

Joint and obesity, Adverse effects and means of prevention

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Abstract :

Obesity is the consequence of two different entities: adiposity, which is an exaggeration of the body's fat tissue, and Obesity itself, which is responsible for an increase in mechanical stress on the weight-bearing joints. These two phenomena are at the origin of the appearance of osteoarthritis. The articular disorder appears especially at the knees and hips, much less at the joints of the wrists and hands (Francis Berenbaum, 2008, p1). The role of overweight in the development and chronicity of low back pain remains to be clarified. Mechanical overload alone does not provide a satisfactory explanation for other pathologies associated with obesity (such as rheumatoid arthritis), hence the hypothesis of the existence of a metabolic factor. The early management of this obesity reduces the risk of developing osteoarthritis including knee, sometimes even with a moderate reduction in weight. Obtaining weight loss should be part of a "new lifestyle" project (Meyer L, 2003, p3528).

Key words: obesity; osteoarthritis; prevention

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1. Introduction

According to the World Health Organization (WHO), 35% of adults in the world are obese or overweight (Julia C and Hercberg, 2015, p.1). Obesity is the evil of the century, likely to lead to chronic osteo-articular deterioration with major physical disability. Obesity is a public health problem not only because of its cardiovascular and metabolic complications, but also because of its impact on the musculoskeletal system. Indeed with overweight by itself, the risk is multiplied by 5 to see such an osteoarticular disorder. Increased body fat is reported to correlate with decreased knee cartilage thickness, and its reduction is significantly associated with improved clinical symptoms of knee osteoarthritis than weight loss (Rat, 2016, p.14). The origins of obesity are multifactorial resulting from multiple genetic factors associated with environmental factors (Faucher, 2015. p.5), responsible for excess morbidity and excess mortality (Jean-Louis Schlienger, 2010, p.914).

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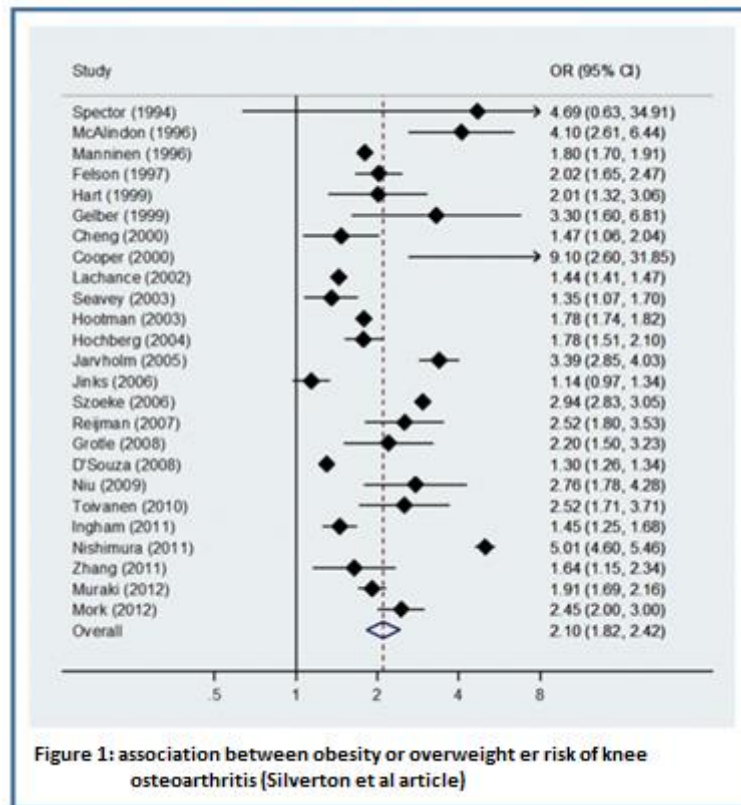
Changes in diet and the reduction of physical activity play an incontestable role in the recent emergence of obesity. Why do we let these pathological situations happen, what is the risk to the life's quality (Meyer, 2003, p.3532), and above all, how to prevent these very painful diseases?

2. Issue

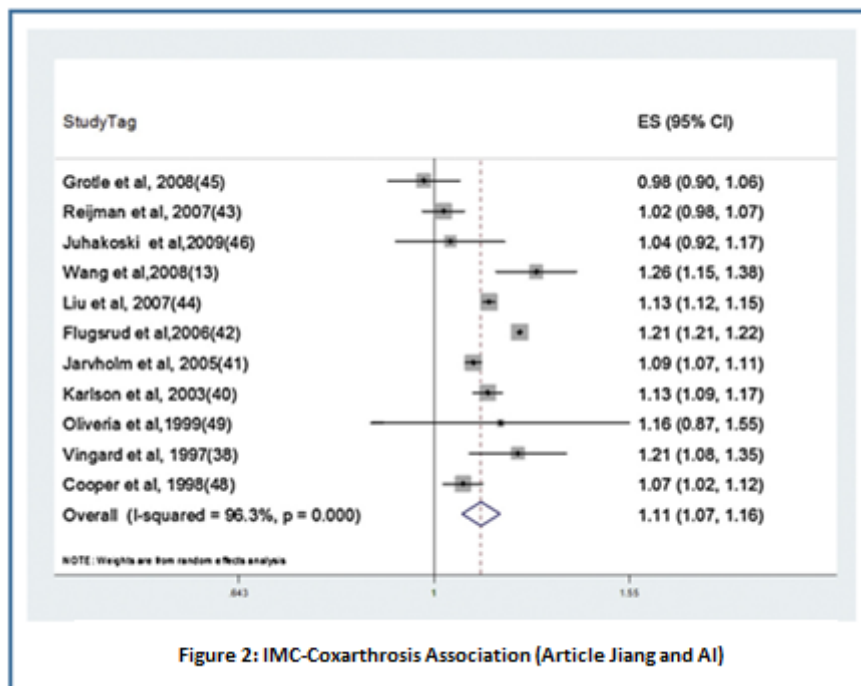
In addition to the mechanical consequences of overweight, the risk of osteoarticular disease is also higher in obese people because of their metabolism. At the origin of chronic osteoarticular pain, sometimes unbearable, which can settle permanently and systematically at the slightest solicitation of the joints. Wear can also result in replacement of the joint with a very expensive prosthesis. Hip and knee prostheses are more common in people with obesity.

3. Locomotor impact of obesity

3.1. Obesity and gonarthrosis: Obesity is a key risk factor for knee osteoarthritis (Rat, 2016, p.2). In the study by Reijman and Al (Reijman, 2007, p.160), the association between obesity and the risk of knee osteoarthritis was found, the association of which was significant between BMI > 30 and radiographic knee osteoarthritis. A recent meta-analysis found the association between BMI and knee osteoarthritis by showing a dose effect. An increase in BMI of 5 units was associated with an increased risk of knee osteoarthritis of 35% (RR: 1.35 [95% CI: 1.21-1.51]). The association was stronger in women (RR: 1.38 [95% CI: 1.23-1.54]) than in men. Overweight and obesity are constantly risk factors for knee osteoarthritis (Jiang & Body, 2012, p.159)? and it was held that the risk factors taken into account so far are only age, race, female sex and obesity are strongly related to knee osteoarthritis (Fig. 1).



3.2. Obesity and osteoarthritis: Obesity slightly increases the risk of symptomatic or radiological hip osteoarthritis, especially for bilateral forms. Obesity is a risk factor for hip replacement. The relationship between obesity and hip osteoarthritis was found mainly in favor of an increase in clinical prevalence and not radiological. Namely, the risk is multiplied by 2 in case of obesity, which has been demonstrated in a recent meta-analysis (Lievens AM and Verhagen AP, 2002) (Liyang, 2010, p. 571). Prosthetic hip replacement is largely due to coxofemoral osteoarthritis, advanced age, and obesity (Karlson, 2003, p.97)



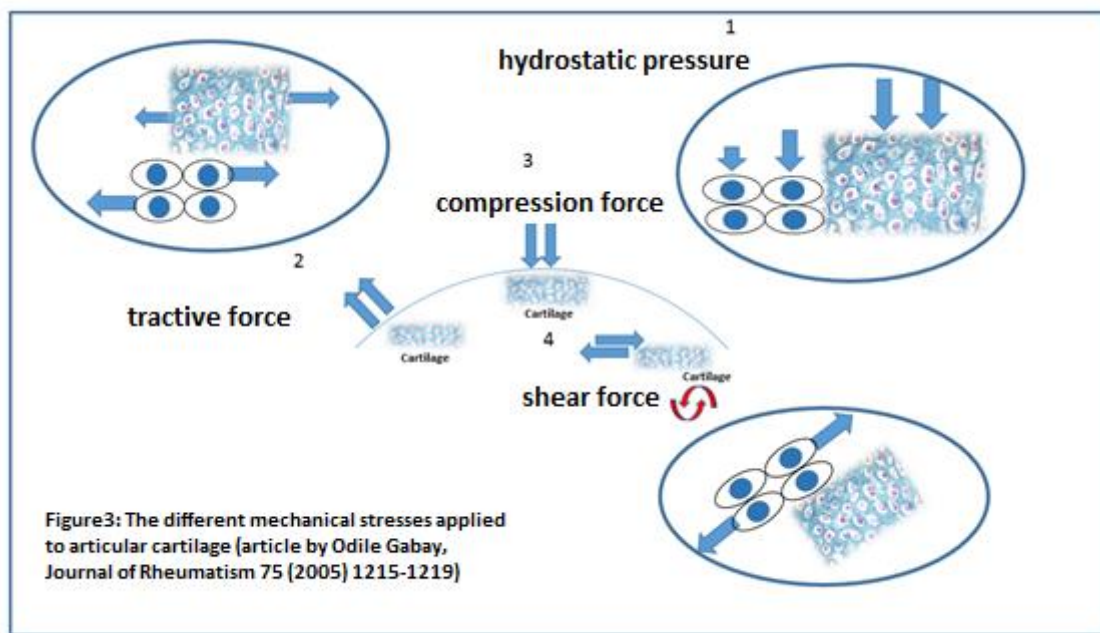
3.3. Obesity and low back pain: Obesity works by modifying more and more the vertebral statics, thus favoring lumbar hyperlordosis and increasing posterior articular constraints (the 4 / 5th of the weight of the body will rest on this region instead of being the 1 / 5th in the non-obese subject). A recent study in subjects aged 20 to 60 years showed a significant increase in disc-related low back pain in both sexes when BMI and abdominal perimeter were elevated (Lievens & Verhagen, 2002).

In fact, the excess weight aggravates the wear and the degeneration of the intervertebral disc, overloads the posterior articulations of the vertebrae, but also promotes ligament pain and muscle relaxation.

3.4. Obesity and digital osteoarthritis: Obesity is not only a risk factor for osteoarthritis of the weight-bearing joints but also for digital osteoarthritis (Courties A, 2016, p7). Studies have shown that obesity is a risk factor for osteoarthritis of the knee, particularly in women (Cicutini FM, 1996, 1225). This discovery illustrates the possibility of a systemic role of obesity in the pathogenesis of this disease.

4. Mechanisms in cause

Osteoarthritis is a multifactorial condition. Age and obesity are the most known risk factors for osteoarthritis. Various experimental models are used to study the effect of obesity and overweight on osteoarthritis. Cartilage subjected to mechanical constraints in vitro is the most studied model. The forces that can be applied on the cartilage are of four types: shear, compression, traction and hydrostatic pressure (Fig 3).



4.1. Effects of mechanical stresses on cartilage and bone

In the joint cartilage and subchondral bone (Berenbaum, 2008, p.937), are permanently subjected to various mechanical constraints. The chondral tissue is subjected to four mechanical stresses: compression, shear, tension and hydrostatic pressure (Fig. 3).

Various in vitro studies have demonstrated that production by extracellular matrix chondrocytes is significantly influenced by the mechanical signals generated by the existence of stresses. Sport and moderate exercise have a beneficial effect on cartilage structure (Gabay, 2008, p.1217), while excessive or static stresses create an imbalance between anabolism and catabolism within the cartilage.

The function of osteoblasts is closely related to the production of cytokines, growth factors and prostaglandins (PG). The mechanical stresses influence the production of some of these compounds.

4.2. Role of Adipokines in osteoarthritis

Recent studies have shown a correlation between osteoarthritis of the hand and obesity. In 1994, the discovery of leptin, allowed to understand its role in adipose tissue (Courties, 2016, p.2). It is the main adipokine and its role has been extensively studied (Berenbaum, 2008, p.938). Leptin works in combination with adipokines (adiponectin and resistin) and very narrowly to provide a regulatory effect on the effects of insulin, inflammation, homeostasis and certain pathological events (Fig.4).

4.3. Role of cardiovascular comorbidities, hyperglycemia and insulin resistance

Obesity and osteoarthritis fit into a wider clinical profile, in fact, due to their integration into the link between osteoarthritis and metabolic syndrome, the cause of metabolic osteoarthritis. Cardio-metabolic pathologies (arterial hypertension, diabetes and insulin resistance), through metabolic stress, can trigger meta-inflammation (chronic low-grade inflammation), ultimately leading to a osteoarthritis. The association in osteoarthritis and diabetes is also observed for digital osteoarthritis (Courties, 2016, p.4).

4.4. Scientific research: Role of the intestinal microbiota in osteoarthritis related to obesity?

Both quantitative and qualitative intestinal macrobiota dysfunction have been observed in obese subjects accustomed to a high calorie diet. In whom there has been disturbance in the metabolism incriminated in chronic low grade inflammation (meta-inflammation). Delay, the involvement of this dysbiosis in the genesis of metabolic osteoarthritis has been demonstrated. This track to explain the relationship between obesity and osteoarthritis deserves the attention of researchers and deepen the scientific work (Courties, 2016, p.5).

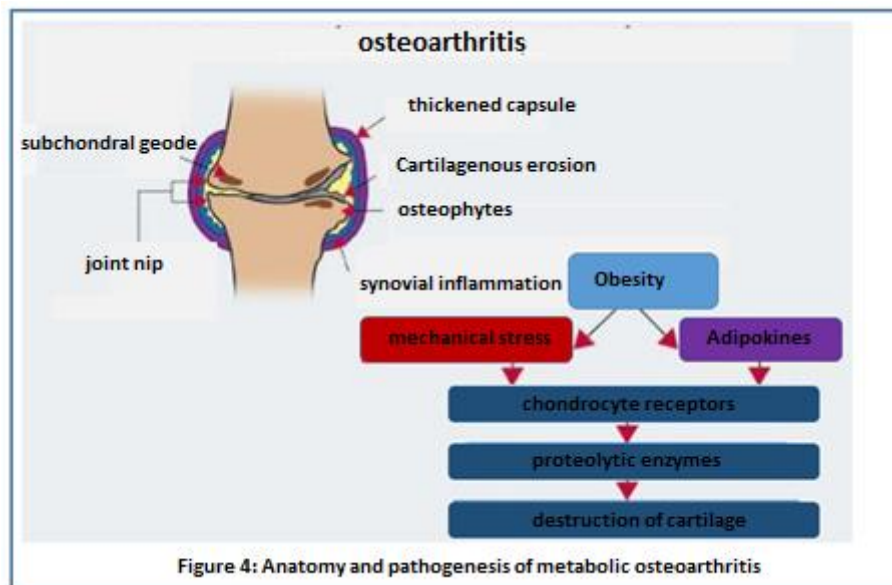


Figure 4: Anatomy and pathogenesis of metabolic osteoarthritis

4. What causes obesity?

- A high-calorie and high-fat dietary lifestyle leads to an imbalance in the energy balance and an increase in adipose tissue.
- International studies suggest that obesity is more and more common whose gene has been found to be "gene" (Zhang, 1994, p.425). Our way of life has fundamentally changed in recent decades, and seems to be responsible for this disorder. Our diet is too unbalanced, to this is added the notion of sedentary lifestyle. We are moving less and less in relation to many technological innovations. In other words, our diet provides us with considerable energy that our sedentary lifestyle makes partially useless. This imbalance leads to the storage of unused energy in the form of adipose tissue, resulting in weight gain and sometimes congested degrees of obesity.

5. Health risks related to obesity outside joint damage

- Diabetes (type II, non-insulindependent).
- Hypertension Francis Berenbaum, 2008, p938), increased blood lipids (hyperlipidemia) (Courties, 2016, p.4).
- Beyond BMI of 27, increased cardiovascular risk.
- Risk of developing certain cancers.

- Gall stones.
- Venous insufficiency and increased tendency to thrombosis and embolism.
- Decline in quality of life and life expectancy.

7. Preventive measures to be taken (a hygienic and dietary way of life)

- Adopt a low-calorie diet lifestyle: less candy and fat, more fruits, and vegetables.
- Exercise regularly (eg walking, swimming, biking, taking stairs more often, less often driving). Even if the first efforts seem minimal, they are essential: they represent the beginning of your approach.
- Incorporate these changes into everyday life.
- Consult your doctor according to the importance of obesity.

8. Discussion

Obesity therefore represents a serious danger, especially on the joints; Beyond various diseases and restrictions, it can also mean a decrease in life expectancy. This has been confirmed in many studies that have also signaled the importance of prevention and the need for adequate treatment of obesity. It is imperative to know that every kilogram of weight lost results in a 4-fold reduction in knee load per step during daily activities (Messier, 2002, p.2030).

Conclusion

The osteoarticular degradation, all localizations combined, is extremely frequent. Obesity exacerbates functional disability, painful symptomatology and alters quality of life (Meyer, 2003, p.3532). It is therefore very desirable to prevent this obesity by setting up a national action with multiple and synergistic partners (Julia & Hercberg , 2015, p.1), and to take care of it early as well as the functional and painful consequences of osteoarticular pathologies. The benefit of a global management of this obesity associating weight loss, even moderate, and regular program of activity is amply demonstrated.

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