MORPHOMETRIC STUDY OF LUMBAR VERTEBRAE'S PEDICLE

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SUMMARY

A morphometric study was performed on ten lumbar spine fragments from adult cadavers of both genders in order to study parameters related to lumbar spine pedicles' morphometry. The pedicles were cross-sectioned on both sides at the level of their smallest diameter. Vertebrae were photographed and the morphometric study was conducted using a Minimop instrument. The following parameters were bilaterally assessed: pedicle shape and diameter, cortical walls thickness, pedicle area, cortical bone area, spongy bone area, and percentage of spongy and cortical bone of the pedicle. The vertebral pedicle of the lumbar spine has an oval shape, its vertical diameter is larger than its horizontal diameter, the medial cortical bone wall is thicker, the area of the pedicle increases towards skull-tail, and the cortical and spongy bone areas ratio is constant throughout the extension of the lumbar spine.

Keywords: *Lumbar Vertebrae; Spine; Cadaver.*

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INTRODUCTION

Vertebral pedicles have been extensively used as fixation site for implants on spine, especially at lumbar spine[1,2]. Vertebral pedicle has also been used as an access port for procedures performed inside the vertebral body, such as biopsies, vertebroplasties or kyphoplasties[2,3].

Vertebral pedicle use was disseminated by Roy-Camille[4] and its acceptance is directly associated to the biomechanical advantages of pedicular fixation and to the potential to provide a three-dimensional correction of vertebral deformities with pedicular fixation systems[1,2]. However, there are drawbacks in using vertebral pedicles, specially represented by the injury potential to this vertebral structure and to adjacent vascular or nervous structures[5].

The objective of this study is to report the results of a morphometric study of adult lumbar vertebrae's pedicles, aimed to provide morphometric inputs for the use of this vertebral component in implants fixation or as an access port to vertebral body.

MATERIALS AND METHODS

Segments of lumbar spine (L1-L5) of 10 cadavers have been used in the study, which were supplied by the Death Examination Service of the Medical College of Ribeirão Preto (USP).

Six cadavers were males and four females, ages ranging from 27 to 88 years (average: 74 years). The vertebrae used in the study did not present traumatic lesions, tumoral lesions, or congenital abnormalities.

The morphometric study was performed on a Minimop machine, with the following parameters being laterally assessed: pedicle shape, diameter, cortical walls thickness, pedicle area, cortical bone area, spongy bone area, percentage of spongy bone and pedicle's cortical.

For performing the study and measuring associated parameters, vertebrae were dissected, adjacent soft tissues and ligamentar and muscular insertions removed. After that preparation, the vertebrae were sectioned across vertebral pedicles with cross-sectional axis at the thinnest portion of the vertebral pedicle. (Figure 1). Then, the sectioned vertebra was photographed, including the sectioned pedicle, and the photo was used for assessing morphometric parameters selected for the study.

RESULTS

Parameters were individually measured at the right and left sides of each vertebra of the lumbar spine, which are presented according to the level (L1,L2,L3,L4 and L5). The detailed values for the parameters measured are depicted on Tables 1,2, 3 and 4.

Pedicle shape was oval and irregular at all studied levels. The pedicle does not have a cylindrical format at the cross-sectional plane, being oval, with a wider and a narrower diameter. The wider diameter is at cranial-caudal direction (vertical) and the narrower one at lateral-lateral direction (horizontal) (Figure 1).

The wider cortical diameter (vertical) was more extensive than the narrower cortical diameter (horizontal), which lends an oval shape to lumbar vertebral pedicle. Vertical and horizontal diameters showed increased values to distal direction and maintained the difference between values. This trend was also seen when the spongy bone component alone was considered (Figure 2).

Study conducted at the Department of Biomechanics, Medicine and Locomotive Apparatus Rehabilitation, Medical College, University of São Paulo, Ribeirão Preto, SP.

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Pedicle diameter			C1		C2		C3		C4		C5		C6		C7		C8		C9		C10		M
			i	r	i	r	i	r	i	r	L	r	i	r	i	r	i	r	L	r	i	r	
L1	C	V	16.4	17.3	15.5	15.3	13.8	15.2	16.9	17.2	16.3	15.2	14.9	16.5	16.6	15.8	18.3	15.5	18.0	17.1	14.0	14.7	**16.0**
		H	9.3	9.7	6.7	7.8	9.6	10.1	14.6	11.9	5.9	6.4	8.6	7.8	11.1	10.0	8.0	9.6	7.5	6.7	2.7	3.4	**7.9**
	E	V	15.2	16.8	12.8	11.8	10.0	11.1	14.3	15.3	13.4	12.7	12.6	13.9	14.8	13.9	17.5	13.6	16.9	15.7	12.6	13.6	**13.9**
		H	8.4	8.9	6.0	6.8	7.4	7.9	12.4	10.6	4.7	5.2	7.5	6.6	10.1	8.7	7.0	8.4	6.3	5.7	2.0	2.7	**7.2**
L2	C	V	15.5	16.8	15.5	16.7	14.2	16.1	14.9	13.3	16.3	17.2	13.3	13.6	14.9	15.1	19.5	17.3	15.1	13.6	14.8	15.6	**15.5**
		H	10.8	10.4	7.8	5.2	9.7	8.7	8.5	8.8	6.3	6.6	9.3	8.1	10.2	12.5	10.0	10.1	9.3	9.8	6.2	6.2	**8.7**
	E	V	13.4	14.8	12.9	15.0	10.8	14.1	13.4	11.6	9.4	9.4	11.8	12.1	12.3	13.3	18.7	16.1	13.3	12.3	14.2	13.6	**12.6**
		H	9.6	9.3	6.4	4.6	7.1	6.3	7.0	7.5	5.3	5.2	8.1	7.2	8.5	10.9	8.9	9.4	7.9	8.8	5	4.9	**7.4**
L3	C	V	17.5	17.2	14.9	14.3	15.0	13.2	28.7	25.8	14.4	13.1	15.5	12.5	17.4	15.6	16.8	17.1	15.7	17.5	15.1	14.8	**16.5**
		H	11.6	11.8	11.6	10.1	9.0	10.9	12.9	9.5	8.9	8.3	10.7	10.7	11.0	11.8	8.7	8.4	10.0	11.7	4.4	5.8	**9.9**
	E	V	15.8	14.8	12.7	11.6	11.4	10.2	23.9	20.5	10.8	10.4	14.2	10.7	14.9	13.3	15.2	16.1	14.4	15.5	12.9	13.2	**14.1**
		H	10.3	10.8	9.1	8.8	6.9	8.5	6.5	8.4	7.2	6.6	8.9	8.9	10.4	10.8	7.0	6.9	8.7	11.0	3.4	4.5	**8.2**
L4	C	V	17.4	17.0	17.1	15.0	19.3	17.4	29.4	24.5	12.0	13.0	14.8	12.2	18.3	15.7	16.0	15.8	30.1	22.6	15.1	15.2	**17.9**
		H	13.4	11.2	9.2	11.7	10.4	10.1	12.2	13.9	9.9	9.2	9.3	10.3	13.4	12.4	11.0	12.7	14.3	12.2	5.5	7.3	**11.0**
	E	V	16.2	15.0	14.9	12.6	17.4	14.1	25.7	23.4	9.9	11.3	13.1	10.8	16.8	14.1	13.4	14.2	28.3	22.0	13.6	14.4	**16.9**
		H	11.9	9.8	7.2	9.9	8.8	8.4	9.1	12.2	8.3	7.7	8.7	8.9	11.8	11.2	10.3	11.8	12.0	10.9	4.7	6.8	**9.5**
L5	C	V	18.6	16.9	22.7	17.8	14.7	14.8			16.1	14.9	23.0	18.1	21.4	20.8	20.1	18.8	20.3	25.4	18.9	18.9	**19.0**
		H	11.1	12.4	10.4	9.3	11.4	9.9			12.6	9.7	13.3	15.1	13.6	14.1	14.0	14.8	12.9	7.2	9.5	10.1	**11.7**
	E	V	17.2	12.9	20.7	12.6	12.2	11.8			14.7	12.5	21.2	16.2	20.0	19.6	18.9	17.5	18.5	24.3	17.6	17.4	**17.0**
		H	8.7	10.7	8.7	5.7	10.0	8.4			11.0	7.8	10.3	12.1	12.8	13.1	12.5	13.6	12.3	6.0	8.6	8.9	**10.1**

Table 1 - *Values of the external cortical (C) and trabecular (T) diameters at both axis of the pedicle at vertical (V) and horizontal (H) coronal planes.*

Pedicular cortical thickness		C1		C2		C3		C4		C5		C6		C7		C8		C9		C10		M
		i	r	i	r	i	r	i	r	i	R	i	r	i	R	i	r	i	r	i	r	
L1	U	0.5	1.1	1.7	1.3	1.8	2.6	1.2	1.0	2.1	2.0	1.3	1.3	1.1	1.0	1.0	1.7	1.1	1.0	0.8	0.3	**1.7**
	L	0.9	0.2	1.2	2.5	2.8	3.7	1.8	1.3	1.9	1.0	1.5	1.9	1.1	2.2	1.0	1.1	1.1	0.9	0.9	0.6	**1.3**
	M	0.2	0.4	0.4	1.0	1.4	1.4	0.8	0.4	0.5	0.4	0.8	0.8	0.4	0.6	0.5	0.6	0.5	0.9	0.3	0.3	**0.6**
	LAT	0.9	0.2	0.4	0.6	1.1	0.7	0.2	0.6	0.5	0.5	0.5	0.1	0.4	0.6	0.5	0.5	0.6	0.4	0.4	0.4	**0.5**
L2	U	1.2	1.7	1.3	1.1	1.7	1.0	0.6	1.0	2.4	2.9	0.9	1.0	1.1	1.0	1.3	0.8	0.8	0.7	0.9	0.9	**1.2**
	I	1.3	1.4	1..8	2.2	1.4	1.4	0.9	0.7	2.1	2.1	1.1	1.0	1.4	1.7	1.2	0.8	0.9	0.7	1.0	0.9	**1.3**
	M	0.6	0.6	1.3	0.5	1.0	O.9	0.5	0.5	0.6	0.5	0.7	0.5	0.7	0.9	0.6	0.7	0.7	0.6	0.4	0.3	**0.7**
	LAT	0.6	0.3	0.7	0.4	0.5	0.9	0.8	0.4	0.9	0.6	0.4	0.4	0.8	0.6	0.8	0.5	0.5	0.5	0.3	0.2	**0.6**
L3	U	1.1	1.1	1.2	0.9	3.0	1.7	0.7	1.5	1.3	2.0	1.1	0.9	1.1	1.7	0.8	0.8	0.5	0.9	0.7	0.6	**1.6**
	I	1.5	1.4	1.5	1.6	1.2	2.0	0.8	1.1	1.3	1.8	0.5	0.8	1.1	1.5	0.9	1.0	0.8	0.7	0.9	0.6	**1.2**
	M	0.7	0.7	1.1	0.5	1.2	0.8	1.3	1.3	0.8	0.8	0.7	0.8	0.6	0.7	0.6	0.9	0.8	0.7	0.4	0.5	**0.8**
	LAT	0.7	0.4	0.4	0.7	0.8	1.2	1.0	1.2	0.7	0.5	0.6	0.7	0.7	0.6	0.3	0.6	0.8	0.7	0.4	0.3	**0.7**
L4	U	1.4	1.3	0.7	0.9	0.6	0.7	1.3	1.3	1.3	1.5	1.2	1.6	0.6	0.7	0.9	1.0	1.2	1.1	1.1	0.8	**1.1**
	I	1.4	1.3	1.0	1.0	1.0	1.8	1.3	1.6	1.2	1.6	0.6	0.9	0.8	1.0	1.1	0.8	1.0	0.8	0.9	0.8	**1.1**
	M	0.7	0.9	0.9	0.8	0.6	1.0	1.1	0.9	0.2	0.8	0.8	1.3	0.4	0.6	0.9	0.9	0.8	0.9	0.5	0.3	**0.8**
	LAT	0.5	0.7	0.5	0.5	0.2	0.7	1.3	0.9	0.2	0.8	0.5	0.6	0.6	0.5	0.6	0.8	1.1	1.0	0.3	0.6	**0.8**
L5	U	1.3	1.2	0.8	1.1	1.5	0.9			1.0	1.2	1.1	1.2	0.7	0.7	0.7	1	1,1	0.8	1.0	1.0	**1.0**
	I	1.7	1.9	0.7	1.0	1.9	1.3			0.7	1.0	1.8	1.0	1.1	0.8	1	0.9	0.8	0.7	0.9	0.9	**1.1**
	M	1.3	0.8	0.8	1.2	1.6	1.0			0.4	0.9	0.8	1.0	0.7	0.7	0.7	0.6	0.6	1.5	0.4	0.5	**0.9**
	LAT	1.0	0.8	0.6	1.0	0.9	0.6			0.5	0.7	0.5	0.2	0.5	0.7	0.3	0.6	0.4	0.3	0.5	0.4	**0.6**

Table 2 - *Values of upper (U). lower (L). medial (M) and lateral (Lat) pedicular cortical wall thickness.*

Area		C1		C2		C3		C4		C5		C6		C7		C8		C9		C10		M
		I	R	I	r	I	r	I	r	I	r		r	L	r	I	r	L	r	I	r	
L1	C	20.4	14.9	17.6	21.2	50.0	48.6	47.2	38.3	25.7	25.5	23.6	21.8	25.9	26.4	20.8	24.6	24.5	16.1	11.0	11.8	**25.8**
	S	100.7	111.0	55.4	56.7	55.7	69.9	126.3	118.1	49.3	50.2	66.3	64.0	112.8	89.4	78.1	88.3	6705	67.8	13.6	25.2	**73.3**
	T	121.1	125.9	73.0	77.9	105.7	118.5	173.5	156.4	75.0	75.7	89.9	85.8	138.7	115.8	98.9	112.9	92.0	83.9	24.6	37.0	**99.1**
L2	C	29.8	31.1	27.8	16.8	43.6	37.1	22.4	20.4	24.1	27.0	21.5	13.1	35.0	37.1	25.1	20.7	24.4	17.9	13.2	19.3	**25.4**
	S	93.6	101.5	62.0	50.2	56.8	64.1	66.6	59.4	68.3	70.4	72.1	69.2	69.8	111.2	116.3	106.7	70.9	66.5	42.8	47.7	**73.3**
	T	123.4	132.6	89.8	67.0	100.4	101.2	89.0	79.4	92.4	97.4	93.6	82.3	104.8	148.3	141.4	127.4	95.3	84.4	56.0	66.9	**98.7**
L3	C	30.0	28.2	39.1	32.1	43.1	45.9	130.1	25.2	34.5	27.8	34.4	28.1	32.8	32.1	27.8	22.7	24.8	28.3	16.7	18.7	**38.2**
	S	122.6	113.0	82.6	80.8	50.7	65.2	120.0	132.4	61.3	53.6	91.3	70.9	123.9	109.1	83.5	85.5	96.6	137.8	31.1	39.5	**87.6**
	T	152.6	141.2	121.7	112.9	93.8	111.1	250.1	157.6	95.8	81.4	125.7	99.0	156.7	141.1	111.3	108.2	121.4	166.1	47.8	58.2	**125.8**
L4	C	22.8	31.6	32.0	37.1	42.6	41.7	84.4	46.0	31.1	27.8	26.1	30.5	25.4	26.5	29.5	26.3	60.4	39.0	17.1	12.6	**34.5**
	S	159.3	106.0	83.5	97.6	109.9	94.4	174.6	236.5	62.5	67.4	81.5	71.1	150.9	117.3	98.2	124.0	222.3	183.2	48.3	65.6	**135.3**
	T	182.1	137.6	115.5	134.7	152.5	136.1	159.0	282.5	93.6	95.2	107.6	101.6	175.9	143.7	127.7	150.3	282.7	222.2	65.4	78.1	**169.8**
L5	C	37.6	51.6	31.7	75.7	43.0	27.9			33.9	36.9	51.8	59.7	31.4	31.6	34.6	32.2	22.7	32.1	24.4	28.1	**38.2**
	S	114.1	107.7	136.0	128.0	91.9	69.4			118.0	77.4	137.1	151.6	185.5	204.5	153.4	189.0	159.1	109.1	111.5	117.0	**131.1**
	T	151.7	159.3	167.7	203.7	134.9	97.3			151.9	114.3	188.9	211.3	216.8	236.1	188.0	221.2	181.8	141.1	135.9	145.1	**169.3**

Table 3 - *Values of cortical (C) spongy (S) and total (T) areas of vertebral pedicles at different lumbar levels.*

% C E		C1		C2		C3		C4		C5		C6		C7		C8		C9		C10		M
		I	r	I	R	I	r	I	r	L	r		r	L	r	I	r	I	r	I	r	
L1	C	16.9	11.8	24.2	27.2	47.3	41.0	27.2	24.5	34.3	33.6	26.3	25.4	18.6	22.8	21.0	21.8	26.6	19.1	44.7	31.9	**27.3**
	E	83.1	88.2	75.8	72.8	52.7	59.0	72.8	75.5	65.7	66.4	73.7	74.6	81.4	77.2	79.0	78.2	73.4	80.9	55.3	68.1	**72.7**
L2	C	24.2	23.5	27.8	25.1	43.4	36.6	25.2	25.6	26.1	27.7	23.0	15.9	33.4	25.0	17.8	16.2	25.6	21.2	23.5	28.8	**25.8**
	E	75.8	76.5	69.0	74.9	56.6	63.4	74.8	74.4	73.9	72.3	77.0	84.1	66.6	75.0	82.2	83.8	74.4	78.8	76.5	71.2	**74.2**
L3	C	19.7	20.0	32.1	28.4	45.9	41.3	52.0	16.0	36.0	34.2	27.4	28.4	20.9	22.7	24.9	21.0	20.4	17.0	35.0	32.2	**28.8**
	E	80.3	80.0	67.9	71.6	54.1	58.7	48.0	84.0	64.0	65.8	72.6	71.6	79.1	77.3	75.1	79.0	79.6	83.0	65.0	67.8	**71.2**
L4	C	12.5	23.0	27.7	27.5	28.0	30.7	32..6	16.3	33.1	29.2	24.2	30.0	14.4	18.4	23.1	17.5	21.4	17.6	26.1	16.1	**32.6**
	E	87.5	77.0	72.3	72.5	72.0	69.3	67.4	83.7	66.2	70.8	75.8	70.0	85.6	81.6	76.9	82.5	78.6	82.4	73.9	83.9	**67.4**
L5	C	24.8	32.4	18.9	36.1	31.9	28.7			22.3	32.3	27.4	28.3	14.5	13.4	18.4	14.6	12.5	30.9	18.0	19.3	**23.6**
	E	75.2	67.6	81.1	63.9	68.1	71.3			77.3	67.7	72.6	71.7	85.5	86.6	81.6	85.4	87.5	69.1	82.0	80.7	**76.4**

Table 4 - *Values (as percent) of cortical (C) and trabecular (T) bone composing vertebral pedicles.*

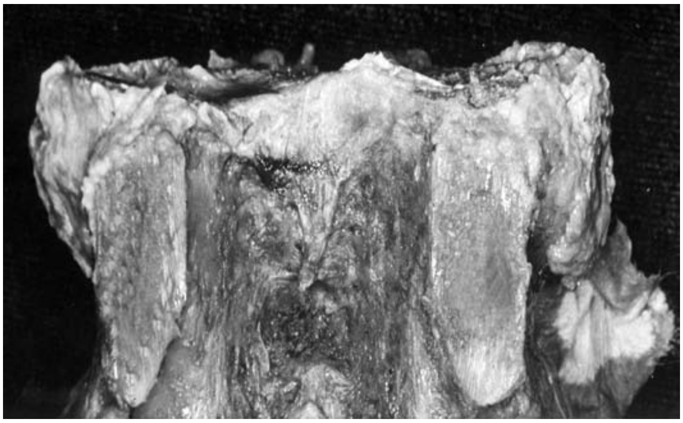

Figure 1 - Photograph of the vertebra after cross-section of the pedicle. The vertebral pedicle area exposed provided information for the study of selected parameters.

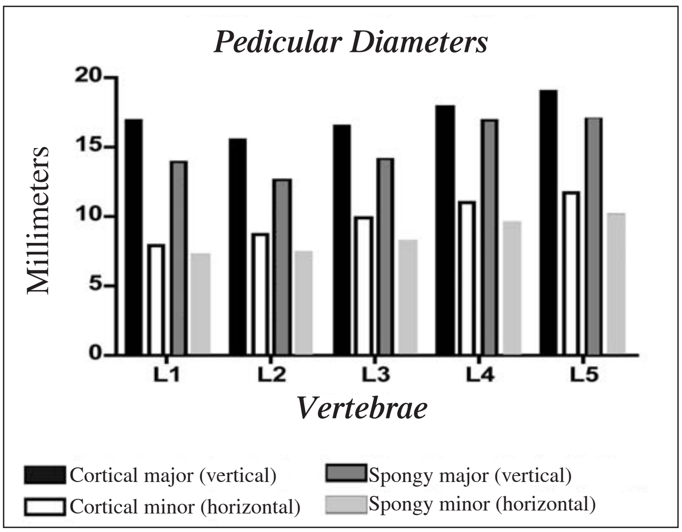

Figure 2 - Different pedicular diameters studied on lumbar vertebrae.

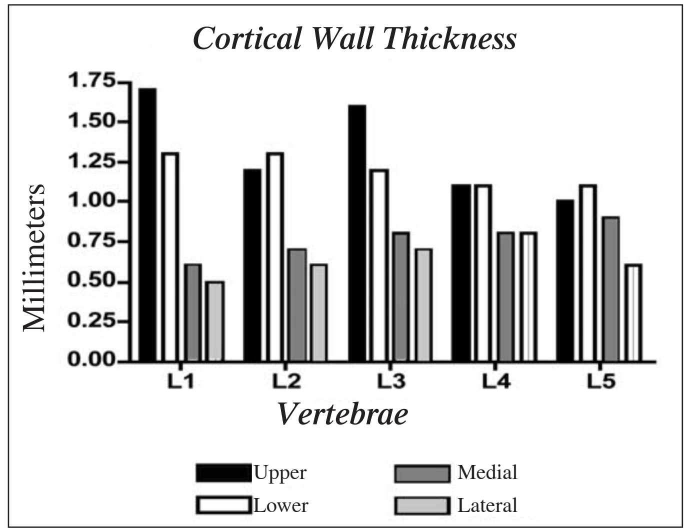

Figure 3 - Lumbar pedicular walls thickness.

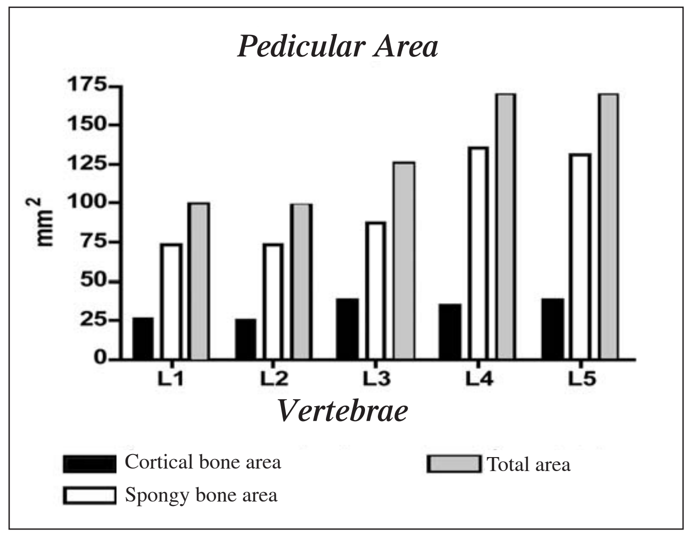

Figure 4 - Spongy, cortical and total bone cross-sectional area of lumbar vertebrae's pedicles.

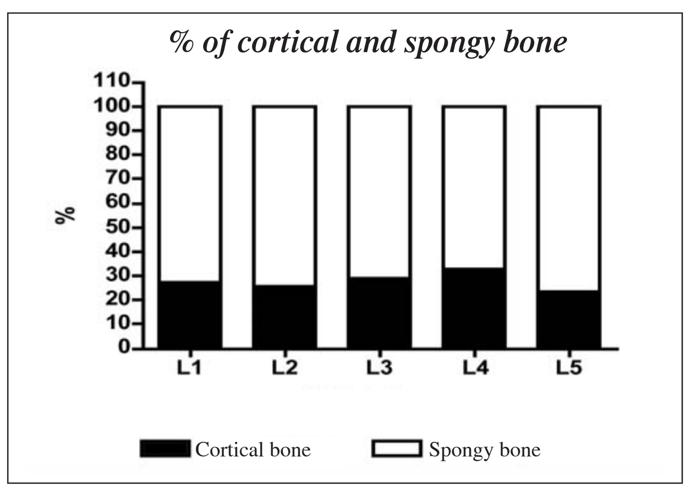

Figure 5 - Percentage of cortical and spongy bone of lumbar vertebrae's pedicles.

Lumbar pedicles' cortical wall thickness showed higher values on more proximal vertebrae, and lower thickness values at the upper portion. This difference in thickness was not seen at L4 and L5 level, and the lowest values were seen at this level. The medial wall's cortical of the vertebral pedicle tend to be thicker at tail direction and a thicker wall when compared to medial cortical. (Figure 3).

Pedicle area presented an increased value at tail direction. The spongy bone area presented a higher value than cortical bone area, and its difference was stronger at L4 and L5 level (Figure 4).

The proportion of spongy bone compared to cortical bone was higher at all levels, remaining steady up to L4 and showing a subtle reduction at L5 level (Figure 5).

DISCUSSION

Vertebral pedicle has been widely employed as a fixation site for vertebral implants since first described by Roy-Camille(4). Pedicle's shape is not cylindrical as early described, and as the use of this anatomical structure became more common, its morphology was better characterized(4).

The results in our study corroborate the idea that lumbar vertebra's pedicle is not a cylindrical and uniform structure, and the analysis of values of the morphometric parameters studied indicates that pedicles do not show symmetry in their constitution.

Lateral and medial cortical walls are not similar in thickness, with medial wall presenting a thicker cortex bone. Kothe et al.[6] also reported that difference of thickness on vertebral pedicles' corticals. According to these authors, the pedicle's lateral cortical thickness ranged from 0.4 to 0.6 mm, and the medial cortical from 0.9 to 1.7 mm. Pedicles' upper and lower corticals also showed different thickness at more cranial levels. However, they presented very close values at L4-L5. This thickness difference on pedicles' cortical bone layer reflects the lack of symmetry in that structure. Pedicel's cortical bone layer has been described as having distinct characteristics from the cortical bone layer that coats the vertical body[6-9].

The extension of vertical and horizontal diameter express a pedicle's oval shape and the subtle increased diameters at cranial-caudal direction may be correlated to the increased dimensions showed by pedicles at more caudal vertebrae, perhaps correlated to the stronger support of physiological loads.

The total area of the pedicle also showed increase at caudal direction, and may be also correlated to the increased dimensions of distal vertebrae. That increase was accompanied by an increase of pedicle's cortical and spongy bones areas. The area corresponding to the spongy bone is larger, and its importance for implants anchorage has been shown[9,10]. Nevertheless, the percentage of spongy bone in comparison to pedicle's cortical bone maintained an almost steady value along all lumbar spine levels. While absolute values for studied parameters presented an increase trend at cranial-caudal direction, the ratio between pedicle's cortical and spongy bone remained steady.

The individual absolute values of studied parameters show variations that are in line with individual anatomical characteristics of the population and its conjunctive analysis reflects the morphologic characteristics of lumbar spine's vertebral pedicles, which present increased dimensions at cranial-caudal direction, but also keeps the ratio between the amounts of spongy and cortical bone within it.

CONCLUSION

Vertebral pedicles of the lumbar region have an oval shape and the thickness of the cortical bone coating is not homogeneous, being thicker at the medial side. Pedicles show an increase of its area and diameters at cranial-caudal direction, but the ratio between its spongy and cortical bone content remains steady.

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INFLUENCE OF THE FEMORAL HEAD LIGAMENT ON HIP MECHANICAL FUNCTION

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SUMMARY

The authors investigated the femoral head ligament at hip flexion-extension and adduction-abduction ranges of motion. Seven human cadavers' hips were measured, initially with intact ligaments, and, subsequently, through arthroscopy, and then with sectioned ligaments also by means of arthroscopy. A specifically prepared device was used for measuring the range of motion which was submitted to a 2.5 N.m torque. An increased abduction-adduction range of motion was observed, which was statistically significant. We concluded that the femoral head ligament restricts hip adduction.

Keywords: *: Hip; Arthroscopy; Range of motion, joint.*

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INTRODUCTION

The hip is an enarthrosis-type joint, which means a kind of ball-socket fitting, composed by the acetabulum and by femoral head, lending a high level of stability and congruence. The acetabular concavity is developed by the presence of femoral spherical head. Inside a child's acetabulum, a three-radiated cartilage is found, which is constituted of the convergence of ileal, ischial and pubic physes(1). In an embryo, the acetabulum develops approximately on the eighth week of fetal development(2) Physis ossification is competed around 16 - 18 years old(1). The acetabulum is anteriorly, laterally, and inferiorly oriented, and femoral head is hinged with it at a medial, anterior and cranial orientation.

The acetabular lip consists of a fixed fibrocartilaginous structure to bone edge of the acetabulum, which increases joint stability by establishing an acetabular depth to reach more than half the volume of femoral head(3).

The femoral head ligament is found within hip joint and goes from acetabular pit to femoral head's fovea at the medial plane of femoral head, a little posteriorly and inferiorly to the center. Constituted of a flat band of well-organized collagen fibers, it is found harbored at the bottom of the acetabulum and its length ranges from 30 to 35 mm(4). It is inserted into the femoral fovea, which is a small depression at the medial portion of the femoral head(4). This ligament can be divided into three bundles:

- Posterior bundle - ischiatic - the longest one, going from acetabular pit and passing beneath transverse ligament.
- Anterior bundle – pubic - starts at anterior acetabular pit, behind the anterior horn of the joint crescent.
- Medial bundle - thinner, it is fixated on the upper edge of transverse ligament.

The purpose of the femoral head ligament is not well established. Some authors find that it helps on providing hip stability because, when ruptured, symptoms of instability and pain may be present(2). Other authors, such as Kapandji, find that the femoral head ligament does not have any relevant mechanical function(4), although it is very rupture-resistant (rupture load = 45kg).

With the development of arthroscopic hip surgery techniques, structures such as the femoral head ligament (FHL) can be now easily identified, both for its normal anatomy and for any pathology. We don't know the consequences for joint function when this ligament is absent, either due to a traumatic injury or arthroscopic resection. Thus, we regard as important to know its biomechanical function in order to guide therapeutic approaches to be taken. Making use of the technical potential to section femoral head ligament but not sectioning ligaments and/ or joint capsule in hip arthroscopy, we aimed, thus, to determine which changes could be caused on hip's range of motion as a result of a femoral head ligament's section.

MATERIALS AND METHODS

For conducting this study, we used nine hip joints removed from human cadavers with a post mortem time evolution ranging from 48 to 72 hours, in which period cadavers were kept under refrigeration at 4º C. Nine male cadavers with ages ranging from 21 to 60 years at the moment of death, with no traumatic death cause and without previous diagnosed hip pathology were selected. All the cadavers were taken upon approval by the committee of ethics in our service.

Joints were removes as blocks by means of hemipelvectomy (sacroiliac detachment, detachment at public symphysis, and femoral shaft osteotomy). The wide ileofemoral port was used, with 20-cm femoral bone resection. Osteotomy was made with saw and osteotomes. All soft tissues around the joint capsule and bones were removed. During this process,

Study conducted at the Laboratory of Biomechanics, Orthopaedics and Traumatology Institute, HC- FMUSP

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