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PERIPHERAL VASCULAR DISEASES;
NONINVASIVE APPROACH FOR EVALUATION AND TREATMENT

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ABSTRACT... Objectives: To observe the prevalence & presentation and to review the noninvasive approaches for the evaluation and treatment of patients presenting with peripheral vascular diseases at Bahawal Victoria Hospital Bahawalpur. Design: Prospective randomized study. Place and Duration: This study was conducted from July 2003 to June 2005 at the department of Surgery Bahawal Victoria Hospital Bahawalpur. Patients & Methods: Twenty patients, 2 females and 18 males admitted with peripheral vascular diseases (PVD) fulfilling the inclusion criteria were evaluated and treated medically and surgically. A standard noninvasive approach for the evaluation of these patients was adopted by history & thorough clinical examination, Doppler USG of the vessels, Ankle Brachial Indices (ABI), Duplex Scanning and MRI in a few cases. Results: The relative frequency of PVD at BVH Bahawalpur was 1.2%. The majority of patients (60%) were in the 4th decade of life and male (90%). The smoking was exclusively the major predisposing risk factor (90%). The common (90%) presentation of patients was intermittent claudication with 60% gangrenous disease with an average duration of 4years, The lower limbs were involved in 90% cases with 70% bilateral disease. Majority (90%) of the patients was diagnosed clinically and the objective severity of the disease was assessed with Doppler sonography in all the patients. The ABI was <0.5 in 85% cases. The duplex scanning was needed only in 10% patients. The treatment procedures carried out were primary amputation in 45% followed by conservative on medicines 20%, atherectomy in 15%, lumbar sympathectomy in 10% and resection or repair of pseudoaneurysms in 10% of cases. The ultimate rate of amputation at various levels was seen to be 75%. Conclusion: The prevalence of PVD is rapidly increasing in our society which is causing a horrible threat in the form of physical disabilities at a younger age group of poor class mostly. Smoking remains exclusively the only major risk factor. Much time and money can be saved by evaluating and treating these patients by noninvasive approaches but prevention is the best therapeutic strategy achieving by abstinence from the smoking.

Keywords: Peripheral vascular disease, Physical examination, Doppler USG, Ankle Brachial Index (ABI), Duplex scanning, Magnetic resonance Angiography (MRA).

INTRODUCTION

Peripheral vascular disease (PVD) is a condition characterized by atherosclerotic occlusive vascular disorder of the lower extremities and functionally it is defined as arterial narrowing causing a mismatch between the oxygen supply and demand resulting in symptoms of claudication, exercise limitations or tissue loss[1'2]. The Biblical third king of the house of Judah, King Asa who reigned between 867 and 906 BC had suffered PVD3 though the Roman emperor Claudius had limping possibly due to poliomyelitis, 10 BC to 54 AD4. The management of vascular disorders started by Herophilus and Erasistrates at Alexandria in 391 A.D in the Hippocrates times and went through historic progress till mid 19th century when Brodie recommended the surgical management for the first time[5-6].

Peripheral vascular disease is a nearly pandemic condition that has the potential to cause loss of limb or even loss of life and can require emergency intervention to minimize morbidity and mortality[7'8]. Vascular diseases are among the most common causes of morbidity and mortality in the Western world. Of these many diseases affecting the peripheral vasculature, atherosclerosis is the most common. While many disorders such as carotid artery and abdominal aortic aneurysms are life threatening, others like varicose veins and superficial femoral artery occlusion may be merely life limiting yet a number are intermediate vascular problems such as extensive diseases involving the lower extremities including vasospastic conditions which make the patients at risk for limb loss[9'10]. The PVD becomes fatal because of its thromboembolic complications and the femoral artery bifurcation is the most common site (43%), followed by iliac arteries(18%), aorta (15%), and the popliteal arteries (15%)[2'11].

The overall prevalence of intermittent claudication in lower extremities for aged >55years ranges from 2% to 4.5% with signs of atherosclerosis in various studies[12"16]. The prevalence of PVD, though a male dominant disorder in relative young ages, increases with age gradually to 20% of men > 65 years and even to 29% in diabetics17'19. In men half of the new cases present in 5th decade of life while in women in latter ages, however by the seventh decade its prevalence is similar in both sexes[16'20].

The major risk factors for PVD seem to be race neutral[20" 23].These factors include advancing age, smoking, diabetes, hypertension, male gender, fibrinogen, hyperlipidemia with an elevated low density lipoproteins and low high density lipoproteins and homocysteinemia[24'27]. Both exercise and alcohol intake are negative risk factors for PVD[28'29]. The most common symptom of the PVD is intermittent claudication but the incidence of symptomatic disease is approximately 5% with asymptomatic disease several times higher[2'10'16'24'25'30].The other presentations are leg cramps or rest pain, leriche syndrome, numbness, critical limb ischemia, toe gangrene and extremity ulcerations. All these presentations are far more common in the lower than in the upper extremities[24'2431]. Through a progressive phase of severity and complications the eventual fate of PVD, though in less percentage is the amputation30. The mortality rate for patients with PVD, though risk dependent is approximately 30% at 5 years, 50% at 10 years and 70% at 15 years which is similar both in asymptomatic and symptomatic subjects[12,32,33].

The history and the physical examination are usually sufficient to establish the diagnosis of peripheral vascular disease. An objective assessment of the severity of the disease is obtained by noninvasive techniques. These include digital pulse volume recording, Doppler flow velocity waveform, Ankle Brachial presser index, Duplex ultrasonography, segmental presser measurements, transcutaneous oximetry, treadmill stress testing, tests of reactive hyperemia, MRI and CT

scanning2[9'1026'31'33], Although the contrast digital subtraction angiography is the first line imaging technique in the detection of accurate site of all vascular diseases yet recent studies have suggested that magnetic resonance angiography (MRA) has diagnostic accuracy comparable to that of contrast angiography rather superior in sense of cost, safety and noninvasiveness[3134;37].

Therapeutic options for PVD include supportive measures like meticulous care for the feet, change in life style, diet modification and regular physical exercise to increase the claudication distance gradually. Complete cessation of smoking reduces the likelihood of amputation and increases the ABI and walking distance. Modifiable risk factors like diabetes, hypertension and hyperlipidemia should be evaluated and treated. Pharmacologic therapy includes vasodilators, antiplatelets, thrombolytic, anticoagulants, xanthenes derative petoxifyline and recently cilostazol a phosphodiestrase inhibitor to increase the claudication distance[2'4'10'18'22'38]. Neovascularization with angiogenetic growth factors include vascular endothelial growth factor (VEGF) and basic fibroblast growth factor (bFGF) and gene therapy by transfer of DNA encoding VEGF[22'27'39].

Revascularization procedures include percutaneous transluminal angioplasty, stent placement and atherectomy with an initial success rate up to 95% for iliac and femoral-popliteal disease. Invasive operative procedures include thromboendarterectmies and various bypasses by in situ or reverse autogenous saphenous vein grafts and synthetic grafts like Dacron or polytetrafluoroethylene with variable long term patency rate. Lumbar sympathectomy alone or an adjunct to aortofemoral reconstruction is disfavored now a days[10'18'40].

PATIENTS AND METHODS

This study was conducted at BVH Bahawalpurfrom July 2003 to June 2005. All patients attending the surgical outdoor with symptoms of peripheral vascular disease were initially assessed thoroughly by history and physical examination and only 20 patients having only arterial diseases were admitted for this trial. The vascular patients presented with associated hypertension, diabetes and stable coronary diseases were also included in the study.

The following vascular patients not fulfilling the inclusion criteria were excluded from the study;

* Patients with venous disorders presenting with leg ulcers, gangrene and swelling.
* Patients with limb claudication or cramps due to spinal stenosis, chronic compartment syndrome, rheumatologic and connective tissue diseases.
* All PVD patients presented with cerebral and coronary casualties.
* Known cases PVD, previously undergone any surgical intervention presenting with complications or amputation.

Patients of PVD already taking treatment from some other centers presented with either because of severity of symptoms or involvement of the contralateral limb were also included in the study. After detailed history and thorough physical examination the basic investigations including serum sugar and serum lipid profile were carried out. The hand held Doppler sonography was carried out of all the patients and the Ankle Brachial Index (ABI) was calculated to grade the disease. Duplex color scanning was done in two patients to get detailed information and only one patient went under magnetic resonance angiography before surgical intervention. None of our patients went under contrast angiography. In patients with a normal resting ABI, an exercise ABI was performed to obtain objective evidence for intermittent

claudication. Depending upon history, clinical judgment of the disease and the ABI, the patients were divided in to two groups for the management.

Patients presenting with claudication only with normal resting limb and ABI >0.8. This group was managed medically with analgesics, antiplatelets and cilostazol etc and directions to change their life style.

Patients presenting with critical limb ischemia, leg or foot gangrene or ulcerations with ABI <0.8, acute arterial occlusion with previous history of claudication and patients with infected ulcerated peripheral aneurysms. This group was managed more actively usually with some surgical intervention.

The patients of group I were discharged on medicines soon after completion of mandatory work up and were followed up weekly to observe the status of the disease. The patients of group II were managed accordingly with active measures and were discharged or referred for rehabilitation with a regular weekly follow up. The informations were fed in computer to make a master Performa and the analysis of the results was carried out on mean and percentage basis.

RESULTS

A total of 2065 surgical patients attended the surgical out door of unit II at BVH Bahawalpurfrom July 2003 to June 2005, out of which 25 with a relative frequency of 1.2% were of PVD. Among these only 20 patients (0.97%) were included in the study. The remaining 5 patients not fulfilling the selection criteria were rejected. 16 patients were referred from medical wards / out door and the 4 from general practitioners. The age varied from 20 to 65 years with a mean age of 42.5 years. Most of the patients were in the 4th decade of life (60%) and majority was exclusively males (90%) with male to female ratio of 1:9 (table-1).

Table-l. Age and Sex Distribution

Age groups	Male	Female	Total	%age
< 30 years	4	1	5	25%
31 -40 years	11	1	12	60%
4 1-50 years	1	-	1	5%
5 1-60 years	1	-	1	5%
>60 years	1	-	1	5%
Total	18	2	20	100%

Majority (90%) of the patients were field workers and laborers belonging to poor socioeconomic class of rural areas. All the male patients (80%) were smokers with or without other addictive habits. None of the female was smoker but it is worth noting that the husbands of both patients were smokers (table-2).Among the smokers 14 (78%) were chain smokers and 2 patients were injecting morphine or heroin in the groin intra-arterially. Alcoholism, though not regular, was noted in 40% of smokers. It should be noted that most of the smoker patients (75%) started smoking at their teen ages and the 16 (90%) were still smoking and 2 left it just few days before or at the day of admission. Only one patient (5%) was diabetic and 3 (15%) were having hyperlipidemia with raised cholesterol and low density lipoproteins.

The chief complaint in majority (90%) of the patients was intermittent claudication or limb cramps with or without complications of the disease (Table III). Two cases presented with false aneurysms in the femoral arteries due to repeated injections of heroin or morphine. The duration of the complaints ranged from 10 years to 1 month

with an average duration of 4 years. The most of the patients (90%) were having the lower limbs involvement while one case (5%) had symptoms both in lower and upper limbs and one (5%) patient presented with only upper limb disease. The bilateral involvement of the lower limbs was seen in 14 cases (70%) and in upper limbs in [2] cases (10%) with variable severity of the symptoms. Two cases also reported repeated attacks of CVA.

The majority (85%) of the patients were diagnosed on the basis of history and clinical examination of the peripheral pulses including treadmill stress test in two cases. Dopplersonography with segmental pressure recordings was carried out in all the 20 patients and ankle brachiai pressure index (ABI) was calculated to get objective degree of the severity of the disease. In most (85%) of the patients ABI was < 0.5. Three (15%) patients showed normal ABI, so exercise ABI was calculated, in the two cases it was <0.8 and in one 0.9. The diagnostic investigations and ABI in various groups of patients have been shown in Table IV. The patient included in the study with MRI presented after the investigations carried at somewhere other center.

The amputations at various levels was the commonest (45%) treatment procedure which had to be adopted for the patients of group II at their presentation followed by conservative treatment with medicines in 20%, endarterectomy and atherectomy in 15%, lumbar sympathectomy in 10% and resection or repair of pseudoaneurysms in 10% cases. Among the 55% cases went under various surgical interventions, in 6 patients (30%) the amputation was ultimately carried out due to progress of the disease. The various treatment procedures and their end results are shown in Table V. There were performed bilateral forefoot or ray amputations of toes in 7 cases (35%). The out comes of the adopted treatment procedures were observed in majority (85%) of the cases during the same admission period. All patients were followed up for an average duration of six months. There was no perioperative mortality and only one patient developed bed sores after above knee amputation which healed by conservative management. Most (75%) of the amputees had started walking with either artificial limbs or with crutches during observed follow up period.

DISCUSSION

The concept of the peripheral vascular disease is very old and its better understanding emerged when the King Asa, the third Biblical King of Judah suffered some disease of peripheral vasculature of legs in 867 to 906 BC3. Since then its management passed through historic progress till the mid 19th century when Brodie recommended the surgical management of PVD[5,6].

Table-ll. Smoking and Addiction Habits of patients

Habits/addiction	Sex	Total	%age	Duration	Current status	
					still smoking	Left smoking
Smoking alone	M	13	65%	1 8 years	12	1
Smoking & heroin/opium etc	M	3	15%	1 6 years	2	1

Smoking + intravenous drug abuse etc	M	2	10%	8 years	2	-
Non smokers	F	2	10%	-	-	-

Table-Ill. Clinical Presentation of patients

Clinical feature	N	%age	Limb involved			Bilaterality	
			UL	LL	Both	N	%age
Claudication alone	2	10%	-	2	0	1	5%
Ciaudication+critical limb ischemia/pregangrene	2	10%	-	2	0	1	5%
Claudication + gangrene ischemic ulcerations	12	60%	-	12	-	12	60%
Peripheral pseudoaneurysms + limb cramps+swekkubg	2	10%	-	2	-	-	-
Raynauds phenomenon with fingers/toes autoamputation	2	10%	1	-	1	2	10%
Total	20	100%	1	18	1	16	80%

A/ = No ofpatientsilL - upper limb LL = lower limb

Table-IV. Adopted Diagnostic Methodology

Diagnostic procedure	N	%age	Ankle brachial index			
			<0.5		>0.5	
			N	%age	N	%age
Clinical assessment + doppler sonography	17	85%	14	70%	3	15%
Dupplex color scanning	2	10%	2	10%	-	-
MRA	1	5%	1	5%	-	-
Contrast angiography	-	-	-	-	-	-
Total	20	100%	17	85%	3	15%

n = no of patients MRA = Magnetic resonance angiography

Table-V. Treatment Procedures and prognosis

Treatment procedure	N	%age	Fate of treatment procedure			
			Initial improvement		Ultimate amputation	
			N	%age	N	%age
Conservative on medicines	4	20%	3	15%	1	5%
Amputations	9	45%	-	-	9	45%
Endarterectomy+atherectomy	3	15%	2	10%	2	10%
Lumbar sympathectomy + medicines	2	10%	2	10%	2	10%
Resection/repair of pseuoaneurysms	2	10%	7	10%	1	5%
Total	20	100%	9	45%	15	75%

n = no of patients

The statement of Semashko DC[8] that the peripheral vascular is nearly a pandemic condition is proved to be true in this study too as 1.2% of all the patients reported to the surgical outpatient department had PVD. This relative frequency of the disease at BVH Bahawalpur is not much less than the 4.5% prevalence reported in most of the Western literature[13"15'17] but it is too less than 15% prevalence reported by Criqui MH et al[16] in a population based study and 20% prevalence in diabetics reported by Nathaniel Clark N et al18. The incidence of the disease in our study is very close to the 2% incidence reported by Eitzaz Ahmad et al in a study carried out at Rawalpindi[12].

This difference in the incidence of the PVD even in the same country or continent is exactly in consistent to the conclusion of Harris JP that the prevalence of the disease is rapidly changing in Asia[23]. The low incidence of the disease in our patients than the Western population is because of many factors. Most importantly that our patients are not well aware of the disease and presents too late to the relative clinicians, this is supported by our observation that in majority of the patients the duration of the disease was more than 7 years with an average of 4 years and 75% of our patients presented with gangrenous disease (Table III). Lastly this study is not population based and many patients of the PVD remains asymptomatic until evaluated specifically as reported by McDermott et al in a study that 63% of the evaluated people had ABI <0.9 with no exertional leg pain and it had been concluded that despite better awareness of coronary arterial disease PAD remains still underdiagnosed[41].

In this study 80% of the patients were male which is in consensus to the most of the studies

demonstrating that male gender is a significant risk factor for the development of symptomatic PVD[11"15'21]. It is worth mentioning that 85% of our patients were quite young below 40 years with major group (60%) in the 4th decade of life (Table I). Although this troublesome observation is not in consistent to most of the studies but it is in agreed to the convincing reports of Harris JP and Berenson et al that the disease may begin at a very young age and is not unique to middle aged or older individuals[2342].

Smoking was observed exclusively to be the major predisposing risk factor for the disease in our study evidenced by the fact that 100% of the male patients were smokers with or without other addictive habits (Table II). It is also worth mentioning that although the 2 female patients were not active smoker but husbands of both the ladies were chain smokers. This is in consistent to all the studies carried out for PVD[24"27]. In this study 40% of the smokers were alcoholics, though not regular presented with the complications of the disease. This observation is in against to the conclusion of Daluz et al and Djousse et al that moderate alcohol consumption is associated with reduction of the complications of the PVD[28'29] but in their studies the confusion arises whether the patients were smokers along with alcoholics like our patients or pure alcoholics only. The most important and lethal event of our study emerged out that 75% of the smokers started smoking in their teen ages and 90% of the patients had not given up smoking even with gangrenous complications (Table II). The hyperlipidemia was noted although in a significant number (15%) of the patients but this is proportionally less than the Western studies which are in evidence to the dietary factors and continental environmental influences overthe prevalence of disease15'16 2a 25. The diabetes was diagnosed in one case only even at admission to hospital which is much less than the report of Nathaniel Clark et al and Robert S et al who revealed that 20% of the symptomatic patients with PVD had diabetes[18'19]. This high disproportion in results is because of very high incidence of the diabetes in the Western countries and secondly most of our patients of PVD are either asymptomatic or not bothering to report the trivial symptoms.

Though the common presentation of patients was intermittent claudication as reported by the majority of the studies but it is worth mentioning that 90% of our patients consulted either with fulminated gangrene or pregangrene (Table III). This high rate of complications of the disease in our patients is because of much delay in their presentation due to many factors as discussed above in details and secondly our general practitioners where the patients usually report first are not giving proper awareness about the fetal outcome of the disease in consistent to the study of Me Dermott et al that only 20% of the patients with PAD have been told about the disease[41]. In our study two intravenous drug abusers patients presented with pseudoaneurysms of femoral artery with overt rupture in one patient and pulsating hematoma in the other with thromboembolic complications. This finding is exactly in consistent to observations of Muhammad Arshad Cheema et al in a study carried out at Mayo Hospital Lahore[45].

Our study focused on the fact that the history and the physical examination is usually sufficient to establish the diagnosis of PVD as 85% of our patients were exclusively diagnosed clinically only (Table IV).The Doppler sonography was performed only to calculate ABI for the objective assessment of the severity of the disease in all patients and only two patients went under duplex scanning. This is in accordance to the most of the international studies[26-3335'43]. The conventional angiography although is considered the standard of reference for anatomic definitions required in few cases but is not free of severe side effects and other drawbacks[35'44]. It should not be advised to the patients rather

noninvasive magnetic resonance angiography is a good alternate as recommended by Nawaz Anjum and Elizabeth Lony[36 37]. So it is very logical to recommend the evaluation of the patients clinically by thorough and careful examination which is quick and compatible to our low socioeconomic setup to save time and money which is against the policy of Philbin et al[23].

A worth mentioning status of the disease emerged out from our study that 75% of the patients went subsequently under certain amputation after variable morbidity what so ever the treatment procedure was adopted. This is because of much delayed presentation of the patients usually with gangrenous disease which has already discussed in detail. These results are in accordance to the conclusions of Crique et al and Me Dermott et al that morbidity and mortality of the disease is roughly similar to that of patients with breast cancer or colorectal cancer[32'33]. Probably this horrible outcome of the disease may be different if such patients are managed in a separate vascular surgery units in agreed to the consensus of Hill et al[30].

CONCLUSION

The prevalence of peripheral vascular disease in our population is rapidly increasing which is resulting in a horrible threat to our society in the form of physical disabilities and socioeconomic morbidities. Smoking remains to be the only major predisposing risk factor for the disease. Prevention is the only best therapy for PVD and a noninvasive evaluation approach should be adopted for the diagnosis and treatment which may be better carried out at separate vascular surgery units. There is an immediate and immense need to adopt a national health policy for proper epidemiological study to detect the asymptomatic patients who are at risk and to adopt strict legal policy to ban smoking especially in the younger age.

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