Plastination: a plastic, humane presentation of anatomical specimens

Remember the days of teary eyes in dissection halls, or your little sister leaving the dining table disgusted by the strange smell from your clothes? Yes, it was that irritating 'formalin' (40% formaldehyde). The International Agency for Research on Cancer has also classified formaldehyde as a known human carcinogen[1].

But are those days gone? Yes, at least in many parts of the world. There, anatomical specimens and cadavers are dry and rubbery, and therefore handy and user-friendly. They are durable and last indefinitely, are virtually odour-free, and may even be somewhat pliable depending on the tissue. Colour differentiation remains adequate, and even transparency can be achieved. Coloured polymer can be injected into the vessels to have further differentiation[2]. All this is due to 'plastination'- a dry way of preservation in which body cells and natural surface structures are said to retain their forms down to the microscopic level[3].

Dr. Gunther von Hagens, an innovative anatomist at the Institute of Anatomy, University of Heidelberg, Germany, invented plastination in 1977 and patented it between 1977 and 1982. The first publication on it came out in 1978. The International Society for Plastination (ISP) was established in 1986, which published the 1st edition of its journal in 1987, and holds an International Conference every alternate year. Regular workshop-based Interim meetings are also held. An index of publications on plastination is available at ISP's official website. The Institute for Plastination came into being in 1993. And at present, more than 400 plastination laboratories are in function in at least 40 countries[3]. Gunther von Hagens' "Body World" Exhibitions of human 'plastinates' tour the world and intrigue visitors by revealing the "functions, strengths, and vulnerabilities of the human body", as von Hagens sees it. Many fascinating, and sometimes 'disturbing', images of such exhibits are available online.

Plastination has been proven applicable for teaching and self-learning, medical research or educational display for the public. Medical disciplines like Gross Anatomy, Embryology, Histology, Pathology, Surgery, Orthopaedics etc. have benefited from the process- its potentials seem to be really 'plastic'.

Plastination takes the tissue through the following four basic steps:

- **Fixation:** With almost any conventional fixative.
- **Dehydration:** Mainly with acetone that replaces the water and soluble fat in tissue.
- **Forced impregnation:** The central step. A vacuum pump forces the acetone out and impregnates the tissue with a curable polymer (plastic material).
- **Hardening (curing):** By exposing the polymer-impregnated specimen to a gaseous hardener, or by UVA-light and heat.

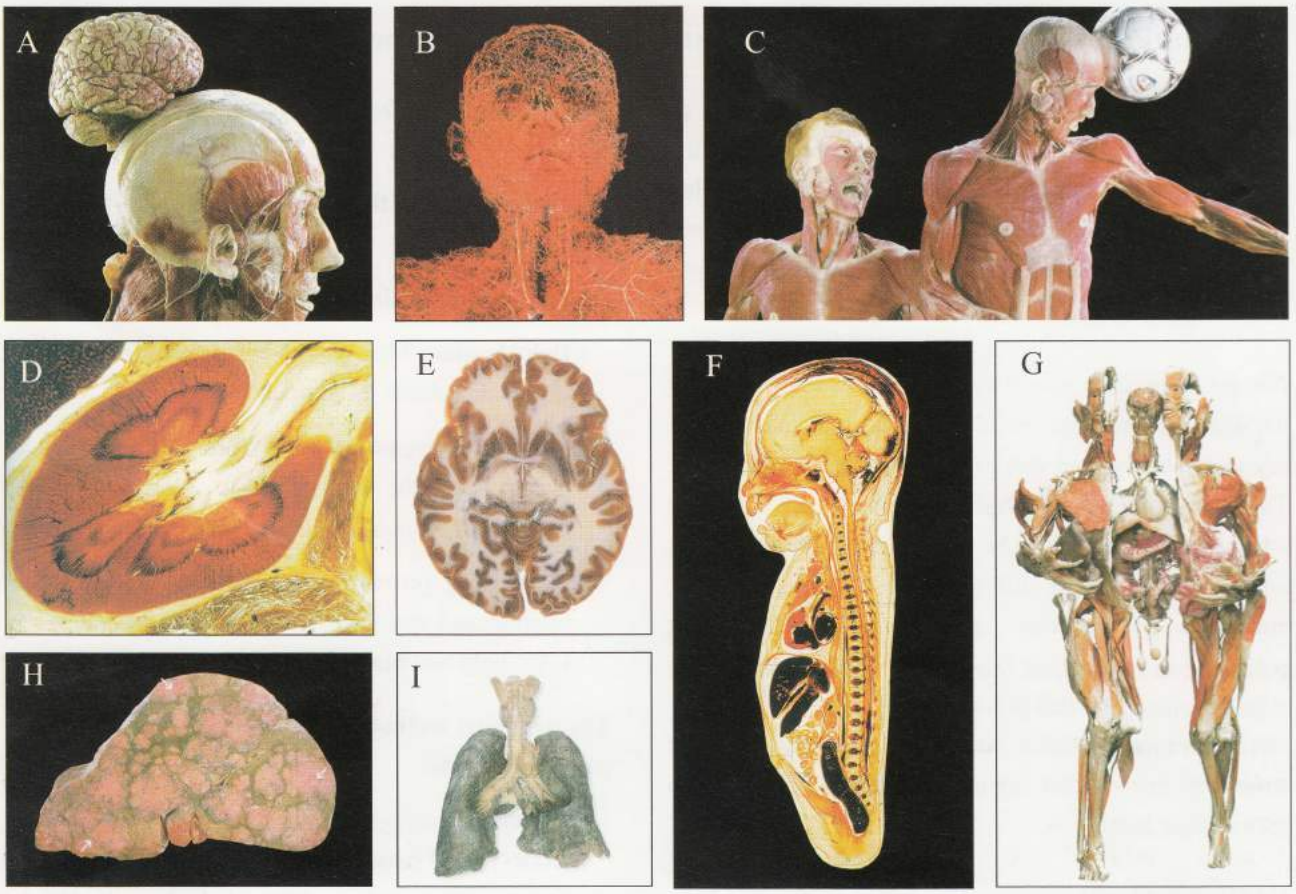
The principal methods of plastination now in practice include:

- **Silicone** (freezing) or
  COR-TECH (room temperature) method:
  for preparing opaque and flexible body parts, organs or whole bodies.
- **Epoxy** method:
  for preparing thin, transparent, and firm body and organ slices (usable for histological studies)
- **Polyester** method:
  for preparing semitransparent and firm brain slices, with excellent differentiation between grey and white matter

Almost any human tissue of almost any size can be plastinated. The following page shows several examples of human plastinates revealing anatomy, function and disease.

Plastination is a tedious process. The average time needed for whole human body plastination is 1,500 hours[2]. But it is understood that good dissection is the baseline requirement- "before plastination, there is dissection"[5], and "the biggest enemy of plastinatiors is shrinkage"[5].

The remarkable characteristic of plastinates is that students are less likely to develop aversion to them than to formalinated cadavers. As would-be doctors, medical students need to be used to the presence of 'dead bodies'



Examples of plastinates revealing human anatomy, function and disease. ***A.*** *Head with the brain taken out.* ***B.*** *Intricate vascular network.* ***C.*** *Human bodies in 'suspended animation'.* ***D.*** *A cross-section of a kidney.* ***E.*** *An axial slice of the brain.* ***F.*** *A longitudinal slice of a fetus.* ***G.*** *The "organ man".* ***H.*** *Liver metastases.* ***I.*** *A smoker's lungs showing bronchogenic carcinoma. (from the Catalogue on Gunther von Hagens' "Body Worlds" exhibition.)*

by their sides as individuals once full of life, rather than as 'objects'- human body is not simply an object. La Torre et al. believe that plastination facilitates the contact of students with Anatomy[6]. It is also understandable that preservation of human cadavers should involve voluntary donation of bodies, as the use of so called 'unclaimed' dead bodies is not a logical nor an ethical choice. Closeness between the 'living' students and the 'deads' may work as a motivator for such a voluntary act.

The Department of Anatomy of Bangabandhu Sheikh Mujib Medical University is about to establish the first Plastination Lab of the country soon. But it's still a long way to go, because motivational, financial as well as man-power and man-hour problems remain.

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