Letters to the Editor

Detection of Silicone in Lung Tissue

To the Editor.—We read with interest the article published in the February 2012 edition of Archives of Pathology & Laboratory Medicine titled “Progressive Granulomatous Pneumonitis in Response to Cosmetic Subcutaneous Silicone Injections in a Patient with HIV-1 Infection” by Hariri et al.1

This is an important subject to bring to the attention of practicing pathologists, because much of the literature relating to this issue has been published in clinical, forensic, or radiologic journals. Although it is not stated in this case report, the majority of reported cases of silicone-related lung disease occurring after the injection of liquid silicone were the result of procedures performed by persons who were unregulated/uncertified or “lay.” This raises both public health and legal issues, but also can make it more difficult to accurately ascertain what was injected and how to detect its presence in pathology specimens.

In the case report, lung biopsies “demonstrated numerous spheroid silicone particles within the lung interstitium and small pulmonary vessels, surrounded by foreign body giant cells and nonnecrotizing granulomatous inflammation,” 4 years after the patient reportedly “traveled to Mexico for silicone injections in the breasts and buttocks.”

Silicone (polydimethylsiloxane) may be present in human histopathology specimens as an elastomer (rubber), gel, or liquid.2 Silicone gel is a refractile, colorless material that often forms a meniscus at the rim of otherwise optically empty round spaces (Figure 1). We have seen specimens following injection of liquid silicone that have a thinner, less gellike, but otherwise similar appearance. Darkfield microscopy is also helpful in revealing the refractile character of silicone.3 In our experience, a 48- or 72-hour oil red O stain for paraffin sections4 will stain silicone (and many plastics containing abundant carbon-hydrogen bonds) in formalin-fixed, paraffin-embedded tissue sections5 (Figure 2), although some reports

Figure 1. Lung showing refractile rim of colorless material lining round spaces within a foreign body giant cell (hematoxylin-eosin, original magnification ×200).

Figure 2. Lung, silicone within a foreign body giant cell showing positive staining with oil red O, 72-hour stain, (original magnification ×200).

Figure 3. Lung, scanning electron microscopy image of round spaces, some clearly within multinucleated giant cell cytoplasm (original magnification ×500).

Figure 4. Lung, energy-dispersive x-ray analysis elemental maps for a, carbon; b, oxygen; c, silicon; and d, phosphorus, from the same field as Figure 3.
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have disputed this finding. We agree that silicone does not usually stain with oil red O using methods for the demonstration of lipids in frozen sections, most likely because of the shorter staining time typical of such methods. Several authors have noted that the presence of the element silicon can be demonstrated in the distribution of the refractile material seen in hematoxylin-eosin-stained sections by scanning electron microscopy with energy dispersive x-ray analysis (SEM/EDXA) (Figures 3 and 4), and infrared spectroscopy (IR) can confirm that the material has the spectral characteristics of polydimethylsiloxane (silicone) (not illustrated). These features (including negative staining on a frozen section stained with oil red O) were present in a case of silicone pneumonitis that we reviewed resulting from leakage of silicone gel from a breast prosthesis (Figures 1–4).

Apart from noting that oil red O “for lipid” was negative, the authors of this case report did not report the features of silicone listed above. In particular, refractile material was not noted, dark-field illumination was not reported, and no SEM/EDXA or IR was performed. Transmission electron microscopy (TEM) was performed, but without EDXA this does not establish the chemical composition of the globular material seen.

Because the solubility of silicone in organic solvents can vary depending on the type of silicone injected, it is possible that silicone was entirely removed in processing, although some residual material was present by TEM. It is also possible that there may be technical issues with the oil red O stain such as the length of staining. Finally it may be that the material within the lung biopsies is not silicone, or could have been silicone adulterated with other material(s), as has been described in the past.

We believe that it is important to document the chemical composition of materials that are associated with untoward clinical outcomes, particularly in situations where the provenance of the material injected is not clear. This can be of service to individual patients and to the larger interests of public health and regulatory agencies. This case report encourages pathologists to consider injected silicone in the differential diagnosis of optically empty spaces within the pulmonary vasculature, even if the typical light microscopic features of residual silicone are not seen.

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References

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In Reply.—We read the response to our recently published paper 2011-0149-CR with interest. Although we agree with the points that were made, it was known that this patient had received silicone injections, so that the findings at the light microscopic level were judged to be sufficient to identify the foreign material as silicone. However, the points are well taken and may be important with respect to public health.

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