Improved Heavy Exercise Tolerance after Correction of Mild Pulmonic Stenosis

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Pulmonic stenosis (PS) is considered as one of the common congenital cardiac abnormalities in dogs in Europe and the United States [3]. However, few cases of PS have been reported in Japan [7]. Surgical repair of PS is indicated when a dog shows signs such as severe cardiac hypertrophy, heart failure, syncope, or right ventricular systolic pressure greater than 70 mmHg [4]. When pulmonary artery-to-right ventricle pressure gradient is less than 50 mmHg, surgical correction may not be required unless the dog is symptomatic, because the dog may have a normal life span [4].

A 2-year-old male German Shepherd weighing 28 kg was referred to the veterinary hospital at Nippon Veterinary and Zootechnical College because of the recurrent syncope only during heavy exercise training. During normal activity, there were no obvious clinical signs including cardiac murmur. The dog was diagnosed as PS by pressure measurement and was corrected surgically. After the surgery, the dog could tolerate heavy training without signs of syncope.

Since hereditary PS was suspected, diagnostic procedures such as physical examination, X-ray, ECG, angiocardiology, and cardiac catheterization were performed. No murmur was auscultated at rest, however, very faint crescendo-decrescendo systolic murmur appeared at pulmonary valve region on the left side thorax immediately after 10 min run. By X-ray examination, the cardiac silhouette demonstrated a slightly enlarged right ventricle with normal pulmonary vasculature. Postoperative X-ray revealed normal cardiac silhouette. Arrhythmias and/or electrical axis deviation were not detected by ECG examination. Possibility of Dirofilaria immitis infection was eliminated by blood (negative microfilaria), echocardiographic and X-ray examinations. A catheter (7 French) was inserted into the right ventricle (RV) to obtain a selective

angiogram of right ventricular outflow tract. The angiogram demonstrated a slightly dilated outflow tract and a very mild subvalvular stenosis. After the angiographic study, a 7F Swan-Gantz catheter (Gould Inc., Medical Products Division) was inserted into the pulmonary artery (PA), and pressures in PA and RV were measured. At the time of initial diagnostic study, the RV and PA pressure were 30 and 20 mmHg, respectively,
and the pressure gradient was 10 mmHg under ketamin anesthesia. However, during the surgery, the pressure gradient was 4 mmHg under thiamylal-halothane anesthesia. Postoperative pressure gradient between RV and PA became almost zero (Fig. 1). The dilated portion of the right ventricular outflow tract returned to normal immediate after release of the stenosed pulmonary valve area. Five ml of cold saline was injected through the Swan-Gantz catheter to obtain cardiac output by thermodilution method. Preoperative cardiac index (CI) was 3.86 l/min/BSA and the CI was significantly increased to 5.50 l/min/BSA (142%) after the surgery (Table 1).

Breznock’s method [2] was utilized for the correction of PS. Briefly, the dog was anesthetized with thiamylal-halothane and positioned in right lateral recumbency. After left 5th intercostal space was opened, the pericardium was dissected and the heart was elevated by means of a pericardial cradle. Pursestring suture (5-0 catgut) was placed in RV and PA and cutting wire was inserted after a long atraumatic needle was placed in the center of two pursestring sutures. After the needle was withdrawn, the catgut pursestring sutures were tied. About 1.5×5 cm ovoid shape Gore-Tex™ cardiovascular patch (Gore-Tex™, 0.6 mm, W. L. Gore & Associates, Inc.) was placed over the two pursestring sutures. A simple continuous 3-0 nylon sutures from two opposite sites were placed around the patch of which suture pattern resulted in crossing pattern. Stenosed area including pulmonary valve was cut by pulling the cutting wire before the termination of continuous suture, and then the rest of the suture were finalized (Fig. 2).

In general, mild PS is not a candidate for surgery, however, in this case the dog was expected to be a champion which required a heavy training. If the dog can live as a pet, surgery was not indicated. Since the PS was very mild as demonstrated by RV and PA pressure gradient, cardiac changes were not obvious by X-ray and ECG examinations. So the diagnosis of PS was possible only by pressure measurement of RV and PA. A small increase in pulmonary valve diameter decreases resistance which significantly improves forward flow. Significantly increased CI after the surgery can support the

Table 1. Hemodynamic data before and after the relief of pulmonic stenosis

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A=Aorta, PA=Pulmonary artery, RV=Right ventricle, Cl=Cardiac index, Sl=Stroke volume index a) L/min/BSA b) ml/best/BSA.
improved exercise tolerance. The surgical technique utilized for the correction of PS was blind technique. Although direct observation of the stenosed area was not available and destroyed part of pulmonary valve, this method can be applied to valvular and subvalvular stenosis with minimum bleeding [2]. Currently, intracardiac balloon method is available in human medicine [1], however, application of this method to veterinary medicine has not come yet. Extracardiac conduit implantation is required in case of supravalvular or infundibular type of stenosis [8]. Study has been done concerning whether or not the pulmonary valve is necessary to maintain normal hemodynamics; result of the study demonstrated that the pulmonary valve is not necessary to keep normal hemodynamics [5].

Widespread Dirofilaria immitis (DI) infection may be masking the presence of PS in Japan, because both DI and PS present right heart failure and their clinical signs are quite similar. The incidence of PS may be much higher if accurate differential diagnoses were made.

REFERENCES


要 約

肺動脈狭帯症の手術後に著明な運動機能の改善が認められたシェパード犬の一例（短報）：鷲巣 誠・川村正道・小林健仁・佐藤和伸・林 太郎・青木 忍・藤田道郎・稲岡博光・本多茂一・友田 勇（日本獣医畜産大学家畜病院）——激しい運動時のみ失神が起こるシェパード犬の心機能を評価したところ、肺動脈狭帯症であった。パッチワークによる肺動脈拡張手術で著明な心機能の改善および運動時の失神の消失が見られた。