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Diagnostic work-up of elderly patients with symptoms of chronic limb ischaemia on the basis of own material

Postępowanie diagnostyczne u chorych z objawami przewlekłego niedokrwienia kończyn dolnych w wieku podeszłym na podstawie materiału własnego

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Słowa kluczowe

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Conflict of interest

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Summary

Introduction. The analysis of the demographic situation in Poland, as in many other developed and developing countries, clearly indicates the process of population ageing. The literature highlights the need for a different approach to the elderly, both in terms of diagnosis and throughout the treatment process.

These patients have an increased risk of impairment as well as an increased risk of complications and/or extended/repeated hospitalisation.

Aim. The aim of this study was an attempt to determine the best diagnostic procedures for elderly patients with peripheral arterial disease (PAD).

Material and methods. The study was designed as a retrospective one. Two hundred and fifty patients over 70 years old with suspected PAD were evaluated. All patients underwent physical examination and Doppler ultrasound examination. CT angiography was performed in 37 patients (14.8%).

Results. 29 patients (11.6%) with intermittent claudication had no haemodynamically significant lesions in Doppler ultrasound examination. In the remaining ones various degrees of atherosclerotic changes were found. CT angiography was performed in patients who were candidates for surgery.

Conclusions. In most cases Doppler ultrasound is the specific method to evaluate the haemodynamic significance of atherosclerotic lesions in the lower limbs. It is a simple and safe procedure in elderly patients. Considering multi-disease and the overall condition of older patients attention should be given to whether the lesions are responsible for the symptoms. This is important for the decision on further management of the patient. CT angiography is of the greatest importance in the diagnostic process when planning surgery and should not be used as a basic diagnostic method.

Streszczenie

Wstęp. Analiza sytuacji demograficznej w Polsce, podobnie jak w wielu innych krajach rozwiniętych i rozwijających się, wskazuje jednoznacznie na proces starzenia się społeczeństwa. W piśmiennictwie zwraca się uwagę na konieczność odmiennego podejścia do osób w wieku podeszłym zarówno w zakresie diagnostyki, jak i całego procesu leczenia. W przypadku pacjentów z tej grupy istnieje zwiększone ryzyko pogorszenia sprawności, powikłań i/lub przedłużonej/powtórnej hospitalizacji.

Cel pracy. Celem pracy była próba określenia optymalnego postępowania diagnostycznego u chorych z objawami przewlekłego niedokrwienia kończyn dolnych w wieku podeszłym.

Materiał i metody. Dokonano retrospektywnej analizy 250 chorych powyżej 70. roku życia diagnozowanych w Klinice Chirurgii Naczyniowej w okresie od 1.06.2015 do 01.06.2016 roku z podejrzeniem przewlekłego niedokrwienia kończyn dolnych. Przeprowadzono badanie przedmiotowe i podmiotowe. Wszyscy pacjenci z tej grupy mieli wykonane badanie USG Doppler tętnic kończyn dolnych. U 37 (14,8%) pacjentów wykonano badanie angio-TK tętnic kończyn dolnych.

Wyniki. U 29 (11,6%) chorych nie stwierdzono w badaniu USG istotnych zmian miażdżycowych, mogących być powodem dolegliwości, z którymi pacjenci zgłaszali się na badanie. U pozostałych stwierdzono różnego stopnia zmiany miażdżycowe powodujące zwężenia o różnym stopniu istotności hemodynamicznej. Pacjenci z grupy, w której wykonano angio-TK, stanowili grupę kwalifikowaną do leczenia operacyjnego.

Wnioski. Ultrasonografia dopplerowska jest badaniem specyficznym, które pozwala w większości przypadków określić stopień zaawansowania i istotność hemodynamiczną zmian miażdżycowych w obrębie kończyn dolnych. U pacjentów w wieku podeszłym w większości przypadków w USG Doppler można stwierdzić obecność zmian miażdżycowych, należy jednak zwrócić uwagę na istotność hemodynamiczną opisywanych zmian. Biorąc pod uwagę m.in. wielochorobowość i stan ogólny pacjentów w wieku podeszłym, należy zwrócić uwagę, czy opisywane zmiany miażdżycowe w tętnicach kończyn dolnych są podstawowym czynnikiem warunkującym występowanie dolegliwości, co ma istotne znaczenie w planowaniu dalszego leczenia. Badanie angio-TK tętnic kończyn dolnych w procesie diagnostycznym ma największe znaczenie podczas planowania leczenia operacyjnego i nie powinno być wykorzystywane jako podstawowa metoda diagnostyczna (tzw. pierwszego rzutu).

INTRODUCTION

The analysis of the demographic situation in Poland, similarly to many other developed and developing countries, clearly shows the process of ageing of society. Over the last 25 years we have been observing the demographic transition to slow down and the age structure to significantly change in Poland. Since the beginning of the nineties of the 20th century the average resident of Poland has aged by nearly 7 years. At the end of 2013 the population of Poland was 38.5 million. There were approximately 5.7 million individuals aged 65 or more. In 1989-2013 the number of elderly people increased by almost 1.9 million and their proportion in the general population rose by 4.7 percentage points, i.e. from 10% in 1989 to 14.7% in 2013. The number of individuals aged 65 years or more has been growing and, according to predictions for the next 20 years, will continue growing (1).

It is emphasised in the literature that a different approach should be applied to elderly individuals, both in terms of diagnostic investigation and the whole process of treatment. In addition, the issue of the lack of appropriate number of geriatric specialists as well as access to outpatient and diagnostic centres for this group of patients has been raised.

For many diseases, including peripheral arterial disease (PAD), the incidence rises with age. The current healthcare law does not give any special privileges to the elderly person. However, it is emphasised that the proportion of elderly patients is rising and this will require the development of modified patient management standards. Geriatric care should be characterised by comprehensiveness and a holistic approach. It should be provided by a multidisciplinary team which should be comprised of a physician as well as a nurse specially trained to work with elderly patients, physiotherapist, psychologist and social worker (2). Geriatric patients have an increased risk of impairment and of hospital stay complications and/or extended/repeated hospitalisation. The Geriatric Medicine Section of the European Union of Medical Specialists has created a definition of a geriatric patient. It is a patient with multimorbidity typical for old age (over 70 years) or any person aged 80 years or more due to an increased risk of complex pathologies (3).

Elderly patients require comprehensive geriatric assessment (CGA). In order to select elderly individuals who should undergo such assessment VES-13 (Vulnerable Elders Survey) may be used, which is already in use at

Polish hospitals. CGA allows to determine the patient's functional status and its limitations, which helps to avoid focusing exclusively on the existing disorders. This enables one to take measures to improve the patient's functional status despite their multiple incurable conditions. The actions taken based on this assessment should lead to finding reversible problems and resolving them (4).

AIM

The aim of this paper was to attempt to determine the optimal diagnostic management of elderly patients with peripheral arterial disease.

MATERIAL AND METHODS

Retrospective analysis was conducted of 250 patients over 70 years of age with suspected peripheral arterial disease undergoing diagnostic work-up at the Department of Vascular Surgery between 01.06.2015 and 01.06.2016. The group included 134 men and 116 women. Physical examination was performed, including lower extremity pulse examination, and thorough medical history was taken. All the patients from this group underwent a Doppler ultrasound examination of the lower limbs. In 37 patients (14.8%) CT angiography of the legs was performed.

Co-morbidities were found – coronary artery disease in 135 patients (54%), hypertension in 170 (68%) and diabetes in 60 patients (24%).

RESULTS

In 29 patients (11.6%) no significant atherosclerotic lesions were found during the ultrasound examination that could be the reason for complaints reported by the patients.

In the remaining patients various degrees of atherosclerotic lesions were found which caused stenosis with different degrees of haemodynamic significance. Patients for whom a preliminary decision on surgical treatment was made based on the clinical symptoms and ultrasound changes underwent CT angiography.

DISCUSSION

Difficulties in the diagnostic work-up of elderly patients may be of various nature.

Elderly patients often do not report or do not pay attention to certain symptoms, treating them as natural, associated with age and the ageing process.

These may include the primary symptom of PAD, intermittent claudication. The presence of leg pain associated with exertion may be treated as something 'normal at this age' both by the patient and the primary care physician. This may lead to a delayed diagnosis and the therapy being started when the disease is already advanced and the treatment possibilities are limited.

Physical impairment may be the result of other conditions which are common at old age such as, for example, degenerative lesions in the musculoskeletal system or cardiovascular and respiratory insufficiency.

Due to the multiple morbidity of old age there may exist the phenomenon of masking of disease symptoms (no intermittent claudication due to e.g. dyspnoea on exertion which compromises mobility).

In an elderly patient PAD often coexists with other conditions. PAD, coronary artery disease (CAD) and cerebrovascular diseases are all the result of atherosclerosis; therefore the coexistence of these conditions is common. Studies on the incidence of cardiovascular disease in patients with PAD demonstrated that CAD and cerebrovascular diseases are detected in 40-60% of patients from this group. Patients with a documented history of CAD also suffer from PAD more often. Various studies have found that PAD is present in 10-30% of patients with coronary artery disease (5). There is also evident correlation between atherosclerotic stenosis of leg arteries and cerebrovascular diseases. The use of duplex ultrasonography demonstrated that carotid artery atherosclerosis (with various degrees of severity) is found in 26-50% of patients with intermittent claudication. In a prospective study that included 1886 patients aged 62 years or more only 37% did not have any evidence of atherosclerosis in any of the areas mentioned above (TASC II 27) (6).

The incidence of renal arterial stenosis in patients with PAD was also analysed. Renal arterial stenosis of 50% or more is found in 23-42% of patients (7). There is also a confirmed link between PAD and diabetes, which is one of risk factors for PAD. The course of atherosclerosis of the lower extremity arteries with concomitant diabetes is more severe. It also frequently involves peripheral artery and microcirculation lesions, which limit the possibilities of effective surgical treatment. Every 1% of HBA1c level increase is associated with a 26% rise in the risk of PAD. The concomitant disturbances of sensation associated with neuropathy may additionally complicate the clinical picture of PAD. The rate of amputations in patients with PAD and diabetes is 5-10 times higher than in patients with PAD without diabetes (8, 9). Another condition the rate of which increases with age is hypertension. It increases the risk of PAD two times (7, 10, 11).

Dyslipidaemia is also a more frequently diagnosed abnormality in elderly patients. The blood serum level of LDL cholesterol and triglycerides as well as the total cholesterol to HDL level ratio are of particular importance. Similarly to diabetes, long-term lipid disturbances significantly intensify the formation of atherosclerotic lesions in peripheral arteries (7, 12, 13).

It is also important to mention the very basic risk factor which is chronic nicotine addiction. The risk of PAD in addicted smokers is 4 times higher than in non-smokers. In smokers PAD is diagnosed approximately 10 years earlier than in non-smokers (7, 14, 15).

The period of influence of the risk factors mentioned above is usually longer for the elderly. The development of PAD is also confirmed to be associated with age. According to epidemiological research PAD is present in 3-5% of the population, rising to 15-20% in individuals over 70 years of age (7).

The data above indicate, on the one hand, a high incidence of PAD in the elderly, and on the other hand, multiple morbidity typical for this group.

Taking history from the patient is important for the diagnosis of PAD. In patients with cognitive impairment associated with age medical interview may be unreliable or even impossible to conduct and evaluate objectively.

The classic symptom of peripheral arterial disease is intermittent claudication, defined as muscular discomfort in the limb of various severity caused by physical exertion, subsiding after a few minutes' rest (7). Initially the pain usually intensifies with faster walking, climbing the stairs or moving objects, sometimes even not heavy ones. However, these first symptoms may remain unnoticed in older individuals with limited physical ability. Intermittent claudication may first manifest itself during a cardiac stress test conducted as part of coronary artery disease diagnostic work-up. However, if CAD coexists in a patient, the test may be discontinued before any lower extremity complaints occur with heart muscle efficiency being the limiting factor (16, 17).

In addition, the location of complaints may be different in different patients. Pain is associated with ischaemia in the muscles supplied by an atherosclerotic artery. Complaints that are present usually in the muscles of the crus, in the area of the superficial femoral artery, are a characteristic feature of this condition. Lesions in the area of iliac arteries or the aorta (e.g. Leriche syndrome) may cause weakening of the muscles of the thighs and crura as well as of gluteal and pelvic muscles. The presence of degenerative lesions in the spine or the lower extremity skeletal system in the elderly may manifest in a similar way; this is a common reason for a specialist referral, often without other, basic tests and examinations.

Other symptoms which may indirectly suggest the presence of PAD include, for example, muscle atrophy and loss of skin appendages (hair, nails). In some patients the most noticeable symptom may be thermoregulatory dysfunction. This is particularly true for patients with diabetes in whom neuropathy plays an important role. Physical examination of elderly patients may often reveal the presence of such symptoms, which may be the result of the ageing process and not necessarily of peripheral artery atherosclerosis.

There is a large group of people in whom the disease is asymptomatic (according to various authors the ratio between the two groups is 1:3 to 1:4). For every patient

with symptomatic PAD there are 3 to 4 patients with PAD without claudication; however, the progression of the disease may be similar regardless of whether symptoms are present or not (7). As mentioned previously, the lack of symptoms in the elderly may be associated both with cognitive impairment and with physical impairment caused by other factors. In some cases even substantial atherosclerotic lesions do not cause any complaints. As the Edinburgh Artery Study results show, in approx. 1/3 of patients with an asymptomatic form of chronic peripheral ischaemia of the legs a completely blocked main vascular trunk was demonstrated during Doppler ultrasound (7). One should bear in mind that unnecessary surgical treatment should be avoided in those patients who are found to have even advanced vascular lesions, but do not present with symptoms and the associated decrease in the quality of life. This is because surgical treatment is associated with a higher rate of complications in elderly patients. Therefore, appropriate medical interview is important for the diagnosis, differential diagnosis and the selection of further management of the patient. A further step should be physical examination to confirm or exclude to a significant degree the diagnosis of PAD. According to the TASC II recommendations, in patients with PAD risk factors, symptoms in the limbs on exertion and compromised leg function, one should evaluate claudication and other symptoms that limit the ability to walk (7, 18).

The basic examination which is possible and necessary to conduct by every physician who suspects limb ischaemia is pulse examination. The lack of pulse in the arteries in the limb that are available for examination should raise suspicion of lesions that cause stenosis or blockage of a vessel. It is emphasised, however, that the examination result may be potentially erroneous – the sensitivity and specificity of this examination are low. Sometimes two doctors examine the same patient and one of them can feel the pulse, while the other cannot. This examination is difficult to document objectively, but it is safe, simple and necessary when PAD is suspected. Sometimes, however, patients referred to specialists claim that they have not had this basic examination, which should not happen.

Patients with a positive medical history or examination result that could suggest PAD should undergo objective tests and examinations (7). The examination methods used in clinical practice, however, have numerous limitations which are particularly evident in elderly patients.

The measurement of the ankle-brachial index (ABI) is recommended in patients with a suspicion of PAD. The resting ABI value of < 0.9 is caused by significant arterial stenosis and is often used as the haemodynamic definition of PAD. The lower the ankle-brachial index, the more severe are the lesions that hinder blood flow in the limb. However, there is a group of patients with a potentially false-high ABI reading (> 1.40) in whom the Doppler signal measured at the ankle will not disappear even with the sphygmomanometer cuff

pressure as high as 300 mmHg. This group may include patients with diabetes and renal failure, which cause severe sclerosis of the arterial wall and compromised susceptibility of peripheral vessels to compression (18). The resting ABI value may be normal and decrease only after a cardiac stress test. This test, however, may be difficult to administer to older patients. An occlusion test (OT) may be performed in such patients instead, which does not require physical activity from them. The drop of pressure measured at the ankle after 30 seconds from the release of air from the sphygmomanometer cuff is comparable to that measured 60 seconds after the point of claudication during walking on the treadmill. While resting ABI measurement is a standard test and should be the basis of PAD screening, it is rarely performed in practice after exertion or an occlusion test. This is caused by the necessity to use a treadmill and the possible habitual reluctance of physicians to perform ABI measurements at specified timepoints after various tests. One may suspect that in these circumstances the majority of patients with lower limb ischaemia are referred to vascular surgery specialists irrespective of the ankle-brachial index (5, 7, 18).

The next stage of diagnostic work-up should include Doppler ultrasound, which is the most commonly performed imaging examination when PAD is suspected. It allows for very precise locating of the site of stenosis or blockage of a vessel. Using additional parameters such as the speed and spectrum analysis of blood flow one can evaluate how vascular lesions affect the haemodynamics of circulation. It is a non-invasive and safe examination, which is sometimes sufficient for the diagnosis of PAD or its exclusion with a high degree of certainty. However, in the current Polish healthcare system it is limited by access to a specialist – a primary care doctor cannot refer a patient to arterial ultrasound. This represents another obstacle for the elderly and a long waiting time for this simple diagnostic procedure may delay diagnosis and appropriate treatment.

Doppler ultrasound examination allows for the diagnosis and confirmation of PAD in the majority of cases. When considering the diagnostic work-up of elderly individuals one should reflect here on whether further tests and examinations, more invasive or less so, are actually necessary.

Another imaging examination is arteriography, which is an invasive procedure. It visualises blood flow through the vessels. It is a very valuable examination which is indispensable for the increasingly commonly performed endovascular procedures. However, it is an invasive procedure which requires vascular access and the administration of a contrast medium that may cause allergic reactions or renal failure. Sometimes iatrogenic damage also happens during the examination. Currently arteriography is rarely performed as a diagnostic procedure for PAD.

Computed tomography angiography allows for a precise, although static evaluation of the vascular morphology and disorders of blood flow. Due to the

use of X-ray radiation this examination cannot be performed frequently; thus its repeatability is limited. The contrast medium administered during CT angiography of the arteries may cause contrast-induced nephropathy (CIN). The results of studies on this phenomenon have confirmed that the occurrence of CIN is associated with an increased risk of delayed cardiovascular morbidity and mortality despite the kidney function being fully restored to the baseline values (WH). The rate of CIN in the general population is estimated to be 0.6-6%, while in high-risk groups this rate is as high as 50-90% according to various authors (19).

It seems that for older individuals it should be considered whether widening the scope of diagnostic investigation to include invasive examinations is actually necessary. The risk of complications during these procedures should be thoroughly analysed. They are definitely useful for planning surgical treatment. However, considering the fact that treatment should lead to the improvement of the patient's functional status, some elements of diagnostic work-up are unnecessary for many patients and do not need to be performed, for example, in asymptomatic PAD when there is no risk of limb amputation.

CONCLUSIONS

1. Colour-coded Doppler ultrasound of blood flow is a specific examination which in the majority of cases allows for the determination of severity and haemodynamic significance of atherosclerotic lesions in the legs.
2. In the majority of elderly patients Doppler ultrasound may enable one to detect atherosclerotic lesions; however, the haemodynamic significance of the observed lesions should be considered.
3. Taking into account multiple morbidity and the general health status of elderly patients, among other parameters, one needs to determine whether the observed atherosclerotic lesions in the lower extremities are the primary cause of complaints, which is important for planning further treatment.
4. CT angiography of the lower limb arteries as part of the diagnostic process is of greatest importance for the planning of surgical treatment and should not be used as a basic diagnostic tool (a first-line method).

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