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Management of Infected Femoral Pseudoaneurysms in Intravenous Drug Abusers: A Review of 57 Cases

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Background. The present study was carried out to evaluate the clinical characteristics and surgical methods used for the management of infected femoral pseudoaneurysms secondary to illegal drug injections.

Methods. Fifty seven consecutive patients who presented with infected pseudoaneurysm of the lower limb and were admitted to the emergency department of Sina Hospital during a 5-year period were enrolled in this study. Surgical methods performed consisted of vein angioplasty, simple ligation of femoral artery, and emergent or delayed revascularization.

Results. All participating patients were males with a mean age of 36.7 years. Three (5.3%) and two (3.5%) patients underwent primary repair and emergent vascular bypass, respectively; whereas delayed revascularization was performed in only eight (14%) cases. Forty four (77.2%) patients achieved a normal lifestyle without any vascular bypass. Early critical ischemia and late claudication was reported in two (3.5%) and eight (14%) patients, respectively. Other complications such as amputation and mortality were rarely reported.

Conclusions. In our study, simple ligation of the external iliac or femoral artery was the most frequent management method for treating infected femoral pseudoaneurysms. Simple ligation of the external iliac or femoral artery seems to be a safe procedure in drug abusers presenting with infected femoral pseudoaneurysms.

Key Words: Infected femoral pseudoaneurysm, Intravenous drug abuse, Vascular reconstruction.

Introduction

Intravascular injection of drugs exposes patients to many dangerous and life-threatening complications including arterial aneurysms at the injection site. The inguinal area is the most common site of injection because it is easily accessible and, therefore, injuries to femoral arteries and the resulting complications are frequently seen in this group of patients (1). Considering the difficulties in treatment and the unfavorable results, management of the infected pseudoaneurysm of the femoral artery is still controversial (1−3). Thus, several techniques including simple ligation without revascularization, primary and delayed vascular reconstruction, and revascularization in cases with signs related to ischemia have been recommended. The advantages and disadvantages of each procedure have been debated previously in numerous studies (3−5).

In this study, we tried to describe the clinical manifestations of patients with infected aneurysm of the femoral artery who were referred to Sina Hospital and also to investigate the selective surgical procedures performed in these pseudoaneurysms.

Materials and Methods

All patients suffering from infected pseudoaneurysm of the lower limb and admitted to the clinic and emergency department of Sina Hospital from January 2000 to January 2005 were enrolled in this prospective study. A pre-designed

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questionnaire was completed for each patient. Follow-up data were recorded in the questionnaire. Diagnosis was made in regard to the previous history of local injection and the existence of a pulsatile, erythematous, and edematous mass at the injection site. Doppler ultrasonography was conducted in 12 cases in order to confirm diagnosis. All patients were preoperatively treated with broad spectrum antibiotics due to the high risk of infection. Frequency and prevalence of the specified variables were then calculated. Ankle-brachial index (ABI) was not calculated in any of the patients. As almost all patients with femoral pseudoaneurysm are believed to be drug abusers, patients enrolled in this study were visited by psychiatrists during several sessions so that necessary management could be performed.

Surgical Techniques

The performed supra-inguinal incision was parallel to the inguinal ligament in all subjects so that the external iliac artery would be the proximal vascular control. Pseudoaneurysm was then exposed to a vertical incision in the inguinal area. At this time, a specific type of surgery was performed according to the patients' symptoms including systemic inflammatory response syndrome (SIRS), leukocytosis and other associated laboratory data, the presence of purulent secretion from the area, and the size of the pseudoaneurysm. In cases for which infection was definitely excluded, surgical repair was achieved by suturing the damaged area or using a venous patch from the saphenous vein. The clot was removed and the debridment was completed, following femoral artery ligation (by silk thread), for other patients; subsequently, they were all closely observed in the operation room. The lower limb was monitored for symptoms of acute ischemia including coldness, sensory and motor impairment, as well as any changes in color and capillary refilling. Revascularization was the procedure of choice if a progressive ischemia of the limb was present; it was performed through extra-anatomical (obturator or ileofemoral) bypass using prosthetic vascular graft (8-mm PTFE graft).

The aneurysm sac was routinely sent to the laboratory for all cases. However, the surgeon was not able to wait for results of the cultures before deciding on the suitable antibiotic as the operation was performed on an emergency basis, due to severe hemorrhage in many cases.

Patients were then transferred to the wards in order to receive intravenous (IV) heparin (for 1 week) and broad spectrum antibiotics. As primary repair was not possible in the infected areas, wounds were left open in all patients despite the high risk of complications. The patients were advised to wash the wounds with normal saline daily and then cover them with a dressing until the time secondary wound healing occurred. At the time of discharge, warfarin (for 3 months) and oral antibiotic were prescribed. Patients were also recommended to visit the clinic frequently to diagnose any signs regarding possible ischemia and to perform a second surgical procedure, if necessary (delayed vascular reconstruction).

Results

During a 5-year study period, 57 patients with infected pseudoaneurysm of the lower limb were admitted to Sina Hospital. All patients were male with ages ranging between 18 and 57 years (mean age: 36.7 years). All patients were reported to be drug abusers. The right and left lower limbs were affected in 42 (73.7%) and 15 cases (26.3%), respectively. Sixteen patients were admitted primarily, whereas 41 of the remaining patients were referred by other medical centers. According to their history, the mean duration of drug addiction was 7.8 years (2 months to 35 years) and 14 months for IV drug injection; heroin was the main drug injected in these patients. Frequency of injection was from one to five times/day. Average time between onset of symptoms and when patients sought medical care was 17.3 days (3−45 days). Pain was the most common finding and reason for seeking medical care, reported in 83.3% of the cases. Edema and erythema were the most common clinical signs diagnosed in 80% and 78.5% of the patients, respectively. Fever was present in 30% of the patients. Bleeding at the time of admission occurred in 34 of the cases; this complication occurred in a mean time of 30.7 h following the onset of the bleeding. Broad-spectrum antibiotics were prescribed for all patients. Following surgery, heparin at a therapeutic dosage of 5000 IU was IV infused every 4 h. All procedures were performed in emergency settings.

In 54 (94.7%) cases, the affected artery was ligated. Ligation of the common femoral or superficial femoral artery alone was performed in 34 and 11 of the cases, respectively. Simultaneous ligation of common femoral, superficial femoral and deep femoral arteries was performed for six subjects, whereas in the other three cases, simultaneous ligation of common femoral and superficial femoral artery was done.

Patients were closely observed during and following surgery, and this led to revascularization in two patients (3.5%) who demonstrated symptoms of acute ischemia. Extra-anatomical ileofemoral bypass via common iliac artery was done in one case. Furthermore, obturator bypass from the external iliac artery to the distal part of the superficial femoral artery was done in another case. Gortex (W.L. Gore & Associates, Inc., Flagstaff, AZ) vascular prosthetic graft was also used in both of these cases. As obvious symptoms of infection were absent in three patients (5.3%), primary repair was performed using a part of the saphenous vein as a venous patch. Eight patients (14%) had to return to the clinic within 27−547 days after the first surgery due to symptoms of severe ischemia including severe claudication and inability to walk properly. Following angiography, surgery was

repeated as revascularization was the requisite procedure. Ileofemoral bypass and obturator bypass (both with 8-mm Gortex; W.L. Gore & Associates, Inc.) were done each in two cases (3.5%) and five cases (8.7%), respectively. However, ileofemoral bypass from the external iliac artery to the superficial femoral artery via the natural saphenous vein was achieved in the remaining cases.

Mean time of hospitalization following surgery and during the follow-up period was 41 days (10–90 days) and 20.5 months (9–32 months), respectively. Sims amputation from the ankle and the calcaneous was performed in a patient who had undergone a primary extra-anatomical obturator bypass, and the patient was found to have signs of acute ischemia.

Evaluation of early claudication during the first month following surgery was not accurately applicable because of the restricted physical activities of the patients due to the extent of the open wound. However, it should be noted that two patients (3.5%) required bypass plus ligation in this phase due to manifestations of critical ischemia. In addition, bypass surgery was later required for the other eight patients (14%) when they were able to have more physical activity (late claudication). These patients were all cured in later visits.

During the study period, mortality occurred in one case (1.75%) due to acute tubular necrosis (ATN) and sepsis. This event happened 29 days after the simple ligation while the patient was still in the hospital ward.

Discussion

Arteriovenous fistulas, venous pseudoaneurysms, deep venous thrombosis, and chronic venous insufficiency or obstruction are not rare in the drug-addicted population (2). Moreover, IV drug injection is more and more associated with infected pseudoaneurysm formation in the femoral artery (1). Complications of these aneurysms are occasionally severe enough to result in serious injuries. As a result, administration of appropriate treatment is compulsory. Difficulties in treatment, unpredictable results, and complications during follow-up have all resulted in controversies for managing these patients. Surgical procedures are mainly divided into two groups: 1) Simple ligation of the femoral artery without vascular reconstruction. Delayed revascularization is recommended in case acute ischemia develops. 2) Early vascular reconstruction by natural (GSV, deep femoral vein, or internal iliac artery) or prosthetic grafts (3,6).

Advocated procedures used in recent years compromise simultaneous extra-anatomical bypass such as obturator bypass with local drainage and debridement (4,5). Complications correlated with this procedure include high rate of infection, thrombosis, and subsequent amputation following the prosthetic graft (3,7). Benjamin et al. suggested deep veins of lower limbs to be used as the grafts (8). A group of surgeons evaluated the use of direct arterial graft in the infected surgical field and reported a 50% increase in the infection rate in such operations (7). Table 1 demonstrates the results of different studies in this field.

Other authors have recommended femoral artery ligation via delayed revascularization in which some complications such as infection, bleeding, graft thrombosis, and even amputation still exist (3,5). DeBakey and Simeon reported the amputation rate following simple ligation without revascularization to be 56–86% (9). However, other researchers believe that the higher amputation rate in the above-mentioned study was due to the target population in this study and as a matter of fact it was because of the lower

Table 1. Comparison of the results gathered in different studies carried out on pseudoaneurysm secondary to drug injection

	Arora et al.[1]	Gan et al.[15]	Cheng et al.[10]	Padberg et al.[2]	Present study
No. of subjects	6	24	19	18	57
Preoperative diagnostic procedure	100% Doppler 83.3% Angiography	55.8% Doppler	36.8% Angiography	5.5% Angiography	21.4% Doppler
Ligation rate	100%	100%	89.4%	33.3%	94.7%
Bypass			21% extra-anatomic (obtrator) (delayed)	38.8% primary 16.6% anatomic 16.6% popliteal	17.5% (10 cases) 8 cases delayed 3 cases anatomic 5 cases obturator (2 cases urgent) 1 case anatomic 1 case obturator
	–	–			
Venous patch	–	–	–	16.6% repair 11.1% patch	5.26% patch
Mean hospitalization period	19.3 days (6–35 days)	10 days (3–150 days)	–	–	41 days (10–90 days)
Amputation rate	–	2.9%	5.2%	16.6%	1.75%
Mortality	–	–	–	–	1.75%

resistance to ischemia in soldiers compared with IV drug abusers who develop several collaterals during the chronic phase of ischemia. In other words, failure of this type of surgery is not surprising in these patients (1). Without using intra-operative Doppler, Redi et al. reported an amputation rate of 33% (7), whereas no amputation was reported in the centers in which femoral artery ligation was performed using Doppler except in the presence of positive distal Doppler signal (1,3). Recent articles suggest simple ligation of affected artery (femoral artery) without performing emergent revascularization (1,3,10,11).

It is now recommended to use Doppler signal as reassurance for the viability of the affected limb (1), which is not yet available in most developing countries where a large population of addicts resides. Doppler is the method of choice in these patients because angiography is rather invasive. On the other hand, patients included in the present study were operated on an emergency basis and, also, performing an angiography in cases in which ligation is performed in proximal and distal parts of pseudoaneurysm is not necessary. As a result, performing an angiography was not possible; however, results of this procedure would not alter the patient's management. Furthermore, it seems that achieving this technology may not be possible in the near future. Two and eight patients needed simultaneous and delayed vascular reconstruction without performing vascular bypass, respectively, which imposed a heavy burden on the patients. We report that 77.2% of our patients were able to resume their usual activities. Amputation following an emergency bypass was indispensable in one case, which was not related to ligation or delayed reconstruction. Various amputation rates are reported in different studies [20% (9), 100% (12), 50% (13), and 10% (14)]. Re-bleeding occurred in one patient and was controlled with primary repair via venous patch, conservative management, and close observation, without any surgical intervention (1,3,10,11,15).

In agreement with similar studies in which the mortality rate was considerably low, only one of our patients died 29 days after surgery secondary to ATN and sepsis. There was no relationship between the cause of death and the type of surgery selected. On the other hand, it should be noted that pseudoaneurysm in drug addicts is always thought to be infected regardless of the presence of signs of infection such as fever. Furthermore, complete surgical control of sepsis is impossible. However, conversion of a necrotic major infected wound to a minor contaminated field (which is at least macroscopically clean) is more achievable (2). Under these circumstances, revascularization with vein material may be justified on some occasions. Even short segments of internal iliac artery may be beneficial to be used as conduits after the excision of infected femoral pseudoaneurysms (6). Moreover, such patients are believed to be noncompliant with regards to taking care of their wounds or to regularly visit the clinic. As a result in the present study, the surgeons were forced to keep the patient in the hospital for a longer time in order to supervise wound management.

In conclusion, considering the increasing rate of addiction, particularly with IV drug abusers, it is believed that the use of the aforementioned procedures in infected femoral pseudoaneurysms would reduce costs as well as unnecessary bypass surgeries. It should be pointed out that performing this technique, despite the high rate of claudication especially in younger patients, could be justified by the fact that performing bypass in an infected area is associated with more severe complications such as graft infection, disruption of the anastamosis, and fatal hemorrhages. The focus of this study was to ligate the artery without performing bypass in order to prevent acute ischemia and amputations; however, performing a bypass is inevitable in cases where claudication is present. It is possible that, in the future, the production of grafts resistant to infection would allow surgeons to perform simultaneous bypass and artery ligation.

The present study has several limitations such as absence of more sophisticated para-clinical instruments such as Doppler technology in order to check the viability of the affected limb in the operation room, not performing the ABI and also the short follow-up period. Overcoming the aforementioned limitations in a similar study is recommended so that more accurate results may be obtained.

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