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L P Mark, D L Daniels and T P Naidich

AJNR Am J Neuroradiol 1993, 14 (6) 1355-1358
<http://www.ajnr.org/content/14/6/1355.citation>

This information is current as
of April 17, 2024.

The Fornix

Leighton P. Mark,¹ David L. Daniels,¹ and Thomas P. Naidich²

The fornix, which is readily demonstrated by magnetic resonance (MR), is an arch-shaped³ major white-matter tract of the limbic system. The curvilinear configuration (Fig 1) of the fornix is similar to the shape of the other components of the limbic system (2).

The main parts of the fornix are the crura, the commissure, the body, and the columns (Fig 1). Each *crus* (Fig 2) arises from the fimbria, which is a fringe-like medial extension of the alveus in the temporal lobe that extends backward and diverges from the hippocampal tail (3). The crura arch under the splenium of the corpus callosum and form part of the anterior-inferior medial wall (Fig 3) of the atria of the lateral ventricles (4). The crura are connected by the psalterium⁴ or *commissure* of the fornix (Figs 1 and 2). More anteriorly, the crura converge toward the midline to form the *body* of the fornix, which is attached to the inferior surface of the septum pellucidum (Fig 4). Just above the foramen of Monroe, the body of the fornix separates into *columns*, which curve inferiorly and divide at the level of the anterior commissure, with many of the fibers extending to the mamillary bodies (Figs 1 and 5).

The fornix is the primary efferent system from the hippocampus. The fibers of the fornix originate from the cornu ammonis, the subiculum, and the dentate gyrus. These fibers traverse the alveus and converge to form the fimbria, which thicken to become the fornix. Some fibers of the fimbria extend over the splenium of the corpus callosum to contribute to the supracallosal gyrus, the dorsal fornix, and septum pellucidum gray matter. The columns of the fornix divide at the level of the anterior commissure (Figs 1 and 2) with approximately 25% of the columnar fibers forming precommissural fibers extending to the septal, lateral preoptic, diagonal band and anterior

hypothalamic nuclei (6). The remainder of the columnar fibers form postcommissural fibers behind the anterior commissure projecting predominantly to the mamillary bodies, though some of the fibers project to the midbrain tegmentum, the anterior thalamic nucleus, and the bed nucleus of the stria terminalis (7).

The arched fornix and adjacent structures are easily seen on sagittal T1-weighted MR images (Fig 6). The body of the fornix is located below the septum pellucidum and body of the lateral ventricles. The commissure of the fornix is positioned beneath the posterior aspect of the corpus callosum. The cistern of the velum interpositum lies beneath the body and commissure of the fornix (Fig 7). In MR, the direction of the fornical displacement is useful to locate masses. The fornix would be displaced superiorly by a mass in the cistern of the velum interpositum (Fig 8) and inferiorly by a mass in the body of the lateral ventricle.

Suggested Reading

1. Poritsky R. *Neuroanatomy: a functional atlas of parts and pathways*. Philadelphia: Hanley and Belfus, 1992:39–40
2. Mark LP, Daniels DL, Naidich TP, Borne JA. Limbic system anatomy: an overview. *AJNR: Am J Neuroradiol* 1993;14:349–352
3. Mark LP, Daniels DL, Naidich TP, Yetkin Z, Borne JB. The hippocampus. *AJNR: Am J Neuroradiol* 1993;14:709–712
4. Naidich TP, Daniels DL, Haughton VM, Williams AL, Pojunas K, Palacios E. Hippocampal formation and related structures of the limbic lobe: anatomic-MR correlation. I. Surface features and coronal sections. *Radiology* 1987;162:747–754
5. Williams PL, Warwick R, Dyson M, Bannister LH. *Anatomy of the human body*. 37th ed. London: Churchill Livingstone, 1989:1039
6. Carpenter MB, Sutin J. *Human neuroanatomy*. 8th ed. Baltimore: Williams & Wilkins, 1983:630–632
7. Nieuwenhuys R, Voogd J, van Huijzen C. *The human central nervous system: a synopsis and atlas*. 3rd ed. New York, Berlin: Springer-Verlag, 1988:334–343

¹ Department of Radiology, Medical College of Wisconsin, Milwaukee, WI 53226. Address reprint requests to Leighton P. Mark, MD, Department of Diagnostic Radiology, Neuroradiology Section, Medical College of Wisconsin, Froedtert Memorial Lutheran Hospital, 9200 West Wisconsin Ave, Milwaukee, WI 53226.

² Department of Radiology, Baptist Hospital of Miami, Miami, FL 33176.

³ *Fornix* means arch or brothel. In Roman times prostitution was practiced under the archways that opened onto the streets. The word *fornicate*, which is derived from the word *fornix*, therefore, means “to go under the arch” (1).

⁴ *Psalterium* or *lyra* refers to its resemblance to the harp (5).

Index terms: Brain, anatomy; Anatomic moments

AJNR 14:1355–1358, Nov/Dec 1993 0195-6108/93/1406–1355 © American Society of Neuroradiology

Fig. 1. Arch-like configuration of the fornix positioned under the corpus callosum. The crura of the fornix are connected by the psalterium, or commissure, of the fornix under the posterior aspect of the corpus callosum. The columns of the fornix divide into fibers that traverse anterior and posterior to the anterior commissure to form the precommissural and post-commissural fornix fibers, respectively. The postcommissural fibers project to the mamillary bodies. Some fibers project to the anterior thalamic nucleus (adapted from Nieuwenhuys et al [6]).

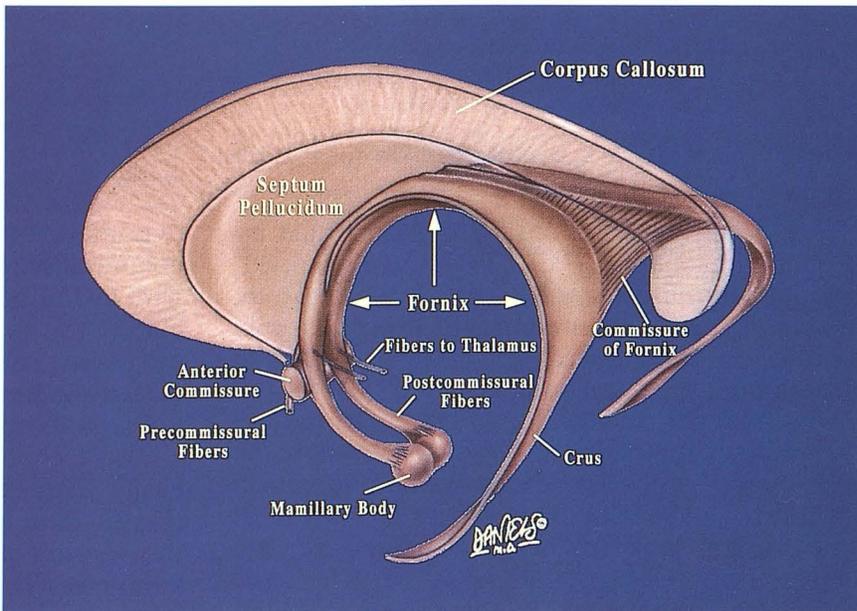
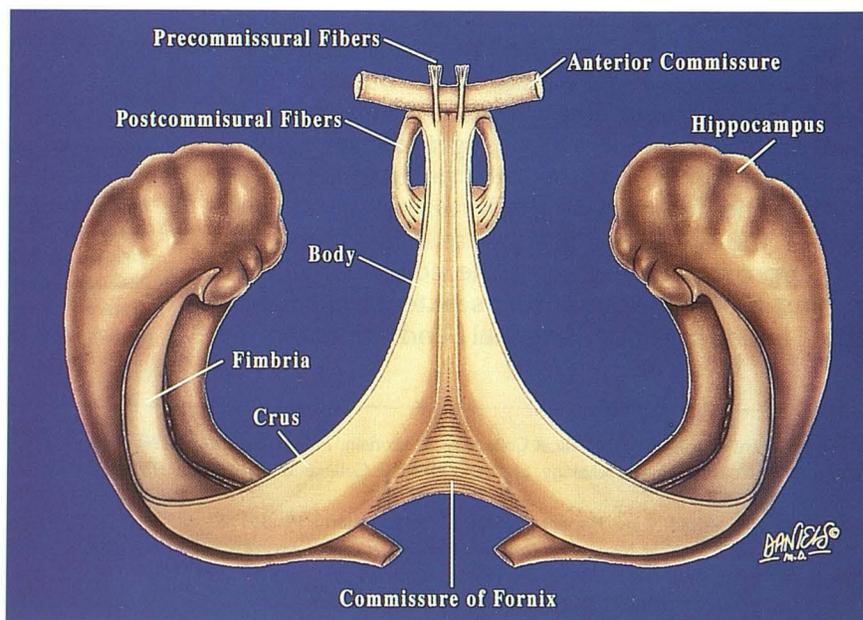


Fig. 2. The fornix as viewed from above. The fimbria thickens to form the crus of the fornix, which diverges from the axis of the hippocampal tail. The crura, which are connected by the psalterium, converge toward the midline to form the body of the fornix. The fornix divides into the pre- and postcommissural fibers at the level of the anterior commissure (adapted from Nieuwenhuys et al [6]).



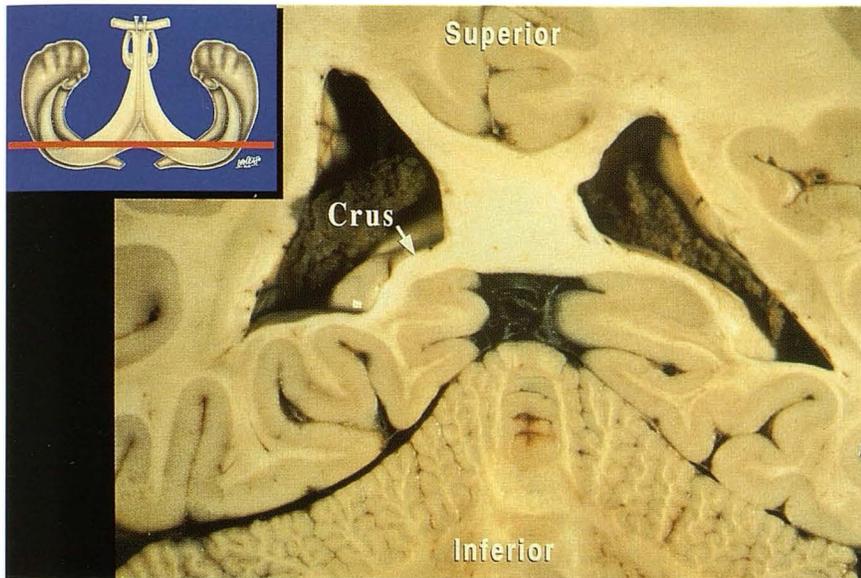


Fig. 3. Coronal anatomic section through the posterior fornix, as indicated on the smaller reference image, showing the crura of the fornix, which help form the anterior-inferior medial borders of the atria of the lateral ventricles.

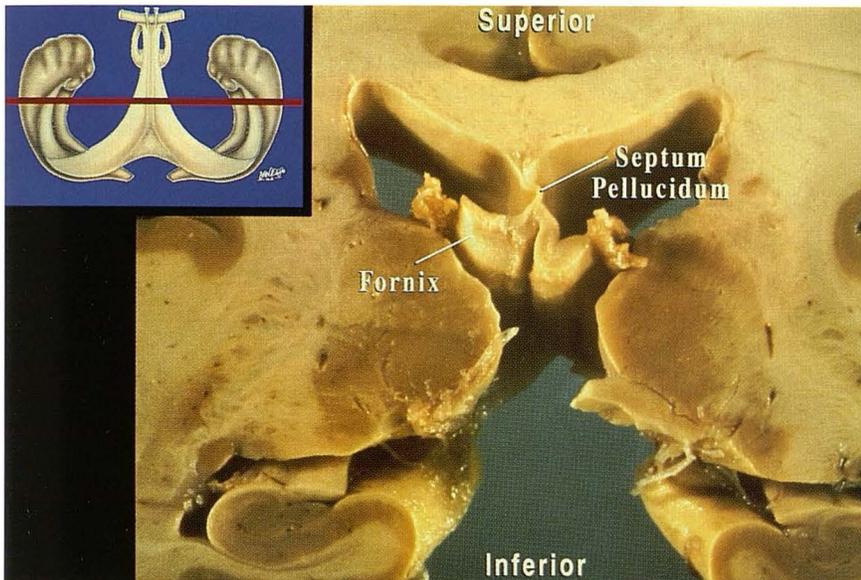


Fig. 4. Coronal anatomic section with a smaller companion reference drawing shows the midline position of the body of the fornix, which attaches to the inferior surface of the septum pellucidum.

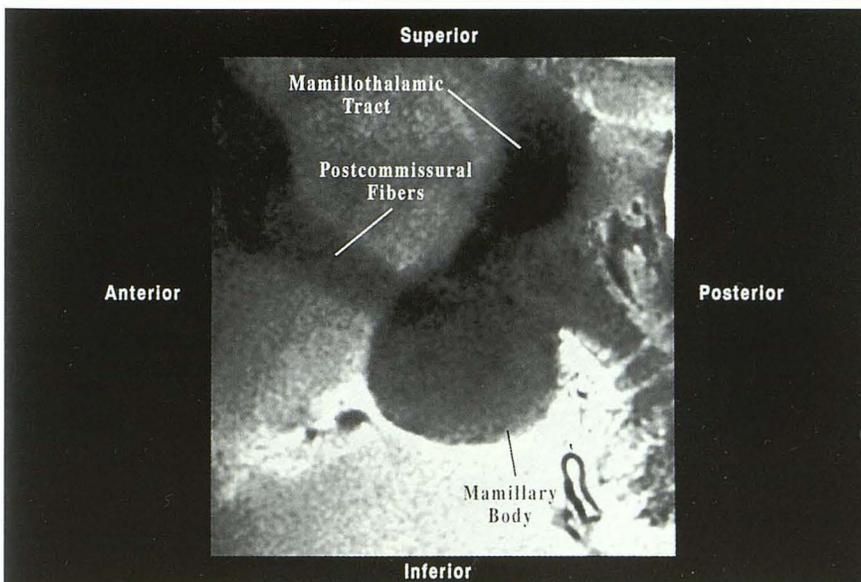


Fig. 5. High resolution (field of view, 4 cm) sagittal T2-weighted MR image of a specimen showing the postcommissural fibers of the fornix extending to the mamillary body. Also shown is the mamillothalamic tract projecting superiorly away from the mamillary body.

Fig. 6. Sagittal T1-weighted clinical MR image shows the fornix positioned below the lateral ventricle (volume averaged with the septum pellucidum) but above the cistern of the velum interpositum, which is traversed by the internal cerebral vein.

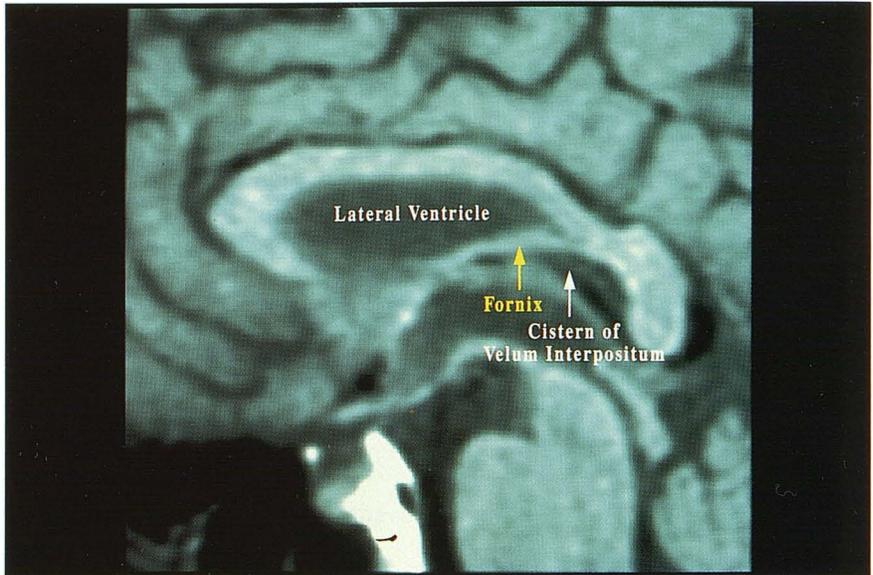


Fig. 7. Sagittal schematic showing the body of the fornix positioned inferior to the septum pellucidum. More anteriorly, however, the arching fornix is located posterior to the septum pellucidum. The cistern of the velum interpositum is inferior to the body of the fornix but above the third ventricle. The choroid plexus (red) is illustrated at the upper aspect of the third ventricle. The green arrow indicates the position of the foramen of Monro. The postcommissural fibers of the fornix extend posterior to the anterior commissure but anterior to the foramen of Monro.

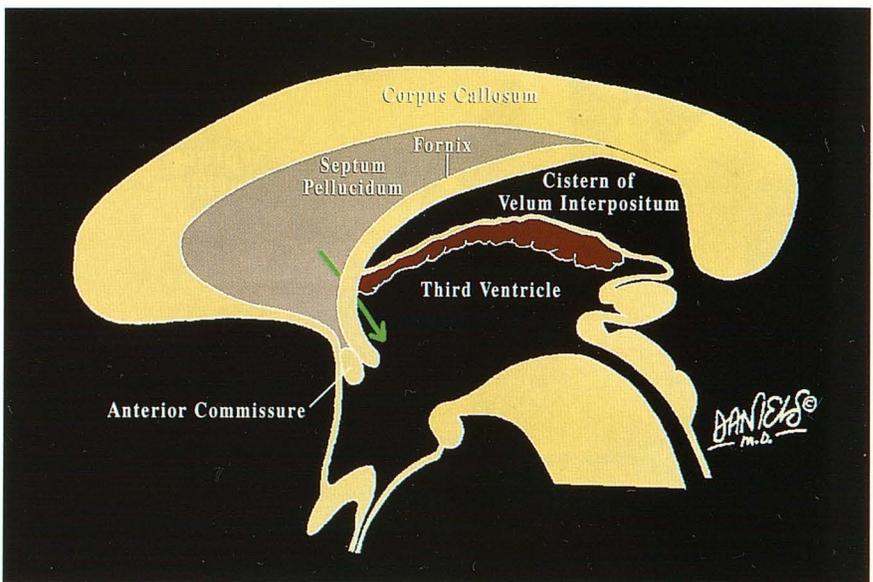


Fig. 8. T1-weighted sagittal MR image demonstrates superior displacement of the fornix by a cyst in the cistern of the velum interpositum.

