VERSITA

ARS Medica Tomitana - 2013; 3(74): 136 - 140
DOI: 10.2478/arsm-2013-0024

Butoi G., Iliescu D.M., Baz R., Bordei P.

Morphological characteristics of the abdominal aorta

Discipline of anatomy, Department I – preclinical disciplines, Faculty of medicine, University "Ovidius" Constanţa

ABSTRACT
The transverse diameter of the abdominal aorta was measured above the origin of the celiac trunk on a number of 82 cases, in male finding a caliber range of 18 to 31.8 mm, in one case, the aorta having a diameter of 31.8 mm. In females, the aorta was between 12.4 to 23.4 mm in caliber, most commonly, in 24 cases, being present a caliber range from 14.8 to 19.7 mm. At the level of the celiac trunk, on a number of 74 cases, the aorta had a diameter of between 12.9 to 28.6 mm in females and 11.4 to 21.8 mm in males. In males, on 20 cases, the caliber was 20 to 25 mm while in females, on 42 cases, we found a caliber range from 11.4 to 21.8 mm and in 20 cases being 19.4 to 2.18 mm. At the level of the superior mesenteric artery, we studied the aortic diameter on a number of 86 cases. In males it had a diameter between 12.9 to 26.4 mm, but in one case with 12.9 mm. In 26 cases, it had a diameter of between 20.1 to 26.4 mm. In females we found a range of 12.5 to 20.4 mm, most commonly with the diameter of 18-20 mm in 19 cases. Next to the renal arteries we studied the aortic diameter on a number of 118 cases, finding abdominal aortic diameters of 10.3 to 27.4 mm. In males it ranged from 10.9 to 27.4 mm diameter while in females had a diameter between 10.3 to 20.4 mm; in one case we met a caliber of 20.4 mm. The diameter of the abdominal aorta at the level of the inferior mesenteric artery was evaluated on 80 cases; in males the diameter ranged from 13.9 to 25.9 mm and in females was 10.6 to 19.3 mm.

Keywords: abdominal aorta - morphological characteristics

Iliescu D.M.

Department of Anatomy, Faculty of medicine, University "Ovidius" Constanţa, Romania
Aleea Universitatii, Nr. 1, Campus B
Constanţa, Romania
dan@anatomie.ro

Introduction

The abdominal aorta continues the thoracic aorta from the diaphragm, it is placed anteriorly and to the left of the vertebral column, ending in its terminal branches at the L4-L5 intervertebral disc. It is a "passage" artery to the lower limbs and nutrient artery of the greater part of the abdomen and pelvis [1]. Located deep in the abdomen, anterior to the lumbar vertebral bodies, posterior to the peritoneum and abdominal viscera, the artery has a vertical, slightly inferior oblique and to the right traject, so that at the origin artery is easily left to the midline and become median by its completion [2,3,4,5,6]. Being located on the convexity of the lumbar vertebral column, the artery will be slightly convex anteriorly. The largest visceral branches of the abdominal aorta, after [6], are represented by the celiac trunk, superior mesenteric artery, renal arteries and the inferior mesenteric artery. These arteries were chose to be landmarks in the abdominal aorta caliber measurements at these levels.

Materials and methods

Our study was performed on angioCT's performed on a GE LightSpeed VCT64 Slice CT scanner and a GE LightSpeed 16 Slice CT Scanner. The caliber measurements were performed on the

abdominal aorta at the following levels: above the origin of the celiac trunk (near diaphragm) and close to the main visceral arteries of the abdominal aorta: celiac trunk, superior mesenteric, renal and inferior mesenteric arteries. The measurements were carried out on a characteristic number of cases in each stage and by gender.

Results

The transverse diameter of the abdominal aorta was first measured above the origin of the celiac trunk on a number of 82 cases, of which 36 were male (43.90% of cases) and 46 females (56.10% of cases). In males we have found a caliber range from 17 to 31.8 mm, in one case the aorta having a diameter of 31.8 mm (2.78% of male cases). Most commonly, in 18 cases (50% of the male) the aorta at this level had a diameter of 20-25 mm, in 13 cases was 25.5 to 27.9 mm, and in 4 cases (11.11% of male cases) aorta was less than 20 mm (17 to 18.4 mm). In females, the aorta was between 12.4 to 23.4 mm in size, most commonly, in 24 cases, being from 14.8 to 19.7 mm (52,17% of female cases), followed in order of frequency from 20 to 23.4 mm caliber in 18 cases (39.13% of female cases) and 12.4 to 12.8 mm in 4 cases (8.70% of female cases).

Next to the celiac trunk, on a number of 74 cases, the aorta a diameter of 12.9 to 28.6 mm in males and from 11.4 to 21.8 mm in females. In males, on 32 cases, in 20 cases (62.5% of male cases) the caliber was 20-25 mm, in 11 cases (34.37% of male cases) was 25.4 to 28.6 mm and in one case (3.125% of the cases in male) the caliber was 13.7 mm. In females, in 42 cases, we found a caliber range from 11.4 to 21.8 mm, in 20 cases (47.62% of female cases) being 19.4 to 2.18 mm, in 18 cases (42.86% of female cases) was 14.3 to 19 mm, and in 4 cases (9.52% of female cases) was 11.4 to 14 mm.

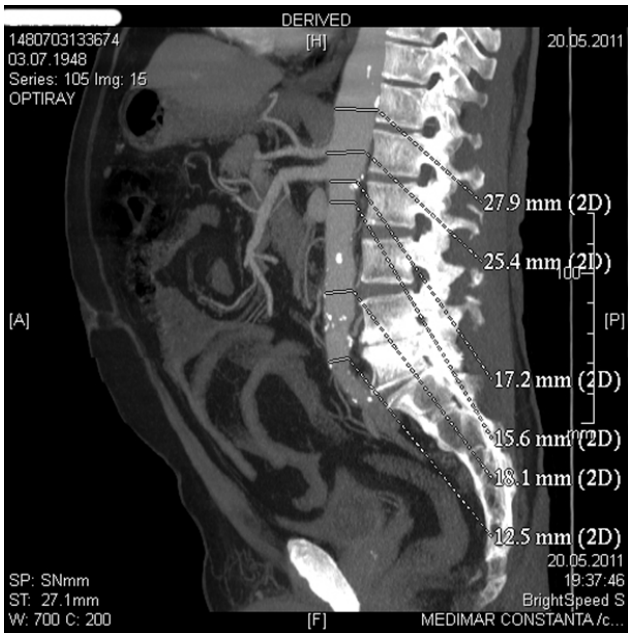

Figure 1 - Abdominal aorta in male; supraceliac diameter: 27.9 mm; celiac diameter: 25.4 mm; superior mesenteric diameter: 17.2 mm; renal diameter: 15.6 mm; inferior mesenteric diameter: 18.1 mm; aortic diameter at bifurcation: 12.5 mm.

At the level of the superior mesenteric artery, we studied the aortic diameter on a number of 86 cases, 42 cases in male (48.84% of cases) and 44 female cases (56.16% of cases). In males it had a diameter of 12.9 to 26.4 mm, only in one case (2.39% of cases of male) being 12.9 mm. In 26 cases (61.91% of male cases) the aortic diameters were 20.1 to 26.4 mm and in 15 cases (35.71% of male cases) the diameter was 17.8 to 19, 5 mm. In females we found a range of 12.5 to 20.4 mm diameter, most commonly the diameter of 18-20 mm in 19 cases (43.18% of female cases). They were in order of frequency: 16 to 18 mm in 12 cases (27.27% of female cases), 13 to 14 mm in 8 cases (18.18% of female cases), 20.1 to 20.4 mm in 4 cases (9.09% of female cases), and only in one case (2.27% of female cases) the diameter was 12.3 mm.

At the level of the renal arteries we studied the aortic diameter on a number of 118 cases, 44 cases were male (37.29% of cases) and 74 cases were female (62.71% of cases). We found the abdominal aortic diameters of 10.3 to 27.4 mm. In males ranged from 10.9 to 27.4 mm diameter, in 10 cases (22.73%

of male cases) was a diameter of 10.9 to 14.9 mm, in 14 cases (31.82% in the case of male) the aorta having a diameter of 16.2 to 18.7 mm and 19.1 to 22.9 mm, and in 6 patients (13.64% of cases of male) the aortic diameter was 22.6 to 27 4 mm. The aorta females have a diameter of between 10.3 to 20.4 mm; in one case we met the caliber of 20.4 mm (1.35% of female cases). In the other cases we encountered the following calibers: in 18 cases (24.32% of female cases) was 12.1 to 13.9 mm; in 15 cases (20.27 % of female cases of the two versions) it was 15.1 to 16.2 mm, in 12 cases (16.22% of female cases) the size was 17.1 to 19.3 mm, in 10 cases (13 51% of female cases) it was a reduced size, being of 10.3 to 11.7 mm.

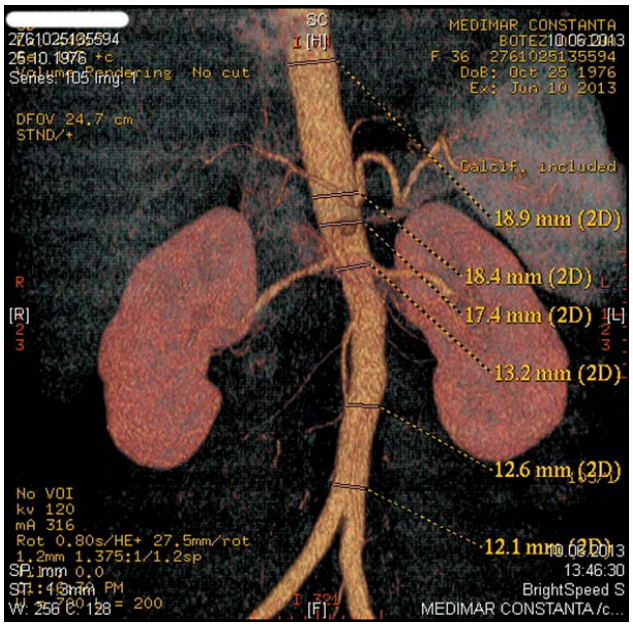

Figure 2 - Abdominal aorta in female; supraceliac diameter: 18.9 mm; celiac diameter: 18.4 mm; superior mesenteric diameter: 17.4 mm; renal diameter: 13.2 mm; inferior mesenteric diameter: 12.6 mm; aortic diameter at bifurcation: 12.1 mm

The diameter of the abdominal aorta at the level of the inferior mesenteric artery was assessed on 80 cases, 34 cases in male (42.5% of cases) and 46 cases were female (57.5% of cases). In males ranged from 13.9 to 25.9 mm, the most common being on 22 cases (64.71% of male cases) with a value of 15-20 mm, after which 4 cases (11.76% of male cases) ranged from 21 to 25.9 mm diameter and aortic diameter in 8 cases was below 15 mm. The females have 10.6 to 19.3 mm diameter, the most common was 24 cases (51.47% of female cases), with 12 to 15 mm caliber, followed by 14 cases (30.44% of cases women) size 15-18 mm. A 19 mm caliber was encountered in 2 cases (4.35% of female cases) and a reduced size, under 12 mm (10.6 to 11.7 mm), was met in 6 cases (13.04 % of female cases).

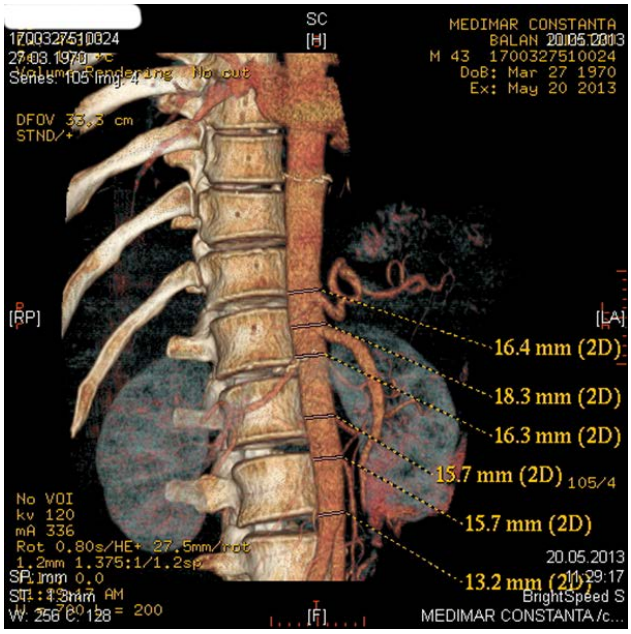

Figure 3 - Abdominal aorta in male. Renal diameter similar with the diameter of the inferior mesenteric artery: 15.7 mm.

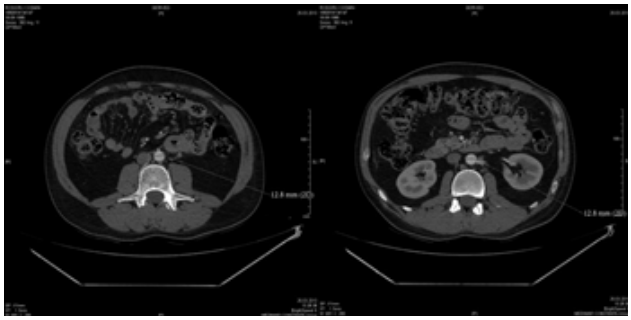

Figure 4 - Abdominal aorta with similar diameters at renal level (right) and inferior mesenteric level (left): 12.8 mm

Discussions

From its origin at the aortic hiatus of the diaphragm and to the lumbar spine at which divides into its terminal branches, the abdominal aorta is narrowing gradually; this is due to the emergence of its collateral branches which are large arteries, according to [1,2,3,4,5,6,7]. By [7], the decrease in size is fast but this we have met only between the diaphragmatic aperture and the origin of celiac trunk, with a diameter decrease by 0.1 to 5.5 mm in males. Note that the decrease in diameter by 1.1 to 1.8 mm was met in 8 cases, the most common being the decrease by 2-3 mm (in 18 cases) and the most significant decreases of 4.3 to 5.5 mm we met in 4 cases. The decreases in females between the diaphragm and the celiac trunk diameter was reduced by 1 mm (0.4 to 1 mm) in 16 cases, a reduction of 1.1-1.8 mm in 8 cases and all 8 cases have met with a reduction of 2.4 to 2.8 mm diameter; we did not found a reduction of diameter greater than 2.8 mm. In one case the two levels measured diameters were equal (18.8 mm). In females we encountered three cases when the aortic diameter at the level of the celiac trunk was higher than the subdiaphragmatic aortic diameter.

Between the celiac trunk and the superior mesenteric artery, abdominal aorta showed in males reductions of 0.2 to 2.4 mm in diameter in 83.33 % of cases, only two cases we encountered a reduction of 4.1 and 4.8 mm. In one case we found a higher with 2.8 mm diameter at the level of the superior mesenteric artery. In female, the diameter at this level showed the biggest changes: a reduction of 0.5-0.6 mm we have encountered in 6 cases, reduction of the diameter of 1 to 1.9 mm in 12 cases, reduction of 2,5-2.6 mm in 4 cases and the reduction from 4.5 to 3.7 mm in 6 cases . In one case we encountered a reduction of 4.7 mm. In female, at this level, we met most cases (8 cases) with an increase of the aortic diameter at the level of the mesenteric with 0.1 to 1.8 mm.

Between the superior mesenteric artery and the renal arteries, in males, we found a reduction of 0.3-0.8 mm in diameter in 8 cases, reductions of 1-1.8 mm in 12 cases, 4 cases these reductions were between 2.9 to 3.1 mm. At this level we encountered two cases when the renal artery diameter increased by 0.5-0.7 mm. In we met 0.3-0.5 mm diameter reductions in 3 cases, reductions of 1-1,6 mm and 2.1 to 2.9 mm were the most numerous in each being a number of 12; reductions of 3 to 3.8 mm were on 4 cases and 4.8 mm diameter reduction were in one case. In females we met four cases when the renal aortic diameter was larger than the mesenteric with 0.2-2.5 mm.

Between the renal arteries and the inferior mesenteric artery, in males we encountered a reducing size of 0.3-0.7 mm in 7 cases, reduction of 1 to 1.9 mm in 8 cases, 2 cases were reduced by 2.9 mm and in one case we encountered a reduction of 4.9 mm. At this stage we encountered 2 cases in which the two levels were equal in size and 4 cases when the aortic diameter at the inferior mesenteric level was greater than the renal with 1.5-7 mm. In 8 cases in females the aortic diameter was reduced to 0.5-1 mm, 1.1-1.8 mm in 6 cases, 4 cases of 2.2-2.5 mm, and only in one case the difference was 4.9 mm. In females we found 8 cases in which the diameters of the two levels were equal and 6 cases of aortic diameter at inferior mesenteric level was larger than the diameter at the renal level with 1.5-1.7 mm.

[8.9] states that at the terminal level the aortic diameter size decreases up to 14 mm, particularly after the origin of the renal arteries. In males we have found that, most common, the abdominal aorta has a diameter greater than 15 mm in most cases.

Conclusions

Physiologically, the caliber of the abdominal aorta decreases progressively as its collateral arteries appear, and the logic size reduction would be higher by more voluminous collateral are issued, as it happens in the origin of the celiac trunk and superior mesenteric artery. A smaller decrease of the aortic diameter below the renal artery origin disproves the claim of authors who argue the opposite. Although there are no subdiaphragmatic branches up to

the celiac trunk, the subdiaphragmatic aorta size reduction is greater than the other levels measured. The existence of additional differences of the aortic diameter in females may be due to the traction exerted in carrying the CT scan, some pathological conditions or errors of interpretation of the image.

An equal sizes between the two levels was encountered only between the renal arteries and the inferior mesenteric artery, a level were we noticed a diminish of the caliber reductions over 2 mm.

References

1. Pillet J. (1994). *L'aorte abdominale et ses branches*. (pp. 421-439). In: J.P.Chevrel. Anatomie Clinique. Le Tronc. Paris: Ed. Springer-Verlag
2. Paturet G. (1964). *Traité d'Anatomie Humaine*. (pp. 230-242). Paris: Ed. Masson
3. Testut L. (1921). *Traité d'anatomie humaine. Angéiologie, livre IV*. (pp. 190-210). Paris: Ed. Gaston Doin.
4. Testut L. (1924). *Traité d'anatomie humaine. Angéiologie*. (pp. 604-606, 621, 710-711, 513-533). Paris: Ed.Gaston Doin
5. Rouvière H. & Delmas A. (1997). Anatomie humaine. descriptive, topographique et fonctionn elle. Tome 2. Tronc. (pp. 177-197). Paris: Ed. Masson
6. Schunke M., Schulte E. & Schumacher U. (2007). *Atlas d'Anatomie. Cou et organes internes*. (pp. 262-263). Trad. Chevalier J.M., Douard R. Paris: Ed. Maloine
7. Gray's Anatomy. (2005). Thirty-ninth edition. (pp. 1116-1118). Ed. Elsevier-Churchill Livingstone
8. Kamina P. (1997). *Anatomie Clinique. 10. Tome 3. Thorax. Abdomen*. (pp. 129-130). Paris: Ed. Maloine
9. Kamina P. & Di Marino V. (1997). *Anatomie. Introduction à la clinique. Vol.8. Tome 1. Abdomen. Aorte abdominalé*. (pp. 45-58). Paris: Ed. Maloine