
Shoulder Ring Complaints as a Rare First Symptom of Malignant Pleural Mesothelioma

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Abstract

The prevalence of malignant pleural mesothelioma is often encountered in the areas highly exposed to asbestos. The aim of this paper was a retrospective analysis of shoulder pain as a rare, first symptom of pleural mesothelioma, which constitutes an interdisciplinary diagnostic problem concerning both orthopedics and pulmonology. The research was based on a retrospective review of the patients' medical records. The considered period of time included the years 2006–2012. The study group included a total of 49 patients. Seven patients (14.3 %) presented a complain of shoulder pain, as the first symptom of mesothelioma. The remaining 42 mesothelioma patients, without this symptom, constituted a reference group. The intensity of shoulder pain was, on average, 4/10 on an analog scale. A concomitant limitation of mobility was observed in five out of the seven subjects. In one case, limitation of motion and dysfunction of the shoulder joint were at an advanced stage. Neuralgia of upper limbs was found in two cases. We conclude that shoulder pain may be a manifesting symptom of malignant pleural mesothelioma. The neoplasm appears to have a pleiotropic effect on human body, reflected in different ways of its primary manifestation which may also include the motor system.

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Keywords

Asbestos • Environmental exposure • Pleural malignancies • Pulmonology • Orthopedics

1 Introduction

The incidence of mesothelioma reaches 20/1,000,000 people. However, the estimates are variable as the standardized mortality rate from mesothelioma in the years 1994–2008 was 4.9/1,000,000 people, which makes it even a rarer neoplasm. There also are differences among countries concerning the incidence of mesothelioma (Opitz 2014). It is estimated that about 39,000 cases in the countries of Russia, Kazakhstan, China, India, and Thailand have not been reported, which suggests that the available data may not be up to date (Park et al. 2011). It is known that, in general, the incidence of mesothelioma has an upward trend (Carbone et al. 2012; Robinson 2012) and men are more often affected than women (3.6:1.0) (Delgermaa et al. 2011). Pleural mesothelioma, along with lung cancer and other pleural diseases, is lined to asbestos exposure (Konieczko et al. 2013; Carbone et al. 2012; Skammeritz et al. 2011). There were 4,253 cases of asbestos-linked diseases reported in Poland in the years 1974–2010; pleural mesothelioma was 6.4 % of them (Szeszenia-Dabrowska et al. 2011). Although medicine is still looking for an effective method of treatment, the prognosis in this neoplasm is bad. The survival is about 1 year, despite the application of different methods of treatment - chemotherapy, radiotherapy, aggressive surgical treatment, or phototherapy (Weder and Opitz 2012; Aziz et al. 2002). There are also articles on autoimmune phenomena that arise in response to asbestos exposure (Lee et al. 2014; Pfau et al. 2014) and later accompany pleural mesothelioma if it develops. That is why immune-modulatory drugs have also been tried.

There are a number of non-specific symptoms that accompany mesothelioma. The most frequent are the following: chest pain, dyspnea, cough, weight loss, hyperhidrosis, or fever. Some of them are caused by hydrothorax (NCCN 2013; Mott 2012). Due to the non-specific or asymptomatic course the disease runs, particularly at the beginning stage, it is often detected too late for an effective treatment. It is rather rare when a presaging symptom, like shoulder ring pain, on which this article focuses, can be observed. So far, only two articles have been written, describing single cases of such pain (Verpeut et al. 1999; Mazel and Roolvink 1997). The present study focuses, retrospectively, on describing pleural mesothelioma as one of the shoulder ring pain causes, which should alert diagnostic attention of orthopedicians, patients may sick help from, in this basically pulmonary disease.

2 Methods

The study was accepted by an institutional Review Board for Human Research and was performed in accord with the Declaration of Helsinki for Medical Research Involving Human Subjects. The records of patients with pleural mesothelioma diagnosed over the years 2006–2012 were reviewed. All patients came from the Szczucin municipality in Poland, an area consisting of a population of about 14,000 inhabitants and of known increased risk for environmental asbestos exposure due to the presence of an asbestos-cement establishment. The patients were living in the area for at least

15 years. Seven patients (4 women and 3 men; mean age 51 ± 10 , range 41–66 years) who visited orthopedicians because of shoulder ring pain were assessed. A reference group consisted of 42 patients (25 women and 17 men; mean age 64 ± 12 , range 38–86 years) with pleural mesothelioma, without any pain in the area of the motor system at the moment of medical consultation. One patient of the seven with the shoulder ring pain and six patients of the reference group were workers at the local asbestos-cement establishment. The shoulder ring pain was diagnosed on the right side in three and on the left side in four patients. Initially, pleura only on one side of the chest was affected. Four of the patients were smoking cigarettes for at least a few years. Two patients presenting with the shoulder ring pain also suffered from asbestosis and Hodgkin's lymphoma.

Chest X-rays and, if necessary, ultrasonography and computerized tomography were used for initial diagnostics. Furthermore, thoracentesis and bronchoscopy were carried out in each case. An average pleural tap amounted to 2,093 ml (range 500–4,600 ml) of fluid in the shoulder ring pain group and 1,250 ml (range 200–3,700 ml) in the reference group. All mesothelioma cases were histopathologically confirmed. Radiograms of two patients presenting with shoulder ring pain are exemplified in Figs. 1 and 2.

After the initial diagnostics at a regional hospital, further treatment took place at the Thoracic Surgery Clinics in the cities of Cracow and Zakopane in Poland. Surgeries of different extend were made, from thoracoscopy with biopsy up to lung resection. Chemotherapy was part of standard treatment. In the shoulder ring pain group videothoracoscopy was carried out in four patients, thoracotomy in two, chemical pleurodesis in three, and pleuropneumectomy with partial resection of the diaphragm and pericardium in another two patients. In six cases, chemotherapy, involving cisplatin, pemetrexed, or adriablastin, and in three cases radiotherapy were used.

Overall, cancer dissemination was found after a few months in all mesothelioma patients



Fig. 1 Chest radiogram of a patient with pleural mesothelioma in the anterior-posterior projection. The examination confirmed hydrothorax on the right side up to the fourth rib, thickened parietal rib pleura and parietal mediastinum pleura. Cardiac silhouette is enlarged with pericardial effusion – neoplastic infiltration of pericardium. Reflexive left bend of the spinal axis due to shoulder ring pain



Fig. 2 Chest radiogram of a patient with pleural mesothelioma in the anterior-posterior projection. Right lung completely shadowed by accumulating fluid

presenting with shoulder ring pain. Metastases to the second lung were found in five cases. In two cases, neoplastic infiltration of the mediastinum was confirmed, including one patient with an additional infiltration of the esophagus. Metastases to the peritoneal cavity, with accompanying ascites, were present in two patients. One of them also had liver metastases and the other had liver and colon metastases. The adrenal gland was infiltrated in one case. Concerning the motor system, pelvic bone metastases were confirmed in one case, muscles in the area of the pelvic girdle were infiltrated in two patients. Three of the patients had metastases to the abdominal integuments. One patient suffered from the armpit metastases with brachial plexus compression, which resulted in the subluxation of the shoulder joint. The location of metastases is summarized in Table 1. The neoplasm

progression and dissemination also were found in the reference group, although it was mostly limited to the lung and pleura on the other side.

3 Results

The shoulder pain was a presenting complain in all seven patients and made them see an orthopedician. The pain was characterized as diffuse, radiating to the scapula or the neck. Its intensity was rated between 3 and 6 on an analog pain scale, where 0 was no pain and 10 denoted unbearable pain. Three patients rated the pain intensity at 3 points, three other at 4 points, and one at 6 points. Five patients suffered from reduced mobility of the shoulder ring, which was confirmed in physical examination. In one case, the mobility limitation and shoulder joint dysfunction were significant. The ulnar nerve neuralgia of the upper limb was found in two patients; with an additional involvement of the medial and radial nerves in one of them. The following accompanying symptoms were found during the initial work-up: chest pain (5 cases), dyspnea (4 cases), cough (4 cases), weight loss (2 cases), appetite loss (2 cases), and fatigue (3 cases). The exact distribution of symptoms is shown in Table 2. Physical examination showed a pain-related left bend of the spinal axis in one patient, which was confirmed by chest X-ray (Fig. 1). The average survival time, from the time of diagnosis, of the patients with the shoulder ring involvement was 25.4 months (range 12–48 months).

Table 1 Metastases in mesothelioma patients with shoulder ring pain

Localization	Number of patients
Lung on the other side	2
Mediastinum	2
Esophagus	1
Peritoneal cavity	2
Liver	2
Colon	1
Adrenal glands	1
Pelvis	1
Pelvis muscles	2
Abdominal integuments	3
Armpit	1

Table 2 Motor system and other symptoms reported to the orthopedician during the initial work-up

	Shoulder ring complaints			Other complaints					
	Pain	Limited mobility	Upper limb neuralgia	Chest pain	Dyspnea	Cough	Weight loss	Appetite loss	Fatigue
Patient 1	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Patient 2	Yes	No	No	No	Yes	Yes	Yes	Yes	No
Patient 3	Yes	Yes	No	Yes	Yes	Yes	No	No	No
Patient 4	Yes	Yes	No	Yes	No	Yes	No	No	Yes
Patient 5	Yes	No	Yes	No	Yes	No	No	No	No
Patient 6	Yes	Yes	Yes	Yes	No	No	No	No	No
Patient 7	Yes	Yes	No	Yes	Yes	No	No	No	Yes

In all 42 patients of the reference group, no complaints connected with the motor system, and especially with the shoulder ring, were reported. In that group, the first symptoms of pleura mesothelioma were the chest pain on the side of infiltration and dry cough. Thirty one of those patients reported dyspnea and fatigue, and six suffered from significant appetite and weight loss. The average survival time in this group was 15.4 months (range 3–48 months). There were no differences between the patients with occupational or environmental asbestos exposure (those having a direct contact with contaminated agricultural areas). We did not observe a longer survival time than 4 years (the longest were 48 and 36 months). The other patients did not survive longer than 26 months. There were no age or gender-related differences in the survival time.

4 Discussion

There is many a cause of shoulder ring pain. The pain may arise due to congenital and acquired orthopedic disorders, but is also a sequela of neural diseases or damages, vascular diseases, and of other internal causes. When examining a ‘painful shoulder’ from the orthopedic standpoint, the most frequent causes taken into consideration are the following: bone fractures or luxations, strains or ruptures of tendons or joint capsule structures, degenerative or inflammatory changes, tumors, scalene muscle attachment anomalies, cervical rib pathologies, scoliosis, thorax deformations, brachial plexus anomalies, and brachial artery pathologies. Other pathologies that can cause shoulder joint pain are rarer and thus taken into account much less frequently in orthopedic anamnesis and physical examination. However, the literature shows that other disorders, particularly originating in the thorax, may lead to the shoulder ring pain. These include lung and pleura anomalies, congenital and acquired diaphragm defects, pathologies of the heart and pericardium, and of other mediastinal structures pathologies like esophagus (Ramponi 2011; Adamietz et al. 2008; Caravati et al. 2001). The present review of

mesothelioma cases points attention to those relatively infrequent, non-orthopedic reasons of shoulder ring pain, which may be spuriously attributed to an orthopedic pathology. An interdisciplinary approach and unceasingly diligent diagnostic pursuit are thus sometimes required to resolve the diagnostic uncertainties surrounding the underlying cause of the shoulder ring pain. There are additional non-orthopedic symptoms that may increase the awareness toward a malignant underlying reason of the shoulder pain. Some of the most common and non-specific pleural mesothelioma symptoms are dyspnea (90 % of patients), chest pain connected with chest wall or intercostal nerves infiltration, and cough (Neumann et al. 2013). The present study, in general, confirms those findings, although chest pain, in particular, may be misleading as it is encountered in a wide spectrum of cardiac, pneumological, and orthopedic conditions. Concerning the orthopedic conditions, chest pain is a feature of the inflammation of the sternoclavicular joint or rib cartilage, and of cervical discopathies.

In the present study, the primary localization of mesothelioma was the parietal pleura, which lines the inner surface of the chest wall. The metameric innervation comes from the intercostal nerves. There is anastomosing innervation between the parietal pleura and other chest wall layers, which enables the transmission of pain along the dorsal thoracic nerve and the dorsal scapular to the shoulder area. It is therefore reasonable that the first symptom of pleural mesothelioma can be the shoulder pain, radiating to the neck and scapula as we found in the present study. The patients could not precisely localize the focus of pain; it was diffuse, with radiation to the chest. In some instances, pain radiated the other way around, from the chest to the shoulder area; the direction could be interchangeable. The pain intensified with inspiration. These complaints were usually vexing and worrisome enough for the patient to seek orthopedician’s advice. Mesothelioma remains a relatively uncommon malignancy, particularly taking into account more widely used counter measures against exposure to asbestos. Nonetheless, it remains a difficult to diagnose, deadly

disease, with no effective cure in sight (Mott 2012). Therefore, we believe that the present study's description of the shoulder ring pain as a rear presenting syndrome of mesothelioma is a worthwhile addition to the only two other papers we were able to trace in the literature dealing with the involvement of shoulder pain in the disease recognition (Verpeut et al. 1999; Mazel and Roolvink 1997). This plausibly orthopedic complaint should raise alertness to the possibility of malignancy in the respiratory system, particularly in the areas of known exposure to asbestos.

Conflicts of Interest The authors declare no conflicts of interest in relation to this article.

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