Methods and Materials

We performed a case review and a literature review. We searched MEDLINE and PubMed using the search words “cilia,” “cilia ultrastructure,” “ground zero,” “transmission electron microscopy.” We reviewed articles on the observation of living preparations used to analyze cilia specimens from a single patient. The stamens of the antlers of each of the doublets. In normal cilia (Figure 1) each microtubular doublet and a central pair of singlet microtubules. However, dynein arms are normally associated with peripheral doublets. Another contributor to this change in cilia ultrastructure may be the absence of certain microtubular elements necessary for the assembly of cilia. In this study, we present a unique set of findings that suggest a new understanding of the mechanisms of cilia ultrastructure.

Results

The first cilia biopsy was taken on October 9, 2006 from the trachea and prepared as a wet mount preparation and for electron microscopy. Follow-up specimen from the nasal posterior turbinate were taken 1 week after the initial biopsy. A second cilia biopsy was taken from the nasal posterior turbinate of the subject on October 9, 2006, and the specimens were stained with uranyl acetate and lead citrate and examined using a Philips CM-12 electron microscope. A third cilia biopsy was obtained from the subject on November 29, 2006, and stained with uranyl acetate and lead citrate and examined using a Philips CM-12 electron microscope.

Discussion

In 2006, the Mount Sinai Medical Center released the findings of the World Trade Center and Volunteer Medical Screening Program, the largest multi-center clinical program providing medical screening examinations for the workers and volunteers who worked at Ground Zero and other sites following the 9/11 terrorist attacks. The screening program included close to 12,000 subjects from diverse professions aiding in the WTC rescue, recovery, and cleanup operations. Over 2,000 unusual and unreported findings are reported in this study.

Proper ciliary motility is key to efficient mucociliary transport along the respiratory tree. Failure to perform properly may cause a combination of structural and functional abnormalities. When in their normal operating state, these factors allow cilia to move mucus containing entrapped bacteria, toxins, and environmental pollutants along the respiratory tract to the nasopharynx where they may be swallowed or expectorated. Genetic abnormalities, respiratory infections, environmental stresses, and locally applied drugs may cause absence or failure of any of these factors, which may lead to loss of mucociliary transport and the occurrence of respiratory disease. Ciliary defects that are genetic in origin can either cause or result in the occurrence of diseases collectively called Primary Ciliary Dyskinesia (PCD) that have a variety of abnormalities that may be identified by electron microscopy.

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