The Role Of Profundaplasty In Management Of Severely Ischemic Limb

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EKSTREMİTENİN KURTARILMASINDA PROF UNDAPLA S TİNİN ROLÜ

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Geliş Tarihi: 11 Mart 1985

SUMMARY

Profundaplasty is an essential and effective procedure in the management of severely ischemic limb with stenotic profunda femoris arteries. In this report we presented 8 cases treated by profundaplasty for limb salvage. The average age of the patients were 56 years, with a range of 37 to 75 years. All of our patients were male. All of the patients except one had ischemic ulcers or gangrenous toes. Operative technique varied according to patients' specific conditions and the extent of the atherosclerotic involvement of the arteries. Profundaplasty was considered to be successful for limb salvage in 75% of the patients. We concluded that, profundaplasty is a first line choice among the operations for limb salvage, especially for stenotic profunda femoris arteries.

Keywords: Profundaplasty, limb, salvage, atherosclerosis.

T KI Tip Bil Ara$ Dergisi C.4, s. 1-2, 1986, 58-62

ÖZET

*Prafundaplasti, a. profunda femorisi **'im** almış olan, şiddetli iskemik ayaklarda, hem gerekli hem de çok etkin bir tedavi yöntemidir. Bu . .- zımızda ekstremite kurtarılması 8 prafundaplasti olgusu sunulmuştur. **Olgularımızın** ortalama yaşı 56 olup, yaş **dağılımı** 37 **ile** 75 yaş arasında değişmektedir. **Tüm hastalarımız** erkek idi. Biri hariç tüm olgularımızda, î- ülserler veya gangrene **parmaklar** mevcut **idi.** Ameliyat teknikleri, hastaların kişisel dur na **ve** arterlerdeki aterosklerotik .•'.....•->• v ; « boyutlarına bağlı farklılıklar göstermiştir. Prafundaplasti, ekstremite **kurtarılması** açısından % 75 oranında başarılı bulunmuştur. Profithda-- plastinin **özellikle** daralmış ab profunda **femo-** risterde, ekstremite kurtarılması için ilk **planda** düşünülmesi sonucuna vardık.*

Anahtar kelimeler: P . **ndaplasti,** ekstremite **kurtarılması, ateroskleroz.**

T J Research Med' Sel V. 4, N: 1-2, 1936. 58-62

Restoration of pulsatile flow through profunda femoris artery is the essential feature of successful management, for the majority of patients' who require surgical intervention for severe ischemia of the lower extremity. It has become evident, however that this purpose frequently cannot be achieved, unless the obstructive lesion is removed from the proximal portion of profunda femoris artery (1).

Under normal circumstances, profunda femoris artery functions as distributing vessel to the muscles of the thigh. When atherosclerotic disease occludes superficial femoral artery, profunda femoris artery enlarges and becomes the most efficient collateral, transporting blood from common femoral artery to popliteal artery. With more extensive disease involving the iliac inflow and popliteal runoff, the profunda femoris becomes the vital bridge between pelvic and geniculate collateral vessels to maintain the marginal circulation required for the viability of the foot (1). In patients with these conditions above, stenosis or occlusion confined to the orifice and proximal few centimeters of profunda femoris artery, is a substantial threat for limb loss.

This report is presented to review our experience with profundaplasty, in limb threatening ischemia of the lower extremities, for limb salvage.

MATERIAL AND METHODS

Profundaplasty was performed in **8** patients,

between the years 1988 and 1984 *in* Department of General Surgery of İstanbul Medical Faculty. Surgical indications for these cases were stenotic or occluded profunda tenions arteries with occluded superficial femoral arteries. Also in 4 cases where aorta.bifemoral bypass and in 1 case where axilla-bifemoral bypass was performed, profundaplasty was added to the procedure in order to improve the runoff and the patency rate of the graft.

The average age of the patients was 56 years, with a range of 37 to 75 years. Ail of our patients were male. Diabetes and hypertension were present in 2 of our patients (28.5%). Heavy cigarette smoking was the common problem in all of them. Two of the patients were previously sympathectotnized.

Limb salvage was the indication for revascularization in all of the patients. AH of the patients except one, had ischemic ulcers or gangrenous toes. Arteriography was performed in all of the patients except one, who was operated under urgent conditions. Operative technique varied, according to patients' specific conditions and the extent of atherosclerotic involvement of the arteries.

CASE ANALYSIS

Case İ : 45 years old man. He had a severe rest pain but no ischemic ulcers. He was previously sympathectomized. Both femoral pulses were present and the pulses blow were lacking. Artériographie evaluation showed complete occlusion of the superficial femoral artery, from the exit of the Hunter canal and no patent distal vessels. Profunda femoris artery was narrow and irregular. Operative findings were, the marked stenosis at the origin and the proximal segment of the profunda femoris, which was patent after the first perforating branch. Profundaplasty and endarterectomy was performed with vein patch graft confining to the stenotic portion of the profunda. The patient did well after the operation, he remained claudicant but relieved of rest pain.

Case 2: 37 years old man. Rest pain and ischemic ulcers localized at 2 toes were present for 2 months. Ail distal pulses were absent except a weak femoral pulse. Occluded superficial femoral artery, narrowing of the origin of profunda femoris, and re-opening of popliteal artery with only one patent distal vessel was situated in arteriography. Endarterectomy of common femoral artery with the orifice of the profunda femoris and profundaplasty were performed. Ischemic changes developed rapidly in the postoperative period and below knee amputation was inevitable.

Case 3 : 64 years old man. Rest pain and a gangreneous toe were present. Previous sympathectomy was performed. AH pulses were- absent except the femoral pulse. Arteriography showed, complete occlusion of superficial femoral artery, irregular profunda femoris and re-opening of popliteal artery with only one patent distal vessel reaching only to the middle calf. Vein patch profundaplasty of the stenotic proximal portion of profunda femoris artery was performed. Ischemic ulcers remained and developed to tissue necrosis. Unfavorable development was able to be controlled only by above knee amputation.

Case 4 : 53 years old man. Rest pain and ischemic ulcer were present. Ail distal pulses were absent except weak femoral pulse. Arteriographic findings were, an occluded femoro-popliteal segment with only one patent distal vessel and an irregular, stenotic profunda femoris artery. Endarterectomy of common femoral artery and of profunda femoris and profundaplasty were performed. Rapid healing of ischemic ulcers and diminishing of the rest pain were noted postoperatively.

Case 5 : 70 years old man. Previous stroke with right hemrparezis was noted. An acute arterial occlusion episode within last 6 hours of the right leg. No pulses were present including femora! pulse. Arteriography was not possible because of the urgent condition of the patient. Femoral exploration was performed. A right iliac occlusion, probably an acute thrombosis, stenotic profunda femoris and stenotic superficial femoral artery was noted. Common femoral artery was iigated. Stenotic proximal segment of profunda femoris was resected. A cross bypass was created using saphenous vein from left common femoral artery to right profunda femoris. Right superficial femora! artery was anastomosed to right profunda femoris artery (Fig. 1). In the postoperative period acute ischemic changes disappered rapidly.

Case 6 : 72 years old man. Rest pain and a gangrenous toe was present. No pulses were present including femoral pulse. Arteriography revealed complete occlusion of external iliac artery, irregular, stenotic profunda femoris artery refilling from gluteal ond obturator collateral vessels (Fig. 2). A femoro-profinidai cross over bypass using a Dacron graft, by ligating both common and superficial femoral arteries, in the form of angioplasty up to the medial and lateral circumflex arteries was performed (Fig. 3). Postoperative arteriography revealed patent graft with efficient profunda supplying marginal blood flow for the healing of the amputated toe (Fig. 4, 5).

Case 7 : 75 years old man. Acute onset of ischemic changes inleft leg of 2 days duration, femoral

pulse was present with the absence of the distal ones. Arteriography revealed occlusion of the superficial femoral artery, with no patent distal vessel and a stenotic profunda femoris artery. Popliteal exploration revealed no suitable vessel for a bypass. Profundaplasty was performed for the stenotic proximal segment of the profunda femoris. In the postoperative period ischemic changes were confined to the foot and an economic below knee amputatic was performed.

Case 8 : 74 years old man. He had a severe rest pain but no ischemic ulcers, in right foot. All the pulses in right leg were lacking. Arteriographic examination showed complete occlusion of right external iliac artery, with only patent but irregular profunda femoris artery re-filling from obturator collaterals. Femoro-profundal cross over bypass was performed in the fashion of angioplasty using a Dacron graft. The patient did well after the operation.

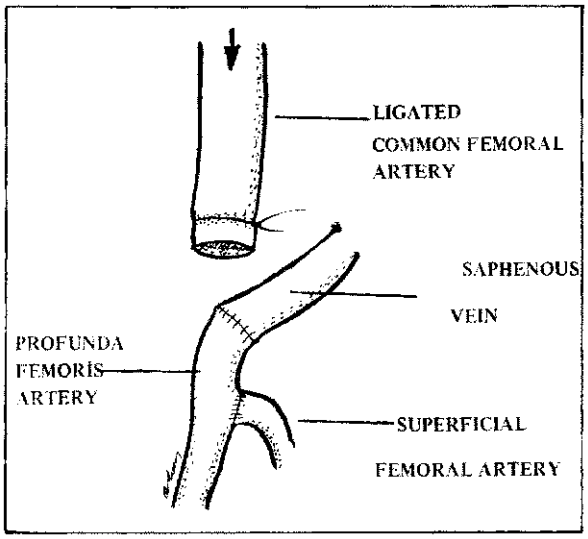

Figure-**1.** Technique applied for Case **5.**

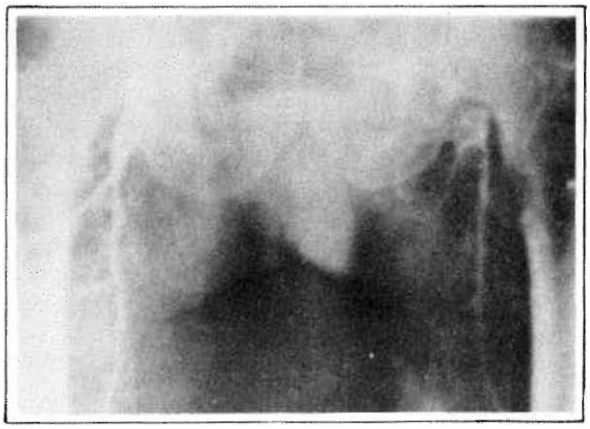

Figure-2- Preoperative arteriography of Case **6.**

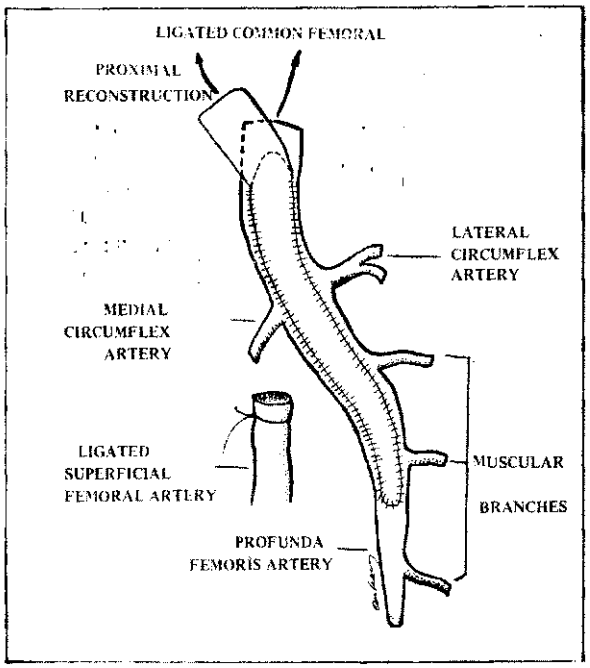

Figure-**3. Technique applied** for Case **6.**

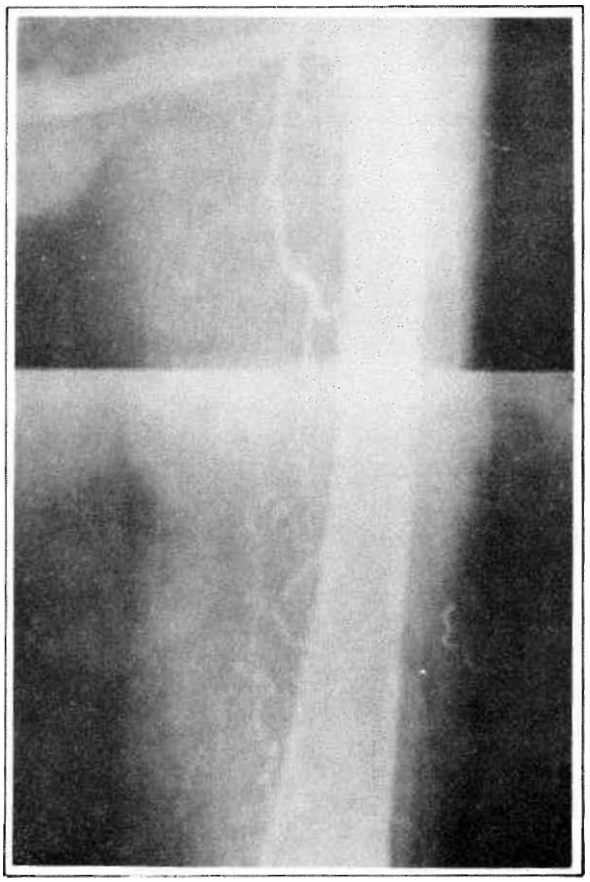

Figure-**4.** Postoperative arteriography of Case **6.** (Note the cross by-pass and the rich collateral network).

Figtire-5. Postoperative view of the foot the removal of the gangreneous toe. (Note the healthy granulation in the base **of** the wound),

RESULTS

Profundaplasty was considered to be successful for limb salvage in 6 of the 8 patients (75%), that is, it either relieved rest pain or ischemic ulcers and gangrenous areas healed primarily after minor amputations.

The results are classified according to clinical manifestations and the preoperative status of the popliteal and distal arteries (Tablo-I and II). Our overall limb salvage rate, which is 75% is in correlation with David's (3) and Bernhard's (1) figures which are 86% and 67% respectively. The success rate in arteriographically blind popliteal arteries, in our series is 100% corresponding figure in David's series it is 72%, Bernhard's series is 46% and Lawson's (5) series it is 87%.

DISCUSSION

After the establishment of clinical importance of profunda femoris artery. Martin (6) was the pioneer in performing profundaplasty with common femoral endarterectomy. Later many authors reflected their experience on profundaplasty (1, 2, 3, 5, 7, 8). The validity of this procedure in lower limb revascularization is established in the cases where deep femoral flow is impaired by obstruction at the orifice and the proximal segment of the profunda femoris artery. Recent electromagnetic blood flow studies revealed 54% increase in mean blood flow through profunda femoris when enlarged by profundaplasty (4). A significant increase in ankle pressures is also recorded in severely ischemic patients (4). Upon these findings, profundaplasty finds widespread use in limb salvage, especially in cases where a distal bypass cannot be performed.

The classical indications for profundaplasty are: 1) An alternative procedure for femoro-popliteal bypass, 2) Improving the runoff of an aorta-bifemoral bypass, 3) Finally, in stenotic profunda femoris arteries where distal bypass is not possible.

There is considerable disagreement in the substitution of profundaplasty as an alternative procedure for femoro-popliteal bypass Bernhard (1), states that, when the pattern of distribution of atherosclerosis provides the surgeon, with the choice of performing either profundaplasty or femore-popliteal bypass, the former option should be tried initially with resort to the latter if ischemia is not adequately relieved. Cotton (2) reaches nearly the same conclusion. On the other hand, Martin (6) and Morris-Jones (8) stress that profundaplasty is no substitute for femoro-popliteal bypass with good outflow tracts. According to our experience in cases with good runoff in popliteal and distal arteries,

Table - I

Correlation Between Clinical Manifestations and Operative Results

	Total	Success	Failure
Rest pain	**2**	**2 (100%)**	
Ischemic ulcers or gangrene	**6**	**4 (66.7%)**	**2 (33.3%)**

Table - **II**

Correlation Between Preoperative Artériographie Findings and Operative Results

	Total	Succès	Failure
Patent popliteal artery with 1/3 distal vessel runoff	**3**	**1 (33.3%)**	**2 (66.7%)**
Total occlusion	**4**	**4(100%)**	

that is, a disease tree popliteal artery and at least patent two distal arteries, fernoro-popliteal bypass will be the ideal procedure in relieving claudication and rest pain. However in eases where distal runoff is poor, that is severe obstruction of the popliteal and distal vessels, with narrowing of the orifice or the proximal few centimeters of the profunda femoris artery, profundaplasty will be more effective in limb salvage, in limb threatening ischemia. Nevertheless profundaplasty is equivocal in limb salvage if profunda femoris artery is diseased.

The other interesting indication of profundaplasty is the reconstruction of blood flow, via profunda femoris artery, by an extraanatomic bypass, in cases where blood flow is impaired below the iliac level, except the stenotic profunda femoris artery. Lawson (5) is one of the effecient appliers of this technique. We performed this procedure by a femoreprofundal cross over bypass in three patients threatening with limb loss, and the results were completely satisfactory.

Our experience in profundaplasty revealed an interesting point, which we have not encountered in reviewing other authors' experience. This phenomenon was the 100% success of profundaplasty performed in patients whose popliteal trunk and distal arteries were completely occluded. The gradual increase of blood flow in profunda femoris after profundaplasty might support the outflow of a good collateral network. Gradual improvement of inflow might protect the thrombotic occlusion of the **col**laterals. On the contrary, in femoro-popliteal bypass procedures, blood flow is directed abundantly to the poor oftflow tract, that is to the occluded popliteal and distal arteries. We are not quite sure of this explanation, but we are satisfied with arteriographically blind popliteal region profundaplasty, as a substitute for femoro-popliteal bypass.

The extension of angioplasty on profunda femoris artery remains as a controversy also. Lawson (5), David (3) and Cotton (2) emphasize the need of extended profundaplasty, that is angioplasty distal to the third muscular branch of profunda femoris artery. Bernhard (1) and Morris-Jones (8) suggest the widening of the proximal few centimeters of profunda femoris where stenosis is usually situated. We believe that the extension of endarterectomy and angioplasty should vary due to the limits of atherosclerotic lesions in profunda femoris artery.

CONCLUSION

In this report, we presented our experience in profundaplasty in the management of severely ischemic limb. We concluded that, in proper indications, such as stenosis in the origin of the profunda femoris artery, profundaplasty is an effective procedure in maintaining adequate blood flow for the ischemic limb, for relieving rest pain and healing of the ischemic ulcers.

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