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Surgical treatment of noniatrogenic trauma of the femoral arteries

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Trauma to the femoral arteries corresponds to 30 percent of all arterial traumas. The authors reviewed 74 patients with noniatrogenic trauma of the femoral arteries treated from January 1991 to December 1993. Ages ranged from 11 to 50 years, with a mean of 24. Seventy-one patients were male and three female. Fifty-two patients (70.2 percent) were white, 20 (27 percent) were black and two (2.8 percent) were Asian. Trauma due to firearms had the highest incidence, with 61 cases (82.4 percent). Absence of pulse was the most frequent clinical symptom (62.5 percent). Severe ischemia, with risk of loss of limb, was found in 66.2 percent of the cases. The superficial femoral artery was impaired in 77 percent of the cases. A preoperative arteriography was performed on only five patients, victims of multiple penetrating trauma or an asymptomatic penetrating wound along a vessel passage. In six cases, arterial and venous ligation was the chosen procedure. In three cases, a primary arterial anastomosis was performed. Simple arteriography was feasible in one patient. In 64 of the patients, a venous graft was undertaken using a segment of the inverted great saphenous vein withdrawn from the other lower limb. Fasciotomy was used in 32 patients (43.2 percent), all of whom exhibited pasting of the lower limb muscles at admission. One patient died during the immediate postoperative period as the result of multiple organ failure caused by polytraumatism. Preservation of the limb was attained in 72 patients (97.3 percent). Severe, previously-incurred ischemia was responsible for the only two amputations, aggravated by an exceedingly long delay between the time of injury and surgery. One of these patients, in addition to severe ischemia, had extensive injuries to the soft tissues. We conclude that trauma of the femoral arteries, attended while the limb still maintains its vitality, has a positive clinical outcome with a high rate of limb preservation. Mortality usually results from injury to other organs.

UNITERMS: Femoral artery. Vascular surgery. Wounds and injuries. Trauma.

INTRODUCTION

There is a high incidence of trauma of the femoral arteries, which correspond to one-third of all arterial traumas^{2,9}. As the common and superficial femoral arteries are major blood-conveying vessels, acute occlusion usually leads to severe consequences and a delay in treatment may cause a poor outcome. During World War II, patients submitted to ligation of the common femoral artery had an amputation rate of 80 percent³.

In this paper, the authors analyze noniatrogenic trauma of the femoral arteries in Brazil, where the primary agents of trauma are penetrating wounds caused by firearms, cutting instruments, or femoral fractures, resulting in distinctive aspects of surgical procedure and postoperative evolution.

CASES

Seventy-four patients with noniatrogenic trauma of the femoral arteries were treated after being admitted to the emergency room of the "Hospital das Clínicas" (General Hospital), School of Medicine, University of São Paulo, between January 1991 and December 1993.

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Ages ranged from 11 to 50 years, with a mean of 24. Seventy-one patients were male and three female. Fifty-two patients (70.2 percent) were white, 20 (27 percent) were black and two (2.8 percent) were Asian. Trauma due to firearms was prevailing, 61 cases (82.4 percent), seven (9.4 percent) were caused by blunt trauma, five were associated with femoral fracture, and the remaining six (8.1 percent) by penetrating wounds.

The clinical symptoms caused by the arterial injury are shown in Table 1, with absence of pulse being the most frequent. Reduction of perfusion or temperature were considered as mild ischemia, while severe ischemia, in addition to the above symptoms, presented motor and sensory impairment of the injured limb.

Table 1
Classification by Clinical Symptoms

Clinical Symptoms	Patients n = 74	
	Nº	%
Absence of pulse	53,0	71.6
Ischemia of limb	49,0	66.2
Hemorrhage	20,0	27.0
Asymptomatic	2,0	2.7

Table 2 shows the distribution of patients according to the degree of ischemia.

Table 2
Distribution by Degree of Ischemia

Degree of Ischemia	Patients n = 74	
	Nº	%
Absence	8	10.8
Mild	15	20.2
Severe	49	66.2
No clinical evaluation possible	2	2.7

Upon clinical examination, the pulse rate in the injured limb was normal in 20 cases (27 percent). Absence of pulse was noted in 53 cases (71. percent) One patient could not be evaluated because of hemodynamic instabilities. Prior to surgery, only five patients, victims of multiple penetrating trauma or an asymptomatic penetrating wound along a vessel passage, were submitted to arteriography.

Table 3 reports the topographic of the injuries.

Table 3
Topography of Arterial Injuries

Injured Artery	Patients n = 74	
	Nº	%
Common femoral	6,0	8.2
Superficial femoral	57,0	77.0
Deep femoral	8,0	10.8
Superficial + deep femoral	3,0	4.0
Total	74,0	100.0

METHODS

All patients with arterial injuries were submitted to a specific surgical procedure. In six of them, arterial and venous ligation was the chosen procedure. In three cases, a primary arterial anastomosis was performed. Only one patient could be submitted to simple arteriorrhaphy. In 64 patients, a venous restoration was performed with a graft from an inverted segment of the great saphenous vein withdrawn from the other lower limb. Upon admission, fasciotomy was performed on 32 patients (43.2 percent), all of them with severe ischemia of the lower limb.

RESULTS

One patient died during the immediate postoperative period as a result of a severe cranio-encephalic trauma. The limb of 72 patients (97.3 percent) was preserved, whereas two amputations resulted from occlusion of the saphenous vein graft in patients with severe ischemia and a prolonged delay between the time of injury and the surgery. One of these patients presented extensive damage to the soft tissues.

DISCUSSION

Penetrating firearm wounds are the primary cause of trauma to the femoral arteries, as reported in the literature⁷, and as observed in this study. Diagnosis of trauma of the femoral arteries is reached by clinical

examination. Physical examination reveals absence of pulse, ischemia, local hemorrhage, and the presence of bruits in arterial passages because of the superficiality of the arteries.

It is noteworthy that as a result of precarious collateral circulation, injury to one of the femoral arteries, excluding the deep femorals, usually causes ischemia of the limb, and that the severity of ischemia is aggravated by a more cranial location of injury.

During World War II, when arterial traumas were treated solely by arterial ligation, the amputation rate was 80 percent for common femoral artery injuries and over 50 percent for superficial femoral artery injuries⁷. Notwithstanding these rates, ligation was the procedure chosen for 8.1 percent of the patients in this study, due to the clinical state of the patient (polytrauma), and no loss of limb was recorded. This procedure has been restricted to patients with multiple organ trauma and an increased surgical risk due to a more prolonged operation.

The development of arterial restoration techniques has brought about a progressive decrease in amputation rates. During the Vietnam War, the rate was 12.1 percent⁹. In our study, the amputation rate was 2.7 percent. The only surrogate used for the arterial grafts was the autogenous great saphenous vein withdrawn from the other limb; synthetic prostheses were not used⁶.

In cases of severe ischemia of the lower limb, with swelling of the extremity, fasciotomy is an extremely useful complementary procedure, undertaken by the opening of the anterior and lateral compartments, and of the superficial and deep compartments of the leg, prior to flow restoration. Such a procedure was undertaken in 43.2 percent of our patients¹.

Arteriography was restricted to cases with multiple trauma or wounds of the vessel passages with no clinical findings¹⁰. As arterial lesions occur in young individuals, in general with no previous history of arterial disease, outflow conditions for the reperfusion are in most instances a sufficient reason to have reached 97.3 percent of graft perviousness.

Mortality related to this type of trauma is rare, and is always related to injury of other organs. The only death in this study resulted from cranio-encephalic trauma^{5,8}.

CONCLUSION

Femoral artery trauma, treated while the limb still maintains its vitality, has a positive clinical outcome with a high rate of limb preservation. Mortality usually results from injury to other organs.

RESUMO

O trauma de artérias femorais corresponde a 30 percent do total de traumas arteriais. Os autores analisaram 74 pacientes com trauma não-iatrogênico de artérias femorais atendidos de janeiro de 1991 a dezembro de 1993. A idade variou dentre 11 e 50 anos, com média de 24 anos, 71 pacientes eram do sexo masculino e três do feminino. Cinquenta e dois pacientes (70,2 percent) eram da raça branca, vinte da negra (27 percent) e dois da amarela (2,8 percent). O trauma por ferimento por arma de fogo foi o mais frequente com 61 casos (82,4 percent). A ausência de pulsos foi a manifestação clínica mais frequente (62,5 percent). A isquemia grave, com risco de perda de membro foi constatada e 66,2 percent dos casos. A artéria femoral superficial foi a lesada em 77 percent dos casos. Foi realizada arteriografia pós-operatória em apenas cinco pacientes. vítimas de múltiplos traumas penetrantes ou ferimento penetrante assintomático tico em trajeto vascular. Em seis deles, optou-se pela ligadura arterial e venosa. Em três casos foi realizada anastomose arterial primária. Em um paciente foi realizada arteriorrafia simples. Em sessenta e quatro pacientes, foi realizado enxerto venoso com segmento de veia safena magna invertida, retirada do outro membro inferior. Empregou-se a fasciotomia em 32 pacientes (43,2 percent), todos eles com empastamento de musculatura de membro inferior desde a admissão. Um paciente faleceu no pós-operatório imediato devido a falência de múltiplos órgãos por politraumatismo. A preservação do membro foi obtida em 72 doentes (97,3 percent). As únicas duas amputações se deveram a isquemia, previamente muito grave, com longo tempo decorrido entre o momento do trauma e o procedimento cirúrgico. Um deste doentes, além de isquemia grave, apresentava lesões extensas de partes moles. Concluímos que o trauma das artérias femorais tratado quando o membro ainda mantém a viabilidade, tem um bom prognóstico clínico, com alto índice de preservação de membro. A mortalidade é geralmente causada pelo trauma a outros órgãos.

REFERENCES

1. Aun T, Gaudencio AM. Fasciotomia e Síndrome Compartimental. *J Trauma* 1993;16:4.
2. Borman KR, Snyder WH III, Wergelt JA. Civilian arterial trauma of the upper extremity: An 11-year experience in 267 patients. *Am J Surg* 1984;148:796.
3. DeBakey ME, Simeone FA. Battle injuries of arteries in World War II: An analysis of 2,471 cases. *Ann Surg* 1946;123:543.
4. Dajani OM, Haddad FF, Hajj HA, Sfeir RE, Khoury GS. Injury to the femoral vessels: the Lebanese War experience. *Eur J Vasc Surg* 1988;2:293.
5. Drapanas T, Hewitt RL, Weichert RF, Smith AD. Civilian vascular injuries: A critical appraisal of three decades of management. *Ann Surg* 1970;172:351.
6. Feliciano DV, Mattox KL, Graham JM. A five-year experience with PTFE grafts in vascular wounds. *J Trauma* 1985;25:71.
7. Hershey FB, Spencer AD. Surgical repair of civilian arterial injuries. *Ann Surg* 1971;173:403.
8. Perry MO, Thal ER, Shires GT. Management of arterial injuries. *Ann Surg* 1960;80:953.
9. Rich NM, Baugh JH, Hughes CW. Acute arterial injuries in Vietnam: 1,000 cases. *J Trauma* 1970;10:359.
10. Tozzi FL, Wolosker N, Aun R, Waksman H, Bechara MJ. Arteriografia em pacientes vítimas de trauma em trajeto vascular sem sinal clínico de lesão arterial. *Cir Vasc Ang* 1988;4:19-24.