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CASE REPORTS

Weight-Bearing Restrictions Following Total Hip Arthroplasty in a Patient with Upper Limb Amputation - a Care Compliant Case Report and Review of The Literature

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Abstract

We present the case of a 71 year male patient with right upper limb amputation who presented to an orthopaedic clinical hospital for increased pain in the hip area associated with decreased range of motion which interfered with most of his daily activities. Patient was evaluated in an interdisciplinary team by rehabilitation and orthopaedic specialists and was scheduled for surgery after a pre rehabilitation period. Acute phase included the first week post-surgery in which early mobilization was initiated with transfer training and verticalization. Weight-bearing as tolerated was indicated on the operated limb from postoperative day 1 and the use of an axillary crutch on the functional upper limb. Walking was supervised by a physical-therapist in the first days post-surgery. Neuromuscular electrical stimulation was associated in order to promote muscle strength and static cryotherapy was applied every 4 hours on the operated limb. At day 7 the patient was discharged with a functional autonomy sufficient for his home activities. The patient was given a precise protocol to follow until control a reevaluation at 6 weeks post-surgery. By the end of the 8 week post-surgery the patient was able to demonstrate reliable gait patterns and was permitted to wean assistive devices. At 6 month follow up the patient was able to restore all functional activities with satisfying results regarding functional scores. Our case report suggests that THA can be indicated for a broader spectrum of patients without posing a major risk regarding the rehabilitation program if supervised properly in an interdisciplinary team.

Keywords: upper limb amputation, total hip arthroplasty, rehabilitation, quality of life

Rezumat

Prezentăm cazul unui pacient de sex masculin de 71 de ani cu amputație a membrului superior drept care s-a prezentat în cadrul unui spital clinic de profil ortopedic pentru durere de intensitate crescută în zona șoldului asociată cu scăderea amplitudinii de mișcare, prezentând interferențe cu majoritatea activităților cotidiene. Pacientul a fost evaluat într-un context interdisciplinar de recuperare și ortopedie și a fost programat pentru intervenție chirurgicală după o perioadă de recuperare preoperatorie. Faza acută postoperatorie a inclus prima săptămână în care a fost inițiată mobilizarea precoce cu exersarea transferurilor și verticalizare. Gradul de încărcare pe membrul pelvin operat s-a realizat în funcție de tolerabilitate, fiind indicat din ziua 1 postoperator cu utilizarea unei cârje axilare pe membrul superior funcțional. Exersarea

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mersului pe distanțe scurte s-a realizat supravegheat în primele zile postoperator. Stimularea electrică neuromusculară a fost asociată pentru a promova forța musculară iar crioterapia a fost aplicată la fiecare 4 ore pe membrul operat. În ziua 7 pacientul a fost externat cu o autonomie funcțională suficientă pentru activitățile casnice. Pacientului i s-a realizat un protocol particularizat de recuperare de urmat până la controlul postoperator la 6 săptămâni după operație. Până la sfârșitul săptămânii 8 post-operator, pacientul a reușit să demonstreze o capacitate de coordonare și echilibru safisfăcătoare, ulterior fiind înlăturat dispozitivul de asistare. La 6 luni s-a reușit restabilirea tuturor activităților domestice si sociale cu rezultate satisfăcătoare în ceea ce privește scorurile funcționale. Cazul prezentat sugerează faptul că artroplastia de sold necimentata poate fi indicată unui spectru mai larg de pacienți fără a prezenta un risc major în ceea ce privește programul de recuperare dacă este supravegheat corespunzător într-o echipă interdisciplinară.

Cuvinte cheie: amputație membru superior, artroplastie totala de sold, recuperare, caliatatea vieții

BACKGROUND

Upper limb amputation (ULA) represents a therapeutic challenge from a rehabilitation point of view. Patients with ULA require prolonged rehabilitation sessions in order to promote functional abilities and self-care capacity, reduction of psychologic distress and also to be able to engage in daily activities. Patients training concerning the use of prosthetics for the correction of impairment and diminishing phantom limb syndrome are main objectives of a rehabilitation team.[1-4]

Total hip arthroplasty (THA) is a world wide used intervention focused on improving range of motion (ROM), pain levels, and quality of life in patients with severe arthritis. The procedure is followed by a phased rehabilitation period in order to return to normal hip activity. However, in the acute phase of the postoperative care, early mobilization of the patient requires the use of assistive devices such as walker of crutches and weight-bearing restrictions on the operated limb. This could however pose a challenge regarding balance and coordination issues and an increased risk of fall, for a patient with upper limb amputation.[5-8]

PATIENT INFORMATION

We present the case of a 71 year male patient who presented to an orthopaedic clinical hospital for increased pain in the right hip area associated with decreased range of motion which interfered with most of his daily activities. Patient history evidenced a right upper limb amputation that was undergone 29 years before, due to a railroad accident. Social and professional aspects revealed that he worked in constructions, and was right-handed. Post amputation, with long time goals set, the patient was able in time to compensate most of his daily activities with his left hand, including learning to write with his left arm, and even perform more difficult activities such as technical drawing, which was a requirement for his professional involvement, which also included supervising activities. Other activities such as driving, dish washing in moderate amount, or cutting small to intermediate items were also managed and compensated by the patient. Until 2009 he lived in an apartment, then relocated to a house with yard where he lives with his wife and is able to perform more demanding gardening activities, including the use of garden tillers or cultivators. Patients' history and evolution can be seen in the timeline (Figure 1).

Pain in the hip area started in the last year before presentation, but aggravated in the last 3 month with a limitation of the walking perimeter to only a couple of meters. Additional pathological background revealed the presence of diabetes mellitus type II in treatment with oral antidiabetics, the patient being a moderate coffee drinker and smoker.

CLINICAL FINDINGS AND DIAGNOSTIC ASSESSMENT

Patient was evaluated in an interdisciplinary team by rehabilitation and orthopaedic specialists. Functional assessment revealed hip stiffness with severe limitation of ROM on all angles of movement. Pain levels were present in resting position (VAS 7-8), and exacerbated with passive mobilization from the examiner.

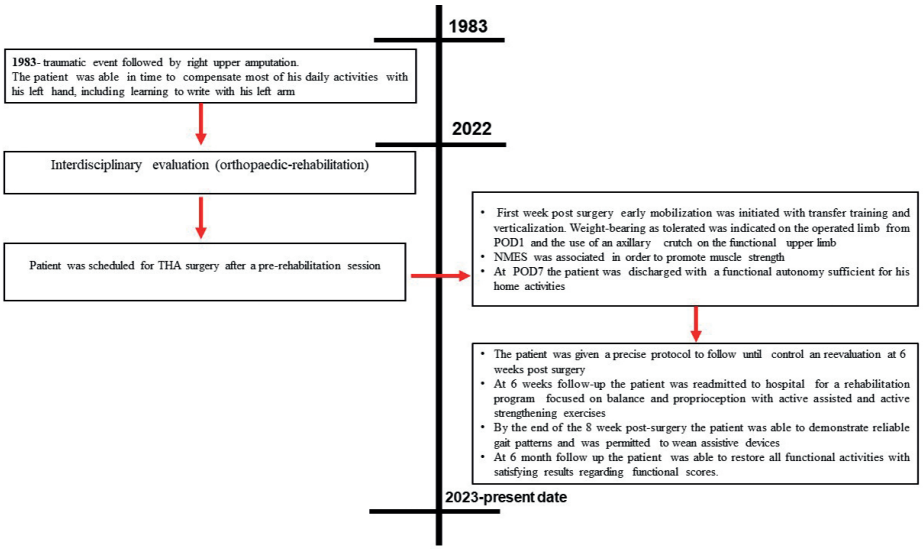

Figure 1. Patient timeline regarding evolution and treatment

Walking perimeter was limited to 2-3 meters with the assistive device -wheal-chair- and was able to be performed with an axillary crutch with poor coordination and a tendency towards instability. Contralateral leg presented reasonable hip and knee ROM and stability. Examination of the involved upper limb revealed shoulder girdle muscles with appropriate strength, glenohumeral joint stability and satisfactory ROM on all angles of movement, with kept cervical spine mobility, and maintained global spine alignment. Hip X-rays were performed as it can be observed in Figure 2.

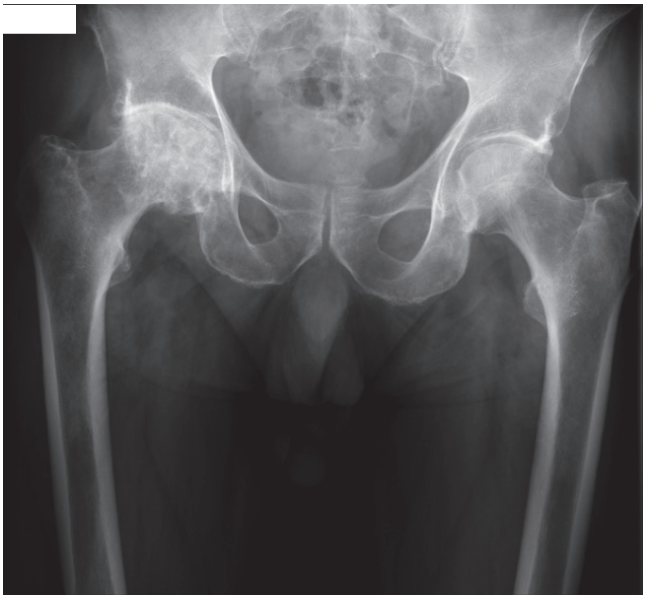

Figure 2. Preoperative antero-posterior view

It was decided by the interdisciplinary team that the patient was to initiate a pre rehabilitation program before scheduling him for surgery, in order to promote muscle strength and stabilization on the contralateral leg and also to develop adequate muscle strength on the functional upper limb which will be required in the weight-bearing period.

INTERVENTION

After the pre-rehabilitation program, the patient was readmitted for uncemented total hip arthroplasty surgery. The procedure consisted in placing the patient in supine position on the surgical table. After local physical and chemical toilet of the surgical site and proper draping, a direct lateral Hardinge right hip approach was practiced with dissection in anatomical planes and careful haemostasis followed by capsulotomy and total capsulectomy. After hip dislocation, osteotomy of the femoral neck and ablation of the remaining femoral head was performed. The acetabular cavity was prepared with successive burs and the acetabular component was implanted, with "press-fit" primary fixation without screws and polyethylene insert mounting. The femoral canal was exposed and prepared with a rasp and the femoral component was implanted. Stability and length tests of the pelvic limb were performed and a metal femoral head was attached, then the endoprosthetic mode was reduced and the endoprosthetic stability tests were resumed. The anatomical planes were sutured and a sterile dressing was applied.

Post-operatively, the patient stayed in the Anesthesia and intensive care unit, for follow-up and pain therapy, balancing of biological parameters, for about 24 hours. After this interval, the patient performed control X-rays and was transferred to the orthopaedic department for the continuity of medical-surgical care and the start of the medical rehabilitation program. Postoperative images can be observed in figure 3.

Figure 3. Postoperative antero-posterior view

FOLLOW UP OUTCOMES

Outcome measures included the use of Hip osteoarthritis outcome score (HOOS), SF-36 Quality of life scale, and Activities Measure for Upper Limb Amputees (AM-ULA) and Harris Hip Score which were measured before surgery in the pre-rehabilitation period and post-surgery at 6 weeks, 3 month, 6 month and 1 year follow-up.

Acute phase of rehabilitation included the first week post-surgery in which early mobilization was initiated with transfer training and verticalization. Weight-bearing as tolerated was indicated on the operated limb from postoperative day (POD) 1 and the use of an axillary crutch on the functional upper limb. However, due to ULA which generated a limited capacity of coordination, it was reasonable to assume that the patient would incline unvoluntary towards FWB on the operated hip. Walking was supervised by a physical-therapist in the first days post-surgery. Neuromuscular electrical stimulation (NMES) was associated in order to promote muscle strength and static cryotherapy was applied every 4 hours on the operated limb. At POD7 the patient was discharged with a functional autonomy sufficient for his home activities.

The patient was given a precise protocol to follow until control a reevaluation at 6 weeks post-surgery. Due to the fact that the patient had limited access to a rehabilitation centre, we adapted an unsupervised home-based rehabilitation program which included isometric exercises for quadriceps, hamstring and gluteal muscles associated with heel slides, straight-leg raises with considerations regarding hip precautions and sit to stand exercises in order to facilitate functional activities. At 6 weeks follow-up the patient was readmitted to hospital for a rehabilitation program focused on balance and proprioception with active assisted and active strengthening exercises for the operated hip with respect to hip precautions and also the contralateral leg. The patient presented an active hip flexion ROM of 95 degrees at 8 weeks post-surgery. By the end of the 8 week post-surgery the patient was able to demonstrate reliable gait patterns and was permitted to wean assistive devices. The patients were given a new set of home-based exercises with the main objective of improving strength on all lower extremity kinematic chains and also return to most domestic and functional activities. At 6 month follow up the patient was able to restore all functional activities with satisfying results regarding functional scores. 1 year control evidenced a patient that was independent for most of his daily activities and was able to functionally participate in social and recreational activities.

DISCUSSIONS

The specificity of the case regards the fact that there is little amount of data in the literature focusing on quality of life and joint replacement in patients ULA. Another topic regards the fact that full weight bearing (FWB) vs. weight bearing as tolerated (WBAT) following early mobilization for cementless THA still remains in debate due to potential development of complications, as literature data is consistent with numerous points of view. In a 2023 meta-analysis which included 14 RCT and 3 retrospective studies concerning the amount of weight-bearing following THA, the authors found no detrimental effect of in case of FWB compared to partial weight-bearing in relation to failure of in-growth

fixation, prosthetic loosening, micromotion of the femoral stem, or the presence of radiolucent lines.[9-11] However, no significant differences were observed in regard to functional levels for both weight-bearing attitudes at 1 year follow up.

In a study by Matheis et al. analysing the need for strength training and targeted mobilization of the hip region in the acute phase of THA, it was observed that a more pronounced physical exercise program starting at POD3 determined favourable outcomes regarding stabilizing forces of the gluteal muscles as well as one-leg stance and walking perimeter in 6 minutes, with improved balance and coordination at POD 7 compared to a more traditional rehabilitation set of exercises. [12-14] Mandelli et al. in a retrospective study focused on the influence of FWB in patients with THA and observed that the association of a medial acetabular breach did not significantly correlate with an increased risk for revision surgery, suggesting that there is no definitive indication for partial weight-bearing is the operator is certain regarding acetabular component stability.[15-17]

In our case report, the patient's perspective is satisfactory regarding THA, which was able to reestablish mobility and independence for daily activities. The patient's motivation for engaging in a consistent rehabilitation program was correlated with the fact that the history of ULA can influence the patient's self-image and psychological determination for regaining function and improving quality of life.[18-19]

LIMITATIONS

The main limitations of case are the same as for all case reports and involve the lack of generalizability, and there for the approach cannot be applied for all rehabilitation strategies. At the same time, the lack of a methodological rigor and the absence of a control group cannot generate cause and effect relationship which are specific for research studies.[20]

CONCLUSIONS

THA remains one of the main treatment options for relieving pain and improving function in patients with hip osteoarthritis. Out case report suggests that it can be indicated for a broader spectrum of patients without posing a major risk regarding the rehabilitation program if supervised properly in an interdisciplinary team.

Informed Consent: The patient has given an informed consent regarding the publication of this manuscript

ABBREVIATIONS

ULA - Upper limb amputation
THA- Total hip arthroplasty
ROM- Range of motion
VAS- Visual Analogue Scale
HOOS - Hip osteoarthritis outcome score
AM-ULA -Activities Measure for Upper Limb Amputees
POD- Postoperative day
NMES- Neuromuscular electrical stimulation
FWB- Full weight-bearing
WBAT- Weight bearing as tolerated

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