

Assessment of Lower Extremity Vessels Disease using Computed Tomography Angiography (CTA)

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Abstract

Lower limb peripheral arterial disease is the atheromatous narrowing or occlusion of an artery or arteries of the leg. If symptoms occur these may include intermittent claudication, ischaemic rest pain, ulceration, and gangrene. Risk factors include advanced age, smoking, hypertension, hyperlipidaemia, diabetes, obesity, and family history. Management strategies differ for patients with intermittent claudication and patients with limb threatening ischaemia, in whom angioplasty, surgical revascularisation, or amputation are usually required. The objective of the study is to assess lower extremity vessels diseases using computed tomography angiography and to correlate computed tomography angiography diagnosis with patients, age, history and patient's gender, and to identify which the diseases most common in the lower extremities' vessels. This is descriptive, cross section study carried out during the period from January to May 2016. The study was classified and analyzed by statistical package for social science. The results showed that incidence of lower extremity vessels diseases was high among the age group 70-74 years which represented 23 cases (25.27%). The study also showed 60 cases (65.93%) were male and 31 cases (34.07%) were female out of 91 cases scanned by computed tomography angiography. The study showed that most of cases were moderate weight 78 cases (85.71%) and the employers were most affected by lower extremity vessels disease represented in 52 cases (57.14%). The most computed tomography angiography diagnoses of cases were atherosclerosis represented in 71 cases (78.02%). The study also showed that location of disease mostly bilateral represented in 52 cases (61.90%) and most of patients had history of diabetic and they were 60 cases (65.93%). The study showed that the computed tomography angiography diagnosis and patients' history had statistically significant association with presence of lower extremity vessels diseases. The study recommended that Computed tomography including computed tomography angiography protocol should be provided in governmental hospitals.

Keywords: Arterial Disease, Atheromatous, Hyperlipidaemia, Computed Tomography Angiography

1. Introduction

Most pathological processes affecting the lower extremity arteries cause stenosis, occlusion or dilatation, i.e. aneurysm formation^[1]. The most common condition affecting the arteries of the lower extremity is ischemia due to occlusive disease. Occlusive disease may be acute, acute-on-chronic (where acute occlusion occurs in the presence of a previous chronic stenosis or occlusion), or chronic occlusion. Most patients present with symptoms of chronic occlusive disease. The most common cause of arterial occlusive disease in the lower extremity is atherosclerosis. Less common causes include thromboembolism, acute thrombotic occlusion, micro-embolism, trauma and vasculitis, including vasospastic disorders and Buerger's disease^[1].

The clinical effect of occlusive disease varies depending on the type, location and number of arterial lesions present. Patients may be asymptomatic, suffer from pain on walking (intermittent claudication), pain while at rest or tissue loss in the form of either ulceration or gangrene^[1]. Investigations used for the definitive diagnosis of lower extremities vessels diseases include conventional angiography, ultrasonography, computed tomography and magnetic resonance imaging^[1].

The introduction of multi-detector computed tomography (MDCT) has had a dramatic effect on computer tomography (CT) imaging and in particular imaging of cardio-vascular system. The development of MDCT has led to much high speed of data acquisition and secondly MDCT acquire volume data instead of individual slice data. Thus, MDCT (without increasing the

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radiation dose) has led to faster scanning, improved contrast resolution and better spatial resolution. The effect of movement artifacts is also minimized [2].

Computed tomography angiography (also called CT angiography or CTA) a technique that allows rapid and continuous acquisition of data during the first pass of a bolus of IV contrast through the arterial tree. The data can be reconstructed at any slice level, reformatted into different planes and processed into high- two- or three-dimensional images of vessels [2].

2. Objectives

To assess lower extremity vessels diseases using computed tomography angiography (CTA).

3. Materials and methods

This is descriptive cross sectional study deal with lower extremity vessels diseases; the study was conducted during the period between January to May 2016. The population target of this study was all patients came to CT department with lower extremity vessels problem which was include about 91 patients, with exclusion of overweight patients and children. The study variables include patient age, gender, occupation, history, life style and CTA diagnosis.

In this study the equipment used are Toshiba 64-slices with output 350 mA and 120 Kvp, manufactured in Japan 2005. All patients were prepared for scan (fasted 4 hour and brought renal function test before the scan) then the patient lying in supine position the feet first and examination started by scout scan with field of view from the diaphragm to the toes after that the contrast injected using automatic injector (18-20 gauge cannula, ominopaque 100-150 ml) then the data was taken where the contrast in arteries using thin slice (1mm) and reconstructed to different forms. The data analyzed by Statistical Package for Social Sciences (SPSS). As for ethical consideration all patients information not throughout this study also the patient should not be entered any unnecessary examination and had known that the data had taken for the research.

4. The results and discussion

The study was conducted on 91 patients with lower extremity vessels problem investigated using computed tomography angiography, The incidence was high among the age group 70-74 which represented 23 cases(25.27%) followed by 18 cases (19.78%) were the age group between 60-64, 17 cases (18.68%) were age group between 64-69, 11 cases(12.09%) were age group between(75-79) , 7 cases(7.69%) were age group between 55-59, 7 cases(7.69%) were age group ≥ 80 ,5 cases (5.49%) were age group between 50-54 and 3 cases(3.30%) were age group <50 . This result agreed with study done by Jian Rong, who found the incidence of

lower extremity vessels disease in mean age 69 ± 11 years (22.8%) [3].

Regarding the patients gender 60 cases (65.93%) were male and 31 cases (34.07%) were female with ratio ranged 2:1(was shown in table 2 and figure 2). This agrees with study done by C. J. Bhatt, L. Patel, N. Ariwala et.al, whose found that the incidence of lower extremity vessels disease in male more than female, with ratio 4:1[4]. The study also agrees with study done by Joshi A, Nimbkar V and Merchant et.al. Who's found that there were 28 patients male and 7 were female [4].

Regarding patients occupation, the study showed that most common occupations were employee 52 cases (57.14%) , followed by housewife 20 cases (21.98%), worker 18 cases (19.78%),% and one case (1.10%) were student. In respect of weight, most patients were moderate 78 out of 91 (85.71%) and followed by 13 out of 91 (14.29%) were thin [5].

Considering the Patients history, the most of patients were diabetic 60 cases (65.93%), followed by 20 cases (21.98%) were hypertensive, 8 cases (8.79%) had no history and the rest 3 cases (3.30%) were both diabetic and hypertensive. This study agrees with study done by Jian Rong who found the diabetic patients had a higher incidence of atherosclerosis (34.2% vs. 27.1% for non-diabetic patients) [6].

According to lifestyle, the study showed that the most of patients were not smokers or alcoholic, only 29 cases (31.87%) were smokers, whereas no one of the patients alcoholic.

CTA diagnosis of the patients were demonstrated 71 patients (78.02%) were atherosclerosis, followed by 9 patients (9.89%) were Vasculitis, 7 patients (7.69%) were normal, 2 patients (2.20%) were AVM, one patient (1.10%) was aneurysm and one patient(1.10%) was tumor. The cases of atherosclerosis were 71 patients (78.02%) were distributed as followed: 42 patients (46.15%) were occlusion, 27 patients (29.67%) were ischemia, 2 patients (2.20%) were thrombus.

Regarding to location of the disease of interviewed patients, the common location were bilateral 52 cases (61.90%), followed by 32 cases (38.1%) were unilateral, its agree with Jian Rong, 2014, he found that 40% had disease in aorta-iliac segment were as 25% had disease limited to lower limb in case of peripheral vascular disease. [7]. The Chi-square test of CTA diagnosis against age was showed statistically significant association (P-value =0.0253). No significant (P=0.171) was noticed for the relationship between CTA findings and gender of the patients. The Chi-square test showed no significant difference between CTA findings and patients weight (P=0.883). The study showed significant association between the CTA finding and patients history, (p-value =0.0027). The Chi-square test of CTA diagnosis against occupation showed high significant association (p-value= 0.0**).

Chi-square test between CTA findings and age

Findings		Age group (years)							
		<50 (n=3)	50-54 (n=5)	55-59 (n=7)	60-64 (n=18)	65-69 (n=17)	70-74 (n=23)	75-79 (n=11)	≥80 (n=7)
Atherosclerosis	Ischemia (n=27)	2(2.20%)	3(3.30%)	1(1.10%)	6(6.59%)	6(6.59%)	5(5.49%)	1(1.10%)	3(3.30%)
	Thrombus (n=2)	-	-	-	1(1.10%)	-	1(1.10%)	-	-
	Occlusion (n=42)	1(1.10%)	2(2.20%)	3(3.30%)	9(9.89%)	7(7.69%)	12(13.18%)	5(5.49%)	3(3.30%)
Vasculitis (n=9)		-	-	1(1.10%)	-	3(3.30%)	3(3.30%)	2(2.20%)	-
Aneurysm (n=1)		-	-	-	1(1.10%)	-	-	-	-
AVM (n=2)		-	-	1(1.10%)	-	-	-	1(1.10%)	-
Tumor (n=1)		-	-	-	-	-	1(1.10%)	-	-
Normal (n=7)		-	-	1(1.10%)	1(1.10%)	1(1.10%)	1(1.10%)	2(2.20%)	1(1.10%)
Chi-square		33.81							
P-value		0.0253							

Chi-squares test between CTA findings and gender

Findings		Gender	
		Males (n=60)	Females (31)
Atherosclerosis	Ischemia (n=27)	22(24.18%)	5(5.49%)
	Thrombus (n=2)	1(1.10%)	1(1.10%)
	Occlusion (n=42)	28(30.77%)	14(15.38%)
Vasculitis (n=9)		3(3.30%)	6(6.59%)
Aneurysm (n=1)		1(1.10%)	-
AVM (n=2)		1(1.10%)	1(1.10%)
Tumor (n=1)		-	1(1.10%)
Normal (n=7)		4(4.40%)	3(3.30%)
Chi-square		10.32	
P-value		0.171 ^{NS}	

Chi-squares test between CTA findings and weight

Findings		Weight	
		Thin (n=13)	Moderate (n=78)
Atherosclerosis	Ischemia (n=27)	4(4.40%)	23(25.27%)
	Thrombus (n=2)	-	2(2.20%)
	Occlusion (n=42)	8(8.79%)	34(37.36%)
Vasculitis (n=9)		1(1.10%)	8(8.79%)
Aneurysm (n=1)		-	1(1.10%)
AVM (n=2)		-	2(2.20%)
Tumor (n=1)		-	1(1.10%)
Normal (n=7)		-	7(7.69%)
Chi-square		3.02	
P-value		0.883 ^{NS}	

CTA classified the 91cases as 84 cases pathologic conditions and 7cases normal, the incidence of lower extremities vascular diseases was (92.3%), this matches with Joshi A, Nimbkar V and Merchant *et.al* 2003, they found In the 10 cases of peripheral vascular diseases, CT angiography adequately demonstrated the presence of any stenosis or occlusion, its degree and extent, the presence of collaterals and distal reformation if any and the presence of plaques, soft or calcified^[5].

Conclusion

The study concluded that computed tomography angiography (CTA) provides excellent details about the lower extremity vessels diseases. Atherosclerosis is predominant over other types of diseases and the

diabetic is the most common clinical history associated with patients with lower extremity vessels disease. The males more affected by lower extremity vessels diseases than females with ratio range 2:1. The incidence is high among the age group (70-74). The employers are most affected by lower extremity vessels diseases.

Recommendations

Individuals at risk of lower extremity peripheral vascular diseases (PVD) should undergo a vascular review periodically for early discover of the disease which helping in treatment. CT including CTA protocol should be provided in governmental hospital. Management of diabetic mellitus and hypertension must undergo to regular follow up and should have balanced diet. Diabetic

patients must take care for any injury to stave the formation of gangrene. Doing exercises is paramount for fat burning and get rid of sediment.

References

- [1]. R.G. Grainger and D.J.Allison. Diagnostic Radiology. 5th ed. A.A dam.A.K.Dixon; British: 2008. Chapter (28).
- [2]. Tim England and Akhtar Nasim. ABC of Arterial and Venous Disease. 3rd ed. John Wiley; Chennai, india: 2014. P (4).
- [3]. He C, Yang J G and Liym. Pubmed . Avialable from <http://pubs Rsna.org>. Assessed on 24 Sep 2014.
- [4]. Ye,C, Mao. Z, Rong . Pumbed, Avialable from www. Ijri.org. Assessed on 2006.
- [5]. Joshi A, Nimbkar V and Merchant *et.al*. Role of CT angiography in the evaluation of peripheral vasculature using MSCT. India. April 2003.
- [6]. Jian Rong. Comparison of lower extremity atherosclerosis in diabetic and non-diabetic patients using multidetector computed tomography. North America. 24 September 2014.
- [7]. C. J. Bhatt, L. Patel, N. Ariwala *et.al*. 64-slice multidetector CT angiography (MDCTA) in infra renal aorto-illic and lower limb vascular disease. China. May 2007.