Surgical Approach to Vascular Complications of Intravenous Drug Abuse

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Objective. To assess the complications related to intravenous drug abuse.

Design. Prospective study.

Methods. Intravenous drug abusers (IVDAs) with vascular complications were assessed.

Results. Sixty-two patients presented with swelling and tenderness in the groin, and 3 patients with similar lesions in the cubital fossa. Infected pseudoaneurysms and deep vein thrombosis (DVTs) were diagnosed in 41 and 31 patients respectively (27 patients had both lesions). In patients with infected pseudoaneurysms, 9 patients underwent excision with early revascularization and 32 patients underwent ligation without revascularization. For all patients with femoral vein thrombosis, ligation and excision was performed. 4 patients with pure DVTs were managed conservatively. Disabling claudication occurred in 6 patients. Four of them underwent late revascularization with an acceptable outcome.

Conclusions. Ligation without revascularization is the appropriate treatment of infected pseudoaneurysms in IVDAs. Late revascularization is of great importance in patients with disabling claudication after treatment of addiction. Pure septic DVTs can be managed conservatively.

Keywords: Infected pseudoaneurysm; Infected deep vein thrombosis; Ligation; Revascularization.

Introduction

Recently, the rate of intravenous drug abusers (IVDA) has dramatically increased in our region.1,2 Many complications may arise in the injection site including: cellulitis, abscess, infected pseudoaneurysm, and infected deep vein thrombosis.3 In addition, these patients may present with other co-morbidities including hepatitis B, hepatitis C, and human immunodeficiency virus (HIV).3,4 Infected femoral pseudoaneurysm occurs as a result of inadvertent intraarterial or periarterial injection of illicit drugs. Extravasation of blood and contamination of the subsequent hematoma causes breakdown and rupture of the vessel wall and formation of an infected pseudoaneurysm, associated with a risk of mortality and limb amputation.5

The treatment of the false aneurysm is controversial. Treatment options include routine revascularization, selective revascularization, ligation alone and non-surgical treatments.5–15 Another life-threatening vascular complication in these patients is septic deep venous thrombosis (DVT). In this article, we report our experience with the management of these patients.

Materials and Methods

This study was conducted in Loqman Hakim medical center related to Shahid Beheshti University of Medical Sciences and approved by the ethics committee of this university.

From March 2002 to April 2005, data on 65 patients with symptoms related to injection sites and/or lower limbs edema were reviewed prospectively. Sixty-two patients presented with symptoms in the femoral region [45 right side, and 17 left side], and 3 patients with similar lesions in the upper limbs [2 right brachial region and 1 left brachial region]. Fifty patients were addicted to heroin and opium and 15 to heroin and cannabis. They had a history of drug abuse.
ranging from 2 to 20 years (mean 6 years). Hepatitis C antibody [ELISA], Hepatitis B surface Antigen [ELISA] and Human immunodeficiency virus Antibody [ELISA] were positive in 33%, 15% and 19% of patients respectively. In 22 patients who did not have previous vaccination for tetanus, tetabulin and tetanus toxoid were injected. Antibiotic therapy (combination of cephalotin and gentamycin) was started preoperatively, changed according to tissue culture and continued for 6 weeks. For stable patients Doppler ultrasonography and x-rays of the related site were performed.

According to preoperative Doppler Ultrasonography and surgical findings, we excluded patients with pure site infections without vascular problem (19 patients).

Vascular complications included infected pseudoaneurysm and/or infected DVT. Infected pseudoaneurysms were divided into two different groups: unstable with active bleeding, and stable patients with any other symptoms.

Septic DVT was diagnosed according to clinical manifestations and Doppler Ultrasonography and/or features of deep venous clot formation in surgical sites with infection. Pure septic DVT was septic DVT without arterial complications.

In patients with vascular complications anticoagulation therapy was started and continued for at least 3 months.

The patients with active bleeding were controlled with direct compression and resuscitated. Following this they underwent urgent exploration in operating room.

Under general anesthesia, proximal control of the external iliac artery was gained via a suprainguinal incision. Longitudinal groin incisions were used to explore the false aneurysm. Aneurysms were excised and local debridement of necrotic tissue performed. Definitive control was often gained with simple ligation of the proximal and distal vessels. After coverage of ligated vasculature with sartorius muscle the groin wound was always left open to heal by secondary intention. Early non-selective revascularization was performed in some patients during our initial experience. After this early revascularization was performed if signs of ischaemia developed in the post-operative period. After discharging patients from the hospital they were followed up by clinical or telephone interview and Doppler ultrasonography scans for at least 6 months. After treatment of addiction, if symptoms of lower limb ischaemia developed patients were considered for delayed revascularisation. According to the patient individual situation, reconstruction was performed with autologous vein or artificial graft, either anatomical or extraanatomical. Antibiotic therapy was based on cultures from infected sites. Data regarding patients’ demography, presenting symptoms, investigation, site of involvement, type of lesion, type of operative technique, microbiology, associated surgical complications, and any needs for revascularization were analyzed.

Results

Forty six patients with vascular complications were included [45 in the femoral and 1 in the brachial region]. Among the included patients, 15 patients had pure infected pseudoaneurysm, 4 patients had pure infected deep vein thrombosis, and 27 patients had a combination of pseudoaneurysm and deep vein thrombosis. Among patients with infected pseudoaneurysms, 7 were unstable with active bleeding, and 35 were stable with any other symptoms. The presenting symptoms are summarized in Table 1.

All of the patients with vascular complications had normal injection site X-rays. Twenty-five patients had a preoperative Doppler ultrasound scan. Doppler ultrasound was compatible with surgical findings in 21 patients (84 percent). Among the operated patients with pseudoaneurysm, staphylococcus aureus, acintobacter, E.Coli, and klebsiella were isolated in 13, 10, 6, and 2 patients respectively. There was no growth in 11 patients.

Among patients with vascular lesions in the femoral area, 9 underwent excision and early non-selective revascularization (2 anatomical, and 7 extra anatomical) and 32 patients underwent ligation and excision of the pseudoaneurysm. For all of the patients with femoral DVTs plus pseudoaneurysms, ligation and excision were performed and necrotic tissue was debrided from the injection sites simultaneously. Among them, 8 patients had constant limb edema during the follow up period. One patient who presented with brachial artery pseudoaneurysm treated with ligation and excision without revascularization.

Postoperative follow up was performed in the hospital for 36 patients. Other patients who were jailed,

Table 1. The clinical findings of injection site vascular complications

<table>
<thead>
<tr>
<th>Clinical manifestations</th>
<th>Number</th>
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<tr>
<td>Mass/Swelling</td>
<td>46</td>
</tr>
<tr>
<td>Pain/Tenderness</td>
<td>41</td>
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<tr>
<td>Absent distal pulses</td>
<td>30</td>
</tr>
<tr>
<td>Bloody discharge</td>
<td>29</td>
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<tr>
<td>Paresthesia/paralysis</td>
<td>9</td>
</tr>
<tr>
<td>Limb edema</td>
<td>8</td>
</tr>
<tr>
<td>Active bleeding</td>
<td>7</td>
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were followed up by prison physicians (we took the history by telephone interview). Complication rate in patients with ligation and excision of femoral pseudoaneurysm was 9/32 and in patients who underwent early non-selective revascularization was 6/9 (Table 2). The most common complication in patients who underwent early non-selective revascularization was graft failure (Table 2). From these patients one had occlusion of an autologous graft, and the other 2 had prosthetic graft reinfection.

From 2 to 8 months after the first operation, 4 patients with disabling claudication underwent late revascularization. Artificial extraanatomical grafts were placed in 3 patients and an autologous vein graft in 1 patient. The amputated patient was a 56 year-old woman with a pseudoaneurysm of the bifurcation of common femoral artery (CFA) extending to the deep and superficial femoral arteries. The patient had distal pulses at the time of admission.

Discussion

The number of intravenous drug users in Iran has been estimated to be around 200,000 to 300,000.\textsuperscript{1,2,16,17} Vascular complications of drug use are a definitive threat to both life and limb.\textsuperscript{7} Loqman Hakim hospital is situated in the southwest of Tehran. This hospital has an active general surgery department.

The mean duration of addiction among our patients was similar to other studies.\textsuperscript{5} As other studies the most common substance, which has been used in Iran was heroin.\textsuperscript{18,19} However, in Indian population buprenorphine seems to be the most common substance for IVDAs with vascular complications.\textsuperscript{6,7} When alternative access routes are exhausted groin injections, are the preferred routes of parenteral drug abuse. The femoral artery has become the most common site for infected arterial pseudoaneurysms.

Berguer and Benitez described the pus, blood and pulsatile groin mass as an unforgettable triad.\textsuperscript{7} If these symptoms are neglected, they may erode the skin and result in massive arterial bleeding. A study reported bleeding in one-third of presenting patients.\textsuperscript{6} In another study, presentation to the hospital occurred only after the pseudoaneurysm ruptured and bled in 70 percent of patients.\textsuperscript{5} In our study, 17 percent of pseudoaneurysms presented with active bleeding. It seems that our drug users referred to the hospital earlier, either by general practitioners or by themselves. Moreover, most of our patients were prisoners, who had been mostly referred at the initiation of their problem.

The differential diagnoses of a painful groin mass are localized abscess, cellulitus, venous thrombosis, or infected pseudoaneurysm. In 1986, Reddy et al.\textsuperscript{20} recommended angiography for diagnosis of pseudoaneurysms. Angiography will show an infected pseudoaneurysm and can delineate vascular anatomy,\textsuperscript{6} but it is not available everywhere and is an invasive modality. In recent years, non-invasive color flow doppler ultrasonography have become the investigation of choice. Gan et al.\textsuperscript{6} studied 23 cases with duplex ultrasound and of these, 19 cases were correctly diagnosed as infected pseudoaneurysm. According to the study of Ting et al.\textsuperscript{7} correct diagnosis was established preoperatively by Doppler ultrasonography in 20 of 21 patients with pseudoaneurysm. In our study, 15 of 18 patients with pseudoaneurysm were diagnosed by doppler ultrasonography. Plain X-ray examination is important to visualize any complications such as air in soft tissue, or broken needle tips.\textsuperscript{21}

In our study, organisms were isolated in 31 of the 41 patients with pseudoaneurysm, similar to the study of Behera et al.\textsuperscript{5} who detected organisms in 72 percent of their studied patients. As previous studies\textsuperscript{5,6} staphylococcus aureus was the predominant organism isolated from tissue culture.

There is no consensus as to the ideal surgical procedure for treatment of infected pseudoaneurysms. The management options include excision and debridement of the pseudoaneurysm with non-selective revascularization; excision and debridement of the pseudoaneurysm with selective revascularization; and excision and debridement of the pseudoaneurysm with ligation of the affected artery without arterial revascularization.\textsuperscript{22} Adequate debridement is the main part of surgical management. Selective

<table>
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<th>Table 2. Complications of surgical operations</th>
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<tr>
<td>Surgery</td>
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<tr>
<td>Ligation and excision</td>
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<td>Early non-selective revascularization</td>
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Eur J Vasc Endovasc Surg Vol 32, October 2006
revascularization may be performed early (i.e. at the
time of operation) or late (i.e. severe claudication after
beginning routine life).

Our patients mostly underwent ligation without
revascularization. Only 9 patients underwent early
non-selective revascularization, when the policy of li-
gation without revascularization was not formulated.
Complications were mostly detected in patients who
underwent early nonselective revascularization.
High rates of complication during our early expe-
riences changed our opinion toward ligation without
revascularization. Our amputated patient was a
woman who had triple ligation for her pseudoaneu-
rys. Reddy et al. revealed that triple ligation for
pseudoaneurysm that involving femoral bifurcation
led to higher limb loss. Ting et al. managed 33 drug
addicts with 34 infected femoral pseudoaneurysms
with ligation without revascularization. All patients
were discharged with viable limbs. During 15.5
months of follow up only 4 patients were completely
asymptomatic. The rest suffered some degree of
chronic ischaemia. Gan et al. ligated and observed
34 patients with infected false femoral aneurysms.
Early outcome of all patients was a viable limb. 33 pa-
tients had claudication in further follow-up. It seems
that ligation and observation is a safe method in pa-
tients with infected pseudoaneurysm, with minimal
complications. 4 patients with disabling claudication
underwent late revascularization. After late revas-
cularization all patients were asymptomatic and could
do their daily activities.

Infected deep vein thrombosis in IVDAs was com-
mon among our patients. Gan et al. reported 34 DVTs
of 37 IVDAs with infected pseudoaneurysm. Behera
et al. reported 6 DVTs of 46 patients with vascular
complications related to IVDA. Fah et al. reported 7
cases of septic deep vein thrombosis in intravenous
drug users. Infected DVTs mostly present with more
severe conditions (i.e. infected pseudoaneurysm, and
site infections). Therefore, they may receive less at-
tention. A history of injection to femoral veins, signs
such as limb edema, pain, and the presence of infection
make the diagnosis of infected DVTs probable. The
diagnosis of infected DVTs can be confirmed by either
Doppler ultrasound scan or contrast-enhanced helical
CT scan. Some reports suggest that CT is more accu-
rate than Doppler ultrasonography. Although some
other studies report Doppler ultrasonography as an
inexpensive, non-invasive, and accurate technique.
In our study preoperative doppler ultrasonography
could diagnose 13 of 14 patients with DVTs. Surgery
was never required for control of pure septic DVTs.
DVTs beside pseudoaneurysm need ligation and debridment of infected vessels.

Anticoagulation therapy with empiric antibiotic ther-
apy is the treatment of choice for patients with pure
septic DVTs. In conclusion, the most appropriate treat-
ment of infected pseudoaneurysm due to groin injection
is ligation without revascularization. The patients must
be followed with serial clinical examinations and
Duppler ultrasonography for detection of severe
chronic ischaemia. Late revascularization is necessary
for patients with disabling claudication after treat-
ment of addiction. Pure septic DVTs can be managed
conservatively.

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