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Opinion Article

Diagnostic and therapeutic physical therapy approach of patients in risk of falling after the surgical operation of total hip replacement

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Abstract

The surgical procedure of total hip replacement is one of the most successful operations in the medical field today. Being introduced back in 1960, THR represents the eradication of the present degradation. Post-surgically, there are some functional precautions that should be followed during the RHB plan as well an increased danger of occurrence of falling incidence. During the RHB plan, which should be followed after the total hip replacement operation, the inclusion of a diagnostic as well therapeutic intervention regarding fallings is of major importance.

Keywords: Physical Therapy, Total hip replacement, Falls, Functional precautions, Evaluation

Brief anatomy of the hip joint and associated kinesiology

The hip (L Coxae) is designated as the anatomical structure that can be found in the lower part of the human body. Being below the middle third of the inguinal ligament and laterally, it comprises of the articulation between the head of the femoral bone and the cavity of the pelvis – thus given the fitting characterization of "ball-and-socket" joint, referring to the architecture of the two contributing bony structures[1,2]. The hip joint, designed in order to provide stability and weight bearing at the expense of mobility, enables the performance of the movements (Table 1).

The movements are delivered in such way that they support the morphology of the referred joint. In Table 1, the movements performed in the favor of the longitudinal axis, external (ER) as well internal rotation (IR), are excluded. The reason backing up that discharge is the consideration of the ER and IR as movements performed as the result of the common cluster of the hip, the lower extremities and compartments of the trunk[2,3].

Completing the depiction of the anatomy as well the kinesiology of the hip joint, great emphasis should be given in the associated structures that are of great assistance in the processing of the above mentioned. These structures are the ligaments, the muscles as well the nerves that engage the correlated anatomical space. Being oriented in a way that they appear in a spiral fashion, enabling the embrace

Movements	Additional Comments
Flexion (F)	Described as the movement during which the angle between two body segments is decreasing. Performed in the frontal/coronal plane. ROM*: 0º-125º [2,3]
Extension (E)	Described as the movement during which the angle between two body segments is increasing. Performed in the frontal/coronal plane. ROM: 0º-10º [2,3]
Abduction (ABD)	Described as the movement during which the associated body segment moves away from the mid-sagittal plane. ROM: 0º-45º [2,3]
Adduction (ADD)	Described as the movement during which the associated body segment moves towards the mid-sagittal plane. ROM: 0º-10º/30º [2,3]

Table 1. Portrayal of the available movements performed by the articulation of the coxae and additional comments /*ROM: Range Of Motion.

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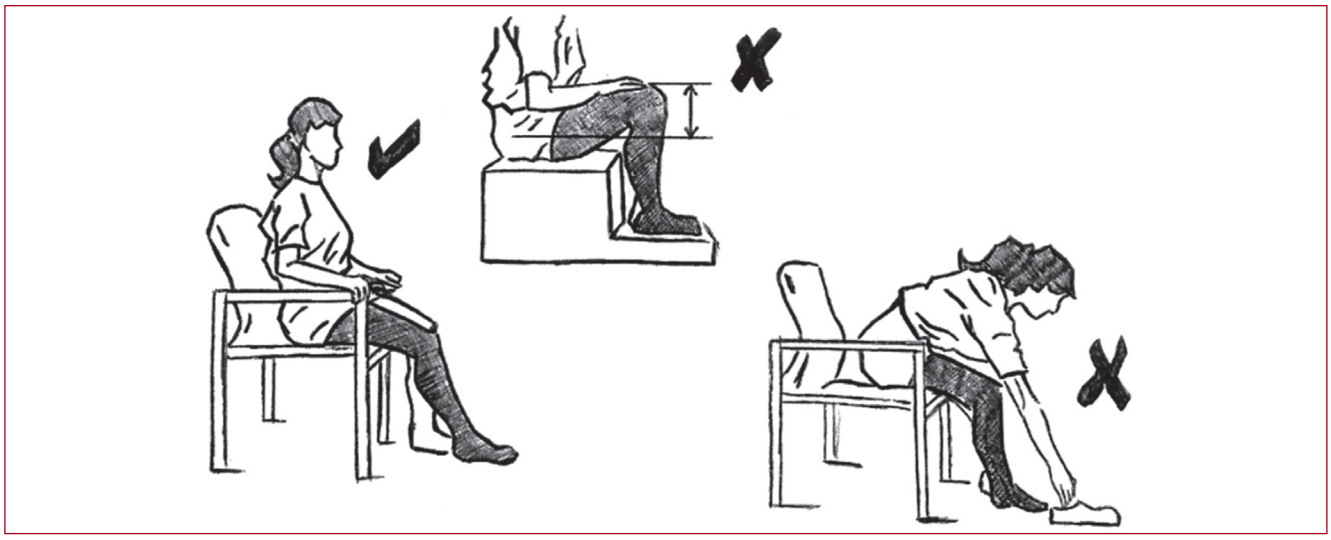

Figure 1. Graphical Illustration of the functional precautions after the surgical procedure of total hip replacement. *(Retrieved from the editor's archive).*

Muscles (Group of muscles)	Additional Comments
The flexors group of muscles (L "flectere")	The main flexors of the hip joint are the psoas minor, psoas major and iliacus muscle. The group of flexors is supplemented in the performance of the associated movement, by a number of some other muscles e.g. Rectus Femoris muscle and Sartorius[3,4].
The extensors group of muscles	The muscles that contribute into the performance of extension of the lower extremities in the area of the hip joint are the Hamstring group of muscles and the Gluteus Maximus muscle[3,4].
The abductors group of muscles	The abductor group of muscles is composed by the rest of the Gluteal muscles (Gluteus Medius and Gluteus Minimus) as well from the muscle Tensor Fasciae Latae[3,4].
The adductors group of muscles	The adductor group of muscles is composed by the Adductor Brevis, Adductor Longus, Adductor Magnus, Adductor Minimus, Pectineus, Gracilis and Obturator Externus[3,4].

Table 2. Presentation of the muscle groups located on the lower extremities.

of the whole hip joint, the ligaments are structures giving stability during the execution of the several movements.

Regarding the musculature, we are met with the identification of the muscle groups (Table 2).

The major nerves that can be found on the associated area of the hip joint, spreading along the hip are the femoral and the sciatic nerve[3,4].

Surgical procedure of total hip replacement (THR)

The surgical procedure of total hip replacement (THR) is performed in order to eradicate the deterioration presented in the referred hip joint[5]. The operation depicts the replacement of the head of the femoral bone and the acetabulum of the pelvic bone, as being the main components of the hip joint, by artificial components the material of which varies[5]. Firstly introduced the year 1960, THR is one of the most successful surgical operations in the field of medicine. That statement is supported also by the improvement being encountered in the technology used nowadays for the procedure as well the material used, leading to an increase in the effectiveness of THR[5].

Functional precautions during the post-surgical state

There are some precautions that should be advised to the patient by the associated surgeon/orthopedic after the integration of the THR procedure, and should be followed by the responsible health professional during the rehabilitating intervention in order to avoid any kind of complications. Having said that the patient shouldn't perform flexion of the freshly-operated lower extremity in the area of the hip joint over 90° and also the crossing of the lower extremities should be avoided too[6].

The uneasiness regarding the previously described movements is based on the instability portraying the freshly-operated arthrosis. The associated instability, in comparison with the controlateral hip joint, will be present regardless the material that will be used. In case the patient performs one

of the so-called "restricted" movements that would lead to dislocation of the operated articulation. These precautions raise quite few questions regarding the movements/ intervention that should be performed by the physical therapist – or in some cases the associated nursing stuff during the patient's hospitalization[6].

An avoidance of 90° flexion of the hip joint in the operated lower extremity: That statement (proclamation) renders the performance of examination such as e.g. the evaluation of the length of the hip flexors according to the principles of H.O. Kendall. Other than the evaluation procedures, the physical therapist should advice the patient not to sit in sofas or couches that the associated surfaces can't prevent the flexion of the hip or use some cushion when the surface is defined by a hard pad[6] (Figure 1).

It is worth mentioning that the avoidance of the flexion over the 90° of ROM should be followed for a period of about six or eight weeks post-surgically. In any case any kind of movement should be performed with the required care and with respect to the patient.

Avoidance of crossing the lower extremities: That statement is outlined as rigorous when it comes to crossing the freshly-operated lower extremity over the controlateral one. The crossing may lead to dislocation of the graph. In order to avoid such complications during the stay of the individual in the health care facility, a cushion is indicated, placed between the two lower extremities. In that way the desired distance between the two extremities, being about 2 to 6 inches apart, is maintained. The cushion is preserved in the above mentioned position even when the patient rotates on the bed voluntarily or because of the nursing stuff[6].

Occurrence of fallings after THR surgical procedure

Even though most of the patients express themselves as satisfied with the undergoing of the surgical procedure and mostly the course of their post-operative lives, recent studies have emerge pointing out that a group of patients, between 7% and 30%, were met with frustrating difficulties during their daily living[7,8-10]. To be more precise these difficulties included, as they reported, "reduced functional ability" and "health-related quality of life" and they were associated with the occurrence of falling incidences[11,12]. It is well documented that population undergone surgical procedure of total hip replacement is portrayed as major candidates for an occurrence of falling[13-15]. In case a health professional would like to single-out the feasible factors that define the post-surgical state (discharged or not) and are possibly portrayed as causes for the occurrence of falling incidence those shall be the reduced proprioception, the instability of the freshly-operated joint and reduced strength of the muscles of the lower extremities[16-18]. Since the center of interest is mainly aimed towards elderly population, the previously specified factors combined with the hospital admission may affect these patients and make them less physical reserved and ready to compensate with the functional confrontations.

Evaluating the balance of the patient, setting up a short-term/long-term RHB plan

Researching through studies in the broad field of geriatrics, it's pretty quite obvious that there is an abundance of approaches when it comes to the clinical evaluation of the individual's balance. Without desire to express preference towards some procedures of evaluating balance over some others, in this particular review is showcased a methodology that up to a certain point - if not in its entirety - reprise actions performed throughout daily living activities. The reason behind that intention lies in the try to give the associated elder individuals the characterization of "community-dwelling", meaning they are able to perform activities in independency. That statement doesn't prevent health professionals to use if they wish some kind of machinery in order to provide greater objectivity to their evaluations[19].

Two exemplary methods of evaluating balance and the accompanying risk of falling, enclosing tasks similar to daily living activities, are the "Timed-Up-And-Go" ("TUG") and "Berg Balance Scale" ("BBS").

"Timed-Up-And-Go" ("TUG") evaluation method

Depending on the individual's unique performance, the "Timed-Up-And-Go" ("TUG") assessment, is a broadly well-known method for evaluating the functional capacities of the lower extremities, the mobility presented as well the possibility for occurrence of falling incidence[20]. Described as quick and easy, "TUG" is favored among many health professionals. The associated academic background supports the method giving the recognition and the status of a valuable tool portrayed as easy to perform and sensitive[21,22]. In brief, the performance of "TUG" is as it follows: The individual rises from an armchair (seat: 44→47 cm / height of arms: 65 cm) and performs a "back-and-forth" ride in space of 3 cm range/ distance. The evaluation method is designed in that way that it reprises activities performed by the individual during his/ her daily living. Being said that, other than enhancing its importance and simplicity, advocates the use of walking supports like e.g. crutches when it is visualized as necessary. For the purposes of evaluation the examiner needs to have a stopwatch in order to record the needed time to complete the task[23-25].

"Berg Balance Scale" ("BBS") evaluation method

The "Berg Balance Scale" ("BBS") came together in formation, as an attempt to administer significant and validate clinical evaluation of the functional balance of the individuals regardless if they are elderly or not[26]. The "BBS" has been, for a long time, in the "receiving end" of many

different negative comments coming from individuals that object its ability to identify and differentiate those in a risk of falling incidence from those who are in stability. On the other hand, the supporters of the "BBS" showcase a big variety of studies backing up its validity and reliability with the most recent study coming from Finland indicating that an alteration of eight points between two successive evaluations is more than enough to accompany major changes in the performance of daily living activities and the related independency[27-30]. As for the tasks of the scale, calculated 14 in total number, they are somehow identical to daily living activities e.g. reaching to an object that is on the ground, getting up from the chair e.t.c. Each task is given a numerical classification depending on the performance of the individual compensated, in order to complete it. The classification ranges from 0 to 4, with "0" being the lowest an individual can perform while "4" being the best, reaching the maximum score of 56. At the end of the evaluation, the singular points of each task are summed up in order to reach a number that representing the risk of falling for the individual[26].

Design of long and short-term rehabilitation plan

Following the conclusion of the performed assessment of patient, regarding the distinctive characteristics of the individual as well the balance, the therapist is met with the challenge to compose a short-term and a long-term plan of the rehabilitation (RHB) intervention. The composition of a fitting RHB plan is of substantial concern, since it's a precursor of a successive intervention. Due to the fact that the patient has undergone a surgical operation, the RHB plan should focus on the freshly-operated side of the body, without downgrading the controlateral extremity. During the execution of the several exercises, as part of the therapeutic intervention, the affiliated health professional should observe for any kind of pain being present. Pain, in such post-operatic cases, is a valuable "colleague" of which the presence should be evaluated with caution and not with lightness. Also it's a responsibility of the health professional to explain to the patient the previously mentioned functional precautions during his stay on the medical facility as well during his post-surgery life in his residence. In order to have the desired coherence in the actions to be followed, the physical therapist enlists those "to-do" in a short-term and in a long-term RHB plan.

Short-term RHB plan

The short-term RHB plan is composed chiefly by the performance of active movements in order to maintain and even increase, if possible, the available range of motion of the lower extremities. It's a fundamental importance, each patient-case to be treated as a unique one, showcasing respect to the needs and the wishes of the individual. Having that being stated, subsequently are presented some of the main goals of each intervention with a possibility of adjustment always according to the case.

- Strengthening exercises of the main muscle groups of the lower extremities: adductors, abductors, flexors, extensors and calf muscles. Our main concern, after the surgical operation of total hip replacement is the quadriceps musculature*.
- Performance of post-isometric relaxation techniques ("P.I.R")[31] for the muscles that present a state of increased tension or even painful trigger points.
- Stretching techniques applied for the muscles that present shortness.
- Correction and improvement of the posture of the patient
- Increase of the sensory perception of the patient, manually or with the use of special equipment (e.g. rocker boards).
- Exercises for the prevention of falling/performance of lunges according to the teachings of V. Janda.
- Performance of a much as possible walking with the correct stereotype (3 point walking type) – also walking upwards and downwards on stairs.

Long term RHB plan

After the integration of the early sessions with the individual, the long-term plan is getting into implementation. Having as a predictor the short-term RHB plan, the long term is composed by tasks such as:

- A general maintenance of the newly-achieved proper condition of the muscle strength, of the posture and of the range of motion the individual presents.
- Improvement of the gait – maintenance of a good walking stereotype.
- Performance of exercises aimed into the increase of the proprioception of the sensory motor stimulation – which may present some deterioration after the surgical procedure.
- Improvement of the walking stereotype, even when walking on stairs.
- Showing exercises that the patient can perform by himself in his residence in the context of self-therapy.

Conclusion

The surgical operation of total hip replacement is without any kind of argument an important achievement in the field of medicine. It can provide a crucial alleviation to the patient, no matter if it's performed after a fracture or because of deterioration of degenerative nature. After the undergone of surgical operation, the lower extremity of the patient might present decline in the muscle power, the proprioception and other distinctive characteristics including the balance. The physical therapist is met with the challenge of composing a

** Most of the exercises post-operatory are focused on strengthening the "Quadriceps" group of muscle. The calf exercises are indicated not only for the reset of muscle power but also for better circulation – needed after the undergone of the surgical operation.*

RHB plan that will pay respect to the needs and wishes of the patient for a better way of living post-surgically, ensuring there won't be any kind of dislocation or other complications and decrease the percentage of risk of falling occurrence characterizing the individual.

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