Case Report

Development of a tennis ball-sized tumor at the site of an implanted pacemaker

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Summary A 77-year-old woman who had undergone a pacemaker implantation 6 years previously developed a tumor on the left side of the chest. The mass gradually grew to the size of a tennis ball and was excised along with the pacemaker generator. Histopathological examination revealed that the mass was a chronic expanding hematoma. Although carcinogenesis occurring around a pacemaker has been reported previously, the development of a hematoma has not been reported. Thus, we suggest that when a patient has a mass in the proximity of a pacemaker, chronic expanding hematoma should be considered as one of the differential diagnoses.

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Introduction

Since tumor formation at the site of pacemaker implantation is rare [1–8], its development raises the question of whether the occurrence is related to the implant. This report describes a mass having the size of a tennis ball that developed 6 years after pacemaker implantation.

Case report

A 77-year-old woman with complete atrioventricular block underwent a VDD pacemaker implantation in October 2002. The device was implanted subcutaneously on the left thoracic side in the pectoral region. The patient’s postoperative course showed no abnormalities. In August 2007, 5 years after the implantation, the patient noticed a painless lump overlying the pacemaker pocket. The mass gradually enlarged to the size of a tennis ball, and the patient was admitted to our hospital in November 2008. Aspirin (100 mg/day) had been prescribed by her home doctor for several years. She had not suffered any traumatic injury to the chest and she had no particular history except for subarachnoid hemorrhage.
A tennis ball-sized mass was found on the left thoracic side.

On admission, her height was 144 cm, and her weight 46 kg. Her blood pressure was 145/86 mm Hg, the pulse 60 beats/min, and the temperature 36.5°C. A 7 cm × 7 cm × 5 cm mass was observed above the pacemaker pocket (Fig. 1). The mass was solid, movable, not pulsatile, and nontender. The skin over the mass had neither rubor nor heat. The white blood cell count and serum C reactive protein level were not indicative of inflammation. Prothrombin time and activated partial-thromboplastin time were normal.

Ultrasonography showed the edge was smooth and the border clear. Color Doppler echography revealed no blood flow in the mass. A computed tomography scan of the chest revealed a soft-tissue mass surrounding the pacemaker generator just over the left pectoralis major muscle (Fig. 2A and B). The mass appeared to be of low density and was not enhanced by the intravenous administration of contrast material. When fine needle aspiration was performed, fluid-like blood was obtained. Bacterial culture showed no abnormality, and cytologic examination revealed no malignant cells.

Because the tumor seemed to grow gradually even though there was no evidence of malignancy, we decided that it should be dissected. The patient underwent insertion of a new pacemaker system with subcutaneous implantation of the generator in the right chest. Subsequently, both the mass and the pacemaker generator of the left side were excised. During the operation, the firm mass appeared to be well-circumscribed, and there was no entry vessel. The mass was completely detached from other adjacent tissues, and the pacemaker lead was transected since it could not be extracted from the right ventricle. After the operation, the clinical course was uneventful.

Histopathological examination of the tissue revealed a hematoma that included fresh and old blood components. Macroscopic examination of the mass showed that it was encapsulated with thick fibrous tissue in which chocolate-colored materials were contained (Fig. 3A). Microscopic examination showed that collagenous tissue was present in the outer layer of the mass (Fig. 3B). Granulation tissue, including capillaries and fresh erythrocytes, was observed on the inner side of the collagenous tissue, and old erythrocytes were present in the inner layer. No malignant change was found in the tissue. Thus, the mass was ultimately diagnosed as a chronic expanding hematoma.

The development of tumors in the proximity of pacemakers is rare. Zafiracopoulos and Rouskas [1] first described the occurrence of a carcinoma associated with pacemaker implantation. They reported two cases of breast cancer appearing at the generator implantation site and raised the question as to whether the association between breast cancer and the pacemaker generator was coincidental or correlated. Hamaker et al. [2] reported a case of plasmacytoma developing in a pacemaker pocket, suggesting that tumor formation could be caused by inflammatory oncotaxis,
Development of a tennis ball-sized tumor at the site of an implanted pacemaker

Electromechanical stimulation, or potential carcinogenic effect of the metal generator cover. Other investigators [3–6] have reported that malignant tumors occurred after pacemaker implantation, such as multiple myeloma, rhabdomyosarcoma, lung sarcoma, and non-Hodgkin’s lymphoma. However, it remains unclear whether a pacemaker itself is responsible for the formation of tumors or if the phenomenon is a mere coincidence.

In our case, the tumor developing over the pacemaker pocket was found to be a hematoma. A hematoma is an abnormally localized collection of blood resulting from a break in blood vessels. Usually, the blood is completely absorbed unless an infection develops. Reid et al. [7] first reported a hematoma that had grown over a month, referring to it as ”chronic expanding hematoma.” Chronic expanding hematomas grow slowly for more than a month and sometimes over 10 years; they consist of a peripheral wall of dense fibrous tissue and a central space containing fresh and altered blood. Its occurrence is rare, and the mechanism underlying the expansion of such hematomas is little understood. Labadie and Glover [8] proposed that the self-expanding nature of the hematoma may be related to an inflammatory reaction triggered by the irritant effect of blood and the cellular breakdown products of leukocytes, erythrocytes, hemoglobin, platelets, and fibrin. In the present case, since aspirin had been administered by her home doctor, it is possible that the mechanical irritation of the pacemaker might have repeatedly caused subcutaneous bleeding followed by an inflammatory reaction and, as a result, the hematoma gradually grew to the size of a tennis ball.

Chronic expanding hematomas occur in many locations, often simulating neoplasms such as sarcomas [9]. It would be difficult to differentiate between chronic expanding hematomas and soft tissue sarcomas on the basis of clinical findings alone. However, this differentiation is important, and there is a need for a differential diagnostic procedure for differentiating between the above mentioned entities. Magnetic resonance imaging (MRI) would be a useful diagnostic tool of non-invasive evaluation. A characteristic heterogeneous intensity pattern on T2-weighted images, called a ”mosaic sign,” was reported as a specific feature of chronic expanding hematoma [10]. In our case, however, it was impossible to perform MRI because of the pacemaker that had been implanted.

Chronic expanding hematoma remains a rare disease. To our knowledge, there has been no report about this disease in relation to pacemakers. We suggest herein that when a mass develops in the proximity of a pacemaker, the possibility of a hematoma must be considered as a differential diagnosis.

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References