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CASE REPORT

Ductal carcinoma of the breast in the pacemaker generator,s pocket

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Abstract: Authors present a case of a 78-year-old female patient with invasive ductal adenocarcinoma in the pacemaker,s pocket. A decubitus-like tumor had developed in this place, and has been missinterpretated as a benign lesion for 5 months. Diagnosis was done with a time delay. An excisional biopsy revealed annvasive ductal adenocarcinoma. The first step was the implantation of a new pacemaker generator performed on the opposite side. The second step was a modified radical mastectomy, according to Madden, and the removal of the originally implanted pacemaker generator. Radiotherapy and hormonal adjuvant therapy were applied after surgery. The patient was followed-up at an out-patient clinic, and died 25 months after diagnosis because of generalization of the disease *(Fig. 2, Ref. 35).* Full Text (Free, PDF) *www.bmj.sk.*
Key words: breast cancer, ductal carcinoma, pacemaker, decubitus.

Carcinoma of the breast in the pacemaker generator's or implantable cardioverter-defibrilator,s pocket is rarely described. The incidence of this type of carcinoma would be expected to be higher according to the high incidence of breast cancer generally and according to the wide spread of pacemaker use in the population.

Other problems occuring in relation with pacemaker implantation are more frequent. These include problems with device malfuntions, with pacemaker syndrome, with infection, and others. In connection with breast cancer, there are technical problems with cancer treatment in patients with an implanted pacemaker. Maisel analysed annual reports about malfuntions and performance of pacemaker and implantable cardioverter defibrilator (ICD) submited to the US Food and Drug Administration. During the study period (1990–2002), 2.25 million pacemakers and 415,780 ICDs were implanted in the United States. Overall, 17,323 devices (8,834 pacemakers and 8,489 ICDs) were removed due to the confirmed malfunction. It represents 0.65 % of all devices (1). Current literature shows that the most common problem after pacemaker implantation is pacemaker syndrom with an incidence of 16 % at 1 year after pacemaker implantation (2). Other problems like infection or development of decubitus occur relatively often as well (3). Other questions are technical problems of breast cancer treatment by patients with an implanted pacemaker and radiotherapy (4–8) or the proarrythmogenic effect of chemotherapy (9, 10).

What is the coincidence of breast cancer and implanted pacemaker or implantable cardioverter-defibrilator? The incidence of breast cancer according to American Cancer Society is 101.1 in the USA, 81.7 in Switzerland and 18.7 in China (11). With this number breast cancer represents the most frequent type of cancer for women in the USA (32 %) (12).The number of new pacemaker implants is rapidly increasing. For example, according to the current data, the incidence of pacemaker implants in the Australian population was 590 per million people in 2005 (486 in 2001) (13). Interesting data was summarized by a worldwide cardiac pacing and implantable cardioverter-defibrilator survey, which was undertaken in 2001. Fifty countries, 22 from Europe, 16 from the Asia Pacific region, three from the Middle East and Africa, and nine from the Americas contributed to the survey. The United States had by far the largest number of cardiac pacemaker implants, although Germany had the highest new implants per million people. All countries that participated in the 1997 survey showed significant increases in implant numbers over the 4 years (14). According to this data regarding the common incidence of breast cancer (cca 100 per 100,000) and the incidence of pacemaker generator (cca 600 per 1,000,000), statistically calculated, the incidence of patients with breast cancer and an implanted pacemaker generator should be 0.06 per 100,000. The real coincidence of breast cancer and of the implanted pacemaker generator is not known. In the future, we can expect a higher frequency of this coincidence in the view of the presented data and in the view of the current trends. This problem is rare compared with other problems or complications presented in relation with pacemaker implants as they were mentioned above. However, it is important to pay attention to it.

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Fig. 1. An inflammatory laesion.

Fig. 2. The modified Madden radical mastectomy.

Case report

A case of a female patient with an implanted pacemaker generator and invasive ductal adenocarcinoma of the breast in the location of the generator is presented. A 78-year-old female patient, with a generator (permanent VVI-R pacing) implanted in the right subclavian area, had a decubitus in generator's pocket. The decubitus developed in this location 6 years after the pacemaker,s implantation. The decubitus, with a size of 5x2.5 cm, was assessed as an inflammatory laesion (Fig. 1). All of the area under the decubitus was hard and painless, and it presented one piece of mass with the pacemaker generator. There was no evidence of a palpable mass, which would be presented before the decubitus development, but it is likely. The invasive ductal carcinoma was diagnosed with a delay of 5 months. The diagnosis was made by excisional biopsy. Because of the hard mass fixed with the pacemaker decubitus in the breast, mammography was difficult to interprete. Ultrasound confirmed a highly suspicious laesion in the pacemaker pocket. Another paraclinical examination showed an absence of any organic metastatic invasion. The implantation of a pacemaker from the left side and the deactivation of the originaly implanted pacemaker generator was performed as the first step before the breast surgery. The modified Madden radical mastectomy, including the removal of pectoral fascia and m. pectoralis maior with dissection of axillary lymph nodes, and the removal of the originally implanted pacemaker, were carried-out in the second step (Fig. 2). The specimen revealed no other foci of ductal carcinoma. A histopathological examination proved 10 lymph nodes with intergrowth through the capsule. (pT4bN3, G3). Other paramethers follow: EIC <25 %, ER 50 % positive, PgR negative, PCNA under 50 %, CRB oncoprotein negative. A radiotherapy, consisting of 60 G and tamoxifen therapy, were then administered. The patient was followed-up at the out-patient breast clinic. She died 25 months after the tumor diagnosis because of disese generalization.

Discussion

Carcinoma of the breast in the pacemaker generator pocket was reported in approximately 10 cases according to Medline's search (15–22). Mellert presented the development of basal cell carcinoma in the skin above a subcutaneously implanted pacemaker generator (23). The metastatic tumor thrombus attached to a pacemaker electrode was described as well (24).

There are several questions concerning the presence of the pacemaker generator or implantable cardioverter-defibrilator and breast cancer. It is difficult to prove that the pacemaker generator generally contributes to the development of the malignancy. Lipworth performed an epidemiologic study of cancer incidence among pacemaker recipients in Denmark. A cohort of 16,357 pacemaker recipients from 1982 until 1996 was identified. The results of this epidemiologic study are very interesting. The cohort showed a slight excess of cancer overall. Among male recipients the risk for multiple myeloma was elevated. The risk for kidney cancer among women had similarly increased (25). The slight excess of cancer could not be unambiguosly explained.

The question of potential cancerogenity of pacemakers occurs here. There is a theory of longtime irritation of generator material with breast tissue, chronic inflammation, and electromechanical stimulation of the tissue. It was mentioned by Hamaker and Lindell, who reported a case of plasmocytoma arising in a pacemaker pocket (26). It is not possible to perform a clinical study to identify all the single factors theoretically leading to cancer in the pacemaker,s pocket. The question of the influence of metalic surface on the tissue could be answered by the studies from orthopaedic surgery. There are studies concerning hip or knee prosthesis and the question of irritation by the metal surface. Orthopaedic implants and their fixatives contain materials with carcinogenic potential. Signorello conducted a nationwide cohort study in Sweden to examine cancer incidence among 116,727 patients who underwent hip replacement surgery. In this study hip implant patients had similar rates of most types of cancer to those in the general population (27). Another study from Finnland has a cohort of 31,651 polyethylene-on-metal total hip arthroplasty patients and they were followed-up for cancer. During the follow-up, 2,367 cancers were observed. There were statistically significantly fewer cancers in the cohort (28). Three Nordic cohorts of total hip (THA) and total knee arthroplasty (TKA) in patients operated on for primary osteoarthrosis during

1967-1995 were partially adapted and combined for meta-analysis. THA was performed in 49,000 patients and TKA in 24,000 patients. The mean and maximum follow-up times were 6.8 and 30 years, respectively. Standardized incidence ratios (SIR) with 95 % confidence intervals were calculated for the observed and expected number of cancers. The expected numbers were based on national incidence rates. The overall SIRs as well as the site-specific ones were similar in the THA and TKA patients. The observed number of cancers at all sites was 7,639 and the expected one was 8,202 (SIR 0.93, 95 % CI 0.91–0.95), what represents a decreased cancer risk in this group (29). Despite the mild similarity, these studies can not answer the question on the impact of a metal surface on the breast tissue. Another similarity in nonmetallic material, can be observed in breast implants. The available epidemiologic evidence does not support a carcinogenic effect of silicone breast implants on breast or other cancers. Friis presented data on cancer risk after breast implantation with follow-up of 30 years for women with the longest implant duration (30). McLaughlin concluded there is no increase of cancers at all with the exception of a two-to threefold excess of lung cancer among women followed for more than 15 years, which would be expected due to the high prevalence of smoking among the Swedish women with implants in his study (31). Cancer risk among Los Angeles women with cosmetic breast implants is consistent with several other long-term cohort studies (32). Women undergoing cosmetic breast augmentation do not appear to be at an increased long-term risk of developing cancer as well (33).

The other question of chronic inflammation or electromechanical stimulation is difficult to answer in this context. Possible similarities with chronic inflammation can be found in Marjolin's ulcer, but it is a squamous cell carcinoma that develops in posttraumatic scars and chronic wounds. It was first noted to be associated with chronic osteomyelitis in 1835. Impaired immunologic activity in chronic wounds has also been shown to contribute to the pathologic process (34).

Diagnostic procedures in patients with an implanted pacemaker generator or ICD and cancer suspicion could be complicated. Clinical signs could be often unclear and it is difficult to identify them in time. Missinterpretation of inflammation and ulceration could easily occure. Ultrasound and mammography after a pacemaker implantation are difficult to interprete. Sardanelli described the use of dynamic breast magnetic resonance imaging without complications in a patient with dual-chamber demand pacemaker. The patient was not pacemaker-dependent (35).

The increasing number of necessary pacemaker implantations due to the increasing number of cardiovascular diseases, an aging population with higher incidence of bradyarythmias, and the introduction of an implantable defibrillator may cause the higher rate of this coincidence.

A routine examination in all patients with implanted pacemaker generators during follow-up visits is very important. The focus on problems with ulceration or any mass developing close to the generator is its inseparable part. The dislocation of the pacemaker generator or ICD into the breast tissue represents a potential risk as well. The higher mortality rate associated with a delayed diagnosis and treatment represents a serious risk of this concidence. Before breast surgery, the pacemaker reimplantation to the opposite side should be done. Another possibility is a temporary stimulation via v. femoralis intraoperativelly with reimplantation and breast surgery at same time. Pacemakers may limit the radiotherapy. It is often necessery to reprogramme the pacemaker generator during chemotherapy.

This case raises concerns whether this association is only coincidental or whether the pacemaker generator is responsible for the occurrence in some inexplicable manner. The etiological role of pacemaker generator in relation with the development of breast cancer is unlikely. Despite the low occurence of the pacemaker generator or defibrillator and breast cancer we shoud keep this posibility in mind.

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