CASE REPORT

Skeletal Sarcoma on the Site of Retained War Bullet Fragments and a Literature Review on Long-Term Complications of Retained War Shells

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Abstract

Long-term complications of retained war fragments in the body are not completely known. Also, bullet migration and slow resorption of metals and distortion in some imaging modalities are frequent and well recognized complications but, now we are concerned about neoplastic changes near the retained war fragments.
We reviewed the literature on complication of retained war fragments and report our 2 cases of malignant changes around old retained war fragments in the limbs.

Keywords: Osteosarcoma, Retained bullet fragment, Sarcoma, War

Introduction

Problems related to bullet fragments or war shells are important health issues among war veterans. The advancement of medical care and increased survival of war injured people, also the increased number of available handguns, lead to more patients being affected by bullet and war shell related complications.

Although in acute phases, war shells can injure important vital organs and lead to death or severe morbidity, for the survivors of war injuries, we should not consider the retained bullet as an inert and harmless foreign body because frequent complications can affect the health status of these injured patients.

Retained bullet fragments positioned near important organs cause irritative, compressive or obstructive signs (1-9). Also, bullet migration and slow resorption of metals and distortion in some imaging modalities are other frequent and well recognized complications (10-20).

However, these mentioned complications are not the sole concern of entrapped war shells.

Today, we are concerned about neoplastic changes near the retained war shells that arise from increased numbers of reported malignancies due to metal implants.

Several case reports have been published about soft tissue malignancies in the brain and lungs and on the skin which are related to retained bullets (21-25). Rarely some cystic changes near the retained bullet in the bone are also reported (26-28). But we have yet to find musculoskeletal malignancies related to war shells in the literature.

In this report, we present two cases of musculoskeletal malignancies around war shells retained more than 22 years in a middle-aged and elderly patient.

Case 1

The first patient was a 44-year-old man who complained of right knee pain that started three months before he presented at our clinic. He injured in battlefronts of Iran-Iraq war (1980-1988). He had a history of a retained war shell in the distal femoral metaphysis and thigh soft tissue from 22 years ago without any problem during this long interval. In the x-ray a metaphyseal lytic lesion around the war shell was noted. (Figures 1, 2) Then the patient underwent an axial CT scan so a lytic lesion with irregular-ill defined borders with cortical erosion and periosteal reaction more compatible with malignancy was noted. (Figure 3) A TC-99 bone scan revealed only distal femoral involvement without a metastatic lesion. Since he had a metallic foreign body, an MRI was not done.

After an open biopsy, microscopic analysis suggested a low grade osteosarcoma. In the second operation, wide margin resection with tumoral endoprosthesis, knee reconstruction was performed. (Figure 4) During the last 2 years after surgery, the patient has not had any significant problem except of decreased range of knee motion. One year later, he got lung metastasis and finally the veteran died from this cancer on the fourth postoperative year.

Case 2

The second patient was a 67-year-old man with pain and swelling in his left forearm. He had a history of a growing mass in the volar aspect of his forearm that started 5 months before he presented at our clinic. He had a retained war shell in his left forearm and palm from 25 years ago in Iran-Iraq war (1980-1988) and did not have any major complaint during this interval. (Figure 5) However, now, the forearm war shell was located within a solid mass.

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Figure 1. Anteroposterior of the right knee, reveal a lytic lesion around the entrapped metaphysical war shell and another entrapped war shell in the thigh soft tissue.

Figure 2. Lateral view of the involved right knee.

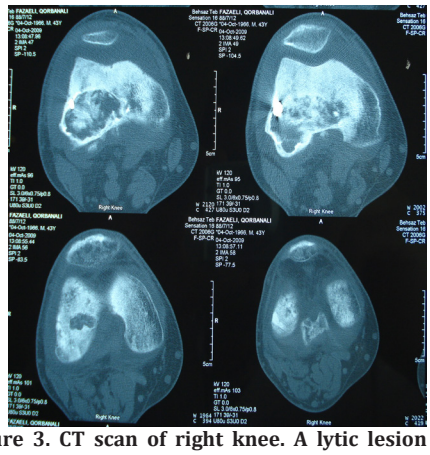

Figure 3. CT scan of right knee. A lytic lesion with ill-defined border and periosteal reaction around retained war shell.

Laboratory examinations were normal. In pre-operative tumor work-up, no metastatic involvement was noted in his bone scan or lung HRCT. Because of having a metallic foreign body, an MRI was not performed. In the first stage an open biopsy was done. Microscopic analysis was more compatible with myxofibrosarcoma. In the second stage, a solid soft mass with dimensions of 3.5×4×9 cm wide was resected (Figure 6). The tumoral mass probably originated from the flexor digitorum profundus muscle belly. As a result, the patient underwent postoperative radiotherapy. During his last four years after surgery, he has not had any major complain (Figure 7).

Discussion

To fully understand the long term complications related to war shells we can categorize them as following:

1. Bullet positioning near some important organs and irritative or compressive symptoms: In several reports, bullet fragment dislodgement near the hypophysis, foramen jugular or spinal cord has led to hypopituitarism, syncope or neurologic claudications respectively (1-3, 6).
2. Obstructive signs: Intra luminal bullet entrapment may lead to appendicitis, biliary obstruction or urinary tract obstruction as reported in the literature (7-9, 29).
3. Bullet migration: These complications are frequent and well-recognized and most reports of long-term complications of retained bullet are about migration.

Bullet migration from vessels to the heart, lungs or brain (and vice versa), bullet movement in neural tissues, migration from the brain to the spinal canal or intra spinal

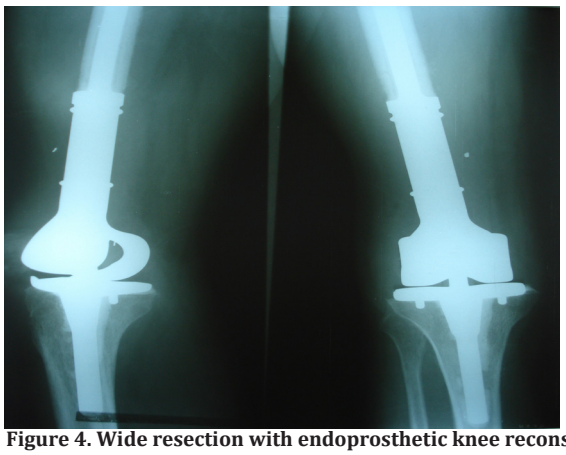

Figure 4. Wide resection with endoprosthetic knee reconstruction.

Figure 5. Retained war shells in forearm and palm.

Figure 6. Postoperative radiograph. Soft tissue mass widely resected. Palmar war shells retained.

Figure 7. Photograph 3 years after surgery. Previous volar forearm fasciotomy is noted.

movement are frequently reported (13, 30-32).

4. Intoxication: After the bullet is entrapped in solid tissues, it is encapsulated by fibrotic changes, so, we theoretically do not expect heavy metal absorption and subsequent lead or cupper poisoning (33).

There are controversies about bullet removal indications. Most authors believed that if there is concern about absorption of metal elements, only intra-articular or intrabursal entrapped war shells should be removal and other positioned war shells may be consider as inert harmless metallic bodies (5).

But increasing reports about lead poisoning and heavy metal intoxication have been published that indicate this attitude should be reconsidered (14-20).

5. Imaging considerations: CT scan and MRI imaging can be affected and distorted with metal bodies. Also, there are some concerns about metallic body movement in electromagnetic fields of MRI.

However, safety of MRI in the presence of entrapped bullets has been shown in some studies (34, 35).

The prolonged presence of metallic bodies in human or animal tissues can irritate macrophages and lead to some neoplastic changes.

Increasing reports related to tumoral changes near orthopedic implants are available, although, unfortunately, the exact mechanisms of these changes are not fully understood.

The number of reported tumor cases is low considering the total population behind them /with metallic bodies; therefore, it is the long term risk of retained metallic elements that is potentially hazardous.

Qi reported two cases of lung cancer related to bullets (21). Also Hanzava *et al* and Philip J reported such cases (22, 23). Additionally, a case of malignant glioma induced by an intra cerebral war shell 38 years after World War II has been published (24).

Witzmann *et al* reported on a young patient with glioblastoma multiforme five years after a war shell penetrated into the brain (25).

Multiple intraspinal epidermoids have been shown by Smith and Timperley related to an intraspinal retained bullet (36).

The last remaining World War I veteran was affected by angiosarcoma after a revised THA (37). Also, we find two reports by Himmer *et al* and Albert *et al* about angiosarcoma related to TKA (38, 39). Gebhart *et al* in 1999 reported a case of a desmoids tumor after 45 months around THA (40). A disseminated osteosarcoma that occurred in the pelvic after THA has been reported by Prasad *et al* (41).

A case of proximal tibial angiosarcoma primarily presented with recurrent hemarthrosis has been reported by Drexler *et al* in a patient with a prior history of tibial plateau malunion and plating and secondarily total knee arthroplasty (42).

Osseous Non-Hodgkin Lymphoma associated with THA has been reported by Syed *et al* (43).

Weber *et al* reported a case of epitheliod sarcoma after THA (44). Several reports about the development of MFH around THA, TKA and nails are available (45-51).

Also Hughes *et al* reported a patient with MFH near the cannulated hip screw (52). In review of the Bristol Bone Tumor Registry on 240 malignant soft tissue sarcoma, it showed four cancer cases that developed around the hip prosthesis (53).

In two comprehensive review articles in 2001 and 2006, 12 and 46 cases of orthopedic related malignancies have been studied separately (54, 55). Some patients in these two reports have been overlapped by themselves and by the above mentioned reports.

In the first article that was published by Keel *et al* in 2001, seven cases of osteosarcoma, four cases of MFH and one case of a peripheral nerve sheet tumor was studied. These tumors were related to hip prostheses, nails, staples and a plate (54).

Surprisingly, Visuri *et al* reported 46 cases of malignancies subdivided into 31 soft tissue sarcomas, 10 bone sarcomas, four cases of lymphoma and one case of epitheliod carcinoma between 1974 and 2003 in western articles (55).

In the English literature only three reports about benign cystic changes after bullet penetration into bones have been published (26-28).

Up to now, we cannot find a report of malignant bone or muscle tumors due to retained war shells or bullet fragments in the literature and this article is the first published report in this area.

Although some can interpret these two malignant changes as an incidental event and not related to war shell fragments, we know osteosarcoma in middle-aged patients is generally a secondary event and a prolonged period of intramedullary war shell entrapment and the development of a tumor around it increases the possibility of this casual relationship.

Fibrosarcoma is a rare soft tissue tumor in 30-50-year old patients most commonly seen in the lower extremities. Upper limb involvement in elderly patients and a well-sited war shell in a tumoral mass, increase the casual relationship between the tumor and retained war shell.

Therefore, we have concluded that retained war shells are not inert bodies at all and insidiously affect the health of injured patients in variable amounts.

Although the low number of reported neoplastic changes due to orthopedic implants and war shells raise a little concern about their carcinogenic effect, in the future, if increasing reports about these changes are published, authors can design a standard approach for the follow-up of retained war shell fragments.

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