

Provision of tricuspid valve leaflets by septal papillary muscles in the right ventricle of human and other mammal hearts

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Leaflets of the tricuspid valve are provided by tendinous cords extending from the papillary muscles. The situation is complicated with the septal muscles, which generally occur in two groups, one as constant musculus coni arteriosi and the second as other variable septal muscles. We tested whether there is a variability in the provision of the tricuspid valve in different taxonomical groups of mammals. The material examined consisted of 299 hearts of mammals (Primates, Ungulata, Carnivora, Lagomorpha, Rodentia, Marsupialia). The musculus coni arteriosi in the majority of mammals provided only the front leaflet, but among Ungulata and Rodentia it provided simultaneously the front and septal leaflet. The other septal muscles provided the front, septal and even back leaflets. The following regularity was observed: in the hearts of Primates provision of the front leaflet and the front part of the septal leaflet predominated, among Ungulata the muscles provided the middle part of the septal leaflet, but among the other mammals the rest of the septal muscles provided, significantly, the back part of the septal leaflet. Such a provision was characteristic for predators, hares, rodents and marsupials. These circumstances may allow the conclusion to be drawn that there is a taxonomical dependence in the provision of the tricuspid valve in the hearts of the mammals under examination.

key words: heart, tricuspid valve, septal papillary muscles

INTRODUCTION

It is believed that leaflets of tricuspid valve are provided by tendinous cords extending from three papillary muscles. These muscles are generally located below the intercuspidal incisure and provide the closest parts of the leaflets [3]. The situation is more complicated when many forms of muscles occur, leading to a division in the provision of leaflets by particular parts of the muscles. With regard to this phenomenon, the most interesting are the septal muscles, which occur in several groups [5, 7]. It must be pointed out though, that the conus muscle, *mus-*

culus coni arteriosi, or *m. subarteriosus* [1], are always present, whereas other septal muscles are likely to change.

Research work into the valvular system is rare and it is usually human hearts that are subject to research. Even fewer works deal with the comparative anatomy of the heart [1, 2, 4, 6]. We would like to contribute to the extension of this knowledge by testing whether there is a variation between taxonomical groups of mammals in the provision of the tricuspid valve by the septal muscles, which are most of interest to us.

MATERIAL AND METHODS

The material examined consisted of 299 hearts of mammals, among which were 111 human hearts, 36 of other *Primates*, 88 *Ungulata*, 19 *Carnivora*, 41 *Lagomorpha*, 2 *Rodentia* and 2 hearts of *Marsupialia*.

RESULTS

In majority of mammal groups the conus muscle (*m. conus arteriosus*) mainly supplied the front leaflet.

Among hoofed animals and rodents the muscle most often supplied simultaneously the front and the septal leaflet and a commissure between them (Table 1, 2).

Other septal muscles provided leaflets in a very broad range from the front leaflet, through the front commissure, the septal leaflet and the back commissure to the back leaflet. (Table 3).

A certain regularity was observed in the provision of leaflets by this group of septal muscles. Pro-

Table 1. Parts of the tricuspid valve provided by the papillary conus muscle; CA — cuspis anterior, CSa — cuspis septalis, pars anterior, Com a — commissura anterior, N — number of hearts

Taxonomy group	Only CA		CA + Com a		CA + CSa		CA + Com a + CSa	
	N	%	N	%	N	%	N	%
Homo	87	78.37	6	5.41	6	5.41	12	10.81
Primates	22	61.11	4	11.11	4	11.11	6	16.67
Ungulata	22	25	7	7.95	8	9.09	51	57.95
Carnivora	10	52.63	1	5.26	2	10.53	6	31.58
Lagomorpha	41	100	0	0	0	0	0	0
Rodentia	0	0	0	0	0	0	2	100
Marsupialia	1	50	1	50	0	0	0	0

Table 2. Provision of the tricuspid valve by tendinous cords from the conus muscle; N — number of cords

Taxonomy group	No. of heart	Cuspis septalis pars anterior		Commissura anterior		Cuspis anterior	
		N	%	N	%	N	%
Homo	111	26	6.75	28	7.28	331	85.97
Primates	36	20	13.51	13	8.78	115	77.71
Ungulata	88	111	26.37	84	19.95	226	53.68
Carnivora	19	14	18.42	10	13.16	52	68.42
Lagomorpha	41	0	0	0	0	82	100
Rodentia	2	3	27.27	2	18.18	6	54.55
Marsupialia	2	0	0	1	20	4	80

Table 3. Provision of tricuspid valve leaflets by other septal papillary muscles; N — number of cords, CP — cuspis posterior, Com p — commissura posterior, CSp — cuspis septalis pars posterior, CSm — cuspis septalis pars medialis, CSa — cuspis septalis pars anterior, Com a — commissura anterior, CA — cuspis anterior

Taxonomy group	No. of heart	CP		Com p		CSp		CSm		CSa		Com a		CA	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
Homo	111	0	0	6	0.64	113	12.10	248	26.55	317	33.94	171	18.31	79	8.46
Primates	36	1	0.24	9	2.20	67	16.38	115	28.12	125	30.56	64	15.65	28	6.85
Ungulata	88	2	0.39	3	0.59	68	13.44	170	33.60	178	35.17	54	10.67	31	6.13
Carnivora	19	0	0	0	0	64	25.29	85	33.60	69	27.27	28	11.07	7	2.77
Lagomorpha	41	0	0	0	0	122	27.98	130	29.82	118	27.06	59	13.53	7	1.61
Rodentia	2	0	0	0	0	5	25	5	25	8	40	2	10	0	0
Marsupialia	2	0	0	2	9.09	8	36.36	5	22.73	5	22.73	2	9.09	0	0

vision of the front leaflet and the front part of the septal one (most visible in humans) predominated among primates, while among hoofed animals (*Ungulata*), it was mainly the middle part of the septal leaflet that was provided by the muscles tested. In other species provision of the back part of the septal leaflet by the septal muscles was at a significantly higher rate. This was linked with the occurrence of these muscles in the back part of the septum, close to the back papillary muscle. Such a provision of the leaflets was characteristic for predators, hares, rodents and marsupials (although the last two groups were too small to be considered — 2 hearts each).

CONCLUSIONS

There is evidence then to conclude that there are taxonomical dependences in the provision of the tri-

cuspid valve by the septal papillary muscles in the hearts of the mammals examined.

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