Is it the BMI of 35? This kind of policy causes moral dilemma of threat to human rights, one very important is the right to medical treatment. This requires a thorough analysis of risks vs benefits. Greater prospective studies with longer following periods should be conducted to allow determination of the relationship between obesity and total hip arthroplasty, and to also allow determination of the optimal BMI value above which this elective operation will not be recommended (Namba et al., 2005).

The fact that the number of total hip arthroplasties has increased raises the question of whether we have changed the indications. The indications have in deed remained the same, however the treatment capacity has increased.

Why are changes constanly introduced in orthopedics? Is it fashion, progress or because they simplify or speed up the procedure? Often, by answering one question we get overwhelmed by a multitude of new questions, or in the process of solving one problem we create another, even greater problem. Numerous failed inovations and concepts in total hip arthroplasty are known. One of the traits of such inovations is their "less forgive" character, in other words they forgive less for the mistakes that a surgeon makes. The reason is that they are advanced, narrowly specialized and expertly, and therefore require great skills and precision. That is also why their learning curve is difficult and long lasting.

In an institution which deals with arthroplasty, the method of selection and procurement of material for implantation is a priority. Therefore, a consent between surgeons and management is important. An expertly and realistic approach to this issue is also imortant since the most expensive prosthesis is a cheap and a short lived one that will end with complications and revisions and vice versa.

Obesity is a disprortionally big problem for patiens being subjected to total hip arthroplasty. Antibiotic prophylaxis with cefazolin was performed on all patients. Considering body mass, the query on the need for increased dosage of cefazolin in obese patients arises. The surgeon has to recognise an increased risk of infection associated with obesity and inform the patient of it.

Evident connection between obesity and degenerative diseses leads to tendencies that obese patients become overrepresented in the population of those subjected to total hip arthroplasty. Obese patients are under the impression that the exact cause of their coxathrosis is obesity. It is intuitive to think that pain associated with the disease limits physical activity and loss of calories. Similarly, it seems reasonable that total hip arthroplasty, by limiting or eliminating the pain allows the patient to be more active and lose body weight. Numerous publications were invesigating the operation outcome based on this issue, with varying degrees of quality and evidence. Patients in general complain that thier hip osteoarthritis limits their ability to exercise and reduce weight. Many of them believe that after total hip arthroplasty their ability for physical activity and to reduce weight would increase. In the course of the past decade, numerous studies investigating change in weight after total hip arthroplasty came to a conclusion that maintenance of same body weight is more common than reduction. According to these studies, even an increase in body weight after total hip arthroplasty can be expected in some patients. The only clinically significant predictor for reduction of body weight after total hip arthroplasty is age of the patient. Decrease in weight is more common for older patients in particular. Body weight is recognized as potentially correctable risk factor for coxathrosis, for its occurance as well as for its develoment. A high BMI could be related to structural damage of joint cartilage and subchondral bone. Every kilogram of increased body weight contributes to the increase in



forces acting on the joint. A decrease in weight decreases the load forces on the joint. This is a good short term investment aimed towards longer lasting of the joint. The result of increasing body weight after total hip arthroplasty is not in contrary with other orthopedic surgeries either. Even after lumbar decompression surgery there is an increase in body weight and BMI. The results from these studies are consistent and show that successful total hip arthroplasty actually does not lead to decrease in body weight but rather towards its increase. The results support the idea that obesity is a multifactorial disease and that its treatment can not be just brought down to freeing from pain during total hip arthroplasty. Surgeons and patients should not consider hip arthroplasty as a way of decreasing body weight with certainty (Kandil et al., 2015).

As a result of conflicting reports in literature on influence of obesity on the outcome of total hip arthroplasty, the Working Group of the American Association of Hip and Knee Surgeons has issued a statement based on literature. The effect of BMI on infection rate, respiratory complications, thromboembolic complications, revision surgeries, component malposition, hip prosthesis loosening, its dislocation, treatment length and treatment costs was confirmed (AAHKS, 2013).

Kremers in his research confirmed increased treatment costs of obese patients in comparison to non-obese patients relevant to total hip arthroplasty. This fact needs to be weighed against the benefit that an obese patient would get from the same operation. In any case, this is a huge problem to the whole healthcare system (Kremers et al., 2014).

Kadri was investigating the effect of obesity on the surgery duration and the results showed significant effect on extension of that duration and their direct relation. The majority of time was used up during the surgical approach (Kadry et al., 2015).

In primary hip arthroplasties, with the application of “double mobility” of endoprosthetic systems, it was implicitly confirmed that they do not dislocate to a higher degree in obese patients. The application of such systems on some obese patients seems reasonable (Maisongrosse et al., 2014).

Relationship between obesity and undesired outcome of total hip arthroplasty was confirmed in some prospective studies (Stickles et al., 2001; Smith et al., 2015; Haynes et al., 2017; Bradley et al., 2014).

Weakened muscle strength often present in obese patients could be a cofactor in the risk of dislocations after total hip arthroplasty. This specially refers to the middle gluteal muscle as the main hip abductor (Liu et al., 2015).

It is necessary to identify and pay attention to obese patients prior to total hip arthroplasty operation. Since this risk factor is correctable, conditioning and preparing a patient for surgery means that a better operation outcome can be provided. It is a challenge to design multidisciplinary initiatives for operation and all phases of recovery of obese patients after total hip arthroplasty (Jovičić et al., 2007).

Defining epidemiology of complications after total hip arthroplasty in relation to the mass body index will assist in developing strategies for improved preoperative care. There are always boundaries in medicine. Those boundaries must be appreciated. It is not good to cross the indication area boundaries for an operation regardless of how narrow they might seem.

In the case of morbid obesity (BMI above 40) the case is reversed. Even when a clear indication for operation is present, it should be postponed until decrease in body weight is achieved. More rigorous prevention to access to total hip arthroplasty could be interpreted as violation of human rights, or denial of the rights to medical treatment. Only then with studies and registries we will be able to say that hip joint arthroplasty in these domains has the character of medicine based on evidence (Evidence Based Medicine).

## CONCLUSION

Obesity is not only a public health issue, but a specific problem met by an orthopedist during the treatment of a destroyed hip joint. In association with comorbidity states, it will continue in future to have

a powerful impact on the outcomes of total hip arthroplasty. Obese patients will still have greater chance to experience complications usually calculated out as a single digit percentage, but in their case the calculation result will be hundred percent (Mason et al., 2014).

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