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Multidisciplinary Approach to Rehabilitating an Elderly Dysvascular Bilateral Amputee: A Case Analysis

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ABSTRACT: This case study presents the clinical journey of an 85-year-old male patient with a complex medical history, including advanced peripheral arterial disease (PAD), diabetes, and a history of amputations. The patient was admitted on April 13 due to dyspnea, fever, and a deteriorating general condition, exacerbated by an infected chronic heel wound. Investigations revealed an inflammatory syndrome, bacteremia, anemia, and acute renal failure, alongside bronchopneumonia and cardiac decompensation. Following revascularization via angioplasty and stabilization of glycemia and anemia, the patient was transferred to a rehabilitation clinic for wound management. Despite initial refusal, the patient ultimately accepted a right leg amputation after a multidisciplinary consultation due to insufficient blood supply post-angioplasty. The rehabilitation assessment indicated mild emotional impairments influenced by health-related fears and a grieving process, alongside moderate cognitive limitations affecting memory and attention. Mobility assessments showed the patient utilized a wheelchair indoors and a four-wheel walker outdoors for short distances. Goals set by the patient and family included regaining the ability to walk with a prosthesis. Overall, the patient exhibited significant strength loss, particularly in the lower limbs, and required assistance with daily activities. This case underscores the complexities of managing elderly patients with multiple comorbidities and highlights the importance of a multidisciplinary approach in optimizing rehabilitation outcomes.

KEY WORDS: Elderly, dysvascular, bilateral amputation, rehabilitation, early fitting

I. PATIENT CHARACTERISTICS

The patient is 85 years old, retired, and living at home with his wife. He is a former bank employee, with a social life limited to neighbours and children. His main diagnosis is a peripheral arterial disease (PAD) in phase IV, with right lower limb (LL) intermittent claudication, and septic necrosis of the right heel.

Co-morbidities/relevant histories:

- Insulin-dependent Diabetes type II•Peripheral polyneuropathy, retinopathy
- Left trans-tibial amputation (2003), and right transmetatarsal amputation
- PAD since 2003 with 2 saphenous vein bypasses and 3 angioplasties
- High blood pressure treated, left ACV(2000) with persistent sensitive hemisyndrom Chronical lymphoid leukemia (diag 2014)•Post-operative pulmonar thrombosis (2003)
- Severe sepsis on urinary infection

Reasons for admission (13th April): dyspnea and fever, a drop of general status, infected chronic heel wound.

Further investigations showed inflammatory syndrome, bacteremia, anaemia and acute renal failure, a consequence of fever and dehydration, in the context of Diabetes. Bronchopneumonia and cardiac decompensation were consequences of the infectious context. Bypass occlusions in both LLs were objectivized, with TCPo2 inferior to the critical ischemic threshold.

Infectious status was attended to, revascularisation by angioplasty was carried out, glycemia stabilized, and anaemia substituted. The patient was then transferred to the hospital rehabilitation clinic for wound follow-up.

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As blood supply was still insufficient after angioplasty, the patient proposed a right leg amputation, during a multidisciplinary consultation, which he first totally refused. He attended 7 sessions of hyperbaric chamber therapy[1] [2], the ultimate attempt to increase vascularisation.

He was finally re-transferred to the acute orthopaedic unit for amputation, which he accepted (4th June).

II. EXAMINATION FINDINGS

Environmental situation: lives with active wife (but weak), 5th floor with lift, 2 children not far.

Mobility at home: wheelchair inside, walking with a 4-wheel roller and his prosthesis outside for short distances

Patient/ family goals: he already knows the process of fitting and rehabilitation and his aims to walk, with a prosthesis, the same way as "before". The family supports him.

Overall evaluation findings:

- Emotional functions are mildly impaired, influenced by fear and depressive status secondary to his health evolution and the grieving process he is going through. During the acute post-op phase he even loses severely his energy and driving function for up to 2 weeks.
- Memory, attention, orientation and perception functions are moderately limited, which is probably a continuous status for this elderly man. The same applies to initiative, management of body parts care, and multiple tasking.
- Cardiovascular functions include PAD unchanged sequellae, but the infectious status is regulated, which gives range to general status improvement.
- Sensory function impairments (sight and sensitivity on the left side) are to be noted, even if mild, especially for prehensions, management of the socks, donning, etc...
- Proprioceptive function and balance are low, if tested sitting in the bed without prostheses, but transfers to a wheelchair only need partial help, as well as donning/doffing the left prosthesis and using the wheelchair.
- Pain is moderated, but phantom pain is noted already (EVA 2).
- Joint mobility measures show bilateral loss of hip flexion that must be addressed (flexum 15° L , and 0° R), and a tendency to posture in knee flexion, on both sides.
- Strength loss is important: especially on left LL M3, and right LL M2, except quad M3. UL and trunk globally M4
- Oedema is regular for post-op, perimeter 320mm. Scar and skin is very fragile.

III. CLINICAL HYPOTHESIS

Main problems in priority order:

1. Fragility of the stump, important risk of scar dehiscence, and skin breakdown. Posture in knee flexion to be avoided imperatively.
2. Stump pain: to be addressed rapidly, it may induce increased knee flexion. Phantom pain is less of an issue at first: can be primarily treated by medication, close follow-up is necessary to react if worsening
3. Oedema : although "within the norms" (poor blood supply and scar fragility)
4. Hip joint ROM: issue for future gait training, as well as both LL loss of strength. Especially quadriceps, and hip extensors, abductors, rotators
5. Balance and proprioception: global, and specific for (both) legs
6. Falling-risk
7. Gain trust: for an efficient therapeutic education

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IV. INTERVENTION

Pre-op (multidisciplinary consultation): information leaflet, exposition of bilateral amputation rehabilitation opportunities, and discussion on patient's feelings.

Acute post-op : knee-extension splint, dependent position, hips and knee joints positioning, pain medication check, lung expansion exercises, bed mobility, quadriceps isometric contractions, UL and trunk stimulation with PNF. Wheelchair adaptation for bilateral amputation.

Body-image related sessions: video (peer testimony), patient encouraged to put words on his emotions.

Transfer on the wheelchair (48h post-op): with one prosthesis and partial help

- Push-ups not efficient enough
- Ancient socks management and donning: re-education necessary. Correct use of brakes and footplates revised.
- Sitting balance assessment and exercises, explanation of weight/lever arm loss.

Gradually longer sessions were possible:Hips/knees active mobility, contract -relax stretching of hip flexors, hip muscles and quad strengthening, soft pressuring/enveloping of the stump for proprioception, desensitation, training of balance, push-ups and transfers. Careful compression of the stump after 5 days. A transparent silicone liner was first applied, but showed local ischemic area on the patella, so classical bandage was chosen. Unilateral standing in parallel bars started, with balance exercises.

Day-8: provisory scotchcast PTB prosthesis[3] mould, day-12: first fitting, static alignment, proprioception and weight transfer exercises. For dynamic alignment purposes, the patient walked 2x 12m in the parallel bars, without pain. Adaptations for skin breakdown (medial side of proximal tibia) were done in the next few days, until no more issues arose. After weight bearing, gait training started. Focus on proprioception, balance, and falling risk management. A mirror was used during certain exercises.

Day-15: Patient transfer to the rehabilitation clinic, handover during 2-3 joint sessions.5th week: definitive prosthesis. He is still in rehabilitation, working on gait pattern, pelvis stabilisation, proper weight transfer in stance phase, passing obstacles in swing phase, and so on. Patient education was given throughout all activities, with lots of repetitions, and time necessary for slow elderly patients.

V. OUTCOME

Early intervention was aimed to avoid complications, respiratory, further strength loss, joint stiffness and contractures. In these terms the objective was reached. Correct knee positioning and dependent position avoided pressure and oedema-caused tension on the scar and its dehiscence. Mobilisation allowed to reduce the hip contractures, although not completely. It also maintained total knee extension. Both facilitated the fitting, alignment and gait. Active exercises globally stimulated the patient, gradually gave him confidence, and participated in maintaining vascularisation and functional strength level. Global prefitting strengthening training and early provisory prosthesis permitted a rather quick functional recovery for an elderly person, at risk of multiple decompensations. Autonomy, self-management, and supervised gait at one month post surgery are serious outcomes for patients of that age and initial status.

Specific LL reinforcement prepared for enough stability during gait. Although some improvements were gained, extensors and hip rotators still need reinforcement, in parallel to gait training, as does the hip joint mobility. As an example, during first gait with a T roller, a Trendelendburg sign was still obvious on the right side, although reducible with proprioceptive stimulation during gait. Revision of ill-fitting and equipment mis-use, together with constant, patient and repetitive education contributed to a better safety and prosthesis management, preventing falling and skin complications. Apart from improving balance, proprioception, at stump level as well

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as during weight bearing, probably participated in decreasing phantom pain, which disappeared gradually, and drastically since fitting. Sadness, fear and grief decreased slowly with functional exercises, little and greater challenges met.

VI. DISCUSSION

Bilateral amputation is a challenge at any age, but brings elderly patients to a scary edge: losing functional independence, becoming a burden. However, refusing it may lead to death. Respect of patient's choices is a golden standard, but opportunities deserve to be explained. Why, what, how, pain, prosthetic service, lifestyle, feelings are considered aspects. A multidisciplinary team offers the patient a complete view and is a key to rehabilitation success.[4]

Pre-surgery, acute post-surgery physiotherapy and early fitting are essential in multiple co-morbidity contexts [5], they provide a programme to avoid complications leading to no-fitting decisions[6]. Amputee rehabilitation is however often not known in the various settings or units where patients receive pre-surgery care.

The rehabilitation focus is also very different from that for younger amputees. Beyond gait, the risk of falling comes in the top objectives, together with sitting to standing transfer, and therefore, techniques may differ. Transfer training will gain importance, with its psychological and physiological benefits. Co-morbidity-linked difficulties arise, like donning/doffing issues with polyneuropathy. Energy expenditure becomes an important concern, where safety criteria vs. efficiency or independence influence the device choice[7].

In our case, the situation is particular, as the patient has been managing a same level prosthesis for years. It can be very positive, however also a trap for the multidisciplinary team, especially in terms of patient education. Indeed, it may be far more difficult to change ancient wrong habits, than to teach new concepts, moreover in a context of low cognitive functions[8].

Finally, follow-up of elderly patients is of great importance[9], and should consist in a real frame, as rehabilitation for them is never finished. It is about keeping them active as long as possible, in order to prevent further complications and disablement.[10]

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