PRINCIPLES OF PLASTINATION - SPECIMEN PREPARATION

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The concept of plastination is: Replacing tissue fluid with a curable polymer. This is accomplished by removal of tissue and fixation fluids with a dehydrating fluid; subsequent saturation with a volatile intermediary solvent; and finally exchange of the volatile intermedium with a curable polymer. "Specimen preparation" is an extremely important part of the plastination process. If the specimen is not prosected and presented in a manner which will highlight the desired structure of the specimen, it may not be as useful as was intended. It is important to first plan what pertinent structures of the specimen are to be demonstrated and then prosect it accordingly. A typical fault of prosections is attempting to preserve too much detail. Hence, the final product appears cluttered. Therefore, it maybe best to highlight only the more pertinent structures to carry out the theme of the specimen. Vessels may be highlighted with colored latex, epoxy (Biodur E20), silicone, or gelatin. Excess connective tissue should be removed from nerves, vessels and other delicate structures. Muscle groups should be well-defined and cleaned of excess connective tissue. Consider removing periosteum from bone preparations. Hollow organs should be dilated to an appropriate diameter using water and then should be emptied of their contents. Emptying intestinal specimens of their

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contents is facilitated by making an incision in the organ. After the contents are evacuated and the organ is flushed, the incision may be closed using suture and the organ redilated to the desired volume with a low percentage formalin solution. Over-dilation produces a more flexible intestinal preparation. However, over-dilation will decrease inner surface detail, e.g. mucosal folds may be lost. Both fixation time (1-3 days) and concentration of solution (1-5% formalin solution) should be minimal. After fixation, the fixative is washed from the specimen using running tap water. Once the specimen has been rinsed of the fixative, it is ready for dehydration. Stained specimens may be brightened using a 0.5% to 3% hydrogen peroxide solution prior to dehydration. Freeze/fixation may be used and is especially helpful to preserve specimen color and shape. Formalin (5%) [stabilized with 105 Methanol] is placed in acetone for freeze fixation. This acetone-formalin solution also serves as the first acetone (dehydration) bath (95% acetone). After one week of fixation/dehydration, dehydration is continued by transferring the specimens into new acetone.

PRINCIPLES of PLASTINATION - GAS CURING (HARDENING)

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Curing or hardening of the polymer varies for each polymer used. This paper will reference only the standard silicone procedure. After impregnation of the specimen with the polymer-mix, the polymer must be hardened. First, the excess surface polymer is allowed to drain from the specimens and this polymer is returned to the vacuum chamber for reuse. For the S10 process, **Gas Cure with Biodur SH06** is the hardening agent. S6 is a liquid which vaporizes and reacts with the polymer and commences the process of side-to-side linkage of the polymer molecules. Side-to-side linkage produces a stronger product. Curing commences on the surface of the specimen and proceeds to the interior of the specimen. Two curing procedures have been used over the years. **Slow cure:** the specimen is held at room temperature for several weeks prior to exposure to S6 and excess polymer is blotted from its surface. Room temperature enhances S3 activity and hence end-to-end linkage occurs, which hopefully, produces a more flexible specimen. Exposure to heat (60°C oven) may also be used with this methodology. Slow cure is an older methodology and is still used, but is not necessarily a procedure of choice. The other procedure is: Fast **cure:** the impregnated specimen, shortly after impregnation and draining of the excess polymer, is exposed to a concentration of S6 vapor. In a few days, the specimen is nearly cured and may be used. Volatilization of S6 may be enhanced by bubbling air through the liquid S6. The environment for the gas cure should be dehumidified via a desiccant (calcium sulfate). An increase in humidity, in the curing chamber, may cause white silicate salt precipitation on the surface of the specimen. During fast cure, to avoid hardening of oozing polymer on the surface of the specimen, specimens should be manicured twice daily until the surface polymer has hardened. Hollow specimens should first have air blown into their lumens to void them of pools of polymer and to inflate them to their normal contour. For curing, a concentration of volatilized S6 can be directed into their lumen to assure that the organ is cured in a dilated position. Both the slow and fast cure methods utilize Biodur S6. Exposure to the curing agent (S6) is carried out in a closed chamber at room temperature. Exposure of the specimen to S6 produces a hardening of the surface polymer in the specimen after 12 to 36 hours. However, the interior of the specimen will take longer to harden and is dependent on the S6 penetrating to the depths of the specimen. The specimen maybe used before deep curing has been completed. After curing is complete, the specimen can be stored indefinitely at room temperature.