Case report

Medical Ultrasonography
2011, Vol. 13, no. 2, 161-164

Imaging findings after fascial injection of tetanus vaccine

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Abstract

Adverse reactions to vaccines vary from mild to fatal. Local reactions are often due to hypersensitivity to the adjuvant substances in the vaccine. This case report aims at illustrating the imaging findings of a fascial injection of the tetanus vaccine. A 14 year-old boy, vaccinated 6 months previously presented with a mass lesion in the left deltoid area. Magnetic resonance imaging and ultrasonographic evaluations were performed and the findings were characteristic for fascial granuloma. The histopathologic examination confirmed the diagnosis. The histopathologic examination confirmed the diagnosis. In our knowledge, this is the first case of granuloma post intrafascial injection of tetanus vaccine which was MRI and ultrasonographic evaluated and histopathologicly confirmed.

Keywords: aluminum, subcutaneous nodules, vaccination, magnetic resonance imaging, ultrasonography

Rezumat

Reacţiile adverse apărute după administrarea de vaccinuri variază de la reacţii uşoare la fatale. Cele locale sunt frecvent datorate hipersensibilităţii la substanţele adjuvante prezente în vaccin. Aceast prezentare de caz doreşte să ilustreze modificările imagistice apărute după administrarea intrafascială de vaccin antitetanos. Un băiat de 14 ani, vaccinat în urmă cu 6 luni, se prezintă cu o formaţiune palpabilă în aria deltoidului stâng. Rezonanţa magnetică şi ecografia au caracterizat leziunea ca fiind un granulom fascial. Examenul histopatologic a confirmat diagnosticul. După cunoştiinţele noastre acesta este primul caz de granulom intrafascial după vaccin antitenaos evaluat prin rezonanţă magnetică şi ecografie, cu confirmare histopatologică.

Cuvinte cheie: aluminiu, nodul subcutanat, vaccin, rezonanţă magnetică, ecografie

Introduction

Although vaccine delivery is a safe and cost-effective method to prevent natural infections that may cause significant morbidity and mortality, adverse reactions after the injection of vaccines are well-known [1,2,3].

Vaccine-related adverse reactions can be divided into two distinct categories: local and systemic reactions. Local adverse events are caused by inaccurate injection technique-procedure or due to hypersensitivity against a variety of adjuvant agents in the vaccine. Systemic reactions are generally uncommon and typically mild and self-limited, rarely fatal, and can be attributed to the vaccine itself [4].

This paper illustrates the imaging findings of the first case in the literature, where a patient was inadvertently exposed to a fascial injection of tetanus vaccine.

Case report

A 14 year-old boy was admitted with the complaints of pain and palpable mass on the lateral aspect of his left upper arm. The parents stated that he had received an intramuscular anti tetanus vaccination approximately 6 months before. Physical examination revealed a painful semi-mobile mass 4x3 cm in diameter on his left deltoid area. No enlargement in the regional lymph nodes was found. The patient had no other complaints.

Received 08.12.2010 Accepted 29.03.2011
Med Ultrason
2011, Vol. 13, No 2, 161-164
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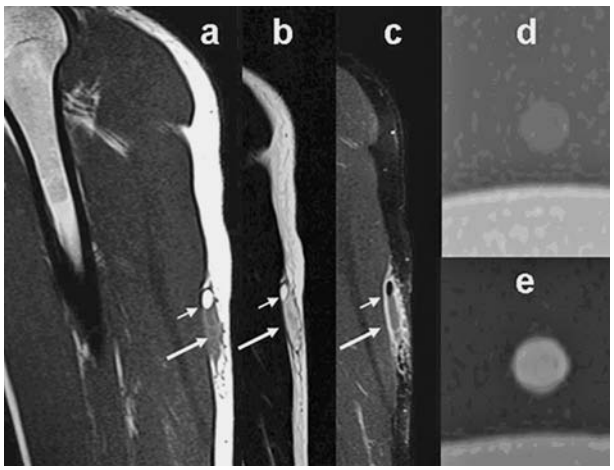


Fig 1. Sagital oblique views showing the main lesion (long arrow) and the uppermost component (short arrow) in a (Precontrast T1W), b (T2W) and c (Postcontrast T1W). The lesion has a fusiform shaped appearance with superficial and perifascial location. The T1W hyperintense focus in precontrast series, hypointense at postcontrast fat-saturated series which represents the lipoid admixture of the content. The vaccine itself displays slightly intense signal characteristics on T1W and hyperintensivity on T2W images (d, e).

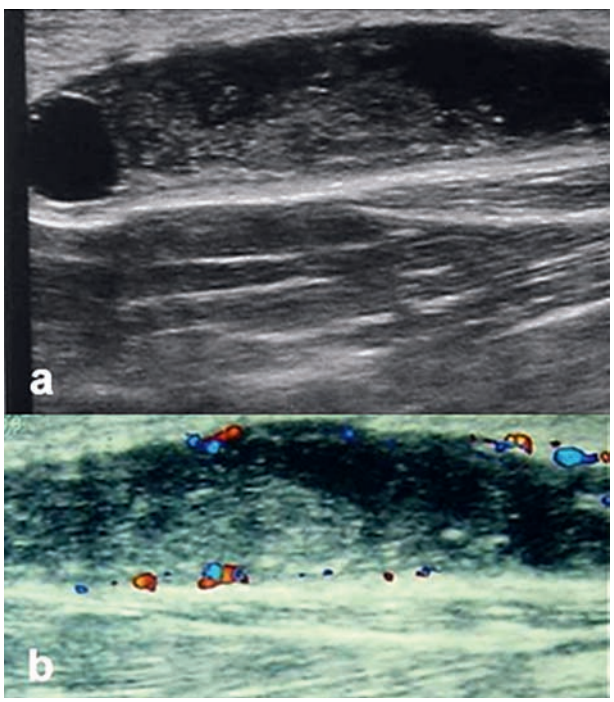


Fig 2. US images acquired in the parallel axis relative to the lesion with slight posterior compression to the arm: a) Gray scale US-heterogenous and hypoechoic fusisorm shaped lesion containing anechoic cystic components at the apical part; b) Color Doppler US demonstrated peripheral vascularization.

All baseline laboratory investigations were within normal ranges except for a mild decrease in the platelet count (144,000/mm^3), moderately elevated quantitative CRP value (7.89 mg/dl) and normal leucocytes count with monocytosis (19%). Erythrocyte sedimentation rate was in normal range (7 mm/h).

Contrast enhanced magnetic resonance imaging (MRI) and superficial high resolution sonographic (US) evaluations were performed. All the MR images were obtained with 1.5 Tesla MRI system (Magnetom Avanto, Siemens Healthcare, gradient strength: 45 mT/m) using body coil to include the whole left arm. Precontrast axial-coronal-saggital T1W images were acquired with TR/TE:2170/113 ms values. Postcontrast T1W images were acquired with the same parameters apart from the additional fat saturation. T2W turbo spin echo (TSE) images were acquired, with Tr/TE:3400/41 ms values. Generally, slice thickness was adjusted 4 mm and matrix achieved in 512x512 format. Also, an unused closed vaccine vial was examined with the same parameters in the same MRI unit to compare the signal features of the vaccine and the lesion.

Precontrast MR images showed a mass deeply seated in the subcutaneous fat layer adjacent to the fascia. Lesion was mildly iso-hypointense on T1W images, apparently hyperintense on T2W images (fig 1a-d). At the upper pole of the lesion, multiple subcentimeter hyperintense foci were determined in both T1 and T2W images (fig 1b,d). In vitro MRI examination of the vaccine vial did not reveal the same signal features with the lesion (fig 1e). The lesion demonstrated intense peripheral contrast enhancement in fat-sat T1W sequences (fig 1c,d). The fluid collection in the lesion, assumed to be encapsulated toxoid material intermixed with enzymatic fat necrosis, showed suppression of signal at fat-saturated postcontrast imaging, similar with the vaccine vial on consecutive images.

Superficial gray scale and color Doppler US of the respective area was performed with high resolution system (Acuson S2000 ultrasound system, Siemens Healthcare, 12 MHz linear transducer). At the US examination, the lesion was heterogenously hypoechoic, the upper pole containing milimetric anechoic foci. On color Doppler study, the lesion showed moderately increased peripheral vascularity (fig 2).

The lesion was surgical excised. Histopathologic examination revealed a fluid collection in the center surrounded with hyalinized fat necrosis, a few lymphoid follicles with reactive germinal centers and perifollicular areas, and a predominantly mononuclear inflammatory infiltrate. Inflammatory cells mainly consisted of lymphocytes, histiocytes and plasma cells (fig 3). Histopathological examination was reported as a local granulomatous reaction in response to the vaccine material, which consisted of coagulation and liquefaction necrosis.

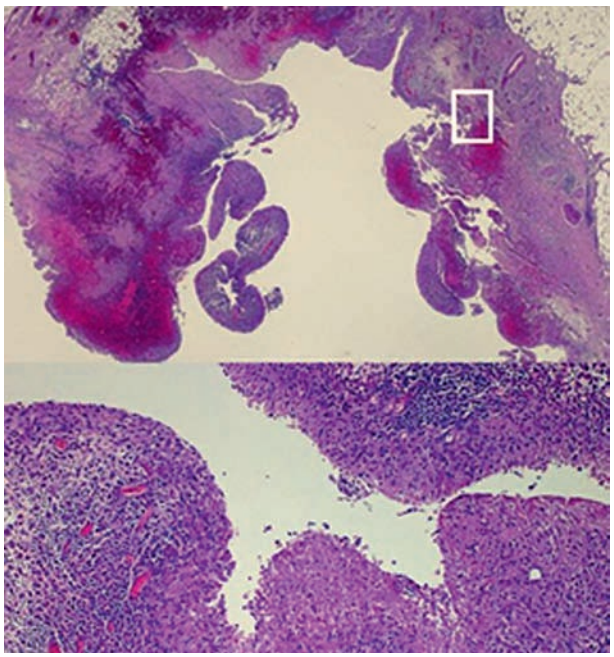


Fig 3. Histopathological examination a wide cavitation surrounded by the fascia, subcutaneous tissue and dermis. A tiny layer compounds of liquefaction necrosis and coagulation necrosis was seen centrally. X100 enlarged area shows clearly lymphocytic infiltration.

Discussion

Development of transient palpable nodules at the injection site following vaccination or upon hyposensitization with allergens containing aluminum salt is well-known. This is attributed to the immunological interaction with the administered antigen and a foreign body reaction against the aluminum salt. The persistent subcutaneous nodules at the injection site is observed, usually several weeks or months (minimum 1 month, maximum 2 years) after vaccination or desensitization [4-9].

According to the histopathological features, the persistent subcutaneous nodules may be due to two different mechanisms: non-allergic, toxic effect from aluminum, and a delayed type hypersensitivity reaction to aluminum [3,4,8]. It is noteworthy to mention that different histopathological patterns of the lesion frequently share a similar clinical outlook [3,5,7].

It has been suggested that the injection site and the technique used might have an effect in the appearance of the nodule. In their study, Frederiksen et al [10] compared subcutaneous and intramuscular injections, and considered subcutaneous application more likely to be associated with the development of a subcutaneous nodule. However, Bergfors et al [6] stated no association between the type of injection and frequency of development of the nodules. Positive patch tests to aluminum is seen with a high percentage (up to 77%) , even in symptom free vaccinated siblings [8].

In our patient, no hypersensitivity test was performed prior to the vaccination, and the patient experienced more local pain than his prior vaccinations. The patient presented with swelling and pain at the site of injection after 6 months, which revealed a delayed hypersensitivity. The laboratory tests were unremarkable except for a mild elevation of acute phase reactants.

The radiological modalities clearly demonstrated the hypersensitivity lesion with sterile abscess and granuloma formation components. The radiological findings were correlated well with the pathology. Excision of the lesion provided disappearance of the symptoms and prevented the development of any possible future complications.

To our knowledge this is the first case in the literature with demonstrable radiological findings after the inadvertent injection of the tetanus vaccine into the fascia. This case is unique, in terms of MRI and US demonstration of fascial granuloma formation, which was further confirmed with histopathology.

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