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Original Research Article

Morphometric Liver Study in Adults

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ABSTRACT

Background: The aimis to study the dimensions of the adultliver in Senegal in order to contribute to the data of the manufacture of a peri-hepaticprosthesiswrapping in the therapeuticmeans of post-traumati chemorrhagiclesions of the liver.

Materials and methods: This study involved 50 livers of anatomicalsubjectswith an averageage of 38 years. We have notedsomebiometricparameters. On the liverscollected, wemeasured the weight and some dimensions.

Results: The intermediate morphotype predominedwith 48% of cases. The dorso-petal position of the liverwasobservedin 84% of the subjects. There was no correlationbetween the morphotype of the subjects and the orientation of the visceral face of the liver. The averageliverweightwas 1410 g. The average transverse diameterwas 25.77cm while the antero-posteriordiameter of the right lobe was 16 cm. The sagittal circumference of the liver in the sicklecell ligament wassignificantlylowerthanthosemeasured at the right and left lobes. The sagittal circumferences of the liver in the Breviligneoussubjectwerelowerthanthose of the intermediate and long morphotype subjects.

Conclusion: The choke zone between the two lobes of the liver in the sicklecell ligament is a mooring point for the peri-hepaticwrappingprosthesis. However, this can onlybe segmental for each right and left lobe. The morphotype of the subject, however, affects the weight, thickness and sagittal circumferences of the liver, which are essential for the dimensions of a peri-hepaticprosthesis.

KEYWORDS: Livermorphometric, peri-hepaticprosthesis.

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INTRODUCTION

The liver is a firm but fragile organ whose complex post-traumatic wounds requiring hemostasis are no longer sutured. However, because of its malleability and its ability to mold itself on the anatomical structures of the neighbourhood, the liver endures harmonious compressions in case of trauma [1]. It has a specific morphology related to its development in the right hypochondria and escapes any geometricre presentation [2].

Its peritoneal fasteners and vascular connections theoretically impede any wrapping process. However, the manufacture of a peri-hepatic wrapping prosthesis (PPHE) capable of providing effective compression in cases of severe trauma is still possible according to the studies of Rosset and Brunet [3,4]. They make peri-hepatic poly glact in prostheses with slow resorption of a trapezoidalform, equipped with bursa sallowing effective compression of the liver parenchyma.

There prostheses have enabled the effective treatment of 35 patients with hemorrhagic liver trauma.

In this study, we will specify the dimensions of the liver in the adult in digenous Senegalese subject. We will compare some anthropometric data of subjects to the respective morphometric elements of the livers.

This workis part of a contribution to the manufacture of liver restraint equipment indicated in the management of serious trauma of this viscera whose frequency is increasing with that of road traffic accidents and in particular their speed in Senegal. This restraint, like that of the spleen and kidney, can beprovided by a peri-hepatic envelop eprosthesis (PPHE) that meets universal standards [3,4].

MATERIALS AND METHODS

This study was carried out in the necropsy room of the Bichat pavilion of the Aristide Le Dantec University Hospital Centre in Dakar.

It involved 50 livers of indigenous adult Senegalese anatomical subjects whose cause of death was neither liver disease nor liver trauma. They were 45 men and 5 women between the ages. We used the following material: a tape measure, a reporter, a knife blade suitable for a handle, a dissecting clamp, a Kelly pliers, a scissor to dissect, a scissor to cut, a wire, a scale, a Kirschner pin, a digital camera. The study looked at the biometric parameters of the subject, morphology and certain dimensions of the liver.of 18 and 80 with an averageage of 38.

The biometric parameters noted in each anatomical subject were: sex, age, size, chest perimeter in horizontal plane passing through the nipples, abdominal perimeter in the horizontal plane passing through the umbilical, xiphoid angle (AX) usinga reporter placed on the tip of the sternum after spotting the right and left costa wnings that constituted the limits of the angle.

Depending on the value of the xiphoid angle, subjects were referred to as short if AX was greater than 80 degrees, intermediate if AX was between 80 degrees and 60 degrees, and long if AX was less than 60 degrees [5].

We know the orientation of the visceral face of the liver in relation to the horizontal plane. She was referred to as a ventro-petal when she looked down and forward, dorso-petal when she looked down and back, and mixed when she looked strictly down [6, 7].

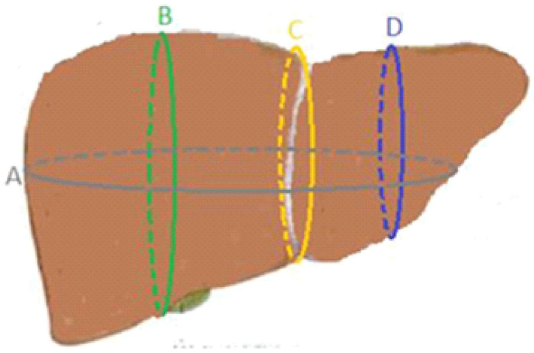

Fig.1: Anteriorview of the liver illustrating circumferences

A : Transverse liver circumference (CTF)

B : Sagittal circumference of the right lobe (CSLD)

C : Sagittal cellcircumference of the sickle ligament (CSLF)

D : Sagittal circumference of the left lobe (CSLG)

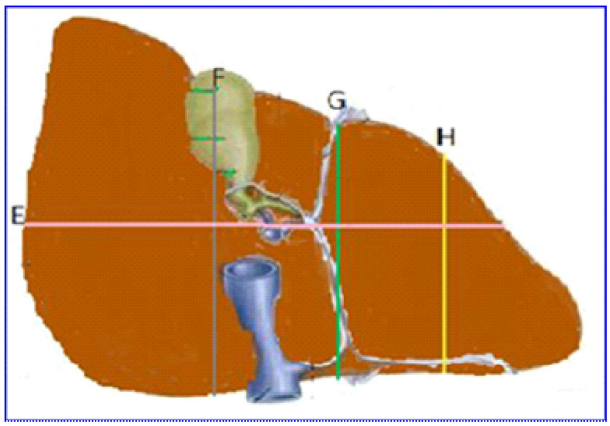

Fig.2: Lower live rview illustratingdia meters.

E: Medium transverse diameter of the liver passing through the hile of the liver

F: Medium antero-posteriordiameter of the right lobe passing the gallbladder

G: Medium antero-posteriordiameter at the level of the sicklecell ligament

H: Medium antero-posteriordiameter of the left lobe.

On the liver taken, rinsed with water and then weighed (in grams) we would perform (values expressed in centimeter) the following measurements (Figures 1 and 2):

- the transverse circumference of the liver (CTF) ;

- the frontal circumference of the liver (SBB) ;

- the average transverse diameter of the liver (DTMF) passing through the hile furrow;

- the sagittal circumference of the right lobe (LTC) half way between the right extremity of the right lobe and the sickle cell ligament ;

- sagittal circumference of the sickle cell ligament (CSLF);

- the sagittal circumference of the left lobe (CSLG) half way between the left extremity of the left lobe and the sickle cell ligament ;

- the antero-posterior diameter of the right lobe (DAPLD) half way between the right extremity of the right lobe and the sickle cell ligament ;

- the antero-posterior diameter at the level of the sicklecell ligament (DAPLF) ;

- the antero-posterior diameter of the left lobe (DAPLG) half way between the left extremity of the left lobe and the sicklecell ligament ;

- the maximum thickness of the right lobe (EMLD) using a Kirschner pin vertically piercing this lobe at the liverdome;

- the average thickness of the left lobe (EMLG) measured half way between the left extremity of the left lobe and the sicklecell ligament.

RESULTS

The morphotype, depending on the value of AX, was long in sevensubjects (14%), intermediate in 24 subjects (48%) and breviligne in 19 subjects (38%). Three of the five women were of the breviline type. The average size was 179 cm in long subjects, 177cm in intermediates and 173cm in brevilles. The other external parameters are listed in Tables 1 and 2 ; these are age, height, abdominal girth (PA) and chestgirth (PT).

The weight and dimensions of the liver in men, women and the morphotype are listed in Tables 3, 4 and 5, respectively.

Table 1: Biometric Settings of Subjects.

	Average value	Extreme values
AGE (year)	38	18-80
SIZE (cm)	176	162-194
PT (cm)	86	67-105
PA (cm)	72	60-97
AX (degrees)	79	55-120

F:Feminine **M:** Male **PT:**chestperimeter

PA: abdominal perimeter

AX: Xiphoid angle in degrees

OFVF: orientation of the visceral face of the liver:

DP: dorso-petal

VP:ventro-petal **IN:**intermediate or mixed.

Table 2:maximum, minimum and average value of liverweight (g) and size (cm).

	PDS	CFF	DTM	CTF	CSLD	CSLF	CSLG	DAPLD	DAPLG	DAPLF	EMLD	EMLG
V.moy	1410	76,7	26	55,3	37,34	25,1	26,6	16,2	13,3	11,8	6,3	3,2
V.max	2100	96	30	62	44	31,5	36	19	17,5	16,5	8,5	5,4
V.min	900	63	21,5	48	30	18	21	12	10,5	9,5	4	2

V.moy: average value ; **Vmax:**maximum value ; **V.min:** minimum value

Table 3: Weights and Dimensions of the Liver in Humans.

	PDS	CFF	DTM	CTF	CSLD	CSLF	CSLG	DAPLD	DAPLG	DAPLF	EMLD	EMLG
V.moy	1402	76	26	55,2	37,3	24,8	26,6	16,1	13,2	11,6	6,4	3,2
V.max	2100	96	29	62	44	31,5	36	19	17,5	15	8,5	4,5
V.min	900	63	21,5	48	30	18	21	12	10,5	9	4,5	2

Table 4: Weight and Dimensions in Women.

	PDS	CFF	DTM	CTF	CSLD	CSLF	CSLG	DAPLD	DAPLG	DAPLF	EMLD	EMLG
V.moy	1480	80,1	26,4	56,1	37,6	27,4	26,6	16,6	14,6	13,4	5,8	2,9
V.max	1900	93	30	59,5	42	31,2	30	19	16,5	16,5	7	3,5
V.min	1050	64	23	53	35	25	25	14,5	12,5	10,5	4	2

Table 5: Averageliverweight and size by morphotype.

	PDS	CFF	DTM	CTF	CSLD	CSLF	CSLG	DAPLD	DAPLG	DAPLF	EMLD	EMLG
V.moy	1414	79,6	26	55,3	37,6	25	26	16,8	13,3	11,5	5,6	2,8
V.max	1373	76,6	26,3	55,5	37	24,5	26,4	16	13	11,6	6,2	3,2
V.min	1455	76	25,5	55,5	37,5	26	27,1	16,1	13.7	12.1	6,7	3,3

DISCUSSION

We note a real male predominance with a sex ratio of 9 ; this is far superior to the study of Pietri et al [8] and that of Rosset et al [3] who have a sex ratio of 0.85 and 1.17 respectively. This difference can be explained by the high frequency of autopsy of male victims of accidents including road traffic. The averageage of the subjectsis 38 years, which is relatively young compared to the study of Pietri et al [8] whoseaverageageis 43.5 years.

We do not note a correlation between the morphotype of the subjects and the orientation of the visceral face of the liver. The average liver weightis 1410 g ; this is not far from the average reported by Rouvière et al [9] and Kamina et al [10] which is 1500 g while Leguerrier [1] gives an average value between 1400 and 1500 g. The minimum value of 900 g of our series is very far from that reported by Couinaud [11] which is 500 g in a 30-year-old woman. Depending on the morphotype of the subjects, we note that the average liver weight of the subjects of breviligneous morphotypes is higher than that of subjects of long and intermediate morphotypes. The average transverse diameter is equal to 28 cm in the literature [1, 9, 12, 13, 14] greater than that of our study which is 25.77cm.

The antero-posterior diameter at the right lobe is 16 cm in our study consistent with all the data in the literature. [1, 12, 13, 14].

The maximum averagethickness of the right lobe is 6.33 cm in our study. This value is much lower than that found in the literature series where the average value is 8 cm [1, 12, 13, 14].

The sagittal circumference of the liver in the sickle cell ligament is significantly lower than that measured in the right and left lobe. This finding is consistent with Rosset's study [3].

In women, the sagittal circumference of the liver in the sicklecell ligament is significantly lower than that measured in the right lobe ; on the other hand, it is slightly higher than that of the left lobe. This is contrary to the results of Rosset's study [3] which argues that the circumference of the liver in the sickle cell ligament is significantly lower than the maximum sagittal circumferences of both lobes. But the low number of female cases in our study, compared to the Rosset study [3], does not allow us to beunequivocal about this contradiction. In humans, on the other hand, our results are consistent with Rosset's study [3]; but the average value of the sagittal circumference of the left lobe is very slightly higher than the average circumference of the sicklecell ligament.

The maximum thickness of the right lobe and the average thickness of the left lobe in brevillesare greater than those measured in intermediates and longlines. The sagittal circumferences of the liver in the breviline subject are less than the intermediate and long subjects. This result is consistent with Rosset's study [3].

CONCLUSION

The thickness of the right lobe is less important. The weight and liver thickness are higher in brevilles. The sagittal circumference of the liver in the sicklecell ligament was significantly lower than those measured in the right and left lobe. This is an essential data because it confirms the existence of a choke zone between the two lobes at the sicklecell ligament level in subjects that can beused to moor a peri-hepatic wrapping prosthesis. This prosthesis can only beleft or right lobar and should take into account the morphotype of the subject that affected the weight, thickness and sagittal circumferences of the liver that are essential for the dimensions of a peri-hepatic prosthesis.

Conflicts of Interests: **None**

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