Polyvinyl alcohol foam cell blocks from a needle hub residue device

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Cell block immunohistochemistry (IHC) and other molecular studies are often required to fully characterise tumours diagnosed by fine needle aspiration (FNA) cytology. These supplementary investigations are best done on cell blocks. We describe a device that allows cell blocks to be collected while performing FNAs with little extra effort or reduction in the quality of the cytology smear specimen. Experienced FNA operators will recognise that often a significant amount of the sample is left behind in the hub of the needle when the specimen is ejected on the slides (figure 1A). We have designed a device that collects this material during the FNA procedure. It consists of a plastic adaptor that has a core of sterile polyvinyl alcohol (PVA) foam protruding from its lumen at the end that fits onto the hub of the needle (figure 1B). The tip of the foam core extends into the apex of the needle's hub. The other end of the adaptor then fits onto the syringe, if a syringe suction technique is used (figure 1C). As the FNA is being performed the sample material flows up the lumen of the needle's shaft and, if a sufficient volume is collected, emerges into the hub of the needle where it is absorbed into the tip of the foam core (figure 1D). When FNA sampling is finished, smears are made by ejecting the specimen from the needle onto a slide in the usual way by air pressure from an attached syringe. The air passes through the foam forcing some of the sample in the foam back down the needle but some remains behind. The device is then removed, placed in a formalin specimen pot and sent for histopathology. Once fixed, the core is pulled from the adaptor (figure 1E), processed and sectioned as for routine histology specimens (figure 1F). On microscopic examination, cells are seen in the spaces in the foam matrix (figure 1G). IHC and other molecular investigations can be performed (figure 1H) as for routine histology specimens. An adequate cytology smear specimen and cell block specimen can usually be collected by the same FNA attempt. Some samples may be too scanty, or too thick, to travel up the needle into the hub. However, we have found that this difficulty can be overcome by ejecting the sample onto a slide and then uplifting some sample from the slide with the tip of the device (figure 1J). There should be at least 12 hours of formalin fixation; less may yield unreliable IHC, particularly for nuclear markers such as TTF1 and WT1. If preservation of high quality DNA is a priority then it may be worthwhile to cut in two the part of the core bearing the sample with a scalpel, freezing part of it for DNA studies and formalin-fixing the rest for paraffin processing. Sometimes there is only a small amount of sample absorbed in the tip of the foam. In this case it is best to transect the foam core just proximal to the tip after fixation and then embed it so that the tip is cut in cross-section, so as to maximise the number of cells in the section. When there is an abundant sample, for example a cystic lesion, it is notable that the larger clusters of cells tend to lodge close to the tip, as the foam acts as a partial filter. Most plastic foams are not suitable for paraffin processing but PVA has some particular properties that make it ideal for this purpose. It is resistant to organic solvents and on histological processing paraffin wax penetrates into the solid elements of the foam so that it sections smoothly without fragmenting. A method for using gelatin foam to make cytology cell blocks has been previously described [1] but we believe that PVA is superior gelatin foam in this role. PVA is considerably cheaper than gelatin foam and is more rigid and easier to machine into cores. Gelatin foam is derived from animal products, but PVA is synthetic and this makes the classification and licensing of a medical device employing it, more straightforward. PVA foam is also used as a nasal packing material and to embolise arteriovenous malformations.

Reference:

1. Mayall FG, Wood I. Gelatin foam cell blocks made from cytology fluid specimens. J Clin Pathol 2011;64:818e19.

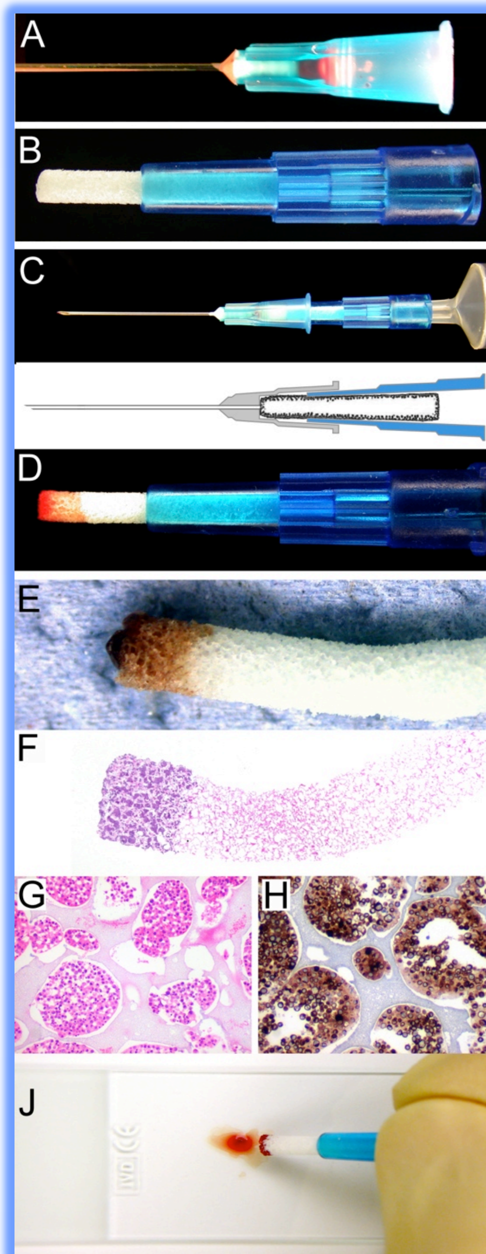

Figure 1 (A): Residual fine needle aspiration cytology material is often left in the hub of the needle after the specimen has been ejected. (B): The foam residue device consists of a core of polyvinyl alcohol foam housed in a Luer type plastic adapter. (C): The device attaches to a needle and syringe. (D): The sample is absorbed into the tip of the foam core. (E): After formalin fixation the core is removed from the adapter, paraffin processed and sectioned (F) in the usual way. (G): Adenocarcinoma cells within the polyvinyl alcohol foam. (H): Adenocarcinoma cells immunostained for cytokeratin 7. (J): The tip of the foam core can also be used to collect material from the surface of a slide.

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