THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
Popular Article
March, 2026 Vol.6(3), 728-731

Cast preparation of the Brain

Achla Shyam[1], Payal Jain[2], Rakhi Vaish[3], Nidhi Gupta[4], Rakesh Kumar Barhaiya[5], Shashi Tekam[6]
Department of Veterinary Anatomy, College of Veterinary Science and A.H. Nanaji Deshmukh Veterinary Science University, Jabalpur (M.P.)
[1]Post graduate student, Department of Veterinary Anatomy
[2]Professor and Head, Department of Veterinary Anatomy
[3,4,5,6,] Assistant Professor, Department of Veterinary Anatomy
doi.org/10.5281/ScienceWorld.19332547

Introduction

The internal spaces of the brain, such as ventricular system and its blood vessels, form intricate three-dimensional networks that are difficult to appreciate through routine dissection or two-dimensional images alone. To overcome this limitation, anatomists have long used casting techniques, in which hollow structures are filled with a substance that hardens to create a three-dimensional replica of the original space. This approach allows the otherwise hidden architecture of cerebral vessels and cavities to be visualized in a durable form that can be handled, studied and preserved for teaching and research. Over time, both the materials and techniques used for preparing brain casts have evolved considerably, reflecting advances in chemistry, imaging and laboratory practice.

Materials and methods

Earlier, brain casting relied on readily available solidifiable media such as waxes, gelatin, natural resins and early acrylic formulations, which had several **limitations** including poor microvascular penetration, distortion and inconsistent results and low keeping quality. To overcome drawbacks of the previous method modern low-viscosity polymers and standardized protocols that provide better capillary filling, durable casts and compatibility with high-resolution imaging are evolved.

Modern materials and methods

Modern brain casting methods are chosen to match the purpose of the cast as in teaching, SEM/morphometry, surgical simulation. The two main modern approaches are:

- elastomeric silicone injection (coloured RTV silicones) and
- rigid methacrylate/acrylic resins (Batson's/Mercox). There are also epoxy and polyurethane variants, plus hybrids using 3D printing and plastination for enhanced displays.

Silicone (RTV / two-part pigmented silicone)

Silicone mixes yield flexible, brightly coloured casts that are robust in teaching labs, are safer to handle than volatile monomers, and permit partial dissection so anatomical relations remain visible. It commonly uses low-viscosity two-part RTV silicone mixed with pigments, delivered through syringes and cannula.

Modern resin-based brain casting (corrosion method)

These resins capture very fine microvascular detail and are preferred for high-resolution studies and microscopy because the cured casts are rigid and can be examined at high magnification. It typically uses commercial methacrylate vascular casting resins such as Batson or Mercox mixed with their catalyst, injected through syringes or low-pressure pumps using cannula.

Procedure

1. **Specimen preparation**

   Obtain a **fresh cadaveric head** or intact brain from an abattoir or institutional source with permission. Fresh specimens perfuse better than old fixed ones. Process as soon as possible to reduce clotting and vessel collapse.

2. **Exposure of injection sites and Cannulation**

   Carefully expose the major cervical vessels and secure a cannula in the **common carotid artery with ligatures** for arterial inflow. Tie off side branches if needed to direct flow. Keep the **jugular vein open** for venous outflow during flushing and injection. If the ventricular system is to be cast, create a small burr hole in the skull and introduce a fine cannula into the **lateral ventricle**, securing it to prevent leakage

3. **Flushing**

   Flush the arterial system using warm saline with or without heparin. to remove blood clots until the venous outflow runs clear

4. **Preparation of the casting medium**

   - Silicone: mix the silicone base, catalyst and pigment as instructed, avoiding air bubbles.
   - **Resin:** mix resin with its catalyst exactly by weight; resin pot life is short. Degas if possible to reduce bubbles.

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 25/03/2026

5. **Colour-coding of vessels**

For demonstration of both arterial and venous systems, prepare separate coloured media, commonly red for arteries and blue for veins, to distinguish the two networks clearly.

6. **Injection**

Prime the cannula to remove air and inject the casting medium **slowly under low, steady pressure** through the common carotid artery, watching the venous outflow for appearance of the medium as confirmation of capillary filling; avoid forceful injection to prevent rupture or leakage.

7. **Curing**

Allow the injected medium to cure fully at room temperature as per manufacturer guidance, silicone remains flexible after curing, whereas resin cures rigidly and may release heat during polymerization

8. **Exposure of the cast**

After curing, silicone casts are exposed by careful dissection while preserving anatomical relationships, whereas resin casts undergo controlled alkali maceration (corrosion casting) in which the cured specimen is submerged in an alkali bath to dissolve surrounding tissues and obtain a free rigid cast. Recent studies note that some methacrylate resins can shrink while curing, so this must be considered during measurements, and that gentler alkali solutions can be as effective as stronger ones for tissue removal while being safer for delicate casts.

Conclusion

Cast preparation of the brain remains relevant because it helps convert complex internal spaces into clear three-dimensional models that can be easily studied and preserved. However, the technique also has limitations and practical challenges. Procurement of suitable brain specimens is often difficult and requires ethical approval, timely access to fresh material, and careful handling to prevent clotting and vessel collapse. Technical difficulties such as incomplete filling of fine vessels or ventricles, leakage at injection sites, air bubbles, and occasional rupture of fragile vessels can compromise the quality of casts. Material-related constraints, including the short working time of some resins, heat released during curing, and the hazards associated with chemical maceration in corrosion casting, further add to the practical complexity of the method. Despite these limitations, careful planning, proper preparation of specimens, controlled injection and adherence to safety practices can greatly improve outcomes. When carried out responsibly, brain casting bridges the gap between

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 25/03/2026

fragile tissue and lasting understanding, turning complex neuroanatomy into something we can actually see, hold and learn from.

References

Domagala, Z. (2021). Maceration stage in corrosion cast specimen procedure. *Folia Morphologica, 80*(4), 877–885.

Shih, K. C. J., Wu, Y., & Wang, X. (2022). Non-linear shrinkage of Batson's #17 resin during vascular casting. *Journal of Anatomy, 240*(3), 504–514

Kumar, R., Thyagaraju, K., & Velichety, S. (2023). Resin cast in situ: A technique to demonstrate the vasculature of the nervous system in a goat model. *International Journal of Anatomy and Research, 11*(2), 8619–8624.

Giuvaraşteanu, I. (2019). Scanning electron microscopy of vascular corrosion casts in biological and biomedical research. *Romanian Journal of Morphology and Embryology, 60*(3), 725–737.

Limpastan, K., Vaniyapong, T., Watcharasaksilp, W., & Norasetthada, T. (2013). Silicone injected cadaveric head for neurosurgical dissection prepared from defrosted cadaver. *Asian Journal of Neurosurgery, 8*(2), 90–92

Çırak, M., Yagmurlu, K., Soldozy, S., Norat, P., Shaffrey, M. E., & Kalani, M. Y. S. (2021). Common challenges and solutions associated with the preparation of silicone-injected human head and neck vessels for anatomical study. *Brain Sciences, 11*(1), 32.