

Hip arthrosis and surgical intervention: what and when?

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Summary

Osteoarthritis of the hip is a common pathology and involves forms of disability and need for treatments that affect the quality of life of patients and their families, and in general of the whole society. It should be considered as such degenerative joint disease is increasing as the increase in life expectancy and musculoskeletal trauma, the latter responsible for secondary forms of osteoarthritis. The treatment of osteoarthritis of the hip has changed a lot over the years, since the earlier diagnosis and, before, with prevention through proper lifestyle. More in-depth knowledge of the biology of the tissues involved, first of all hyaline cartilage, has led to non-surgical treatments such as infiltration with hyaluronic acid (viscosupplementation) and autologous growth factors derived from platelets (platelet rich plasma). Surgical therapy with prosthetic replacement is finally a choice to share with the patient based on pain and functional limitation, bearing in mind always the best technology and tribology and the possibility of less invasive surgical access, while recognizing that there are not still eternal prosthesis. Of particular importance then is the age of the patient. There are also other types of surgery (hip arthroscopy, forage) for other pathologies of the hip which can be resolutive, or, in a sense, can delay the arrival to the prosthetic replacement. We will discuss below the decision-making process that leads the surgeon with the patient to the surgery option.

KEY WORDS: hip arthrosis; hip arthroplasty; viscosupplementation; growth factors.

Introduction

“To try to enunciate the golden rules to guide the choice of patients for total hip arthroplasty is an impossible task” (John Charnley 1979) (1).

Since sir Charnley told this phrase more than 30 years have been spent, but it is not yet possible to establish a rigorous criteria by which to select patients candidates for total hip arthroplasty and the definition of when to operate remains a complicated process that involves both the surgeon and the patient.

The surgeon has to provide his store of knowledge and the patient has to report his symptoms and his complexive state of health, not only his x-rays.

The scope of a hip arthroplasty is to relieve patient from pain and to restore his articular functionality, so we cannot forget how these two parameters are fundamental to evaluate if a patient is a candidate to this surgical intervention.

In fact, in 1994 a Consensus Conference of the American Institute of Health stated that the indication for total hip replacement was represented by “pain and functional limitation moderate or severe, associated with radiographic evidence of impaired joints, and that were not substantially modified by a complete non-surgical treatments”.

But it is clear that this definition is too difficult to apply if we don't consider age, body mass index, comorbidities and hope and expectations of the patient (2).

The purpose of this chapter is to try to rationalize the factors to be considered in reaching a final decision.

We believe that it is useful to distinguish: 1) primary factors to the indication, 2) modifying factors, 3) risk factors, 4) contraindications, 5) patients' expectation.

Primary factors

Pain and functional limitation

As already mentioned, the primary factors for assessing claims to a total hip replacement are pain and limitation of joint function.

Therefore, it is firstly important the anamnesis that allows us to classify the patient and to classify the type of pain. The parameters examined are: the site of pain (buttocks, trochanter, groin, thigh), onset of pain (acute, subacute, chronic), occurrence and intensity of pain (after functional commitment, at rest, strong, mild), if there is a sensation of articular click or snap, if the pain is limited to the hip or if there are other articulations involved, if there are systemic symptoms (fever, loss of weight), if the patient has had previous surgery at the hip, previous tumors.

Then an accurate objective exam will evaluate the general aspect of the patient, how the patient walks, if there is lame of escape or of fall (Trendelenburg sign), the range of motion in an analytic manner (flexion-extension, intrarotation-extrarotation, abduction or adduction), and we will note if any of these movement will exacerbate the pain or will trigger the pain. A complete objective exam cannot avoid to note if there hypotrophy of muscles of the gluteus and of the thigh, and also neurovascular exam of the whole inferior limb.

The scores

To standardize the indications for some time there has been felt the need to have recourse to systems of scoring that, on the basis of an analysis of certain parameters, enabling it to quantify in the first place the initial impairment and later results obtained with the treatment adopted.

Even if all the scoring systems have the defect to add each other patchy factors and they cannot describe in an exact manner the symptoms reported by the patients, however they allow to quantify a situation and to compare the results obtained with a treatment but also to evaluate the indications to a certain intervention.

In this sense we distinguish three categories of scores: in the first there are those who consider in an elective the exclusive examination of the hip, in the second group includes those scores that evaluate in a more extensive involvement of the lower limb with joint disease, and finally in the third category includes those scores that do not specifically evaluated in an individual diseases, but oriented towards the patient's expectations, consider the overall impact on quality of life that causes the disease.

In our experience, we consider the most appropriate and with the largest diffusion for each kind, the Harris Hip Score for the first one, the WOMAC for the second and the SF-36 for the third.

Harris Hip Score

The evaluation board to the most popular for the assessment of hip disease remains the one proposed by Harris in 1969.

This form, that has to be filled in by a doctor, is composed by four sections: pain, function, deformity and range of motion. For each section there is a score and the maximum score is 100 (3).

More specifically, the card is mainly oriented towards the assessment of pain and function for which they are provided respectively 44 and 47 points, while significantly lower scores are reserved to the deformity and the range of motion, and in fact the data is considered reliable only for the first two sections and in particular as regards the assessment of the pain and the path.

An analysis of the literature shows us how the pre-operative average score of patients undergoing surgery of the hip prosthesis was between 40 and 50 points, but as yet the standard deviation was very high, to indicate this score alone is not sufficient for the indication to the prosthetic replacement.

This score can therefore be considered as a first step in the assessment of the patient primarily designed to quantify the initial functional impairment and improvement after surgery.

WOMAC

The WOMAC takes its name from the Canadian center in which it was developed: Western Ontario and McMaster University (Bellamy et al. 1988) and represents a specific index for the evaluation of arthrosis of the hip and knee. It is filled in just by the patient, and includes three sections. One for the pain (five questions), one for the rigidity (two applications) and one for the function (seventeen questions). For each application can be used on a scale from 0 to 10 according to a visual analog scale, or it can be expressed as a semiquantitative evaluation in 5 shades. The latter system in our opinion is the one that is most easily understood by the patient and may even be applied in less cooperative patients and by telephone (4).

Compared to specific index for the hip it gives an evaluation in the section of the physical function of how an articular pathology involve the most common activities of the daily life, as to go in and outside of a car, to go to the bathroom, to care of his personal hygiene, to make household chores, etc., allowing the doctor to understand how really the pathology of the hip limits

the life of the patient (5).

Today, both the AAOS and SICOT recommend to use an evaluation system as the disease-specific WOMAC in any study of total hip replacements (6).

As other analogous systems, it allows, with absolute scientific standard to measure the symptomatology of a pathology, assessing how the patient feels his disease without the intrusion of a doctor, and it is in our opinion the scoring system that best fit to the indication of a hip arthroplasty. In the Table 1 we show the version we use: for each section the patient states his evaluation on the seriousness of the symptoms for each questions of the section, receiving a score from 0 to 4. The total score ranges from 0 (the worst scenario) to 96 (the best scenario), that it is normalized to 100 for a better comparison with other form. In a survey from the American hip register (that analyses more than 2000 implants), the mean pre-operative score was 44 (Table 1).

SF-36®

The SF-36® (Short Form 36) is a questionnaire consisting of 36 questions that is not specific to a disease, but has been developed to describe a generic concept of health intimately related quality of life.

Also compiled by the patient, is composed of 8 groups of questions. Three groups of questions: physical activity, role physical and bodily pain, are closely correlated with the physical component of the disease, two of these: the mental role and emotional state, are related to mental health and finally the last 3 scales: vitality, general health and social work have a correlation with both components. The results of the scores of the eight domains are combined into two summary scores, one for physical and one for mental health.

The system that evaluates the quality of life represents a way to really understand what the patient needs, that most of time does not need only to eliminate pain and restore articular function, but also to recover a good mental health that the disease had distorted (7). There is no actually a demonstration that this scoring system is valid to define an indication to hip arthroplasty (8).

Modifying factors

The analysis of the primary factors for the indication to a surgical intervention of hip arthroplasty considers all these factors that are related to the pathology itself and so to the symptoms and its relative functional impotence. We have seen that after an initial evaluation performed by the doctor on the specific troubles of the hip (HHS) we also follow as indication what the patient evaluates about his functional restriction (WOMAC) and his quality of life (SF-36) (9).

There are moreover other additional factors, that are noticed only by the surgeon, that can modify the indications to hip arthroplasty and that, in particular when the indications are relative, will acquire a fundamental role (10).

In some case they will act as factors to postpone the surgical intervention (choosing a non surgical therapy as viscosupplementation or growth factors), in other case to exclusion factors.

Radiographic evaluation

The radiographic examination, although essential for the surgeon for the pre-operative planning and for the choice of the type of system most suitable for the patient, however, very often does not provide essential information in the evaluation of the indication to an intervention of arthroplasty of the hip, as our experience shows that often the degree X-ray is not related to the actual functional impairment of the joint (40% of patients with radiographic abnormalities are asymptomatic) (11).

The radiographic projections are the basin under load, antero-

Table 1 - WOMAC Index.

Indicate intensity of pain while:	Pain:				
	None	Slight	Moderate	Severe	Extreme
1. walking	4	3	2	1	0
2. stairs climbing	4	3	2	1	0
3. nocturnal	4	3	2	1	0
4. at rest	4	3	2	1	0
5. weight bearing	4	3	3	1	0

Indicate how is the stiffness:	Stiffness:				
	None	Slight	Moderate	Severe	Extreme
1. morning stiffness	4	3	2	1	0
2. stiffness occurring later in the day	4	3	2	1	0

Indicate how difficult is to do these actions:	Physics function:				
	None	Slight	Moderate	Severe	Extreme
1. descending stairs	4	3	2	1	0
2. ascending stairs	4	3	2	1	0
3. rising from sitting	4	3	2	1	0
4. standing	4	3	2	1	0
5. bending to floor	4	3	2	1	0
6. walking on flat	4	3	2	1	0
7. getting in or out of a car	4	3	2	1	0
8. going shopping	4	3	2	1	0
9. putting on socks	4	3	2	1	0
10. rising from bed	4	3	2	1	0
11. taking off socks	4	3	2	1	0
12. lying in bed	4	3	2	1	0
13. getting in or out of a bath	4	3	2	1	0
14. sitting	4	3	2	1	0
15. getting on or off toilet	4	3	2	1	0
16. heavy domestic duties	4	3	2	1	0
17. light domestic duties	4	3	2	1	0

Table 2 - Measurement of radiographic hip osteoarthritis (OA).

Measure, feature	Score or grade
Individual radiographic features (IRF)	
Joint space narrowing (superolateral, medial)	0-3
Osteophytes (superior, inferior)	0-3
Subchondral sclerosis	0-1
Subchondral cysts	0-1
Femoral head deformity	0-1
Summary grade of radiographic findings in each hip	
Normal (no findings of OA)	0
Possible osteophytes (IRF grade 1) and/or narrowing (IRF grade 1), or isolated definite osteophytes or narrowing (IRF grade \geq 2)	1
Definite osteophytes or narrowing (IRF grade \geq 2) plus cysts or sclerosis	2
3 of the following: definite osteophytes or narrowing (IRF grade \geq 2), cysts or sclerosis	3
Grade 3 (as above) plus femoral head deformity	4

posterior and lateral 30X40 and allows us however to identify and stage the disease (Table 2).

In some case a CT scan can help or a MRI can be necessary to arise a surgical indication. And this surgical indication can be less invasive, for example allowing us to detect an avascular necrosis in a early stage (that can be treated with decompression and bone with stem cell and a bioceramic) or femoroacetabular impingement (that can be treated with arthroscopy).

Age

The patient's age is an important parameter to consider in setting the indication of a hip arthroplasty. In fact the duration of the arthroplasty is still limited to the wear of the materials. The data reported in the literature, considering the prosthesis older generation (1979-1987), showed a survival rate at 19 years of 82.1% of cemented implants and 61.9% at 15 years of cementless implants. The improvement of materials and surgical techniques have resulted in a reduction of course failures as

demonstrated by data from the Swedish registry reported to the ski run from 1987 to 1997: 10-year survival was 94.6% for cemented prostheses and 85.8% for the uncemented prosthesis. However, the same Swedish record shows that the revision rate in patients older than 55 years is much higher: 81.2% at 10 years for men and 79.7% for women more than 10 years (12). In recent revision published in 2012 by Trumm et al. (13) we can see that with a follow up of twenty years using cementless acetabular cup, considering aseptic loosening as the end point, a survival rate of 97.7% was found so results are still going to increase, while old implants (Charnley Hip prosthesis with twenty five years of follow up shows 23% of revision, as we can see in an article published by Callaghan et al. in 2000) (14). Even second generation of emispherical cup have led to survival of 96.4 % at ten years (15). Good clinical and always better results seems to be reported even for what concerns new design of stem.

We can suggest that, even if it is always improving the revision techniques and revision implants, if the patients is under 50 years we have to suggest surgical interventions only in particular and severe functional limitations, a relative indication in patients between 50 and 60 years and an elective indication in patients above 60 years.

Pathology

There are pathology, that differently from arthrosis, in which the articular distruction progress quickly so that postpone the surgical indication can complicate the intervention itself. In these cases the surgeon has to suggest the surgery option before pain and limitation of the function become disabling. We can mention rheumatoid arthritis, in particular when there is protrusio acetaboli, hip necrosis, tumoral pathology, etc.

But as we have already told, there are also pathologies as avascular necrosis that in an initial phase can be treated with other kind of intervention less invasive (for example decompression with tantalum rod or forage and graft with bone and stem cells and growth factors and filling defects with bioceramic) (16). Or other kind of disease like femoro-acetabular impingement that in the two ways of presentation (CAM or PIN-CER) can be treated with arthroscopy (17).

These two pathologies just now mentioned can be treated in a surgical manner even in patients with young age, because the intervention gives pain relief and restore function making the patients to return to an active life.

Risk factors

In this group we consider those factors, not directly related to the underlying disease, but which can significantly increase morbidity peri-and post-surgery, and the doctor who must decide when to operate on a patient with them must always keep in mind these factors when present, if not such as to preclude the intervention, to implement adequate prevention pre-operatively.

Inferior limb pathology

There is a lot of local clinical conditions that can interfere in negative manner with a hip arthroplasty. We have to remember neurologic diseases (poliomieliytis, mielomenigocele, spastic pathology, Parkinson and parkinsonism, etc.) and vascular pathologies (deep venous thrombosis, superficial venous insufficiency, peripheral arteriopathy), skin problems (psoriasis, previous surgical incisions).

Weight

The presence of a body overweight has been related to a slower functional recovery, with increasing aseptic loosening, so in grave obesity the indications should be proposed only in ex-

Table 3 - Classification of BMI.

Classification of BMI		
GRADE 1	Less than 18.5	Underweight
GRADE 2	18.5 - 24.9	Normal
GRADE 3	25 - 29.9	Overweight
GRADE 4	30 - 35	Obesity of first degree
GRADE 5	35 - 40	Obesity of second degree
GRADE 6	> 40	Large obesity

treme cases of pain and functional limitations and only after having tried in all manner to reduce weight with diets or surgical bariatric intervention. We can evaluate weight using body mass index that is calculated dividing the weight in kilos by the square of the height expressed in meters. We can distinguish 6 degrees (Table 3).

General pathology

With regard to the general conditions, however, we must consider those that increase the risk of mortality or morbidity, peri- or post-operative, such as cardiovascular disease, lung and kidney disease and diabetes.

In this connection we may refer to the criteria of the American Society of Anesthesiologists (ASA score) (18) (Table 4).

Table 4 - ASA Score.

Class	ASA Score
1	No organic pathology or patients in whom the pathological process is localized and does not cause any systemic disturbance or abnormality. Examples: This includes patients suffering with fractures unless shock, blood loss, emboli or systemic signs of injury are present in an individual who would otherwise fall in Class 1. It includes congenital deformities unless they are causing systemic disturbance. Infections that are localized and do not cause fever, many osseous deformities, and uncomplicated hernias are included. Any type of operation may fall in this class since only the patient's physical condition is considered.
2	A moderate but definite systemic disturbance, caused either by the condition that is to be treated or surgical intervention or which is caused by other existing pathological processes, forms this group. Examples: Mild diabetes. Functional capacity I or IIa. Psychotic patients unable to care for themselves. Mild acidosis. Anemia moderate. Septic or acute pharyngitis. Chronic sinusitis with postnasal discharge. Acute sinusitis. Minor or superficial infections that cause a systemic reaction (if there is no systemic reaction, fever, malaise, leukocytosis, etc., aid in classifying). Nontoxic adenoma of thyroid that causes but partial respiratory obstruction. Mild thyrotoxicosis. Acute osteomyelitis (early). Chronic osteomyelitis. Pulmonary tuberculosis with involvement of pulmonary tissue insufficient to embarrass activity and without other symptoms.
3	Severe systemic disturbance from any cause or causes. It is not possible to state an absolute measure of severity, as this is a matter of clinical judgment. The following examples are given as suggestions to help demonstrate the difference between this class and Class 2.

(to be continued)

(continued from Table 4)

Class	ASA Score
	Examples: Complicated or severe diabetes. Functional capacity IIb. Combinations of heart disease and respiratory disease or others that impair normal functions severely. Complete intestinal obstruction that has existed long enough to cause serious physiological disturbance. Pulmonary tuberculosis that, because of the extent of the lesion or treatment, has induced vital capacity sufficiently to cause tachycardia or dyspnea. Patients debilitated by prolonged illness with weakness of all or several systems. Severe trauma from accident resulting in shock, which may be improved by treatment. Pulmonary abscess.
4	<p>Extreme systemic disorders which have already become an eminent threat to life regardless of the type of treatment. Because of their duration or nature there has already been damage to the organism that is irreversible. This class is intended to include only patients that are in an extremely poor physical state. There may not be much occasion to use this classification, but it should serve a purpose in separating the patient in very poor condition from others.</p> <p>Examples: Functional capacity III - (Cardiac Decompensation). Severe trauma with irreparable damage. Complete intestinal obstruction of long duration in a patient who is already debilitated. A combination of cardiovascular-renal disease with marked renal impairment. Patients who must have anesthesia to arrest a secondary hemorrhage where the patient is in poor condition associated with marked loss of blood. <i>Emergency Surgery</i>: An emergency operation is arbitrarily defined as a surgical procedure which, in the surgeon's opinion, should be performed without delay.</p>

Contraindications

By now, considering all the factors previously exposed, the only one absolute contraindication to total hip arthroplasty is the presence of an active infection both local that systemic. We have also to consider immunodepression present in HIV patients in which there is a high risk of infection after the intervention: in these patients we have to consider how many lymphocytes are present, especially CD4+. In these patients a hip arthroplasty has to be considered only if other therapy are not effective and working strictly together with a specialist in infectious diseases.

There are also relative contraindication and if these are present we can justify a surgical intervention only if it is present at the same time a pain that does not respond to all other non surgical therapies:

- A neurologic arthropathy as Charcot disease or other pathology in which an irreversible atrophy of the hip muscles is present, because this represent a high risk for control of movement post surgery and a high risk of dislocation of the prosthesis;
- an atrophy in a patient that does not ambulate, especially if there is a polydistriktual arthrosis;
- life expectation less than 1 year.

There are also other contraindications that relate to the mental health of the patient; we have to ask patient a perfect collaboration for the optimal result of the surgical intervention. So we think that patients with dementia, chronic depression, alcohol abuse or narcotic abuse, little motivation and hostile character are relative contraindication and the decision to perform a surgical intervention has to be set in particular conditions.

Patient's expectation

The last, but not least important element to consider in the guidelines is patient's expectation. In fact, once it is the surgeon that the patient took the decision to proceed to surgery is important to assess the real expectations of the patient towards the prosthetic replacement.

It is important that the patient does not have unrealistic expectations in the prosthesis. Especially in relatively young patients who want to return to sporting activities or heavy work activities. This aspect is not a factor of exclusion nor of procrastination. It is important, however, that the surgeon can establish an adequate program of information and education on what will be the life of the patient after joint replacement and what activities he will be granted or not.

It is not less important to consider even increasing life expectation of the population (Figure 1), and the possibility of the need of a revision of the prosthesis in the future especially when performed in young patients.

When surgical hip arthroplasty then?

The multiplicity of factors involved in the indication for surgery of total hip arthroplasty does not allow us to define absolute guidelines, but we will try to suggest, in relation to the factors set forth above, what in our experience can be a decision-making process rational when to operate on a patient with a hip disease.

As we have still mentioned the first therapeutic approach to the patient with a hip pathology has to be preservative. Hip prosthesis will be indicated only when pharmacological and physical therapy have failed in improving the condition of the patient and only when other surgical treatment less invasive have been excluded.

LEVEL I: includes the objective assessment of symptoms by history and physical examination, and allows us to understand the pain and functional deficits accused by the patient. For this level, the Harris Hip Score can help us to quantify the impairment of the hip, but we believe it is not in itself sufficient to define indications.

LEVEL II: at this level we integrate objective data collected from the visit with the subjective evaluation of the complaints by the patient with the self-assessment questionnaires and in particular the WOMAC index that assesses not only the symptoms of the hip, but also the impact on main activities of everyday life.

LEVEL III: the third level involves the evaluation of modifying factors by the physician, their impact will be different depending on the level of the WOMAC score reached. They are generally irrelevant if the score is less than 40. In case of higher score, the age of the patient acquires a fundamental role. We distinguish three age groups: under 50 years, between 50 and 60, and finally over the age of 60. In the first two bands is also important to assess the stage of the disease and in particular its evolutivity. At above 60 aa., in the category with WOMAC between 40 and 60 the modifying factors are very often irrelevant, since, in relation to age of the patient the therapeutic alternatives do not achieve equally satisfactory results. In the category with WOMAC > 60, with a minor functional impairment staging of the disease is important.

LEVEL IV: the fourth level provides for assessment of local risk factors that allows, in cases with a greater articular impairment, to decide whether to establish a specific treatment or prevention of their complications; on the contrary, when the WOMAC score is higher, their presence may be a contraindication to surgical intervention.

LEVEL V: the fifth level includes an assessment of the general

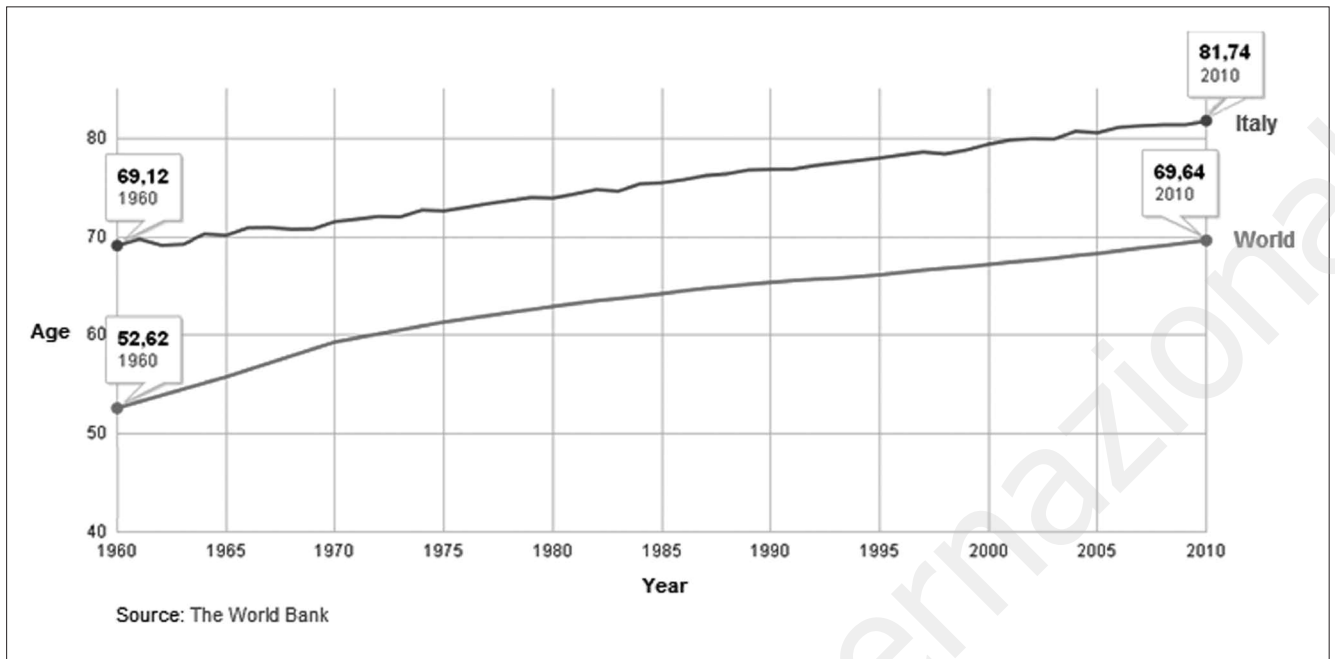


Figure 1 - Increasing life expectation of the population.

risk factors that indicate the risk of mortality and morbidity peri- and post-operatively. Very often in patients with severe impairment of general health (ASA 3 and 4) it is advisable to abstain intervention. In cases with health conditions discrete (ASA 2), will be the degree of pain symptoms and functional limitation of the joint to indicate whether to establish a therapy and delay the intervention, or if abstain.

LEVEL VI: at this level, the decision to perform surgical intervention has been made, and we may need to make an assessment of the real expectations of the patient, through an appropriate program of information and education, not only through the interview, but also with the support aids of paper and/or digital video to allow an awareness of the real prospects and limits that the total hip replacement surgery involves.

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