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Intentional, intravenous injection of metallic mercury – multislice CT findings in the chest of the patient after 13 years of clinical observation – a case report

Intentional self-administration of potentially toxic substances in suicidal attempts is a serious social and clinical problem. Although the wide range of chemical compounds, including legal drugs and domestic products may be taken purposely with suicidal intent, the cases of deliberate mercury self-poisoning are relatively infrequent. However, since mercury still can be found in some equipment for everyday use such as thermometers or fluorescent tubes, such cases are still reported.

The severity of mercury intoxication depends on its chemical form, the dose and the way it is administered. There are three main forms of this metal (6, 7): 1. Inorganic, water soluble salts are the most irritant and have the strongest toxic action on different organs, especially kidneys. 2. Organic, fat soluble compounds which can cross the blood – brain barrier and cause the neurological syndrome known as Minamata disease. 3. Metallic mercury which has the least toxicity and is slightly absorbed through the digestive tract. The lethal dose of mercury oscillates between 0.5 and 4 g and may be administered via oral route, by intravenous or subcutaneous injection and may be vaporized (4, 6, 8).

The diagnosis of poisoning in case it is caused by inorganic salts or organic compounds is based on clinical picture and laboratory tests. If the cause of intoxication is metallic mercury radiological examinations should be performed additionally. Since mercury is a material of high density, it is easily detected by radiological methods (2, 3, 6). Usually, the x-ray pictures and computed tomography is performed in revealing the mercuric deposits in the body's tissues. The typical radiographic findings on plain chest radiographs after intravenous injection of mercury are multiple, metallic particles localized mainly in middle and lower pulmonary fields and in the projection of cardiovascular silhouette. Computed tomography of the chest usually shows scattered, high dense particles in the lungs due to pulmonary microemboli and in cardiovascular structures of the chest as the result of passing of the mercury from the lungs to the systemic circulation directly or through the precapillary shunts (2, 3, 4).

CASE REPORT

On 10th of April, 1991 a 20-year-old female reported at a local hospital with chest pain, hacking cough, dyspnoea and subfebrile body temperature. She did not reveal any important facts in anamnesis. The ailments were treated as the symptoms of upper air tract infection and the routine treatment was applied. Neither laboratory tests nor radiological examinations were performed. The

symptoms abated after two weeks. After six months of relatively asymptomatic period the patient was readmitted to the hospital where the nephrotic syndrome was diagnosed. The standard chest x-ray picture revealed multiple, fine-grained, metallic deposits localized mainly in the lower fields of both lungs (Fig. 1). The patient acknowledged having injected into her right antecubital vein 2 ml of metallic mercury with suicidal intent six months before. She was referred to the nephrology unit in our hospital where further examinations were done.

Fig.1. Plain chest radiograph presents scattered, metallic particles localized mainly in lower and middle fields of both lungs and in the projection of the cardiovascular silhouette

The patient manifested generalized edemas and the small nodule in the spot of injection was present. The neurological state was normal. Serum protein in laboratory tests was decreased and the cholesterol level was increased. Significant proteinuria was detected. The excretion of mercury was 1016±724 mg/l. Other parameters were normal. Accumulation of mercuric deposits in the liver, spleen, kidneys, mesentery and urinary bladder with further radiological examinations was revealed. The mesangiocapillary glomerulonephritis was diagnosed by means of renal biopsy. The chelation therapy as a treatment of choice in elimination of elemental mercury and immunosuppressive treatment with steroids were applied. The patient has remained under constant medical care of nephrology outpatients' clinic since that time.

The chelation therapy was discontinued after 10 months as it was ineffective. The clinical complications such as phlebothrombosis appeared during following hospitalizations. The levels of cholesterol were increased and the markers of renal insufficiency were present in laboratory tests during the whole period of medical care.

In 1997 because of cachexia and deterioration the pharmacological nephrectomy with angiotensin converting enzyme inhibitor was applied. The treatment with peritoneal dialysis was initiated and it has been continued up to this day.

In the year 2004 the follow-up multislice spiral computed tomography examination (MSCT) of the chest including HR option and cardiac CT protocol in order to evaluate the coronary arteries was performed. The scattered metallic dense deposits in the parenchyma of both lungs concentrated mainly in the subpleural region of the middle lobe were revealed (Fig. 2). A number of mercuric

deposits in the cardiac muscle, mainly in subendocardial space of the lateral and inferior walls was also present (Fig. 2). The highest concentration of mercuric particles in the heart was in the lateral wall of the right ventricle, along the right coronary artery. Moreover, single grains were visible in the interventricular septum near cardiac apex, in the pericardium, and in the adipose tissue of the heart. Few particles were localized in pleura, chest wall, vertebral canal and in the vertebras (Fig. 3). In addition slight signs of overhydration in the lungs related to the dialysis and single air traps were noticeable. Neither signs of interstitial fibrosis nor aseptic abscesses in pulmonary parenchyma were found. Coronary arteries were normal.

The comparative analysis of CT examination and plain chest radiographs with the radiological documentation collected during the whole period of observation did not reveal any significant changes related to the essential problem.

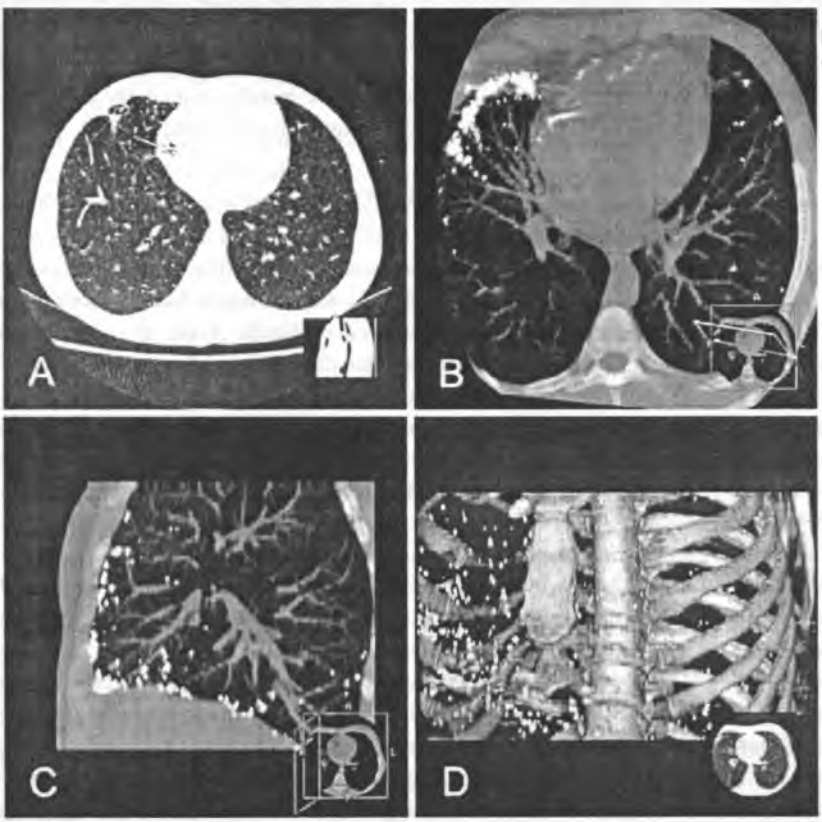

Fig. 2. Computed tomography of the chest; A) HRCT, axial projection – the grains of mercury localized in the parenchyma of the lungs and in the heart. Areas of ground glass density as the signs of slight overhydration; B) MIP reconstruction, oblique projection – High concentration of the mercuric deposits in the middle lobe and in myocardium; C) MIP reconstruction, sagittal projection – subpleural deposits; D) VR reconstruction – distribution of the mercuric particles in the chest

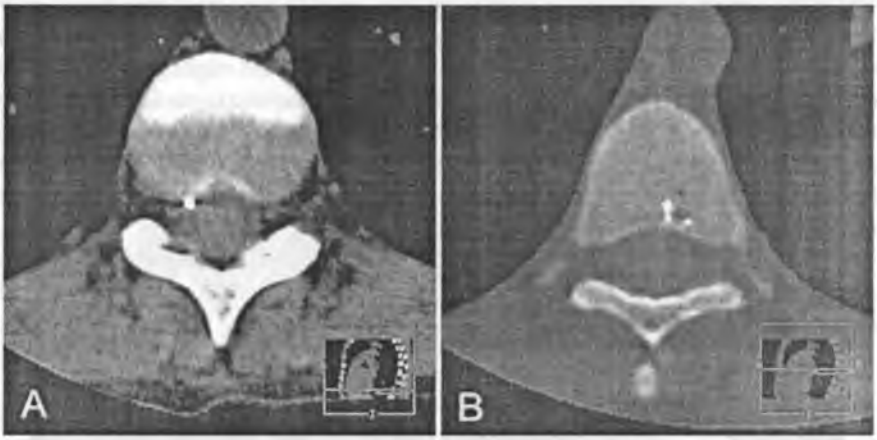

Fig. 3. Computed tomography, axial projections; A) Single metallic grain in the vertebral canal; B) Particles of mercury in the course of nutrient canal of the vertebra

DISCUSSION

The first symptoms the patient manifested were insignificant. The chest pain, cough and the dyspnoea, first diagnosed as the upper respiratory tract infection, was in fact the result of embolism in the lungs. It is uncertain if routine x-ray picture would enable the proper diagnosis. Givica-Perez et al. reporting similar case, paid attention to the fact that plain radiographs of the chest were normal shortly after self-injection of mercury while the thoracic pain was present (6).

The main clinical implication of intravenous injection of metallic mercury was nephrotic syndrome and irreversible renal failure consequently. Although the renal complications caused by metallic mercury are extremely rare, single cases had been reported in the literature (6).

The chelation therapy appeared being ineffective. The failure of the treatment could be related to the fact that the patient concealed the suicidal attempt and the treatment was initiated six months after self-poisoning. On the other hand, as Eyer F. et al. report, even early beginning of the chelation therapy does not guarantee the success due to inadequate elimination of the mercury in comparison with total amount of the metal in the tissues deposits (5).

Accumulation of the mercuric deposits in the structures of the chest resulted in typical radiological picture. Either concentration of metallic particles in lungs' parenchyma and pleura or presence of the mercuric grains in the heart's walls related to intravenous injection of metallic mercury is commonly described in the literature (1–4, 6, 10). Single cases of occurrence of the mercuric deposits in vertebral canal have been reported (9). The papers describing long-term observations are not very numerous and usually the radiological picture is relatively stable (1, 4, 10) as it was in our case. Sterile abscesses and granulomatous foreign body reactions are also reported (3) but none of those phenomena were present in the examinations we performed.

CONCLUSIONS

The patient we reported had suffered from irreversible chronic renal insufficiency in consequence of intravenous injection of metallic mercury. The insignificant initial symptoms, concealment of important facts in anamnesis by the patient and the lack of

either laboratory or radiological examinations led to incorrect first diagnosis. The long, relatively asymptomatic period of time delayed the proper diagnosis additionally and made the effective treatment impossible. For that reason any suspicion of intravenous self-administration of mercury should induce the clinician to extend the diagnostics. To reveal the characteristic mercuric deposits the plain x-ray pictures of the chest are sufficient, however, to localize the deposits precisely and to exclude eventual pathological changes related to them the MSCT should be performed.

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SUMMARY

Intentional self-administration of potentially toxic substances in suicidal attempts is a serious social and clinical problem. Although the wide range of chemical compounds may be taken purposely with suicidal intent, the cases of deliberate mercury self-poisoning are relatively infrequent. However, since mercury still can be found in some equipment for everyday use, such cases are still reported. A case of a 33-year-old female diagnosed with renal failure related to deliberate self-injection of metallic mercury is described. Apart from the clinical course, the radiographic findings including plain chest radiographs on the basis of which the mercuric pulmonary emboli was diagnosed and CT examination, are presented. Multiple metallic dense deposits in the parenchyma of both lungs, in the pleura, chest wall and in the cardiac structures were detected with follow-up MSCT examination of the chest performed 13 years after self-poisoning. Single particles were also found in the vertebras and in the vertebral canal. The comparative analysis of radiological documentation collected during the whole period of observation did not reveal any significant changes related to essential problem. To detect the mercuric particles the plain x-ray pictures of the chest are sufficient, however to localize the deposits precisely and to exclude eventual pathological changes related to them the MSCT should be performed.

Obraz w wielorzędowej tomografii komputerowej klatki piersiowej u pacjentki po 13 latach od zamierzonego wstrzyknięcia metalicznej rtęci w celu samobójczym – opis przypadku

Próby samobójcze z wykorzystaniem potencjalnie toksycznych substancji stanowią poważny problem społeczny i kliniczny. Możliwe jest wykorzystanie do tego celu szerokiej gamy związków chemicznych, jednakże zatrucia rtęcią są stosunkowo rzadkie. Mimo to niektóre produkty codziennego użytku zawierają rtęć i przypadki samozatrucia tą substancją są nadal opisywane w literaturze. Opisano przypadek 33-letniej kobiety z niewydolnością nerek spowodowaną dożylną iniekcją metalicznej rtęci. Oprócz klinicznego przebiegu opisano także obraz radiologiczny widoczny zarówno w badaniu CT, jak i na zdjęciach przeglądowych klatki piersiowej, na podstawie których rozpoznano zatorowość płucną spowodowaną metaliczną rtęcią. W kontrolnym badaniu MSCT wykryto liczne metalicznej gęstości depozyty zlokalizowane w miąższu obu płuc, w opłucnej, w ścianie klatki piersiowej i w strukturach serca. Pojedyncze drobiny rtęci widoczne były również w obrębie kanału kręgowego i trzonach kręgów. Analiza porównawcza dokumentacji radiologicznej, uzyskana w ciągu całego okresu obserwacji klinicznej, nie ujawniła istotnych różnic w obrazie. Przeglądowe zdjęcia klatki piersiowej są metodą pozwalającą na pewne wykrycie drobin rtęciowych, jednakże MSCT umożliwia zarówno precyzyjną lokalizację depozytów, jak i wykluczenie ewentualnych patologii spowodowanych obecnością rtęci w tkankach.