



## **Arterial Vascular Complications after Total Knee Arthroplasty Decrease the Quality of Post-op Rehabilitation (A Case Report)**

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### **Authors' contributions**

*This work was carried out in collaboration between all authors. Author IK designed the study, wrote the protocol, and wrote the first draft of the manuscript. Author BY wrote the PT protocol. Authors IK and FM managed the literature searches. All authors read and approved the final manuscript.*

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**Case Report**

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### **ABSTRACT**

**Introduction:** Routinely patients with hip or knee arthroplasty are transferred from acute clinic to rehabilitation department at an ever earlier stage (one week post-op).

The most frequent complications after lower extremity arthroplasty are: local pain, edema, contracture, tardive calcification, infection, hemorrhage, pulmonary embolism and deep vein thrombosis. Sometimes unexpected complications can provoke a delay or even suspension of the rehabilitation.

**Aims of the Study:** The principal objective of the current article is to remind to the wide public the possible presence (and subsequent care) of other complications, e.g. the lower limb arteritis.

**Case Presentation:** The presented patient is 77 years old male. Hospitalized in our PRM Department one week after operation, with the objective of *post-op orthopedic rehabilitation after total knee arthroplasty* (for advanced gonarthrosis - genu varum with angle 4°). **Arterial Echo-Doppler of the lower extremities:** Acute thrombosis of the left femoral superficial artery, and the left popliteal supra-articular artery (aneurysm of 30 mm), missing images of retro & supra-articular

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popliteal arteriae. **Urgent operation** was needed for the **left leg** diagnosed with **Arteritis: femoro-peroneal distal pontage in the intern saphenous vein with angioplasty of the distal anastomosis.**

**Discussion:**In every case our goal is to prevent possible complications and to assure a high quality of the rehabilitation.

**Conclusion:**Vascular complications after joint replacement can postpone or even interrupt the fluency of the rehab process. In every clinical case the PRM & OT medical doctors must be immediately alerted of any suspicion for complication or significant variation in expected progression / outcomes.

*Keywords: Knee arthroplasty; complication; arteritis; rehabilitation; physiotherapy.*

## 1. INTRODUCTION

The joint replacement (endoprosthesis, arthroplasty) is frequently applied in cases with permanent pain complaints due to advanced arthrosis, joints deformations and calcifications that do not respond to intra-articular drug injections or simple physiotherapy [1,2].

Routinely, patients with hip or knee arthroplasty are transferred from acute to rehabilitation (rehab) department at an ever earlier stage (one week post-op).

In rehab, major goals are the improvement of the range of motion of the knee or hip, the amelioration of the patient's state, the rehabilitation of the posture and gait, the resocialization of patient and the restoration of his / her autonomy in everyday life [3,4].

The most frequent complications after lower extremity arthroplasty are indisputably: local pain, edema, tardive calcification (due to general osteoporosis), infection or hemorrhage; development of joint or muscle contractures, pulmonary embolism and deep vein thrombosis [1,3].

Sometimes unexpected complications can occur and provoke an important delay or even suspension of the normal rehabilitation process. This is the present case.

The principal objective of the current article is to remind to the wide public the possible occurrence (and the subsequent care) of rare complications, like the lower limb arteritis [5].

## 2. PRESENTATION OF CASE

### 2.1 Patient's Presentation

The presented patient is a 77 years old male. Hospitalized in our PRM Department one week after operation, with the objective of *post-op*

*orthopedic rehabilitation* after *total knee arthroplasty*, for advanced femorotibial arthrosis - genu varum with angle = 4° (gonarthrosis). *Figs. 1 and 2* present radiographies of patient's knee before and after operation.

**Details of the operative protocol:** Total knee arthroplasty, prosthesis type Smith Nephew TC + without preservation of the posterior cruciate ligament (PCL); femur - size 8, tibial rotatory base – size 8, tibial plateau - polyethylene 11 mm; Patella arthroplasty (S Celle 29/8). Loco-regional anesthesia (rachis anesthesia).

**Active co-morbidities:** arterial hypertension; ischemic heart disease.

**Previous diseases:** thrombophlebitis, deep vein thrombosis (DVT x 2); pulmonary embolism; hemorrhoids; cataract; bilateral total hip arthroplasty (right THA – in 2001, left THA – in 2013) – *Fig. 3*; appendectomy.

No previous history of arteriosclerosis with other locations.

Not any previous skin ulcers or necrosis with difficult healing. No diabetes.

No obesity. BMI = 24,6.

Not at all addictions to alcohol or tobacco use.

### **Patient complaints:**

Excessive pain and stiffness in the left knee and muscles around it;

Difficulties in standing up, transfers and mobility; Reduced autonomy in activities of daily living (ADL);

Impossible autonomic gait.

### **Clinical exam before rehabilitation [6]:**

*Limited range of motion* (ROM) of the correspondent lower extremity; Post-operative cicatrix – with complications.

ROM of the left knee: active flexion - 75°; passive flexion - 90° (with tolerable pain); active extension was reduced to 10°. *Manual muscle test (MMT)* for muscles around the left knee: MMT=3/5 for vastus medialis & vastus lateralis.

Reduced capacity for transfers; Verticalization realized; Reduced capacity for autonomic gait: locomotion is possible with technical aids (walker) and with an assistant physiotherapist (PT).



Fig. 1. Gonarthrosis before the operation – in sitting (a) and standing (b) position (genuvarum with angle 4°)



Fig. 2. Recent knee endoprosthesis (X-ray after operation)



**Fig. 3. Bilateral hip endo-prosthesis of the same patient (previous arthroplasties)**

Intensive pain – in bed and during movements (VAS=8/10).

*Small black spot* (necrosis of diameter of 2 cm) - present at the surface of the first toe of left foot (Fig. 5a). Absent pulse of the left *posterior tibial artery* and the left *dorsalis pedis artery*.

**ICF** (*International classification of functioning assessment*) [7]

- Impairments of body functions – left leg pain, muscle weakness, and restricted knee ROM;
- Changes in body structures;
- Activity limitation - limited walking ability and problems with putting on socks;
- Participation restrictions - reduced participation in leisure activities;
- Decrease of the patient's level of autonomy.

**Biological constants:**

RR 140/85 mm Hg, frequency – 72 beats/min., saturation – 100%.

**LAB exam:** normal Hb, Leuco, Thrombo; ionogram, lipid and glucidic patterns. Transient increase of CRP. Vitamin D(25-OH D) = 7 ng/ml.

**Cardiological consultation:** (with *Electrocardiography, Echocardiography and Doppler*): Possible ischemic P wave, preserved rejection function of the left ventricle.

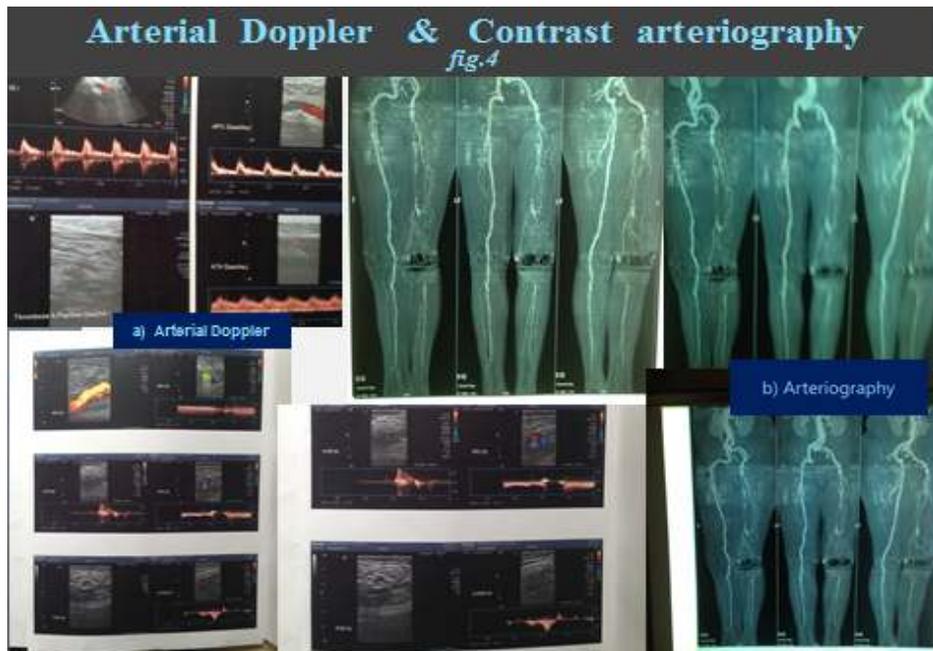
**Venous Echo-Doppler of the lower extremities:** without signs of acute deep vein thrombosis (DVT), but DVT sequelae: residual thrombi (non-occlusive) in: femoralis communis dextra, femoralis superficialis, poplitea sinistra.

**Arterial Echo-Doppler of the lower extremities** (Fig. 4a): Acute thrombosis of the left femoral superficial artery, and of the left popliteal supra-articular artery (aneurysm of 30 mm), missing images of retro & supra-articular popliteal arteries.

**Contrast Arteriography** (Fig. 4b) confirmed the diagnosis of arteritis and thrombosis.

**Urgent operation** was needed for the left leg: *distal femoro-peroneal by-pass in the intern saphenous vein with angioplasty of the distal anastomosis*. (Post-op cicatrix in Fig. 5b-d)

**After the operation: secretion of the operative cicatrix** with temperature, sedimentation time 140 mm at the first hour, C-reactive protein /CRP/ 71,7 mg/L, isolation of colonies of *Escherichia coli*; antibiotic treatment with Amoxicillin-Clavulanic acid (Augmentin).



**Fig. 4. Arterial doppler & contrast arteriography (before the by-pass operation)**

**Pain** in the left foot and toes (Visual analogue scale - VAS 6/10).

**Radiography:** osteochondritis of the astragalin dome.

**Scanner:** Arthrosis, subchondral lesions of the talus dome, no signs of bone infarct.

## 2.2 PRM Program of Care [8,9]

**Goal:** functional recovery.

### Tasks:

- ❖ recovery of the stability and mobility of the lower limb joints;
- ❖ restoration of the muscle and ligament balance, accentuating on muscles around the knee joint; keeping the knee in the economic limb biomechanics;
- ❖ control of pain, cicatrix, ROM, possible complications;
- ❖ education of transfers;
- ❖ normal gait recovery with correction of eventual abnormal walking scheme;
- ❖ activities of daily living (ADL) training;
- ❖ amelioration of autonomy in everyday life;
- ❖ psycho-emotional stimulation;
- ❖ enhancement of the health-related quality of life;

- ❖ home adaptations;
- ❖ recovery of functionality at home and resocialization.

### Methods

- **Antalgic and anti-thrombotic drugs;**
- **Patient's education;**
- **Posture (activity modification),**
- **Preformed physical modalities:**
  - Transcutaneous electroneuro stimulation (TENS) for pain relief, low intensity low frequency magnetic field (MF) for edema reduction.
- **Cryotherapy** - for the knee joint (before the massage and the kinesitherapy);
- **Massage** – classic massage (relaxing for the rectus femoris muscle; stimulating for vastus lateralis and vastus medialis),
- **Individualized physio-therapeutic (PT) programme:** correct posture of the leg, lower limb joint mobilization (active range of motion), analytic exercises for vastus muscles; post-isometric relaxation /PIR/ for rectus femoris muscle;
- **Balance and gait training** with supporting walker or two crutches, education in mobility with obstacles, up and down the stairs.
- **Occupational therapy (OT) & ADL training.**

**The applied Physiotherapy protocol comprises:**

- ✓ ROM techniques - passive and active mobilizations of the knee joint, passive mechanotherapy (device Kinetec);
- ✓ proprioceptive training;
- ✓ strengthening (active) exercises for the basic muscles of the principal kinetic chains of lower extremities and for stabilizers of the hip, knee and ankle joints (gluteus medius& gluteus maximus; ilio-psoas muscle; tight abductors and adductors; quadriceps femoris, hamstrings; triceps surae, tibialis anterior and peroneus longus; flexors and extensors of the ankle and toes),
- ✓ analytic exercises for the quadriceps muscle (with special attention to the heads vastus lateralis & vastus medialis obliquus);
- ✓ stretching exercises for the gastrocnemius – soleus complex, for the quadriceps and hamstrings;
- ✓ PIR (if necessary) for some muscles: rectus femoris, soleus, ilio-psoas.

The complex PT / OT program includes too balance and gait training, with technical aids (walker at the beginning, two crutches, two canes, one cane).

During gait rehabilitation the principle of progressive weight bearing (WB), with restoration of the correct gait pattern was considered (no WB for the first post-op week, after that – progressive augmentation of the WB).

**2.3 Results of the Applied PRM Programme and Future Recommendations after the Rehabilitation, We Observed**

- ✓ Amelioration of the ROM of the left knee: active flexion 95°, full extension;
- ✓ Amelioration of the functional capacity: 10 meters walk test – 6,5 seconds;
- ✓ Independent stand up and transfers - Timed Up & Go test 5,2 sec;
- ✓ Independent gait with crutches – in the room and the corridor;
- ✓ Balance & Gait stabilization;
- ✓ Pain relief in lower limbs – Visual analogue scale 2/10;
- ✓ Revascularization of the operated limb (Fig. 5c);
- ✓ Amelioration of the autonomy in ADL.

Treatment plan after the exit from the hospital includes: **Auto-PT at home:** physiotherapy every day at the 3<sup>th</sup> month post-op; Gait training – with crutches; Next hospitalization for rehabilitation - 3 months later.



**Fig. 5. Black necrotic spot before operation [a] and sic necrosis after revascularization [c]; Post-operative cicatrix [b & d]**

### 3. DISCUSSION

According to the definition of the European Union of Medical Specialists – PRM Section [1] **Physical and Rehabilitation Medicine (PRM)** is an „independent medical specialty, oriented to the promotion of physical and cognitive functioning, activities (including environment), participation (including quality of life) and changes in personal factors and environment. The specialty PRM is responsible for the management of the prevention, diagnostics, treatment and rehabilitation of patients with health-related disability and co-morbidity of all ages.

According to the White Book on Physical and Rehabilitation Medicine [1] **the basic objective of PRM** is the optimization of social participation and the amelioration of the quality of life of patients. This includes the aid of the patient to reach possible levels and patterns of autonomy and independence, including participation in professional, social and leisure activities, part of his human rights [3].

**Tasks of PRM** are: treatment of existing pathology; reduction of disability; prevention and therapy of complications; amelioration of functioning and activity; stimulation of patient's participation in different types of activities [3,8,9].

In orthopedic and traumatologic (OT) conditions, including after orthopedic surgery, during **clinical assessment** we accentuate on some analyses: *pain* (localization, type, intensity – verbal or visual analogue scale; modifying pain activities); *joint stability* (including joint position sense) and *range of motion* (active and passive); presence of oedema, muscle or joint *contractures*; *evaluation of the muscle force / muscle insufficiency, motor deficit; analysis of the grasp and gait; mobility* (necessity of technical aids - canes, walking sticks, crutches, walkers, wheelchairs and other devices); *fatigue* (physical endurance, necessity of rest during the examination or the functional activity); *autonomy in everyday activities* (bathing, dressing, eating, putting shoes on, personal hygiene, need of help in ADL). Evaluation of problems must be qualitative and quantitative, including: fatigue, motor deficiency, coordination problems (body position, gait, grasp); pain; conscience for the necessity of technical aids; difficulties in ADL; limitations in functional mobility [6].

The complexity of rehabilitation in OT cases imposes the necessity of a holistic approach to the patient – detailed functional analysis before and after the rehabilitation courses; application of therapeutic methods of different medical specialties (principally orthopedics and traumatology; neurology and neurosurgery; rheumatology; PRM) and from non-medical fields (kinesitherapy, sociology, psychology, occupational therapy). We apply basic principles of the specialty Physical and Rehabilitation medicine [3,6,9].

In every stage of the rehabilitation process us we must define precisely the goal, tasks and algorithms of rehabilitation. In every case our goal is to assure a high quality of the rehabilitation, optimal for the clinical form of the principal disease or condition, adapted to the age, co-morbidities, capacity and desire of the concrete patient; with the strategic goal to receive the best result for his quality of life.

### 5. CONCLUSION

Vascular complications after joint replacement can postpone or even suspend the rehab process. In every clinical case the PRM & OT medical doctors must be immediately alerted for any suspicion for arteritis, deep venous thrombosis, pulmonary embolism, infection, excessive oedema, or significant variation of expected progression / outcomes.

### CONSENT

All authors declare that '*written informed consent* was obtained from the patient for publication of this case report and accompanying images'. Protection of privacy of the patient is guaranteed. Authors accomplished all requirements of SDI Patient Consent Form 1.0.

### ETHICAL APPROVAL

All authors hereby declare that the work have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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