

Proximal partial fibular resection instead of total knee prosthesis in a patient with metal allergy

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Knee osteoarthritis is a common joint disease affecting middle-aged and elderly individuals.^[1] High tibial osteotomy (HTO), unicompartmental or total knee arthroplasty (TKA) can be preferred as surgical treatment modalities in patients with medial compartment arthrosis. These methods are usually determined according to the age of the patient, the degree of medial arthrosis, the presence of arthrosis in the lateral compartment, and the experience of the surgeon. All of these surgical treatment options require metallic biomaterials such as stainless steels, titanium alloys, and cobalt-chromium alloys. According to the patch test and blood analysis, the frequency of nickel, cobalt, chromium skin allergies in the general population is 13%, 2% and 1%, respectively. Although metal hypersensitivity is estimated between 10 to 15% in the general population, even higher incidences may be observed up to 25%.^[2]

ABSTRACT

A 66-year-old female patient with Grade III osteoarthritis was considered for primary total knee arthroplasty (TKA). Due to her metal allergy, TKA was abandoned and proximal partial fibular resection (PPFR) was planned. The patient was evaluated at regular follow-ups. Based on the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Visual Analog Scale (VAS) scores, a significant improvement, particularly in terms of pain and functional scores with limited radiological change, was observed. In conclusion, the PPFR is a viable surgical treatment option in patients with gonarthrosis who have metal hypersensitivity.

Keywords: Medial release, metal allergy, metal hypersensitivity, osteoarthritis, proximal partial fibular resection.

In the literature, the frequency of cutaneous reactions due to metallic implants has been reported at rates ranging from <0.1 to 5%.^[3] Due to these reactions, the relationship between metal hypersensitivity and implant failure has been the subject of research in many studies in recent years.^[4]

Proximal partial fibular resection (PPFR) has been emerging as a viable option which is an easier, less invasive and proposedly cheaper surgical treatment method than HTO and TKA in recent years.^[5] On the other hand, PPFR technique has a risk of peroneal nerve damage, if the nerve is not dissected and protected properly.^[5] It does not require bone union and implant usage; therefore, there is no risk of metal hypersensitivity which was the main purpose of our PPFR application.^[6] Herein, we report a case of gonarthrosis having metal allergy in whom the PPFR technique was used as an alternative surgical method.

CASE REPORT

A 66-year-old female patient was admitted to our clinic with pain in both knees. Upon physical

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Figure 1. The preoperative bilateral weight-bearing knee X-ray.

examination, limited flexion of 95° in both knees was apparent. Grade III osteoarthritis was detected according to the Kellgren-Lawrence classification on weight-bearing X-ray radiographs (Figure 1). The patient was considered for primary TKA; however, after obtaining a detailed medical history, her allergic reaction to metal jewelry was detected. Dermatology consultation was requested to determine the severity of the allergic reaction to metallic implants. The skin patch test revealed that the patient had a + (erythema + infiltration) reaction at 48 h and a ++ (erythema + infiltration + papule) reaction at 96 h. Diagnostic criteria for metal hypersensitivity reactions to metallic implants were examined in terms of patch tests findings.^[7] Nickel and molybdenum measurements were within the normal range in the blood tests.

Due to the allergic condition of the patient, TKA was abandoned and PPR and medial ligament complex release were planned for both knees, abolishing implant requirement. The patient was informed about



Figure 2. The postoperative weight-bearing orthoroentgenogram at first year of follow-up.

the surgery complications including the risk of nerve injury and a written informed consent was obtained.

Both lower limbs were prepared for surgery. To loosen the peroneal nerve, a sterile roller was placed under the knee in 40° flexion position. A posterolateral incision was made approximately 6 to 10 cm below the proximal end of the fibula, depending on the patient's height. Peroneal nerve was dissected and protected. Approximately 1 to 1.5 cm bone resection was performed on the proximal fibula using an

TABLE I

Pre- and postoperative measurement and score values of the patient

	Preoperative		Postoperative 1 st month		Postoperative 3 rd months		Postoperative 6 th months		Postoperative 1 st year	
	Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
VAS	6	8	2	2	2	2	2	3	4	2
WOMAC	54.1	69.7	14.5	16.6	17.7	16.6	17.7	19.7	32.2	14.5
Medial joint space (mm)	0.4	0	0.6	0.3	0.5	0.3	0.5	0.3	0.4	0.3
Lateral joint space (mm)	9	10	8	8	8	8	7	8	7	8
Femorotibial angle	181	183	178	180	178	179	177	179	178	178

VAS: Visual Analog Scale; WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index.

oscillating bone saw. Then, percutaneous pie-crust technique was performed to the superficial medial collateral ligament (sMCL) from the tibial attachment site to the deep medial collateral ligament (dMCL) at the joint level with an 18-gauge needle. The patient was mobilized on the first postoperative day as much as she could tolerate.

The patient was evaluated at postoperative 1, 3, 6, and 12 months. At the postoperative first year, the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) and Visual Analog Scale (VAS) scores were examined (Table 1). The medial and lateral joint space and femorotibial angle were examined on the standing anteroposterior radiographs (Figure 2). There was a significant improvement, particularly in terms of pain and function according to VAS and WOMAC, with a limited radiological change (Table I).

DISCUSSION

Biomechanically, knee osteoarthritis is caused by an imbalance between biological resistance and mechanical stress. In patients with varus deformity, pain is more pronounced in the medial compartment. The main goal in all surgical treatments is to correct the axis. Although causes of pain relief after fibular osteotomy are not fully explained, it is thought that it develops due to the correction of the alignment.^[8] Fibular osteotomy was coincidentally described in prisoners with medial knee arthritis in the early 2000s, with relief of symptoms after proximal fibular fractures during riots. Although the term proximal fibular osteotomy (PFO) is commonly used in the literature, we chose to use the PPFR, as this technique is more likely a resection than an osteotomy.^[6]

The first study on PFO was published by Yang et al.^[8] in 2015 showing the improvement in the radiographic and functional results of 110 patients with a follow-up period of more than two years. They reported two common peroneal nerve palsies and two superficial peroneal nerve injuries which resolved within 3 to 10 months.^[8] With this technique, we performed our first case in our clinic in the same year and have applied this surgical procedure to more than 50 patients until now. The main idea in this procedure is that, although the medial part has only one cortex support, there are three cortex supports (one tibia + two fibulae) lateral to the knee. With partial resection, the main goal is to weaken the lateral fibular support and reduce varus deformity. In varus deformity, we added percutaneous pie-crust technique to the

surgical procedure to loosen the tense soft tissue in the medial compartment.

The advantage of this technique is that it is easy to apply and does not require implant usage. Considering the metal allergy of our patient, we preferred this technique to eliminate metallic implant requirement.

The relationship between metallic implants with dermatitis has been known for nearly four decades. Several studies on localized or systemic skin reactions that persist after TKA have also been reported in the dermatology literature.^[9,10] Therefore, dermatology consultation is recommended for patients who develop chronic dermatitis without concomitant knee synovitis or component loosening. In the last few years, numerous studies of persistent synovitis with severe pain in patients with components of cobalt-chromium TKA have also been reported.^[10] Pathological specimens of patients undergoing revision TKA due to metal hypersensitivity revealed lymphoplasmacellular and eosinophilic fibrous tissue, synovial hypertrophy and hyperplasia, and chronic histiocytic reaction. After revision surgeries, which were performed by changing the type of metallic implant, an improvement in the functions of the patients was observed; however, the regression of the dermatitis was occasionally poor.^[10] Due to these concerns, preferring a different surgical method rather than arthroplasty seems to be reasonable in patients with metal allergy.

The postoperative clinical and radiological improvements of our patient were satisfactory. A significant improvement in pain scores, particularly on the first postoperative day, was remarkable. Although radiological improvement was limited, the relief of symptoms and functional scores were preserved one year after the operation. Of note, utmost care should be taken to identify and preserve the common peroneal nerve that runs from proximal to distal during surgery. Accordingly, the dissection plane to approach the fibula and the resected fibula area are critical. The PPFR technique carries a risk of peroneal nerve damage, if the nerve is not properly dissected and preserved.^[5] In surgical treatment of osteoarthritis, the PPFR technique may be a viable surgical treatment option in patients with gonarthrosis who have metal hypersensitivity. In such cases, attention should be paid to protect the common peroneal nerve.

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