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Original article

Introducing The Efficient Technique And Experience Of Femoropopliteal Bypass Surgery: Our 10-Year Experience Using Autogenous Saphenous Vein

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Abstract

Peripheral arterial disease is one of the most common diseases in societies that have put a heavy burden on the health systems. Studies on various surgical procedures in patients with the peripheral arterial disease have examined the limited number of patients with involvement in different vascular segments of the lower extremities and compared their therapeutic outcomes with different treatment methods. However, in Iran, such studies are performed at a very limited level, so that their results cannot be used for treatment planning, as well as the comparison of different surgical methods. We examined 300 patients who underwent Femoropopliteal bypass surgery with autogenous saphenous vein, from 2009 to 2019 in Shohadaye Tajrish hospital (Tehran, Iran). We recorded, reported, and analyzed information obtained from histories record and patient follow-up. Femoropopliteal bypass surgery using an autogenous saphenous vein in the treatment of peripheral vascular disease according to common criteria such as ten-year mortality, intraoperative mortality, primary patency, gangrene, and postoperative amputation, as well as postoperative complications, compared to other alternative operations had been successful. Femoropopliteal bypass surgery with an autogenous saphenous vein is very promising and recommended.

Keywords: Femoropopliteal bypass surgery, Autogenous saphenous vein, Peripheral arterial disease

Introduction

Today, in the 21st century, significant epidemiological changes have taken place in the incidence of diseases, so that the form of common diseases has moved away from infectious diseases towards chronic diseases. Among them, the diseases related to atherosclerosis of arteries have attracted the most attention [1]. Peripheral Arterial Disease (PAD) is no exception to this rule, and therefore the need for greater care and attention in the prevention and management of PAD patients is increasingly felt. The epidemiology and natural course of PAD in developing and developed countries have been extensively researched over the past 30 years. Based on this research and scientific evidence, sufficient information on the prevalence, effective factors, and prognosis of this disease is available in western countries [2, 3]. It is difficult to estimate the exact number of patients with symptomatic PAD in the world, and this problem has occurred due to the lack of reliable data and extensive field studies in developing countries. However, according to data published in Western countries, the prevalence of PAD is increasing and estimated at about 3 to 10% of the total population and 15 to 20% of the population over 70 years. As expected, in addition to increasing the incidence, the economic and social burden of this disease has also a significant upward trend [4]. In addition, known risk factors for PAD such as smoking, diabetes, impaired lipid profile, and hypertension have been studied in Western countries, and significant steps have been taken to reduce these risk factors [5]. So far, it can be seen that there is a lack of studies on PAD diseases in countries such as Iran, both for epidemiological and clinical purposes, and it

has been concluded that it is time to design such studies to achieve goals such as early diagnosis, prevention, and improvement of treatment methods. In Iran, the aging population and diseases such as diabetes and hypertension increase the need for revascularization procedures in the not-too-distant future. These procedures will consume a large part of the country's treatment budgets, and the least expensive and most effective treatment methods should be used in this field.

Today, in addition to surgical bypass procedures in patients with PAD, endovascular procedures have been introduced and advances have been made in these methods. They include balloon angioplasty, use of stents and stent-grafts, reduction of atheroma plaque volume, thrombolysis, and percutaneous thrombectomy [6]. A noteworthy point that has been emphasized in Western studies is the scope of using alternative methods such as endovascular, which should be per the level of profitability and also the availability of new bioengineering technologies in the country [7]. These types of surgeries are inherently costly and have been reported to be less successful than bypass surgeries, which is why bypass surgeries are becoming more and more important.

The mortality rate, as well as the complications of vascular surgery, are directly proportional to the volume of patients in a hospital and the skill of vascular surgeons [7, 8]. Today, physicians and treatment teams make their decisions based on information published in Western journals and guidelines, which in many cases is not similar to our country in terms of financial resources and infrastructure [9].

In this study, an attempt had been made to report the success rate and complications of Femoropopliteal (Fem-Pop) bypass surgery with high accuracy and truthfulness.

Materials and Methods

In this retrospective study, the files of patients with a peripheral vascular disease with involvement of the Fem-Pop segment during the last ten years (from 1388 to 1398) based on the classification codes of patients' file numbers who underwent Fem-Pop bypass surgery, were extracted and by carefully examining the files, the results and consequences of surgery along with demographic information were collected. Intraoperative results were also completed based on the patient's description of the operation. After that, the endpoints considered in the study were also recorded from the patients' files and all the patients were contacted to fill the forms. It should be noted that if there was no contact information or no referral or no answer to the phone call, the patient would be excluded from the study and his/her information would not be included in the final analysis. After preparing the forms related to each patient, their information was entered in SPSS software to perform statistical analyzes appropriate to the type of variable. It should be noted that other patients who underwent Fem-Pop bypass surgery for other reasons, including trauma, were excluded from the total number of patients before the start of the study, and all 300 patients included in the study were evaluated with a definitive diagnosis of PAD.

All patient information was analyzed in a completely confidential and encrypted manner to avoid publishing any patient data. Also, at the beginning of the study, the research ethics committee of Shahid Beheshti University of Medical Sciences reviewed the study process and after receiving the code of ethics, the research began.

Results

Demographic information

In this study, the data of 300 patients who underwent Fem-Pop bypass surgery using autogenous saphenous vein with the general diagnosis of PAD during 1388-1398 were extracted and analyzed. The mean age of the patients was 61.2 ± 15.24. The youngest patient was 30 years old and the oldest patient was 90 years old. Also, the median age of patients was 60.5. Regarding the sexual distribution of patients, 89.3% were male and 10.7% were female.

Previous medical history

The histories of all patients were studied at the time of admission and before surgery. In this regard, there was a history of 6 diseases, which are: Diabetes mellitus (DM), Ischemic heart disease (IHD), Hypertension (HTN), Chronic kidney disease (CKD), Myocardial infarction (MI), and Cerebrovascular accident (CVA). Among them, the highest prevalence was related to DM with 97 patients (32.3%), followed by HTN with 82 patients (27.3%). IHD with 62 patients (20.7%) was the third most common disease. History of CVA and CKD had an equal prevalence in 14

patients (4.7%). Only 3 patients (1%), had a history of MI.

Prevalence of smoking

Among the studied patients, 225 patients (75%) were smokers and 75 patients (25%) were not smokers. The criterion of patients being smokers in this study is considered as 10 packs/year.

The main manifestations and complaints of patients

The main complaints of patients are divided into four categories: pain, claudication, ulceration, and gangrene. Pain with a frequency of 206 patients (68.7%) was the most common complaint. After pain, claudication was reported in 70 patients (23.3%) and ulceration with 63 patients (21%) being the most common findings. It should be noted that 43 patients 14.1%) also complained of gangrene.

Medications used by patients

Aspirin, warfarin, and opium were the three most widely used drugs among patients. 62 patients (20.7%) were taking aspirin,47 patients (15.7%) were taking warfarin, and 20 (6.7%) were taking opioid analgesics. It should be noted that in addition to the drugs listed here, patients were taking other drugs based on their underlying diseases, including NSAIDs, metformin, and statins.

The location of the distal anastomosis

After careful examination of the patients' operation description, the distal anastomosis site was divided into high and low categories. In this study, femorotibial and femoral tibioperoneal loci were also considered low. In this regard, 64 patients (21.3%) were considered high in terms of the location of the distal anastomosis, and 236 patients (78.7%) were low.

Patient mortality

Intraoperative mortality is mortality during surgery up to thirty days later. Accordingly, studies of patient records over the past ten years indicate that from 300 patients who underwent surgery, 13 (4.3%) died within 30 days of surgery. 100 patients (33.3%) have died during the last 10 years. Regarding the causes of patient mortality, according to the information obtained, 72 patients (72%) died of heart attack, and 15 patients (15%) died of a stroke.

Primary patency

Primary patency is the length of time that a vascular occlusion is open and functioning properly without any intervention. In this ten-year study, out of 200 living patients, vascular occlusion in 87 patients (43.5%) had adequate function without any intervention. Also, taking into account the deaths, the average number of years that vascular occlusion was open without any intervention and had sufficient function was equal to 34 years.

Gangrene

Only 75 out of 300 patients (25%) had gangrene and 225 patients (75%) had not experienced gangrene. Among the patients with gangrene, 55 patients (73%) were in the first year after surgery, 12 patients (16%) were in the second year after surgery and 4 patients (5%) were in the third year. It was also found that out of 75 patients with gangrene, 2 patients were in the fourth year and 2 patients were in the fifth year, each accounting for 3%. It should be noted that no gangrene was reported after the fifth year of surgery.

Amputation

In the follow-up of patients, we found that out of 300 patients, 235 patients (78.3%) had never needed amputation during these ten years. Meanwhile, 65 patients (21.7%) had been amputated. Among the patients who underwent amputation, 48 (73.8%) were in the first year after surgery. 13 patients (20%) underwent amputation during the second year after surgery. In addition, during the fourth and fifth years, 2 patients (3%) had been amputated.

Here it is necessary to explain that by comparing the statistics of gangrene and amputation, we found that 10 patients had gangrene while they were not amputated. Examining the files and contacting the patients, we found that these patients died sometime after the gangrene and they were never amputated.

Complications after surgery

Regarding postoperative bleeding, only 25 patients (8.3%) experienced postoperative bleeding and 275 patients (91.7%) had no experience of bleeding and regarding postoperative wound infection, 44 patients (14.7%) experienced postoperative wound infection. However, 256 patients (85.3%) had no experience of wound infection.

Discussion

Limited studies have been performed on the comparison of infra-inguinal vascular bypass

treatment methods, some of which have been designed with a prospective model and interventional studies [10]. It is noteworthy that the methodology of these studies was in a wide range and the criteria for inclusion in the study as well as surgical techniques in different studies are very different. The majority of studies have published their results with a small number of patients compared to angioplasty and endovascular treatments. Compared to most studies, the present study found an acceptable position in terms of the number of bags included in the research. Also, in the present study, a period of 10 years was set for extracting the data and examining the patients, which also contributed to the accuracy of the information obtained.

A study by BASIL et al. was initially designed to compare the success of bypass surgery with angioplasty treatments in patients with Severe Limb Ischemia (SLI) [11]. In this study, 453 SLI patients with defined pain at rest, tissue loss, or both due to PAD were randomized to two groups of bypass surgery (75% of patients underwent venous graft) and balloon angioplasty. About 25% of these patients underwent revascularization for SLI due to infra-popliteal atherosclerosis (IP). In this study, the final analysis was performed on all patients with epithelial-inguinal involvement and did not have sufficient power for subgroup analysis, and in particular, there was no thorough examination of the venous graft. In comparison, in this study, to clarify and obtain reliable statistical information on autogenous saphenous vein grafts, we examined only patients who underwent surgery with the same type of graft.

Another study by Popplewell et al. in 2017 included 56 patients in the intravenous bypass group and 48 patients in the angioplasty group [12]. Although the results of this study cannot be generalized to all patients undergoing Fem-Pop bypass surgery, the results were thought-provoking. In this study, in addition to demographic and baseline information, the location of proximal and distal anastomoses were reported separately. Approximately 14% of patients in the intravenous bypass group failed due to technical errors, which is a significant statistic.

Another meta-analysis study conducted in 2015 examined the outcome of patients with Fem-Pop involvement who underwent open and endovascular surgery [13]. However, in this study, 4 randomized clinical trials and 6 descriptive studies were reviewed, and finally, 2817 patients were included. The final analysis on these patients showed that the 30-day morbidity was higher in the endovascular group and the technical error was significantly higher in the endovascular group. These results showed that no difference in 30-day mortality was observed between the two groups. This study also included all patients with infra-inguinal vascular involvement and upper and lower knee bypasses with the same errors and biases. In addition, in this meta-analysis, patients with various manifestations, from lameness to critical ischemia, have been included, which, of course, affect the results.

In 2017, a study was conducted by Uhl et al. [14]. In this study, which specifically focused on patients undergoing vascular bypass below the knee, short-term and long-term results were reviewed in two groups. Patients in this study were retrospectively evaluated in two groups of artificial vascular graft (PTFE) and vein and the results were compared between the two groups. Patients with critical limb ischemia (symptoms lasting more than 2 weeks) were included in the study and evaluated for the need for open vascular surgery. If the patient had a suitable vein (according to the ultrasound examination), he/she underwent surgery using an autogenous vein, and otherwise, a 6 mm vascular bypass was performed using a PTFE block. From a total of 151 patients enrolled in this study, all were in class 4 of the TASC classification. Wounds or gangrene were the most common criteria for entering pain at rest. The mean follow-up period was 34 months. According to this study, the patency rate was approximately 74.5% in one year, 65.7% in 3 years, and 51.7% in 5 years. Statistical analysis showed that there was no statistical difference between the two groups in 5-year patency. This study is one of the few studies that examined the results of open vascular interventions in different groups.

In another study conducted in 2016 on 90 patients with vascular disease of the Fem-Pop segment, patients were divided into three groups and the results after surgery between the use of inverted autogenous vein, in-situ vein and non-inverted autogenous vein has been investigated [15]. Like the studies mentioned in this section, it examined a small number of patients and did not thoroughly examine the technical errors and complications of surgery.

In the present study, contrary to many studies to date, the studied cases underwent only and exclusively Fem-Pop bypass surgery with an autogenous saphenous vein. Also, our statistical population has been more than many studies so far. A noteworthy point that highlights the accuracy of the information presented in this study was that all patients who underwent Fem-Pop bypass surgery using autogenous saphenous vein for reasons other than peripheral vascular disease were all excluded from the study.

According to the information and statistics obtained in this study, it seems that Fem-Pop bypass surgery using an autogenous saphenous vein in our country has very acceptable results. However, due to the lack of similar studies on other methods in Iran, it is not possible to make a definite comparison between these methods.

Since there is not any similar study on endovascular methods in our country in terms of the studied criteria, such as mortality, primary patency, postoperative complications, etc., it is recommended that descriptive studies are performed to allow accurate comparisons of endovascular and bypass procedures. It is also recommended that descriptive studies be performed on bypass surgery using different grafts to select the best method from all of them, depending on the patient's condition and the disease, and the facilities available.

In the present study, the results of a descriptive study of Fem-Pop bypass surgery using an autogenous saphenous vein in the treatment of PAD indicated that this method according to common criteria such as ten-year mortality, intraoperative mortality, primary patency, gangrene, and postoperative amputation, as well as postoperative complications, compared to other alternative operations in the treatment of this disease, was successful and recommended. Also, because the statistics of postoperative complications in the early postoperative years were higher than the distant years, it is necessary to carefully follow the patient in the first five years after surgery, especially in the first and second years.

Author contribution

All authors contributed equally in all parts of article and approving the final version of the manuscript before submission

Conflict of Interest

Authors declare no conflicts of interest.

Ethical declaration

There was no ethical declaration.

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