

ANATOMICAL CONSIDERATIONS OF THE OSTIUM OF THE SUBCLAVIAN ARTERY

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ABSTRACT

The subclavian artery's are two voluminous artery's, left and right, which have their origin in a different way, the right one originating from the brachiocephalic trunk, and the left one directly from the aortic arch, at a distance that varies according to the origin of the left common carotid arteries.

Our study was made on computed tomography angiography, on which we have had the opportunity to examine the scans from Medimar Imagistic Center, in the County Clinical Hospital "Sf. Andrei" in Constanta, being carried out on a computer tomography GE LightSpeed 16 slice CT. Also, we had available angiography's executed in the center for diagnosis Pozimed, being carried out on a computer tomography GE LightSpeed VCT64 Slice CT.

The variability of the findings in the anatomical parts of the subclavicular artery's ostium, both as regards the size of the horizontal and vertical diameters, also their shape and as regards morfological relations with other branches of the aortic arch. The dimensions of the diameters vary according to sex, but it is a general rule that the dimensions are higher in male, the minimum and maximum values may be different in the two sexes.

Keywords: ostium, subclavian artery, computed tomography

Introduction

The subclavian artery's are two voluminous artery's, left and right, which have their origin in a different way, the right one originating from the brachiocephalic trunk, and the left one directly from the aortic arch, at a distance that varies according to the origin of the left common carotid arteries. The aortic arch starts posteriorly from the second right sternocostal articulation and lowers to the left posterior root of the lung, next to the T4 vertebra, where it continues with the descending thoracic aorta, posterior to the 2nd sternocostal left joint (1, 2) says that the aortic arch is placed immediately after the aortic

bulb. After (3) the intrathoracic aorta shows an almost uniform caliber, approximately 25 mm with a dilatation at the origin, the aortic bulb and a narrowing between left subclavian artery and the arterial ligament, the aortic isthmus. After (4), from the origin and to its end, the aortic arch caliber does not diminish only slightly and almost untraceable, despite numerous branches which arise over, and at the same time being a vessel passage, but also an arterial trunk of distribution. From the three branches of the aortic arch, the biggest is the brachiocephalic trunk, being between 13 mm (4, 5, 6) and 12-15 mm (7). In the order of the volume follows the left subclavian artery that has an external diameter of

9-10 mm (4, 5, 6), the left common carotid artery, taking the lowest value, on average by 8 mm (5), 9 mm (6), only (4) finding that it can reach up to 9-10 mm.

Summary

Our results have been obtained from the angioCT's study carried out on a computer tomography GE LightSpeed 16 Slice Ct and on a computer tomography GE LightSpeed VCT64 Slice CT, being compared right/left, and on the basis of sex, the diameters, shape and the relationship between the subclavian ostium with other branches of the aortic. The horizontal diameter of the subclavian artery has a value between 5,9-14mm, and a vertical diameter with a value of 4,3-13.8 mm. At the level of the right subclavian artery, the horizontal endoarterial diameter was between 6,5-11.3 mm, and the vertical diameter being between 5,2-11.9 mm. At the level of the left subclavian artery the arterial ostium is most frequently (92% of cases) oval-shaped. In 8% of the cases the ostium of the left subclavian artery presents a round shape. At the level of the right subclavian artery, the arterial ostium presents in 93,75% of the cases an oval-shape. In 6.25% of the cases the ostium of the right subclavian artery has a round shape.

Material and working methods.

Our study was made on computed tomography angiography, on which we have had the opportunity to examine the scans from Medimar Imagistic Center, in the County Clinical Hospital "Sf. Andrei" in Constanta, being carried out on a computer tomography GE LightSpeed 16 slice CT. Also, we had available angiography's executed in the center for diagnosis Pozimed, being carried out on a computer tomography GE LightSpeed VCT64 Slice CT. Being compared right/left, and on the basis of sex: horizontal and vertical diameters of the arterial ostiums, their shape and the relationship between the subclavian artery ostium with other branches of the aortic arch.

Results

Regarding the endoarterial horizontal diameter of the left subclavian artery, I found a value between 5,9-14mm, and the vertical diameter a value of 4,3-13.8 mm.

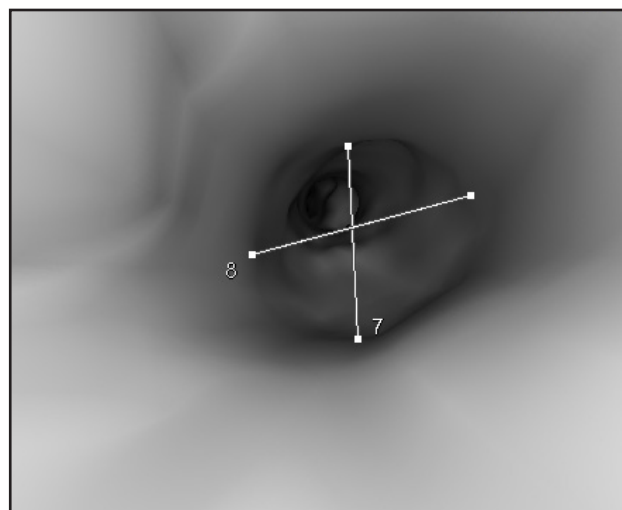


Figure 1. The left subclavian artery. Horizontal diameter: 3.9 mm, oval-shaped, the long axis oblique superior to the left, achieving the appearance of „pear”, with the tip to the left; the vertical diameter : 4.3 mm, oval-shaped, with the long axis vertical, greater than 0.4 mm than the horizontal diameter (female).

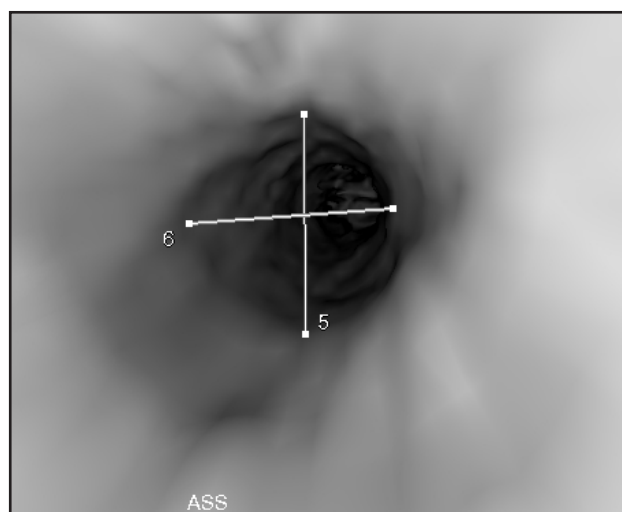


Figure 2. The left subclavian artery. Horizontal diameter: 9.6 mm, oval-shaped, with the long axis transversal, achieving the appearance of „pear” with the tip to the right; the vertical diameter of 9,0 mm: oval-shaped, with the long axis vertical, the horizontal diameter is greater with 0.6 mm than the vertical diameter (male).

In female gender, the value of the horizontal diameter was found between 5,9-14 mm, the vertical diameter has been found between 4,3-

13.8 mm. In male the left subclavian artery has a horizontal diameter between 5,7-14.6 mm, and vertical diameter between 6,1-13.8 mm.

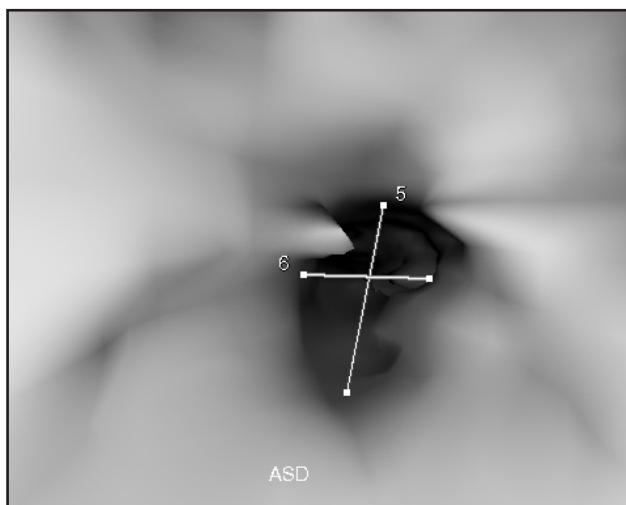


Figure 3 The right subclavian artery. Horizontal diameter: 6.9 mm, oval-shaped, with the long axis transversal; the vertical diameter: 5.2 mm, oval-shaped, with long axis oblique inferior to the right; the horizontal diameter is greater with 1.7 mm than the vertical diameter (female).

At the level of the right subclavian artery, the endoarterial horizontal diameter was found between 6,5-11.3 mm, the vertical diameter being between 5,2-11.9 mm. In female gender the endoarterial horizontal diameter of the right subclavian artery was found between 6,5-11.3 mm and vertical diameter between 5,2-11.9 mm.

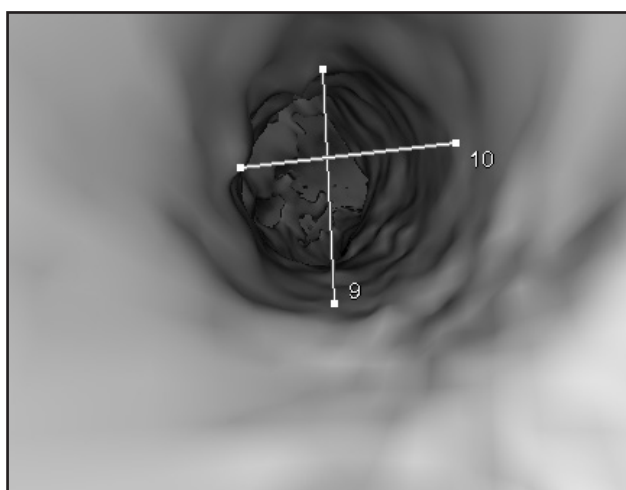


Fig. 4. The right subclavian artery. Horizontal diameter: 7,0 mm, oval-shaped, long axis slightly oblique to the left; the vertical diameter: 7.8 mm oval-shaped, with long vertical diameter larger than the horizontal diameter of 0.8 mm (male).

In male the horizontal endoarterial diameter of the right subclavian artery was found between 7,0-11,2 mm and the vertical diameter between 7,8-10,1mm. At the level of the left subclavian artery, the ostium has ,most frequently (92% of cases), a oval-shape with the following axes: in 28% of the cases the long axis was oriented oblique superior to the left and vertical; in 20% of cases the long axis was oriented transversal, and in 16% of cases was pointing oblique inferior facing left; in 22,22% of the cases, the oval-shape ostium had one extremity thinner, which gave it a pear-shape.

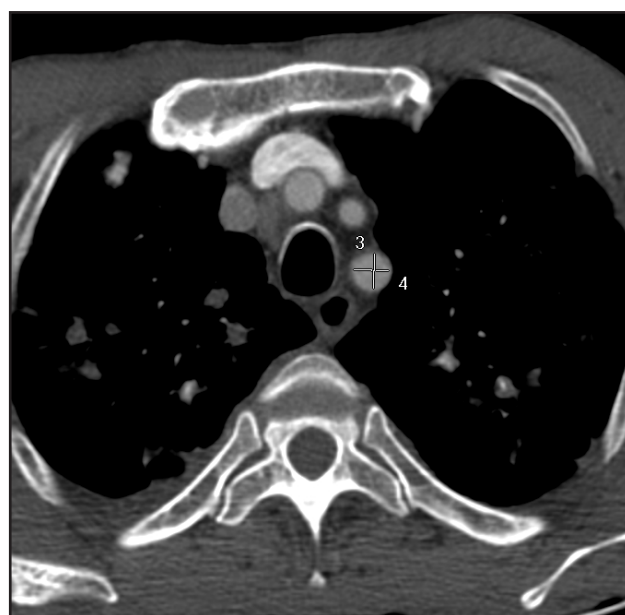


Figure 5 Left subclavian artery having round ostium, the vertical diameter being equal with the horizontal diameter, both having 10,6mm (female).

In 8% of the cases the left subclavian artery ostium presented a round shape. In female gender the left subclavian artery has a oval-shape(in 94,12% of cases) with the following orientation of the axes: in 29,41 % of cases the long axis was oriented transversal, in 23,53% of the cases the long axis was oriented oblique superior to the left and vertical; and in 17,65% of the cases the long axis was oriented inferior oblique and to the left; in the 25,0% of the cases, the oval-shape has a pear-shape appearance. In the or 5,88% of the cases the ostium of the left subclavian artery, in female gender had a round shape. In male the left subclavian artery had a oval-shape in 87.5% of cases) with the following orientations of the axes: in 37.5% of the cases the long axis was

oriented oblique superior to the left, in 25,0 % of cases the long axis was oriented vertically , and in 12.5% of the cases the long axis was oriented oblique inferiorly to the left. In 12,5% of the cases the ostium of the left subclavicular artery had a round shape in male gender.

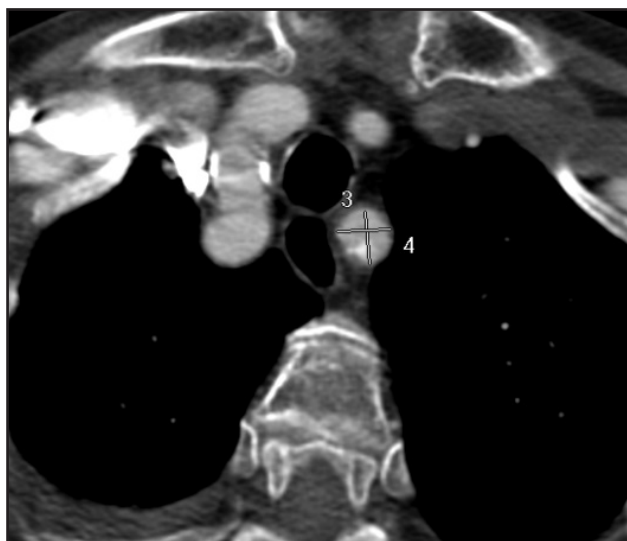


Figure 6 Left subclavian artery. The subclavian ostium is round, the vertical diameter is equal with the horizontal diameter, both having 13,3mm (female).

At the level of the right subclavian artery, the arterial ostium presents in 93,75% of the cases a oval-shape, with the following orientation of the long axis: in 32,25% of the cases the long axis was oriented oblique inferior to the left, 25.0% of the cases the long axis was oblique superior to the left and in 18,75% of the cases the long axis was oriented transversal and vertical; in 13,33% of the cases, the shape was pear-shape. In 6.25% of the cases the ostium of the right subclavian artery had a round shape.

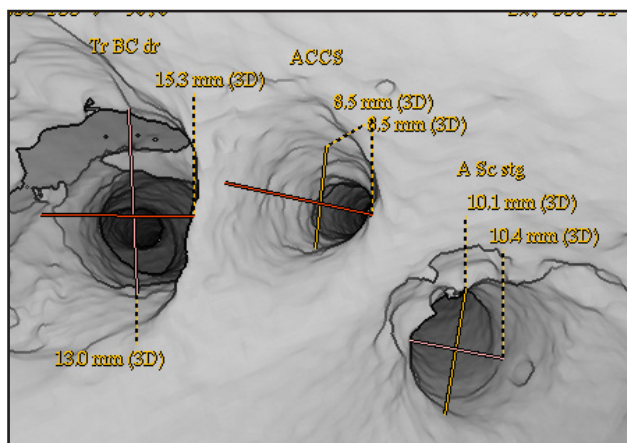


Figure 7 The horizontal diameter of the subclavian artery

is lower than the brahiocefalic trunk with 4.9 mm and larger than that of the left common carotid arteries artery with 1.9 mm and the vertical diameter is less than 2.9 mm than the brahiocefalic trunk and greater than that of the left common carotid arteries with 1.6 mm.

In female gender, the right subclavian artery's ostium has a oval-shape (in 90,91 % of cases) with the following orientation of the long axis: in 27,27% of cases the long axis was oriented transverse and oblique inferior to the left, and in 18,18 % of cases the long axis was oriented oblique superior to the left and vertical; in 25,0% of the cases, the shape was pear-shape. In the 9,09% of the cases the right subclavian artery ostium, for the female gender, had a round shape. In male, the ostium of the right subclavian artery had a oval-shape in 100% of the cases, with the following orientations of the long axis: in 33,33% of cases the long axis was oriented oblique superior to the left and oblique inferior to the left, and in 16,67 % of cases the long axis was oriented vertically and transversal.

Discussions

At the level of the left subclavian artery the horizontal diameter of the arterial ostium has a difference between the minimum and maximum values of 8.1 mm, at the level of the vertical diameter the difference is 9.5 mm. The horizontal diameter was higher than the vertical in 34,21% of the cases, with differences of 0,2-2,2 mm, in 57,89 % of cases was higher the vertical diameter, with differences of 0,4-2,2 mm and 7.89% of the cases, the two diameters had equal size. In female gender, the horizontal diameter of the arterial ostium had a difference between the minimum and maximum values of 8.1 mm diameter, at the level of the vertical diameter being 9.5 mm. The horizontal diameter of the subclavian ostium, was higher than the vertical in 50% of cases, with differences of 0,2-1,7 mm; 45.45% of the cases the vertical diameter was higher , with differences of 0,4-2,2 mm and in 4.55% of the cases the two diameters had the same value. In male, the horizontal diameter of the left subclavian horizontal ostium was higher than the vertical in 75% of cases, with differences of 0,4-2,2 mm; 12.50% of cases the vertical

diameter was higher, with differences of 0,5-0,8 mm, and in 12,50% of cases the two diameters had the same value.

At the level of the right subclavian artery the horizontal diameter of the arterial ostium had a difference between the minimum and maximum values of 4,8 mm, the value of the vertical diameter was 6,7 mm. The horizontal diameter was higher than the vertical in 62,50% of the cases, with differences of 0,2-11 0,2 mm, in 57,89 % of cases I found higher the vertical diameter, with differences of 0,1-10,1 mm and 4,17% of the cases, the two diameters were of equal size. In female gender, the horizontal diameter of the right subclavian horizontal ostium was higher than the vertical one in 62,5% cases, with differences of 0,2-2,3 mm; and in 37,50 % of cases the vertical diameter was higher, with differences of 0,1-2,0 mm. In male, the horizontal diameter of the right subclavian ostium was higher than the vertical diameter in 62,5% cases, with differences 0,3-1,5mm; 25,0% of the cases the vertical diameter was higher, with differences of 40,8 mm and 12,50% of cases the two diameters were the same value.

The average horizontal diameter of the left subclavian ostium in female has a value of 9,28 mm and 9,14 mm vertically, at the level of the right subclavian artery the average value of the diameter being of 8,65 mm and 5,59 mm the vertical one. The average horizontal diameter of the left subclavian ostium in male has a value of 49,6 mm, and vertically 10,53 mm, at the level of the right subclavian artery the average value of the horizontal diameter being of 7,80mm, and the vertical one 9,15 mm.

Comparing them, the average values of the diameters of the ostium of the aortic arch branches, I found that the diameters of the subclavian arteries were always smaller than the diameters of the brachiocephalic trunk, in the case of the horizontal diameter with a difference of 3,98 mm in female and a difference of 2,74 mm in male and, in the case of vertical diameter the difference was of 7,84 mm in female and 3,16 mm in male. Compared to the diameters of the ostium of the left common carotid artery, the diameters of the left subclavian artery were greater , in the case of the horizontal diameter the differences were 1,51 mm in female, and the

differences of 1,11 mm in male, in the case of the vertical diameter the differences were 2,41 mm in female gender and 1,97 mm in male. In the literature, on which we consulted the information are few. Thus, (8), which refers only to the ostium of the left subclavian artery, finds that the horizontal diameter is much larger in male, in relation to the average value of the vertical diameter , between them being a difference of 11,2 mm, and in female a difference of 11,1 mm, we found higher the vertical diameter with 0,46 mm in male and in female we found higher the horizontal diameter with 0,14 mm. the minimum value being less than 2,0 mm, and the maximum 1,5 mm. Our results are smaller in the vertical diameter in relation to the horizontal diameter, the minimum value of 1,6 mm, and the maximum amount by 0,2 mm. (9, 10), who finds only the vertical and horizontal diameter of the ostium of the left subclavian artery, without finding a average value of them, he finds that the horizontal diameter has a lower minimum and maximum value than the vertical diameter, the minimum value being less than 2,0 mm, and the maximum 1,5 mm.

Our results are smaller in the vertical diameter in relation to the horizontal diameter, the minimum value being 1,6 mm, and the maximum value 0,2 mm. . To (9, 10), the vertical diameter is higher in male compared to female gender, with a minimum value of 2,4 mm, and the maximum value being larger in female gender with 2,0 mm. At the level of the horizontal diameter, the minimum and maximum values are greater male, the minimum value being higher with 4,0 mm, and the maximum value with 0,1 mm. We found the minimum value of the vertical diameter higher in male with 3,5 mm, and the maximum value is higher in female with 3,3 mm.

Regarding the shape of the subclavian artery's ostium, most often they were oval-shaped between the two subclavian arteries with only a difference of 1,75% of the cases in which the oval-shape was more frequently at the level of the right subclavian artery ostium. In the oval-shape, we have described a sub-version, the pear-shape, encountered in 22,22 % of the left arteries, appearance whom I didn't find in the case of the right subclavian arteries. In a low number of cases, 8 of the cases on the left-hand side and

6.25% of the cases on the right-hand side, the subclavian artery ostium had a round shape.

Conclusions

The variability of the findings in the anatomical parts of the subclavicular artery's ostium, both as regards the size of the horizontal and vertical diameters, also their shape and as regards morphological relations with other branches of the aortic arch. The dimensions of the diameters vary according to sex, but it is a general rule that the dimensions are higher in male, the minimum and maximum values may be different in the two sexes. Thus, in the case of minimum horizontal diameter for the left subclavian artery, it is higher in female with 0.2 mm, and the maximum value is greater in male with 0.6 mm diameter and, in the case of the vertical diameter the minimum value was higher in female with 1.1 mm, and the maximum value in male with 1.9 mm. At the level of the right subclavian artery, the minimum horizontal diameter had greater value in male with 0.5 mm, and a maximum value in female with 0.1 mm. The vertical diameter of the right subclavian artery ostium has the minimum value greater in male with 2.6 mm, and the maximum value greater in female with 1.8 mm. We specify that the minimum or maximum values have been frequently encountered in one case.

The results obtained firstly depend on the number of cases in which the study is carried out, but also the morphological type of the subject, the methods of study used and in the examiner's imaging experience.

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