

TENDINOUS CHORDS NOT INSERTED IN THE PAPILLARY MUSCLES OF THE RIGHT VENTRICLE OF GOATS

Ausencia de inserción de las cuerdas tendinosas en los músculos papilares del ventrículo derecho de la cabra

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ABSTRACT

The right septomarginal trabecula in goats frequently presents tendinous chords emerging from it. Since we had not observed such great occurrences in any other animal in which we had investigated the trabecula, we decided to conduct this study with the aim of establishing possible relationships with tendinous chords that emerge directly from the interventricular septum. The material used consisted of 32 hearts from non-pedigree goats of both sexes, conserved in 10% formalin. The right ventricle was opened by means of an incision starting at the central point of the pulmonary trunk and continuing through the arterial cone to the right margin. Our results demonstrated that 68.8% of the specimens presented at least one long tendinous cord emerging from the septomarginal trabecula. This emergence occurred predominantly in the third of the trabecula closest to the septum (58.3%) and the cord headed to the septal cusp and attached to its free margin (87.5%). The presence of tendinous chords emerging directly from the right side of the interventricular septum was found in 59.4% of the specimens. These were short, because they were predominantly in the craniodorsal region of the interventricular septum (76.7%). They attached to the septal cusp (96.8%) and headed for the free margin (80%). The presence of tendinous chords in the septomarginal trabecula was unrelated to the presence or absence of tendinous chords in the septum.

Key words: septomarginal trabecula, goat hearts, anatomy, morphology

RESUMEN

A menudo se describe que la trabécula septomarginal derecha del corazón de las cabras presenta cuerdas tendinosas. Sin embargo, en nuestras disecciones este no es un hallazgo frecuente en otras especies animales y el presente trabajo se diseñó para comprobar si las cuerdas tendinosas en esta especie se originan directamente del tabique interventricular. El material utilizado fueron 32 corazones de cabras de ambos sexos, de raza mestiza, conservados en formol al 10%. El ventrículo derecho se abrió mediante un corte en el punto central del tronco pulmonar y continuando a través del cono arterioso hasta el borde derecho. Nuestros resultados mostraron que 68,8% de los corazones presentaban al menos una larga cuerda tendinosa saliendo de la trabécula septomarginal. El origen fue predominantemente en el tercio de la trabécula cerca del tabique (58,3%), destinadas a la valva septal y fijadas en su borde libre (87,5%). La presencia de cuerdas tendinosas originándose directamente del lado derecho del tabique interventricular se observó en 59,4% de los corazones. Estas son cortas aunque predominan en la región craneodorsal del tabique interventricular (76,7%). Ellas se fijan a la valva septal (96,8%) y están destinadas al borde libre (80%). La presencia de cuerdas tendinosas en la trabécula septomarginal no tiene relación con la presencia o ausencia de las cuerdas tendinosas en el tabique.

Palabras llave: trabécula septomarginal, corazón de cabras, anatomía, morfología.

INTRODUCTION

During our dissections of hearts of different mammals we observed a high frequency of tendinous chords emerging from the septomarginal trabecula in goat hearts. We had not observed this anatomical feature in other animals within our line of research until then. Horand (1908), Garinei (1936) and Depreux et al (1976), who also investigated the septomarginal trabecula in goat hearts did not mention this feature. This observation led us to develop a systematic study on tendinous chords inserted in the septomarginal trabecula. Complementing this investigation, we were also interested in observing the incidence of tendinous chords that emerged directly from the right side of the interventricular septum, without participation by the papillary muscles. The aim of the study was to make an anatomical description of the tendinous chords inserted in the septomarginal trabecula or directly in the right side of the interventricular septum, with regard to frequency, number and insertion site.

MATERIAL AND METHODS

The material used in this study consisted of 32 goat hearts weighing between 76.5 and

107.7 g that were fixed and conserved in 10% formalin. The goats were of both sexes, without pedigree. The hearts were obtained from a cold storage unit and, after we removed the heart from the animal's thorax, we washed it to remove coagulum from the cavities. The right ventricle was opened by means of an incision that started at the central part of the pulmonary trunk and continued through the arterial cone to the right margin. In specimens in which it became necessary to facilitate the dissection, we opened a window in the right ventricle wall in order to expose the septomarginal trabecula better. The interventricular septum, apex and atrioventricular apparatus were fully preserved.

To identify the attachment point of the tendinous chords, the trabecula was divided into three parts, starting from the septum (cranial, middle and caudal), and the septum was divided into dorsal, middle and ventral regions, considering the distance from the atrioventricular ring to the apex. Each of these regions was divided into ventral, middle and dorsal parts.

RESULTS

Our results demonstrated that 68.8% of the specimens presented one tendinous cord



Figure 1. Tendinous chords emerging by cranial edge of septomarginal trabecula.

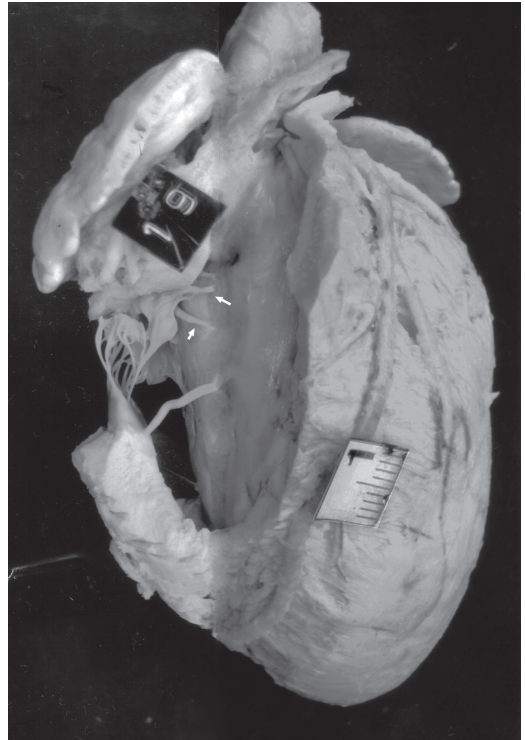


Figure 2. Tendinous chord emerging directly by right side of interventricular septum and fixing in the septal cuspid of the valve.

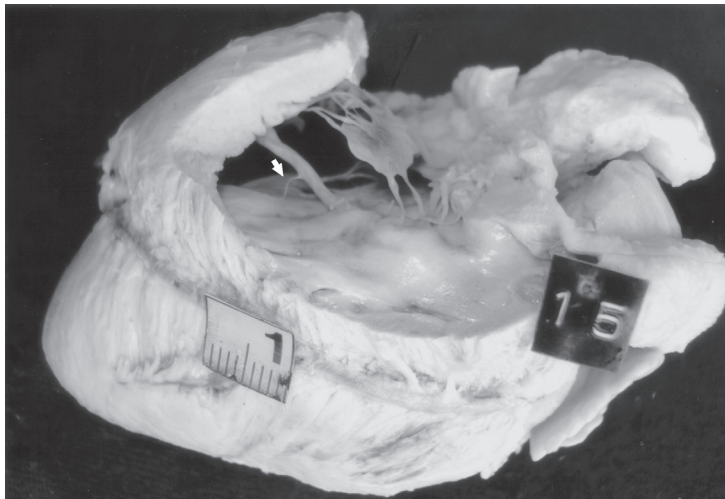


Figure 3. False tendinous chord in the septomarginal trabecula linking its inferior edge to the septum.

(91%) or two chords (9%) emerging from the cranial outline of the septomarginal trabecula (Fig. 1). The emergence occurred in the third of the trabecula closest to the septum (58.3%), in the middle third (37.5%) or in the third that was lateral to the septum (4.2%). The tendinous chords headed to the septal cusp (100%) and attached to the free margin (87.5%), ventricular surface (8.3%) or basal margin (4.2%). The presence of tendinous chords emerging directly from the right side of the interventricular septum without participation from the papillary muscles was found in 59.4% of the specimens (Fig. 2). In the cases in which chords were present, the number ranged from one to five. Cases with one and two occurred most frequently (84.2%). The chords were short because they were predominantly in the cranial region of the interventricular septum (76.7%), of which 13.3% were in the ventral part of the septum, 66.7% in the middle part and 20.0% in the dorsal part. They attached to the septal cusp (96.8%) and headed to the free margin (80%) or the ventricular surface (20%).

In 34.4% of the hearts, we found tendinous chords in the trabecula and in the septum; 34.4% presented tendinous chords in the trabecula but not in the septum; and 25% had tendinous chords in the septum but were absent from the septomarginal trabecula.

The septomarginal trabecula may present a false tendinous cord connecting its lower margin to the septum, as observed in six specimens (18.7%) (Fig. 3).

DISCUSSION

The first mention of the presence of tendinous chords in the septomarginal trabecula that headed to the septal cusp of the tricuspid valve was made by Galton in 1873, in relation to a human heart. Horand (1908) studied the septomarginal trabecula in quadruped animals including goats but did not mention any presence of tendinous chords in the trabecula. Depreux et al (1976)

studied in goats and mentioned the possibility that a tendinous cord might be present in the septomarginal trabecula close to the septum, heading to the septal tricuspid valve. Bagalà (1940) sometimes found a tendinous cord coming out of the septomarginal trabecula in sheep hearts. Argaud (1912) and Garinei (1936) also investigated the septomarginal trabecula in several mammals, but did not mention any presence of the tendinous chords emerging from the trabecula. Ozbag et al (2003) in his search about false tendinous cord in different species did not refer about false tendinous chords in the septomarginal trabecula. The same author (Ozbag et al, 2005) in important search about papillary muscles in different species, did not mention the presence of tendinous chords not inserted. We sought to establish correlations between the presence of tendinous chords in the septomarginal trabecula, but from the statistical tests that we performed, we observed that there was no relationship between presence of tendinous chords in the septomarginal trabecula and presence or absence of tendinous chords in the septum.

CONCLUSION

The right ventricle of goats frequently presented tendinous chords that were not inserted in the papillary muscles. These tendinous chords attached to the septal cusp and came from the medial third of the septomarginal trabecula and from the cranial region of the right side of the interventricular septum. The presence of tendinous chords in the septomarginal trabecula did not present any relationship with presence or absence of tendinous chords in the septum.

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