Atrioventricular Dissociation in a Case of Reticulosarcomatosis and the Effects of Steroid and Co⁶⁰ Irradiation

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THE complete atrioventricular dissociation of the heart caused by the secondary cardiac tumor involving the conductive system of the heart was rare and only 7 cases (Buckberg, 1961)¹⁾ have been reported in the literature. We added a case of bilateral bundle branch block due to metastasis of pulmonary carcinoma to the heart recently.^{2), 3)} In this report another case of reticulosarcomatosis which caused the complete atrioventricular dissociation and was improved by steroid and the precordial irradiation of Co⁶⁰ is presented with the pathological findings and its mechanisms are discussed.

CASE REPORT

The patient was 34 year old male, businessman, who was transferred to the medical ward from X-ray ward on March 3, 1962, because of palpitation, shortness of breath and precordial discomfort for past 2 months.

He began to complain of the nasal obstruction in fall in 1959. In April, 1960, and in June, 1961, the operations of the nose were performed and the specimens showed reticulosarcoma. The chest X-ray (Fig. 1-A) and ECG (Fig. 2) in June, 1961, were normal. In Nov., 1961, the masses appeared in the scalp and the gluteal area, and he was re-admitted on Dec. 17, 1961. The biopsy specimens showed reticulosarcoma. The masses disappeared completely after the irradiation of Co⁶⁰ (Fig. 3).

On Jan. 4, 1961, he became to complain of palpitation remarkably. The physical examination of the cardiovascular system at that time was normal. The pulse was regular and 78 per min. The blood pressure was 112/70 mm. Hg. ECG (Fig. 4) showed prolonged PQ interval and complete right bundle branch block. On Jan. 13, 1962, hematuria was noticed and the cystoscopic examination revealed the mass at the right ureteral orifice. The biopsy was same pathology. The Co⁶⁰ was irradiated to the prevesicular area and the tumor disappeared completely. The pulse rate dropped to about 40 per min. on Feb. 5, 1962. The cardiac silhouette became large (Fig. 1-B), and ECG showed the complete atrioventricular dissociation (Fig. 5).

Past history: He was given left thoracoplasty because of pulmonary tuberculosis in 1947.

Family history: non-contributory.

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Fig. 1. Chest X-ray films.

Physical examination on admission revealed a moderately nourished and developed male in no acute distress. Head: Alopecia after the irradiation. Eye: Myopia and anisocoria. Nose: Complete obstruction of the nostrils by the tumor. Oral cavity: A hole 0.5 by 0.5 cm. in size communicating with the maxillar sinus at the hard palate. Pharynx and neck: Normal. Thorax: The deformity after thoracoplasty. Cardiovascular system: Pulse, irregular and 56 per min. The systolic murmur (Levine 2) was heard at the apex. Abdomen: Hepatomegaly (1.5 cm. palpable at the right midclavicular line). Back: Normal. Neurological: Paresthesia at the right 5th. toe and the left little finger. Lymph nodes: The hard, elastic, movable and non-tender masses, 2 by 2 cm. in size, were palpable in the both supra-clavicular spaces.

Laboratory data: Hematology, on admission, RBC 5.56 million, Hgb. (Sahli method) 85%, WBC 1,900 with differential, N. 98, band 3, L. 9%; on March 29, 1962, RBC 2.82 million, Hgb. 62%, WBC 1,100 with differential, N. 42.5%, band 21.5%, E. 1.0%, M. 17.0% and the tumor cell 0.5%, platelet 129,700; on

April 12, 1962, WBC 1,100 with differential, N. 53.5%, band 2%, M. 3.5%, L. 10.0% and the tumor cell 11.0%. The culture of urine, blood and sputa were negative (on April 9). Icteric index was 75 on April 13.

Interpretations of the chest X-ray films (Fig. 1): On June 12, 1961, the film (Fig. 1-A) was normal except the deformity of the thorax after the operation. On Feb. 23, 1962, the silhouette of the upper mediastinum, the heart and the sup. vena cava became large (Fig. 1-B). On March 3, 1962, the density of the upper mediastinum was still large (Fig. 1-C). On April 9, 1962, the density returned as Fig. 1-A (Fig. 1-D).

Electrocardiographic interpretations: ECG on June 12, 1961, was normal (Fig. 2). On Jan. 9, 1962, it was in sinus rhythm and PQ interval was 0.32 sec., and ST segment was depressed at aV_F , V_1 and L_3 , and complete right bundle branch block (Fig. 4). On Jan. 22, 1962, the atrioventricular block in 2nd degree of Wenckebach type appeared and changed to the complete atrioventricular dissociation on March

Fig. 2. ECG (dated on June 12, 1961).

Fig. 3. Clinical course of reticulosarcoma.

Fig. 4. ECG (dated on Jan. 9, 1962).

Fig. 5. The upper record (dated on March 1, 1962) showed the complete atrioventricular dissociation and the lower record (dated on March 12, 1962) was the atrioventricular block in second degree.

1, 1962 (Fig. 5). ECG on March 27, 1962, returned to the sinus rhythm and PQ interval was 0.24 sec., and the QRS complex remained same (Fig. 6).

Hospital course: On admission the patient was afebrile. From 12th in March, the precordial irradiation of Co^{60} was given as the Fig. 3. Namely 200 r. per day of the surface doses with the radiation surface of 8 by 8 cm. in size was irradiated to part I to IV changing each part every day. But prior to this therapy the patient had been given prednisolone 20 mg. per day for 2 weeks at the X-ray ward. This therapy might have caused the improvement which was shown by the chest film and ECG. On March 15, 1962, the swelling of 2 by 0.2 cm. in size was noticed at the right anterior tibia and this was thought to be the swelling of the periostium by the orthopedic surgeon. On March 22, many, 1 by 1 cm. sized, lymph nodes became palpable in the left inguinal and in the submandibular areas. Tonsils were swollen.

Fig. 6. ECG (dated March 27, 1962).

Fig. 7. A. Photomicrograph of leukemic reticulosarcoma in the nasal cavity.

B. Multiple scars (arrows) with tumor cells in the myocardium.

C. Endocardium of interventricular septum facing to left ventricular cavity showing vascularization (arrow, a) in subendothelial layer with inflammatory cells. Purkinje fibers were also involved by inflammatory cells (arrow, b).

On March 24, 1962, he became to develop the high fever again and prednisolone 30 mg. per day was given but the general conditions became poor and the leucocyte count decreased. And so the precordial irradiation was stopped. The patient was given 1,200 r. to area I, 1,000 r. to area II and 600 r. to area III and IV totally in this period. He continued to have the high fever from March 28 and the lymph nodes in the cervical area became large. On April 2 the fever increased and prednisolone 90 mg. per day was given but was ineffective. He was jaundiced on April 12 and expired on April 16, 1962.

AUTOPSY FINDINGS

The pathological diagnosis was leukemic reticulosarcomatosis. The enlarged lymph nodes were found in the right cervical, in the paratracheal and in the retroperitoneal area along the aorta. The tumor cells infiltrated in the liver, spleen and lungs extensively.

The heart weighed 290 Gm. Macroscopically, the petechial hemorrhages in the endocardium of both ventricles were found. Microscopically the tumor in the nasal cavity was reticulosarcoma (Fig. 7-A). The tumor cells infiltrated in the myocardium and the epicardium diffusely and multiple tiny scars were found in the myocardium (Fig. 7-B). The vascularization was found in the subendothelial layer of both ventricles, and the Purkinje fibers were involved with the inflammatory cells (Fig. 7-C). The atrioventricular node and the His's bundle were not certified.

DISCUSSION

The cardiac involvement of reticulosarcoma found at autopsy were reported in 2 of 6 cases in authors experience,³⁾ in 18 of 45 cases,⁴⁾ in 42 of 114 cases in the literature,⁵⁾ and in 11 of 41 cases by Sokal.⁵⁾ Three cases^{6), 2), 8)} were reported in the literature in this country. Sokal⁵⁾ showed the location of the cardiac lesion in the heart in 6 of 11 cases, in the pericardium no case, and in the heart and pericardium in 5 of 11 cases. The electrocardiographic findings in his case with the cardiac involvement of reticulosarcoma were reviewed as follows; normal record in 2, arrhythmia in 4, low voltage in 3, bundle branch block in 2, ST-T change in 1 case of totally 9 cases in which ECG records were available for review out of 11 cases.⁵⁾

The complete atrioventricular dissociation which was caused by the secondary cardiac tumor was reported in the literature in 8 cases including one of our cases which was reported already.^{1), 3)} One of these was reticulosarcoma.⁹⁾ The deep X-ray irradiation was given only one of them cases, in which the complete atrioventricular dissociation was caused by the primary dural sarcoma and was given the deep X-ray irradiation and then ECG returned normal and the clinical improvement was noticed as our case, and the patient expired after 5 months. This case was not autopsied.¹⁰⁾

The report in the literature are conflicting regarding the effect of the

radiation upon the heart. Electrocardiographically, arrhythmia, prolonged PR interval and T wave changes were noted after the irradiation.^{11), 12)} On the contrary other reports showed no abnormality.^{12), 13)} Pathologically, there were the degeneration and the necrosis of the myocardium, the fibrous proliferation of the connective tissues, and the fibrous thickening of the pericardium.^{14), 15)} But others reported no abnormality in the heart¹⁶⁾ and moreover they noticed that the irradiation caused the dilatation of the existing myocardial capillaries and the precapillary arterioles and so caused the increase of the blood flow.^{12), 17)} These differences may be ascribed to the data which were shown in the different animal species with different doses and the duration of the irradiation. We examined ECG for 30 min. after the irradiation of 200 r. in this case and no change was found. Generally speaking, the therapeutic doses of the irradiation cause no definite alterations in ECG and no changes in the heart and pericardium pathologically.^{14), 18)}

The reticulosarcoma is very sensitive to the irradiation. So the effect of it was certified positively in the nose, nasal cavities, gluteal area and in the scalp. Clinically, the improvement in the chest and ECG was definitely shown after the Co⁶⁰ irradiation to the heart. Pathologically, the tumor cells were found in the myocardium and the pericardium, and the many tiny scars were found at the presumed site of the conductive system though that system was not positively identified. We thought that we were allowed to guess as follows with the certain positivities from the clinical and the pathological data. Namely, we thought that the improvement before the irradiation in the chest X-ray and ECG were done by the steroid, and then the precordial irradiation caused the further improvement in the chest X-ray and ECG. Of course, we could not say positively that the tumor invaded the conductive system of the heart and caused the atrioventricular dissociation and steroid and the precordial irradiation destroyed the tumor and clinical improvement was caused.

In this country such a therapy was not done as far as we know and also these clinical improvement after the irradiation to the cardiac tumor was not reported in the literature written in English. We suggest that we should always think the possibilities of the secondary cardiac involvement of the tumor in the case of the carcinoma and in these cases the irradiation to the heart should be tried.

SUMMARY

A case of reticulosarcomatosis which caused the complete atrioventricular dissociation and was relieved by steroid and the precordial irradiation of Co⁶⁰ was presented. These mechanisms were discussed with the clinical and patho-

logical findings. The effect of the irradiation to the cardiac tumor was stressed with the review of the literature.

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