

## 20

## Sectional anatomy and imaging processes

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## Plastination in science

The ancient human need to remind posterity of ourselves is as old as humanity itself: prehistoric rock paintings, Egyptian mummy cults, ancient art collections or historical monuments provide sufficient testimonials of this tradition to this day. It is also not surprising that in all civilisations there is an additional desire to protect one's own body and the bodies of relatives from decomposition, or at least to slow down the process. The body should not suddenly become something utterly transitory just because of death.

At the same time humans, especially in modern times, tend to suppress thoughts of death. In turn, the wish to preserve one's body beyond death also declines.

The deceased are burned, buried, or embalmed. After burial, the body decays within the life span of the next generation. Embalment with formalin solutions delays the onset of decomposition and drying by several months, and in an air-tight crypt even by several years.

With the development of plastination by Gunther von Hagens (Professor for Anatomy, Dalian Medical University, China), a new era in the conservation of human (and in recent years also animal) bodies has begun. Plastination developed in the 1980s as an answer to new requirements on section modelling which were confronting anatomy. Today, further development of the plastination process can produce permanent preparations of organs and whole bodies which are far superior in quality to conservation methods previously known, such as plastic block moulding or wax impregnation.

Plastination is a very elaborate and complex process which requires a great deal of knowledge and experience. In the course of this preparation technique, a high-grade polymer replaces the body's own tissue fluids in a vacuum and the polymerisation process ultimately permanently protects every body cell of the specimen, and hence the entire body of the person or animal, from decomposition.

Body cells and natural surface relief remain in their original form and are preserved into the microscopic range, and the structural state after plastination is largely identical to the state before conservation.

Today, plastination is applied world-wide in more than 400 institutes of anatomy, pathology, biology and zoology.

The International Society for Plastination was founded in 1986. The journal of the society, the "Journal of the International Society for Plastination", has appeared since 1987.

Plastination, a process for preserving dead human or animal organs and organ systems up to whole bodies, has also been employed for commercial purposes in recent years. Anatomical preparations have been presented in public exhibitions which are often quite remote from academic presentations. These practices have often met with harsh criticism from ethical as well as legal perspectives.

However, the plastination process can be employed far more suitably for the production of teaching and demonstration material, which is of great didactic value in anatomical exercises of human and veterinary medicine. There are a multitude of process technologies that can be applied today – from whole-body plastination to plastination of individual organs or organ systems up to the plastination of sections.

With the help of diamond saws, anatomical slices with a width as small as 0.5 mm can be produced by slice plastination, permitting close examination of the finest anatomical structures in the three-section dimensions of space (transversal, sagittal, and longitudinal) even with the naked eye (Fig. 20-1, 3, 8, 18, 19, 35 and 37).

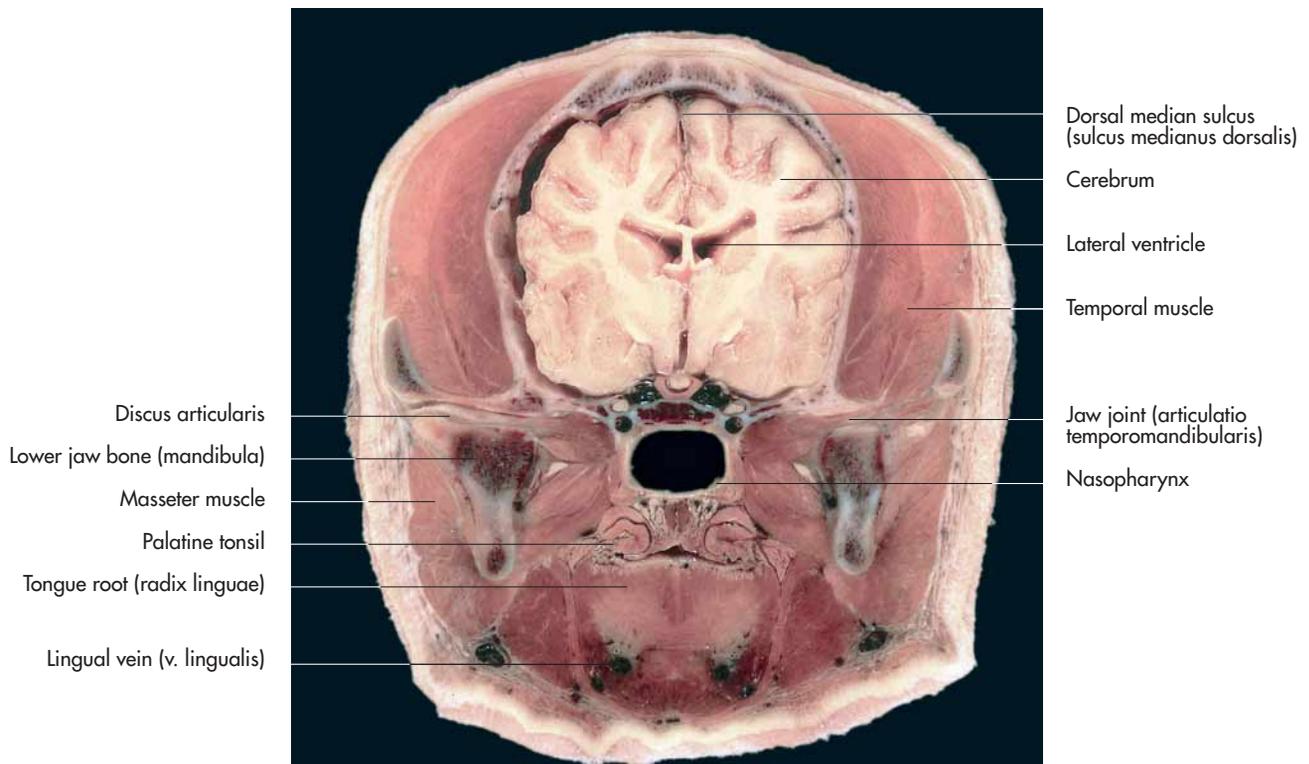
Slice plastination is also a suitable process for more easily and precisely assigning the anatomical basic structures of organs and organ systems by using the findings collected with the help of modern imaging processes such as computer tomography (CT), magnetic resonance imaging (MRI), or ultrasound sonography (US). In addition, three-dimensional images can also be created from a sequence of plastination slice series, which then can serve as anatomical templates to interpret digital 3-D reconstructions of CT and MRI images.

This technology is enormously helpful for teaching purposes and in clinics, since it opens up the possibility of creating interrelationships between topographic-anatomical structure images and digitally-created images for students as well as for medical professionals in practice.

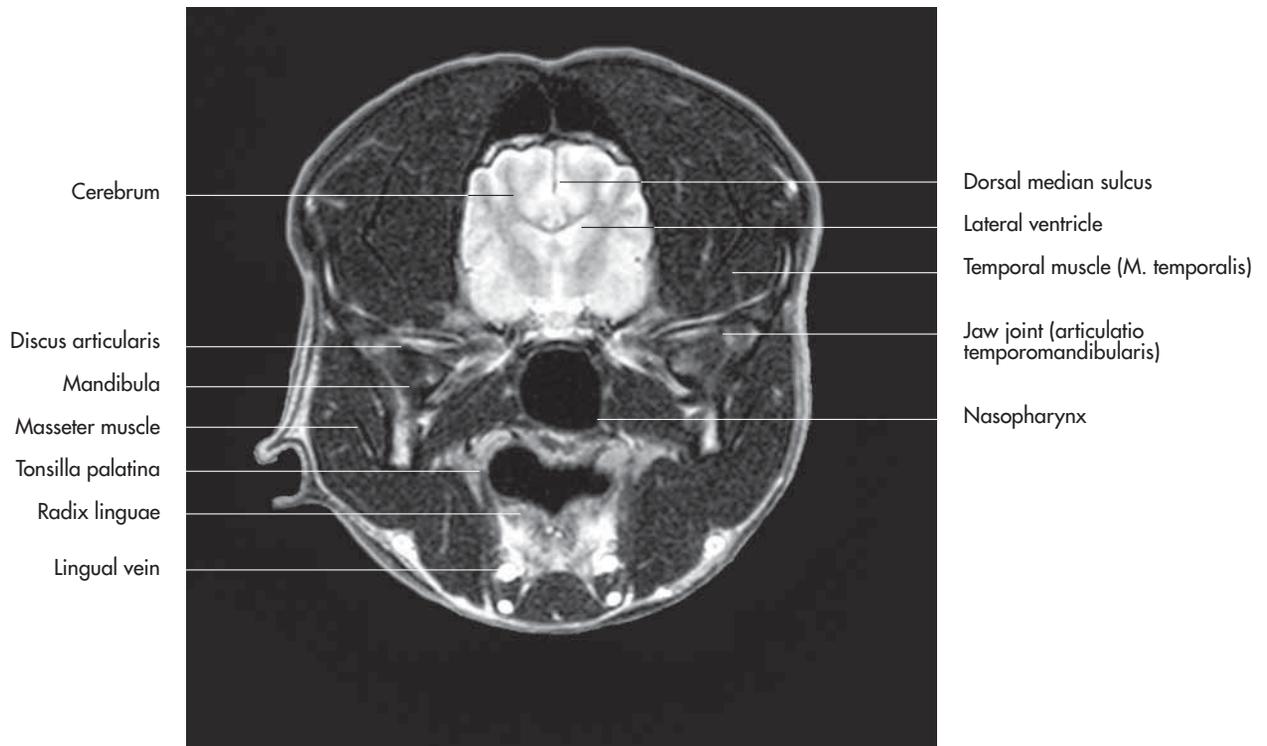
In sectional anatomy, regions for improved didactic understanding are also reproduced by schematic drawings in various cutting planes (Fig. 20-5 to 7, 10 to 17 and 20 to 23).

Slice plastination can also be employed for scientific research purposes. The great advantage of this process is that it does not alter the position of anatomical structures relative to one other. Structures of the connective tissue and their integration in the periosteum, for example, remain preserved.

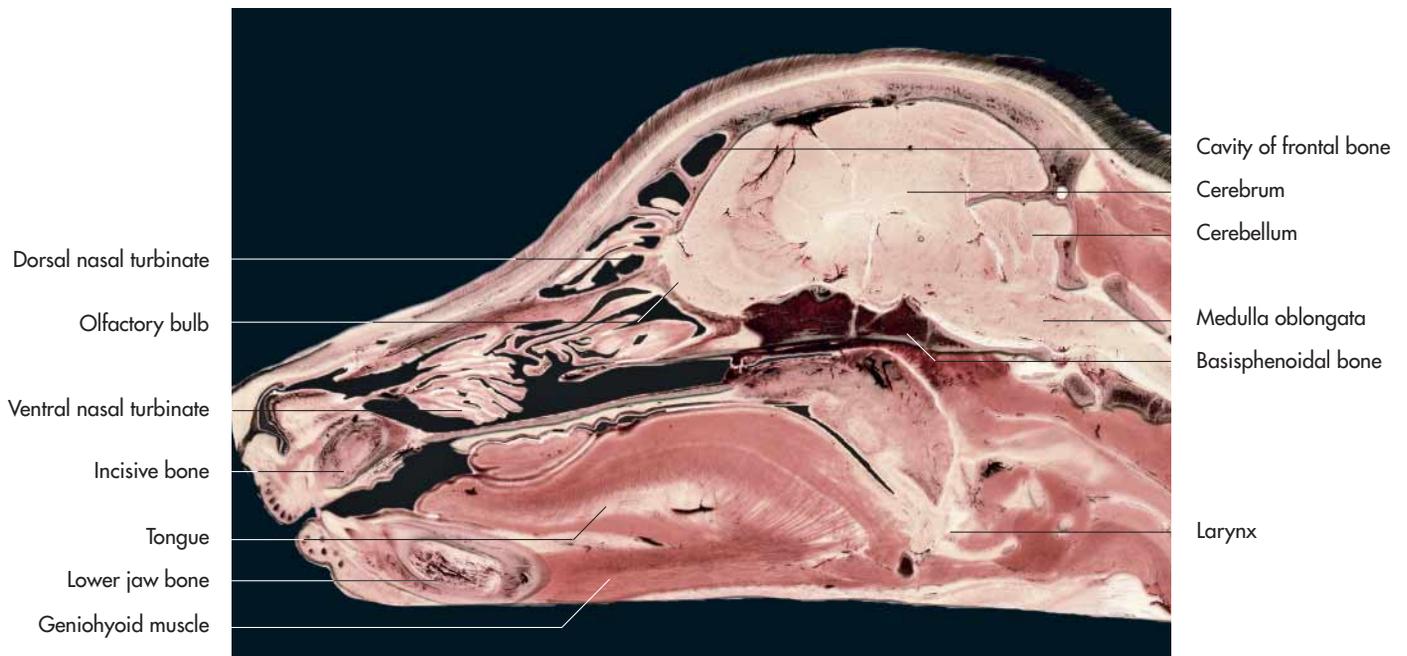
The connective tissue between the structures is also not destroyed as it would be, for example, with conventional dissection or with



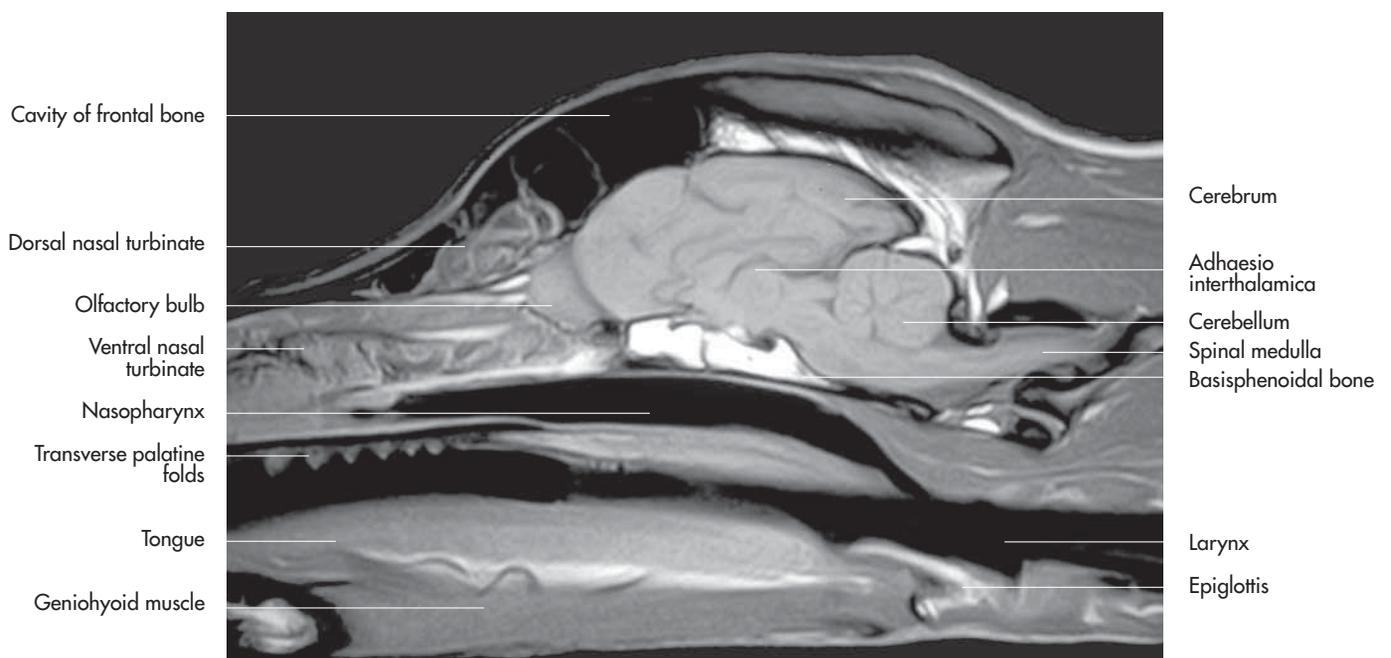
**Fig. 20-1.** Transversal section through the head of a dog at the level of the temporomandibular joint (S-10 slice plastination), preparation Prof. Dr. W. Künzel, Vienna.



**Fig. 20-2.** Transversal section through the head of a dog at the level of the temporomandibular joint (magnetic resonance imaging).



**Fig. 20-3.** Paramedian section through the head of a dog (E-12 slice plastination).



**Fig. 20-4.** Paramedian section through the head of a dog (magnetic resonance imaging, T1-weighting), image by Dr. Isa Foltin, Regensburg.