

Workplace Exposure to Combustion-derived Nanoparticles (CDNP): A Case Report

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Introduction

CDNP originate from a number of sources including welding fume, coal fly ash, and diesel soot. Studies have proven that these particles can cause tissue irritation, inflammation and cancer through oxidative stress. Their potential adverse health impact has been proposed to be either due to direct or indirect/redistribution effect [1,2]. This case report is about possible adverse impact of CDNP following exposure to welding fume. It emphasizes the importance of measuring and air sampling for nanoparticles in breathing zone, especially in case of accidental exposure to separate exposure to nanomaterials from nuisance dust. Additionally, it aims to increase awareness on personal protection equipment availability and adherence at work. It also creates a paradigm for future studies on health surveillance/testing and long term evaluation of the exposure.

Case Report

A pleasant 26-year-old male presented after accidental close contact of eyes to flame powder spray while coating metallic objects which caused him severe eye pain and discomfort. The chemical powder was a mixture of chrome, nickel, zirconium, cobalt, yttrium, and aluminum.

At the time of the visit, his chief complaints were bilateral ocular pain, foreign body sensation, blurred vision, and burning sensation. His symptoms started 48 hours before his visit for which tap water was used that provided temporary relief. However, his symptoms persisted and became worse, so he decided to be evaluated. At the clinic, the patient had constant sharp burning pain in both eyes, grading 6 out of 10. All other systems reviewed and were negative

Physical Examination

Height: 69 inches. Weight: 161 lbs. BMI: 24 Pulse: 84/min. Blood Pressure: 130/100 mmHg. Temperature: 98.0 deg F Respiratory rate: 16 per min.

Uncorrected Visual Acuity: OD 20/20, OS 20/20, OU 20/20.

Peripheral vision: grossly intact.

His past medical history was unremarkable. He denied any allergies to food or medications. He was not taking any prescription, over-the-counter, or herbal medications. His past ocular history was significant for "recurrent eye irritation and discomfort along with upper respiratory tract irritation and coughs" which he was attributing to his "dusty job environment". The patient denied any known past history of ocular injury, ocular trauma, or contact lens wear. Family history was noncontributory. He was married, living with his wife and children and was working in a thermal spray coating company for about 2 years. He admitted to occasional alcohol consumption but denied any history of cigarette smoking or illicit drug use.

On examination, he was a well-developed 26-year-old male in mild to moderate ocular distress. His uncorrected visual acuity was 20/20 in both eyes using the Snellen's visual acuity chart at distance.

Inspection of the patient's face was normal. The extraocular eye muscles were intact. Tetracaine drops were placed for pain relief. The eyelids eversion were normal, other than bilateral mild scleral injection with a yellow-white mucopurulent discharge.

Pupillary exam showed both pupils were symmetrical and equally reactive to light and accommodation. Ophthalmic exam revealed normal shape and color of the optic nerve, normal cup to disc ratio, and no cupping was found on exam. No swelling of the optic nerve was present. No hemorrhages were found during funduscopic exam. Slit-lamp examination of the cornea revealed a hazy appearance with multiple punctate speckles which stained with fluorescein in both eyes. Examination of the anterior chambers were negative for hemorrhage, inflammatory cells and lens displacement. Fluorescein testing showed slight generalized uptake in both eyes. Both pre and post examination pH were ~7.0 bilaterally (normal). Post-exam irrigation performed with saline and ciprofloxacin antibiotic drops were administered in both eyes.

Rest of physical examination was unremarkable.

Differential Diagnosis

Chemical exposure to the eyes,

Bilateral keratitis,

Superimposed bacterial conjunctivitis.

Treatment and Plan

The patient was instructed to use antibacterial drops (tobramycin 0.3% eye drops, two drops every 4 Hours for 5 days, Ice pack to the eyes for comfort, and OCT pain medications.

His next day follow up examination showed significant improvement of eye pain, discomfort and discharge. The patient completed his treatment without apparent complications and his six months follow up reported total recovery.

References

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