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Clinical Case of Transcatheter Arterial Embolization of Popliteal Artery Branch in The Treatment of Knee Osteoarthritis

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Abstract

Transcatheter arterial embolization (TAE) of popliteal artery branches is one of the innovative and promising minimally invasive methods for the treatment of knee osteoarthritis. The article presents a description of clinical case of 60-year-old female patient with left-sided knee osteoarthritis grade 2 and severe pain syndrome. She was admitted to the Orenburg regional clinical hospital named by V.I. Voinov due to insufficient effectiveness of conservative treatment. TAE of popliteal artery branches was performed. Clinical and functional characteristics of joints were assessed using WOMAC and Lysholm scales at baseline and 3 months after intervention. The patient demonstrated significant improvement in clinical and functional results in the form of decrease in WOMAC scale from 136 to 39 points, and improvement in the Lysholm scale (from 56 to 88 points). The postoperative period was without complications. TAE of popliteal artery branches is an effective minimally invasive intervention that significantly reduces severity of pain and improves the function of knee joints. This method requires more studies with larger number of patients.

Keywords: osteoarthritis, transcatheter arterial embolization, pain.

Introduction

Rheumatic diseases are a heterogeneous group of chronic conditions that are characterized by development of severe concomitant conditions in patients. These ailments cause a tremendous negative impact on the modern society as they act as both physiological and psychological burden on patients and as economic burden on the society. Osteoarthritis (OA) is the most common joint pathology worldwide which is accompanied by chronic pain, disability, and showcases a prediction of further increase in incidence.

In 2020, approximately 595 million patients with OA were identified, corresponding to 7.6% of the world population, this amounted to a 132.2% increase in prevalence compared to 1990 [1]. In addition to the annual dynamic increase in incidence, a significant rise of this pathology has been noted among the working demographics [2], which is of great medical and social importance for the state.

One of the promising methods for managing OA is transcatheter arterial embolization (TAE) of popliteal artery branches. It is a new, minimally invasive technique that is used to relieve pain in knee OA and is based on the observation that inflammation causes abnormal neovascularization and sensory nerve fiber growth [3]. Neoangiogenesis can stimulate the growth of osteophytes that results in pain. Furthermore, this process in the synovium can cause disruption of the homeostasis of hyaline cartilage and hypoxia of chondrocytes [4].

As a rule, the area of pathological vascularization is located in the projection of the medial part of the knee joint and is supplied by a network of branches of the popliteal artery. The TAE method involves catheterization and angiography of the femoral artery, popliteal artery and its branches, followed by embolization of the hypervascular area.

There is relatively little scientific data regarding TAE of the branches of the popliteal artery, and their results are often contradictory. But this method has shown effectiveness in small samples of patients with knee OA grades 1-2 [5, 6, 7]. It is notable that this method was found to be insufficiently effective in late stage OA [8], but the early stages of the disease with resistance to standard therapy is a considerable indication for this method [7]. Review works presented in literature indicate the success of this technique, especially in cases when conservative therapy was ineffective or contraindications to surgical treatment existed [9].

Clinical case presentation

Patient B., 60 years old, consulted a traumatologist at the Orenburg Regional Clinical Hospital in 2024 with complaints of pain in the left knee joint and slight limitation of movements since the last 7 years. On palpation, local pain in the projection area of the medial aspect of the knee joint with movement restriction due to pain was recorded. The patient was diagnosed with: Left knee osteoarthritis of Grade 2 as per Kellgren-Lawrence (Fig. 1). Clinical and functional examination results were: Lysholm scale - 56 points, WOMAC scale - 136 points, flexion and extension: significantly limited (Fig. 2).

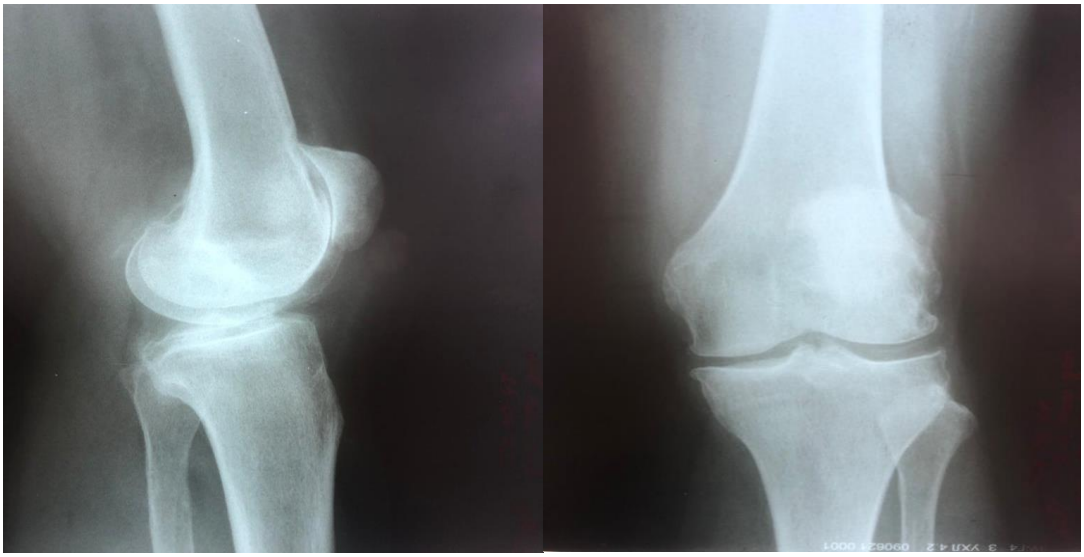


Figure 1: X-ray of knee joint of patient B. with knee OA grade 2 in two projections.

Figure 2: Functional result of patient B. (maximum knee extension and flexion) before surgery.

The patient had a history of treatment with NSAIDs, physiotherapy and a course of SYSADOA (chondroitin sulfate) for 6 months. The intensity of pain and the severity of contracture had remained unchanged over time. The patient was hospitalized, and surgical treatment was performed using the method described above (Fig. 3-5).

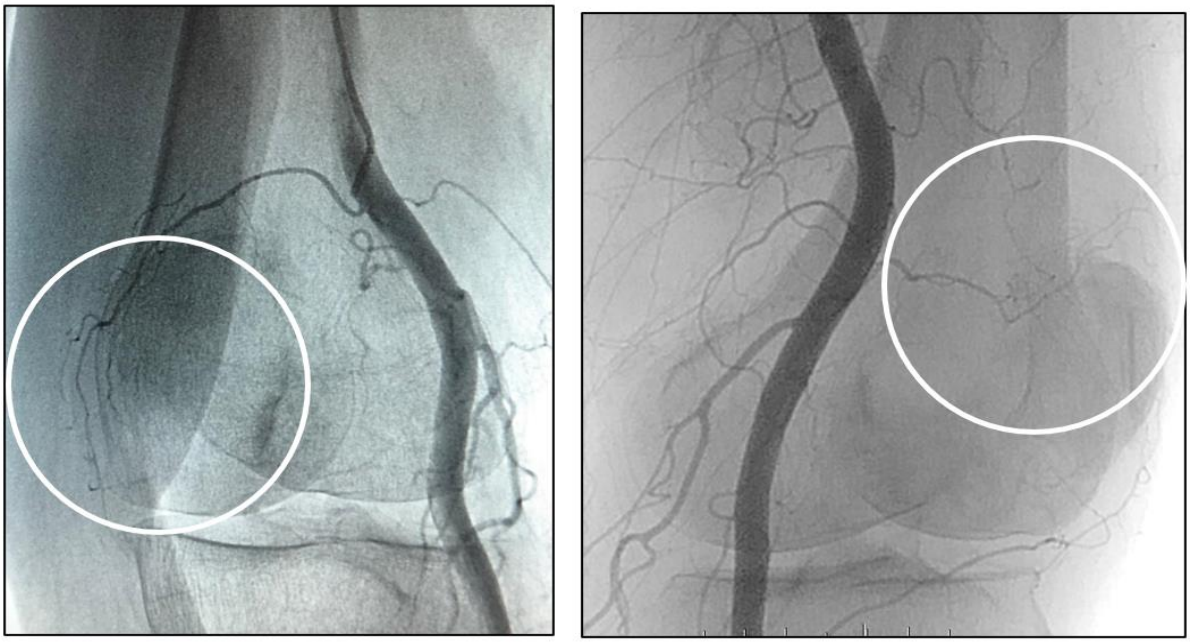
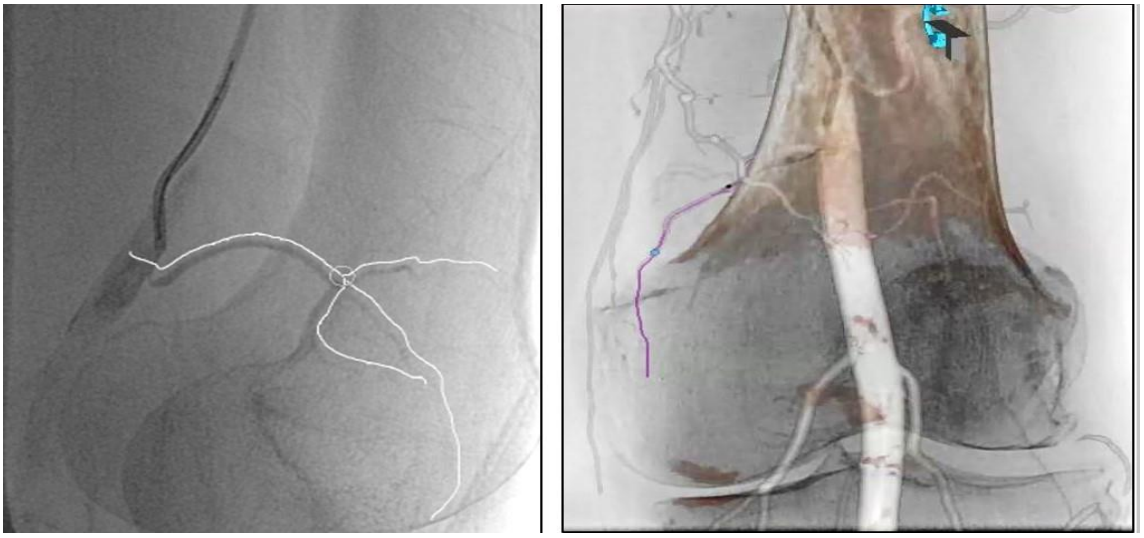
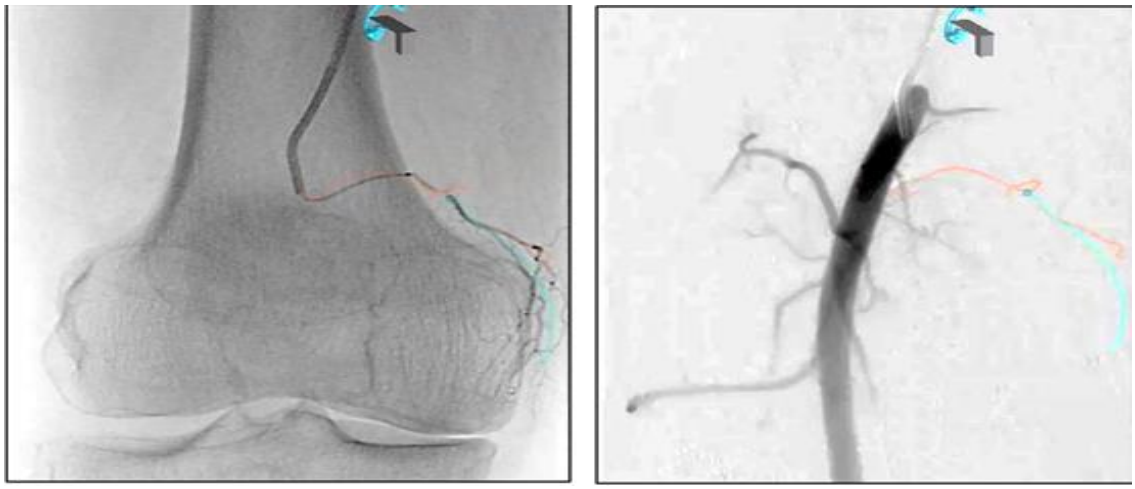


Figure 3: Visualization of pathological vascular network supporting the inflammatory process.



A B

Figure 4. Navigation capabilities using the Embolization Guidance program: A – catheterization of the target artery using the overlay of projection of vessels on the "live" image; B – insertion of a guidewire and microcatheter using the reconstructed 3D image.



A B

Figure 5: Injection of embolizate through a microcatheter (A), the result of embolization is occlusion of the target artery (B). The projection of the target artery is superimposed using a 3D reconstruction program.

The postoperative period was without complications. The patient was discharged on the third day after surgery. A dynamic examination was then carried out after 3 months. A decrease in pain in the knee joint and an increase in the range of active and passive movements was noted. The functional results were estimated as 88 points on the Lysholm scale and 39 points on the WOMAC scale (Fig. 6).

Figure 6: Functional result of patient B. (maximum knee extension and flexion) after surgical treatment after 3 months.

Conclusion

TAE of popliteal artery branches is an effective minimally invasive intervention that significantly reduces the severity of pain in patients and improves the functional parameters of knee joint. The method requires further research, expansion of patient samples, development of a selection criteria in order to increase accessibility for practical healthcare.

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