

A view of Liliequist's membrane through an endoscope- A case report.

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Abstract: Liliequist's membrane is an important surgical landmark in various neurosurgical operations. The structure of the Liliequist's membrane, as reported in the literature, varies considerably. Most of the anatomic studies of Liliequist's membrane have been reported following removal of both the frontal lobes. This report presents the image of Liliequist's membrane as viewed endoscopically from a retrosigmoid, posterior cranial fossa approach, in a formalin fixed cadaver. The images provided, define its anatomic features and boundaries, as well as its relationship with surrounding neurovascular structures.

Key words – Liliequist membrane, endoscope, retrosigmoid, posterior cranial fossa

I. Introduction

Liliequist's membrane is a complex and variable arachnoidal structure. It may be absent but when present, is either a single membrane or two-leaved membrane. Various studies have attempted to define its structure, boundaries and relationships. It is an important structure when approaching the interpeduncular fossa or for ventriculostomy for hydrocephalous, as not opening it may cause the failure of endoscopic third ventriculostomy (Buxton et al. 1998). Therefore it is necessary to do a proper pre-operative Magnetic Resonance imaging for presence or absence of Liliequist membrane or other membranes, located in the prepontine cistern (Yad Ram Yadav et al. 2012). In the present study we tried to study the Liliequist's membrane endoscopically through the posterior cranial fossa approach to define its boundaries and relationships.

II. Material & Methods

Two formalin-fixed cadaveric heads were subjected to endoscopic exploration of Liliequist's membrane through a posterolateral endoscopic access to the retroinfundibular fossa and interpeduncular cistern via a superomedial extension of the retrosigmoid approach transgressing the tentorial hiatus. The study was performed using Richard Wolff 2.0 mm and 5.0 mm diameter rigid endoscopes at viewing angles of 0° and 30°. In one of the cadavers the Liliequist's membrane was exposed in its entirety (Fig.1).

III. Results

In our specimen Liliequist's membrane was a single membrane that arose anteriorly from the arachnoid covering the dorsum sellae, posterior clinoid processes, posterior petroclinoid folds, and adjacent tentorial edge (Fig.1). A posterosuperior free border was seen extending between the two oculomotor nerves in front of the Basilar artery. After removing the Liliequist's membrane posterior cerebral artery, posterior communicating artery, optic chiasma and pituitary stalk were visualized in the interpeduncular fossa (Fig.2).

IV. Discussion

In 1956, Liliequist confirmed radiographically a membrane that was located between the interpeduncular and chiasmatic cisterns using pneumoencephalography. This membrane was also clearly identified on his anatomic dissections with a free border in front of the Basilar artery. Zhang and An (2000) described Liliequist's membrane as a "double-layer fold" of the arachnoid mater, continuous with the arachnoid mater covering the tentorium. Froelich SC et al. (2008) described it as a complex and variable structure of the basal cisterns. More recently Song-tao Qi et al (2011) reinvestigated ambient cistern system and its related arachnoid membranes. They stated that the perimesencephalic membrane is a set of inner arachnoid membranes surrounding the midbrain at the level of the tentorial incisura and the ambient cistern is supratentorial cistern system, which is located above the level of the tentorial edge and perimesencephalic membrane

Liliequist's membrane's endoscopic appearance varies and it is not always seen during ventriculostomy. It may be because the Liliequist's membrane and the third ventricular floor are opened simultaneously in most instances, therefore it cannot be identified as a separate membrane. But in the present study it is clearly evident (fig.1 and

2) with its free border in front of the basilar artery. Yasargil MG et al. (1976), describing the basal cisterns as a “road map” to access vascular or neoplastic lesions stated that Liliequist's membrane “stretches like a curtain from one mesial temporal surface to another”. Matsuno et al. (1988) identified two distinct membranous sheets: the first, a diencephalic membrane, which extends upward and attaches to the diencephalon posterior to the mammillary bodies, separates the interpeduncular and chiasmatic cisterns systems; and the second, a mesencephalic membrane, which extends backward and attaches along the pontomesencephalic junction, separates the interpeduncular and prepontine cisterns. Brasil and Schneide (1993) described Liliequist's membrane as three continuous intercisternal walls: right and left carotid-interpeduncular walls and a central chiasmatic-interpeduncular wall. Lü and Zhu (2005) identified a pair of diencephalic-mesencephalic membranes that join the diencephalic and mesencephalic leaf with a posterior free border between the attachment to the lateral margin of the mammillary body and the attachment to the mesencephalic leaf.

FIGURES

Fig.-1

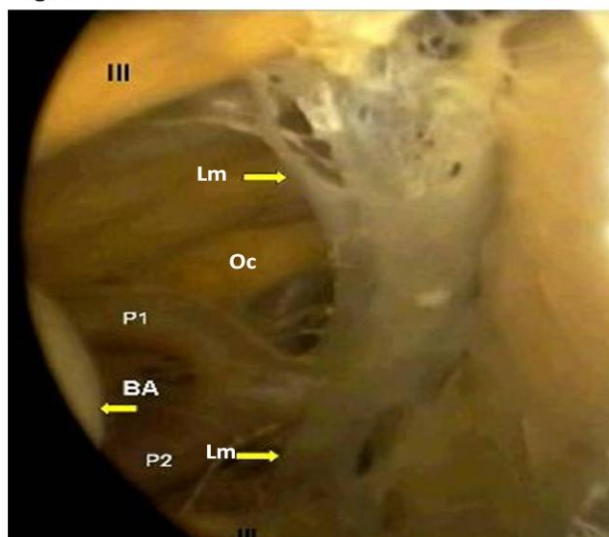
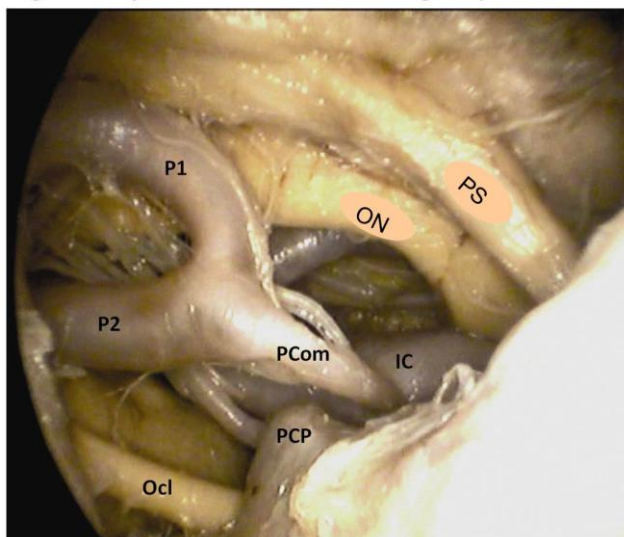


Fig- 1 Liliequist membrane

Lm- Liliequist membrane, P1 & P2- Posterior cerebral artery, III- Occulomotor nerve, PC- Posterior communicating artery, Oc – Optic chiasma, BA- Basilar artery

Fig.-2 – Interpeduncular fossa after removing Liliequist membrane



Note- Please put this photograph

Fig.-2 Interpeduncular fossa after removing Liliequist membrane

P1 & P2- posterior cerebral artery, Ocl- Occulomotor nerve, PCom- Posterior communicating artery, ON – Optic nerve, IC- Internal carotid artery, PCP- posterior clinoid process, PS- pituitary stalk

V. Conclusion

It is necessary to understand the anatomy of Lilliequist's membrane as it is important, particularly to improve current and forthcoming microsurgical and endoscopic neurosurgical procedures. It also acts as an important surgical landmark in various interpeduncular fossa neurosurgeries and in the pathophysiology of suprasellar arachnoid cysts and perimesencephalic hemorrhage.

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