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Information Statement

Obesity and Musculoskeletal Care

This Information Statement was developed as an educational tool based on the opinion of the authors. It is not a product of a systematic review. Readers are encouraged to consider the information presented and reach their own conclusions.

Background

Obesity negatively affects orthopaedic management of nearly all musculoskeletal disease processes. Currently, 36% of Americans are obese and by 2030, 42 % of Americans will be defined as obese.[1] An overweight individual is an adult who has a body mass index (BMI) between 25 and 29.9 while an obese individual is an adult who has a BMI of 30 or higher. As the patient population continues to increase in age and in size, appropriate management of patients will hinge upon decisions that incorporate the underlying disease processes that arise in the setting of an elevated BMI. On the basis of global estimates by the World Health Organization in 2008, approximately 1.5 billion adults (>20y.o.) were overweight and 500 million were obese.[2]

Gallup has estimated that obesity-related healthcare costs are $80 billion annually. Current projections calculate that if the obesity rate is held constant over the next 20 years, over $549.5 billion dollars could be saved.[3] Additionally, in the US adult population, the average QALY (Quality Average Life Years) lost per person due to obesity increased 127% from 1993 to 2008.[4] Numerous orthopaedic studies have concluded that the burden of obesity is significant on a variety of outcome measures including infection risk, non-union, persistent pain, cost, and implant failure.

Whether obesity is a disease process or a modifiable/non-modifiable risk factor remains a subject of debate. Although the answers to these questions are important, they may not aid in the approach to specific problems and issues faced by the orthopaedic surgeon. The management of obesity-related complications after trauma surgery, total joint arthroplasty and spine surgery may differ from those in the non-obese. Provision of orthopaedic care in obese patients will require expanding perspectives on treatment options and challenge surgical skills.

Co-Morbid Conditions and Peri-Operative Management

Direct relationships have been established between obesity and several conditions including diabetes, coronary artery disease, deep vein thrombosis, pulmonary embolus, malignancy, obstructive sleep apnea, and asthma.[5,6,7] Although orthopaedic surgeons do not regularly manage these conditions, each condition can adversely affect surgical outcomes.

A patient with diabetes, which is directly correlated with obesity, has lower returns on education, higher unemployment, decreased household wages, more premature retirement, and increased dependence on welfare than non-obese individuals.[8] Associated conditions in an obese individual that can affect pre-operative evaluation include malignancy, diabetes, venous thromboembolism, stroke, coronary artery disease, pancreatitis, cholelithiasis, Pickwickian syndrome, and obstructive sleep apnea. [5,6] Consequently, in the peri-operative period, obese individuals are more prone to premature death than non-obese individuals.[9]

General Anesthesia poses specific challenges in the setting of obesity. Anesthetic intubation with a fiber-optic intubation may facilitate appropriate ventilation.[10] Regional anesthesia can be utilized to minimize these risks but may be difficult to perform adequately due to anatomic distortion. Individualized anesthetic plans should be developed in a scheduled preoperative evaluation.

Pressure ulcerations, nerve palsies, and compartment syndromes more readily occur in obese than non-obese individuals. As a result, care should be taken to thoroughly and adequately use well-padded tables and boards to prevent these iatrogenic conditions during surgery or other procedures.[11,12]

Total Joint Arthroplasty

Obesity has a direct result on the development of osteoarthritis of the hip and knee joints. In the knee, the Canadian Joint Registry data reported that the need for having a total knee arthroplasty was 8.5 times greater for individuals with a BMI > 30, 18.7 times more likely for those with a BMI > 35, and 32.7 times more likely in patients with BMI > 40 compared to individuals of normal weight.[13] The number of obese patients undergoing total joint arthroplasty has continued to increase as well as the utilization of TKA in obese patients has doubled from 2002 to 2009.[59]

Obese individuals do benefit from total knee arthroplasty, but tend to have higher complication rates.[62,63] Data are still unclear on whether functional outcomes differ in obese and non-obese individuals receiving a total knee arthroplasty. There may be a "glass ceiling" in clinical improvement for obese individuals.[64]

Total knee arthroplasty in morbidly obese individuals has higher risks of infection, increased blood loss; wound related problems, avulsion of the medial collateral ligament, component malpositioning, extensor mechanism rupture, and patellar maltracking.[60] These complication rates also increase as the BMI increases. In medial unicompartmental arthroplasty, obese individuals are more likely to develop component loosening, failure, and fracture. Additionally, obesity has been shown to have a negative impact on clinical outcome.[14]

Weight loss may reduce the risk for developing symptomatic knee osteoarthritis and may also lead to the resolution of arthritic symptoms.[61] The data are unclear but suggestive that marked weight loss is both not maintained nor does it likely occur after a patient undergoes total joint arthroplasty, as patient activity does not change significantly.[15,16]

In total hip arthroplasty, there appears to be evidence that obesity has a direct association with infection rates. Obese patients have higher risks for hardware malpositioning, thromboembolic events, higher blood loss, loosening, infection, and ultimately, catastrophic failure.[17] Currently, there are data that support the use of total hip arthroplasty in obese individuals as functional outcomes and pain may be equal in obese and non-obese individuals.[65]

There may be a higher risk of deep venous thrombosis in obese individuals after undergoing total joint arthroplasty although current data are insufficient to determine this as fact. [18]

Although obesity is defined as a BMI > 30, patients with a BMI > 40 appear to have even higher complication rates after total joint arthroplasty and should be counseled as such prior to surgery.

Pediatrics

Obesity also affects approximately 17% of all children and adolescents in the United States, which is triple the rate from just one generation ago.[19]

Blount's disease is directly associated with pediatric obesity due to mechanical forces leading to varus deformity of the proximal tibia.[20] Furthermore, obese children also have increased risk for genu valgum and recurvatum.[21]

Slipped capital femoral epiphysis (SCFE) has an increased incidence in obese adolescent to pre-teen males. The prevalence of SCFE is currently rising along with the presentation at an earlier age.[22] Although most cases of SCFE are unilateral, bilateral SCFE is seen more commonly in obese children.[23]

In obese pediatric trauma patients, fractures are more likely to occur in the distal part of the extremity when compared to non-obese pediatric trauma patients. This includes the distal radius, distal tibia, and distal femur.[24] This is thought to be due to the soft tissue protection over the diaphyseal portion of the bones.

Spine

Although low-back pain is associated with obesity, it may be affected by other confounding variables such as socioeconomic status, poor coping skills, and job dissatisfaction.[25,26] Recent clinical studies conclude that gastric bypass patients demonstrate reduced low back pain after loss of substantial weight and suggest that excess weight can lead to more pronounced symptoms.[58]

Lumbar disc degeneration has been associated with increased body weight. , Although patients often claim that weight loss is inhibited by low back symptoms, surgical treatment for lumbar stenosis has not been shown to reduce body weight in obese patients.[29,30] Pain relief is however successful.

Open surgical decompression in the obese patient has a higher risk of complications including hardware failure and infection, while newer percutaneous, less invasive treatments show promise to diminish these risks.[31,32]

When treating idiopathic scoliosis, obese surgical patients have higher complication rates than non-obese patients.[33] However, one of the difficulties in management may be poor brace fit and wear in obese individuals.

Shoulder and Elbow

As previously noted, soft tissue disorders occur more commonly in obese individuals. Rotator cuff tendonitis and shoulder impingement are two conditions that have been shown to follow this general trend.[34] Treating obese individuals with rotator cuff injuries has also shown to have a negative impact on the operative time, length of hospitalization, and functional outcomes.[35]

As with any joint, shoulder arthroplasty requires precise osteotomies and careful soft tissue handling. In humeral head replacement surgery, obesity has been shown to be a risk factor requiring a revision surgery while reverse total shoulder arthroplasty has been shown to have successful clinical outcomes but with higher complication rates in obese individuals.[36,37]

Hand

Surgical management of several hand conditions can be affected by obesity. Carpal tunnel syndrome has been shown to be directly correlated with obesity. [38] Weight loss, however, does not lead to an improvement of the symptoms.[39]

Multiple trigger fingers have been shown to be more common in obese individuals than non-obese individuals.[40]

Generalized hand function can be affected by weight gain, as earlier onset of obesity has been shown to lead to a direct decrease in hand grip strength.[41]

Foot and Ankle

Chronic overuse disorders of the foot and ankle are more common in obese individuals. This includes Achilles tendonitis, plantar fasciitis, and posterior tibial tendon dysfunction. As the posterior tibial tendon dysfunction progresses to a pes planus deformity, the plantar fasciitis and Achilles tendonitis that develops can be even more pronounced and difficult to treat.[42,43,44,45] Additionally, stress fractures and Charcot feet are noted in obese individuals, as those conditions correlate with diabetes.

Sports and Arthroscopy

Obese individuals may participate in fitness activities but are at risk for particular conditions. Meniscal tears and rotator cuff tendonitis occur more readily in obese patients than non-obese patients.[46] Additionally, arthroscopic surgery for these conditions can be difficult due to the loss of superficial landmarks utilized during the procedure, which can lead to adversely affected functional results.[47 66] Complications can also be greater with the added co-morbidity of obesity.[67]

Obese patients undergoing anterior cruciate ligament (ACL) reconstruction are at a greater risk for developing post-traumatic osteoarthritis.[48]

Malignancies

Obesity has been linked to several malignancies. Specifically cancers of the colon, breast, endometrium, liver, kidney, esophagus, thyroid, stomach, pancreas, gallbladder, and leukemia have been associated with increasing body mass indices.[48,49] In treating obese individuals with bone metastasis, reconstruction should be performed to handle long-term loads due to improved clinical outcomes with newer oncologic treatments.

Trauma

Although obese individuals sustain abdominal and pelvic injuries less commonly in motor vehicle accidents than non-obese individuals, they are at greater risk for distal femur, ankle, calcaneus and internal degloving injuries.[50,51,52,53] Low energy falls can lead to spontaneous knee dislocations which could lead to popliteal artery injuries and, possibly, amputation.[54] In the trauma setting these patients present in a unique manner since there is limited time to counsel patients on the need to correct any metabolic and/or nutritional deficiencies that affect orthopaedic outcomes. Wound healing and deep infection are significant concerns due to the need for larger exposures and compromised blood supply to adipose tissue.

Obese elderly individuals more commonly develop extra-capsular proximal femur fractures whereas thin individuals are more apt to develop intra-capsular femoral neck fractures. Additionally, in the setting of a femoral shaft fracture, obese individuals are more likely to have a missed proximal femur fracture.[55]

Due to the difficulty in placing an antegrade intramedullary nail, obesity is a relative indication for retrograde nail fixation or antegrade nail fixation in the lateral position. Multiple screw fixation is recommended to prevent hardware failure, just as in fixation of ankle, peri-articular, and pelvic fixation.

Obesity increases difficulty in obtaining adequate intraoperative imaging and increases the risk of hardware failure, wound healing, and deep venous thrombosis in the trauma setting.[68,69,70,71]

Advanced imaging

Most MRI and CT scanners have weight limits that conventionally do not exceed 450 lbs (202.5kg). Obese patients may not fit in these machines or they may exceed the maximum weight and therefore are restricted from obtaining advanced imaging. The lack of discriminate information that can be obtained from these studies can directly lead to inaccurate, inappropriate, or unnecessary treatment. Individuals have been reported to be imaged in veterinary schools or zoos.

Office-based/Care setting concerns

Other hospital and physician office equipment can also pose concerns. Chairs and exam tables may have weight limits and sizes that may not accommodate obese patients. Likewise, OR and procedure tables, as well as imaging tables and gantries may not support or function correctly above variable weight limits.

Patient movement and transfers can be more difficult and represent safety hazards to patients and health care workers if done improperly.

Patients report that their weight is a barrier to obtaining appropriate health care and physician attitudes have a significant contributory component to establishing that barrier. These physician attitudes may have a role in not adequately addressing the safety issues present in the healthcare environment. Looking upon these issues as the patient's problem rather than a problem in the design of healthcare facilities and equipment inhibits their correction.

Projections

Annual medical costs related to obesity topped $147 billion in 2006. With the current plans for the enrollment of most uninsured individuals under the Patient Protection and Affordable Care Act, current data suggest that obese individuals will comprise a large portion of those seeking insurance benefits, which will likely result in significantly higher government costs than previously projected due to the tremendous fiscal burden that obesity currently has on health care.[56]

Conclusion

AAOS recognizes that obesity is not a choice, but rather a complex, multifactorial process that affects a large number of patients and in most cases contributes negatively to their musculoskeletal problems. Our approach to these patients should encompass aid in the medical management of the issues associated with their obesity, as well as the potential surgical care that can help with both their general health as well as specific musculoskeletal problems . Likewise, it is equally important to assure the safety of healthcare facilities addressing those situations specific to the obese patient.

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