

# THE ULTRASOUND RELATIONSHIP BETWEEN THE DIMENSIONS OF THE SPLEEN AND THE HEAD OF THE PANCREAS IN CHILDREN

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**Keywords:** spleen, pancreas, ultrasound

spleen, child,

**Abstract:** Since a competent abdominal ultrasound requires a good view of the pancreas we propose tracking the sizes of the head of the pancreas in the healthy child, the sizes of the spleen (transverse and longitudinal diameter) and the establishment of any parallels in the development of both organs. The results of this study indicate an increase in spleen length and anterior-posterior diameter of the head of the pancreas in the dynamics of age. Increased anterior-posterior diameter was lower in the first three years of life and presented variations. The anterior-posterior diameter of the head of the pancreas correlated with the subject's height was good ( $r = 0.37$ ), which may be selected for use in establishing normal charts. Slower growth in the anterior-posterior diameter of the pancreatic head compared with faster growth rates of the length and the transverse diameter of the spleen calls for different growth rates of the two.

**Cuvinte cheie:** splină, pancreas, ecografie

splină, copil,

**Rezumat:** Având în vedere că un examen ecografic competent al abdomenului presupune și o bună vizualizare a pancreasului ne-am propus urmărirea dimensiunilor capului pancreasului la copilul sănătos, a dimensiunilor splinei (diametrul transversal și cel longitudinal) și stabilirea unor eventuale paralelisme în dezvoltarea celor două organe. Rezultatele prezentului studiu indică o creștere a lungimii splinei și a diametrului anteroposterior al capului pancreasului în dinamica vârstei. Creșterea diametrului anteroposterior a fost mai lentă în primii trei ani de viață și a prezentat variații. Corelația diametrului anteroposterior al capului pancreasului cu înălțimea subiectului a fost bună ( $r=0,37$ ), aceasta putând fi selecționată pentru utilizare în constituirea diagramelor valorilor normale. Creșterea mai lentă a diametrului anteroposterior a capului pancreasului în comparație cu ritmul de creștere mai rapid al lungimii și diametrului transversal al splinei pledează pentru ritmuri diferite de creștere ale celor două.

## INTRODUCTION

Addressing exact measurements of the anterior-posterior diameter of the pancreatic head and body was possible only recently with the use of high resolution ultrasound equipment. The pancreas is studied by cross sections having the ultrasound transducer placed initially under the xiphoid appendix and down the midline. The pancreatic head is usually located on the right of the midline, just below the portal vein, at a more caudal level than the body and tail. The body of the pancreas is located above the upper mesenteric artery. The tail of the pancreas usually inserts in the splenic hilum. The pancreatic parenchyma has a homogeneous texture like "paving stones" or more coarse "stuff" than the liver. The echogenicity must be at least as high as that of normal liver. The normal pancreatic duct is seen rarely, it may be confused with an empty stomach or splenic vein. It is estimated that the pancreatic duct is normal up to 2 mm in diameter. The contour of the pancreas is clear, linear and continuous. The pancreas is limited by its own capsule and peripancreatic fatty tissue (1,2,3,4)

## OBJECTIVES

Since a competent abdominal ultrasound requires a good view of the pancreas we propose tracking the sizes of the head of the pancreas in the healthy child, the sizes of the spleen

(transverse and longitudinal diameter) and the establishment of any parallels in the development of both organs.

## MATERIAL AND METHOD

The study ran from January 2008 -March 2009 in Sibiu County. The study included a total of 158 subjects (79 girls, 79 boys) of similar age ( $p=0,94$ ) and height ( $p=0,76$ ). Healthy children were selected after a preliminary analysis of history and we put emphasis on somatic growth, nutrition and morbidity presented.

The children's age in the study group is between one month and 17 years, and their residence is in Sibiu County.

The medical examination has been performed with a Medison 8800-MT with opportunities for review in 2D, Color Doppler and Power Doppler.

We have practiced for the spleen coronal section for measuring the long axis (length) and the transverse oblique section for the transverse diameter, through the intercostal spaces IX, X, XI. The pancreas was measured in patients in the supine position after a cross-section in the epigastric region, using as a major milestone the splenoportal confluence. The anterior-posterior diameter of the pancreatic head has been determined and we have entered the registration in the child's individual chart.

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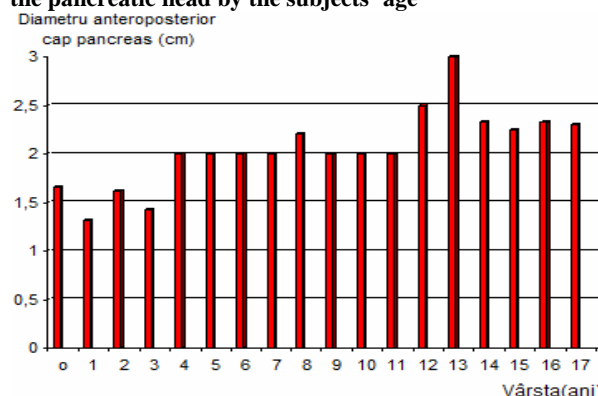
## CLINICAL ASPECTS

### RESULTS

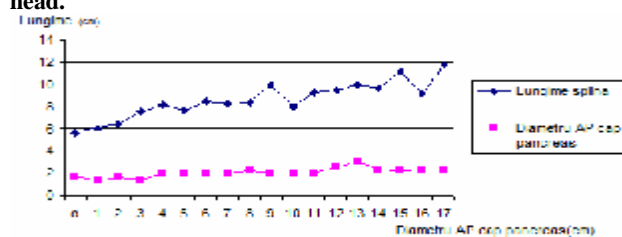
The pancreatic head increased with age ( $r = 0.43$ ) without sex differences ( $p = 0.58$ ) (table 1)

The increase of the anterior-posterior diameter of the head of the pancreas has been slower, with an almost horizontal curve. There is a discrepancy between the faster growth rate of the length of the spleen and the growth rate of the anterior-posterior diameter of the head of the pancreas. The head of the pancreas increased homogeneous after the age of 3 years (fig.1), with age( $r=0.37$ ),reaching adult levels at the age of 16 years without sex differences ( $r= 0.48$ ).

**Figure no. 1. Variation of the anterior-posterior diameter of the pancreatic head by the subjects' age**



**Figure no 2. The relationship between the spleen length and the anterior-posterior diameter of the pancreatic head.**



The anterior-posterior diameter of the pancreatic

head was in relation to the transverse diameter of the spleen ( $r = 0.28$ ) with age. The length of the spleen was correlated ( $r = 0.39$ ) to the anterior-posterior diameter of the head of the pancreas (fig. 2). The results plead for own rates of growth of the spleen and pancreatic head in childhood.

### DISCUSSIONS

The results of this study indicate an increase in the length of the spleen and the anterior-posterior diameter of the head of the pancreas in the dynamics of age. The increase of the anterior-posterior diameter was lower in the first three years of life and presented variations. The mean size of the pancreatic head ultrasound findings in this study fall within the limits established by Văleanu et al. (5) in 1992 in healthy children aged 0-20 years in Cluj County. Regarding the size of the pancreas, there is a diversity of opinions. Coleman and associates (1983) suggest some normal values for the anterior-posterior diameter of the pancreatic head, tail and body. Later Ueda and collaborators (1989) propose other values for the same segments of the pancreas. (6) In 1993 Capaccioli and collaborators propose other values to define "normal" (7). It should be noted that each of the authors cited have established normal values by age, but have used different age groups. The correlation between the anterior-posterior diameter of the head of the pancreas with the subject's height was good ( $r = 0.37$ ), which may be selected for use in establishing normal charts. Data of this study on the pancreatic head dimensions are comparable to those found by Ueda and collaborators in 1989 (6) but they have used other technical examination (pancreatic head size determination by sagittal section) and obtained higher correlation coefficient values than those obtained in the present study. The child's preparation for ultrasound examination and the technique of examination have been correct, the results of this study are similar to other scientists – these are the reasons why we believe that a relationship between the sizes of the spleen and the head of the pancreas has reached its target. The slower growth rate in the anterior-posterior diameter of the pancreatic head compared with the faster growth rates of the length and the transverse diameter of the spleen calls for different growth rates of the two..

**Table no. 1. The sizes of the spleen and of the pancreatic head by age**

Age (years)	SPLEEN		PANCREAS			
	Length(cm)	Standard Deviation (cm)		Length (cm)	Standard Deviation (cm)	
0	5,66	0,516	0	5,66	0,516	0
1	6,10	0,937	1	6,10	0,937	1
2	6,50	0,535	2	6,50	0,535	2
3	7,57	1,397	3	7,57	1,397	3
4	8,25	0,500	4	8,25	0,500	4
5	7,66	1,211	5	7,66	1,211	5
6	8,50	0,527	6	8,50	0,527	6
7	8,33	0,577	7	8,33	0,577	7
8	8,40	0,894	8	8,40	0,894	8
9	10,00	0,000	9	10,00	0,000	9
10	8,00	0,000	10	8,00	0,000	10
11	9,33	0,577	11	9,33	0,577	11
12	9,50	0,707	12	9,50	0,707	12
13	10,00	0,000	13	10,00	0,000	13
14	9,66	0,577	14	9,66	0,577	14
15	11,25	0,957	15	11,25	0,957	15
16	9,16	2,137	16	9,16	2,137	16
17	11,80	0,919	17	11,80	0,919	17
<b>P</b>	<b>P= 0,000</b>		<b>P</b>	<b>P= 0,000</b>		<b>P</b>

### CONCLUSIONS

1. The pancreas and the spleen have their own growth rates with the age of the children.
2. The relationship between the spleen sizes and the pancreatic head is an adjuvant criterion for assessing the spleen in children.

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