Reunión Interinstitucional Hospital Simón Bolívar

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INTRODUCCIÓN

- Mejor comprensión fisiopatología
- Herramientas diagnósticas y terapéuticas
- Advenimiento del concepto de neurocirugía mínimamente invasiva
- Se retoma importancia de NEUROENDOSCOPIA
- Experiencia en dos instituciones
- Se excluye neuroendoscopia espinal y de base de cráneo

APLICACIONES

- **DIAGNÓSTICAS**
  - BIOPSIAS
- **TERAPÉUTICAS**
  - RESECCIÓN TUMORES
  - FENESTRACIÓN
  - TERCER VENTRICULOSTOMIA

INDICACIONES

- **HIDROCEFALIA**
  - Tercer Ventriculostomia
  - Fenestración Septum Pellucidum
  - Acueductoplastia
  - Colocación cateter derivación
- **TUMORES**
  - Biopsia de tumores intra y paraventriculares
  - Remoción de quistes coloides
- **QUISTES ARACNOIDEOS**
  - Fenestración quistes aracnoideos o intraventriculares
- **COLUMNA**
  - Discectomía
  - Corpectomía
  - Tumores
- **ASISTENCIA MICROCIRUGÍA**
  - Transesfenoidal

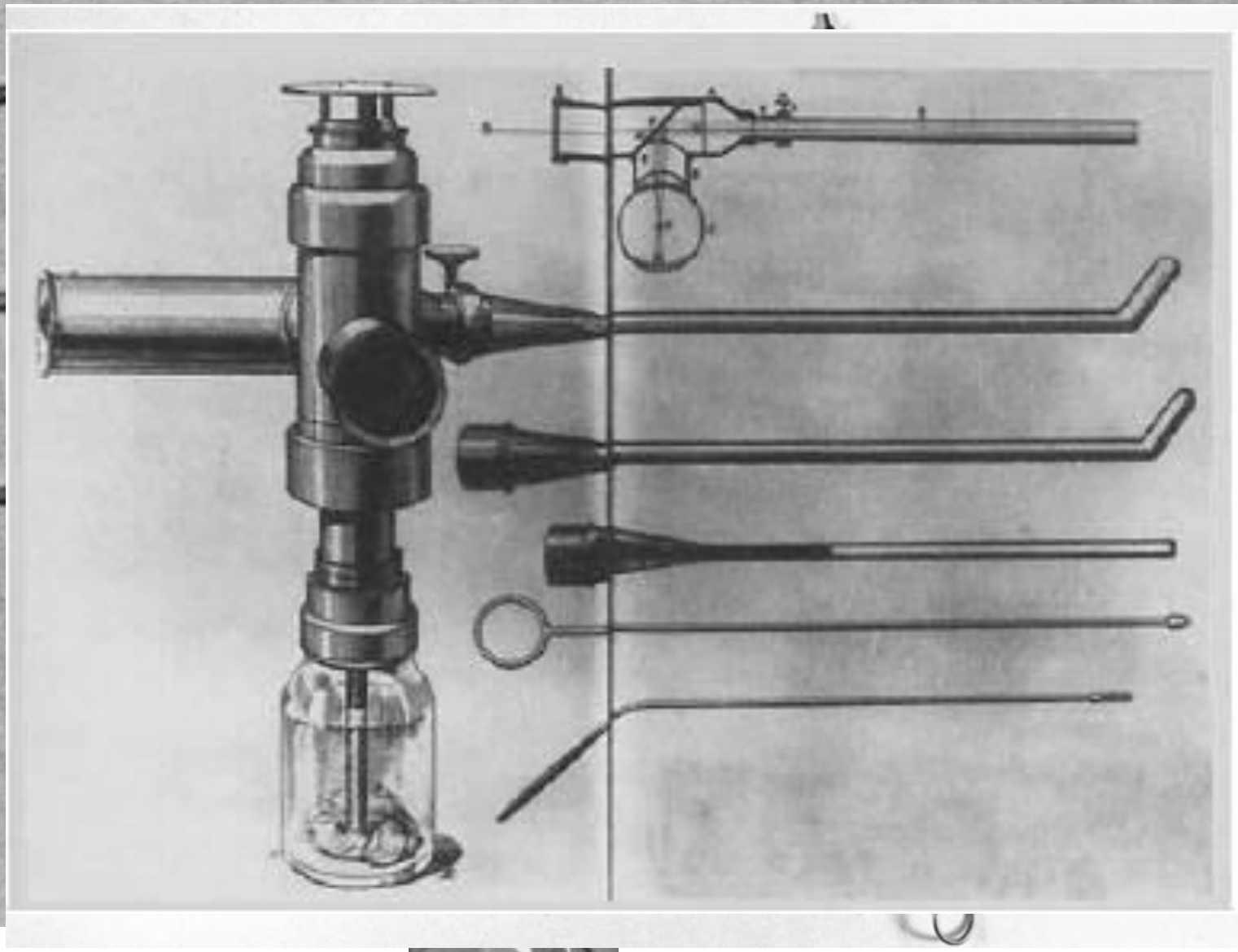
98% PRECISIÓN

HISTORIA

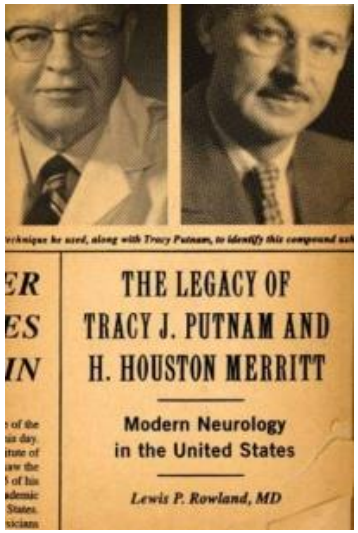
- TV por craneotomía primer TTO.

- Altas tasas de morbi – mortalidad.

Neurosurg. Focus / Volume 19 / December, 2005



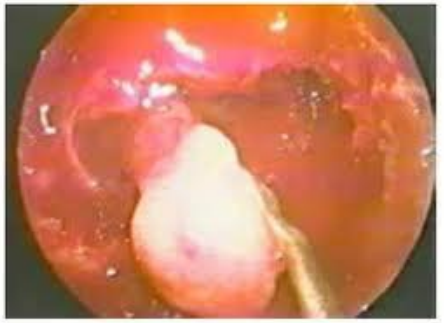
HISTORIA NEUROENDOSCOPIA



T JPutnam.
1934

H. F. McNickle.
1947.

Guiot.
1973



INDICACIONES HISTORICAS

- Estenosis acueductal.
- Tumores del tallo cerebral.
- Estenosis idiopática de foramen Luschka y magendie.
- Malformación de Dandy Walker.
- Hidrocefalia 2ria a HIV.

Neurosurg. Focus / Volume 19 / December, 2005

- Avances en los sistema de derivación en los últimos 30 años dejaron de lado la neuroendoscopia.

TECNOLOGÍA

- Fibra óptica.

- Lentes tecnológicos – alta resolución.

REDESCUBRIMIENTO DE LA NEUROENDOSCOPIA

- Derivación ventricular acompañada de frustración asociada complicaciones.

- Disfunción de la derivación.
- Infección.
- Migración.
- Sobre drenaje.

- Nuevamente estudio de la Neuroendoscopia.

AVANCES

- Nuevos y modernos tipos de lente.

- 1966, Hopkins y Storz.
- Endoscopio rígido.
- Lente SELFOC.
- Mayores índices de refracción.

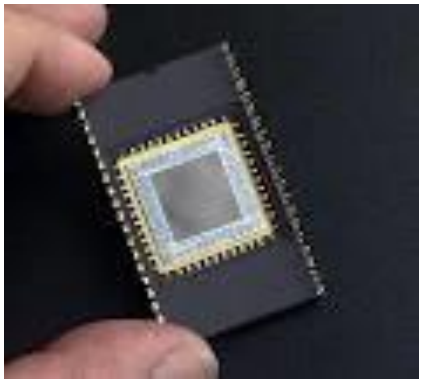
DISPOSITIVOS DE CARGA ACOPLADA

- George Smith y Willard Boyle. 1969.
- Inventaron el CCD por primera vez.

- CCD ideales para entornos de poca luz, fácilmente incorporado en el aparato del sistema.

- Mejor calidad de las imágenes transmitidas.

- Disminución del tamaño de los sistemas endoscópicos.



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FIBRA ÓPTICA

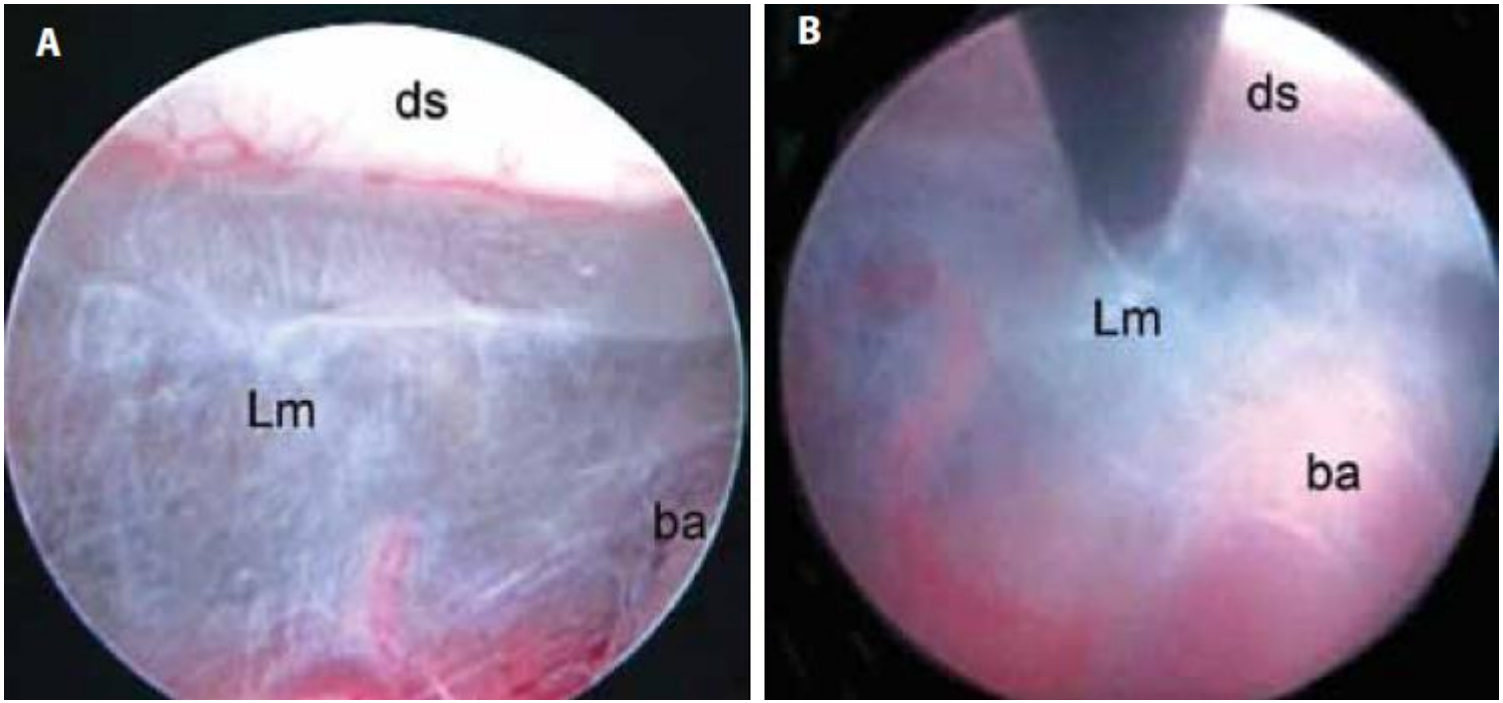
- 1950 y 1960 y se perfeccionó en la década de 1970.

- Scarff . Y Baird. 1963.
- Describe el primer uso de una "iluminación de fibra“.

- Sistema con una fuente de luz externa para ventriculoscopia.

- Luz más brillante.
- Cámaras con mayor resolución.
- Parte clave del redescubrimiento de la neuroendoscopia.

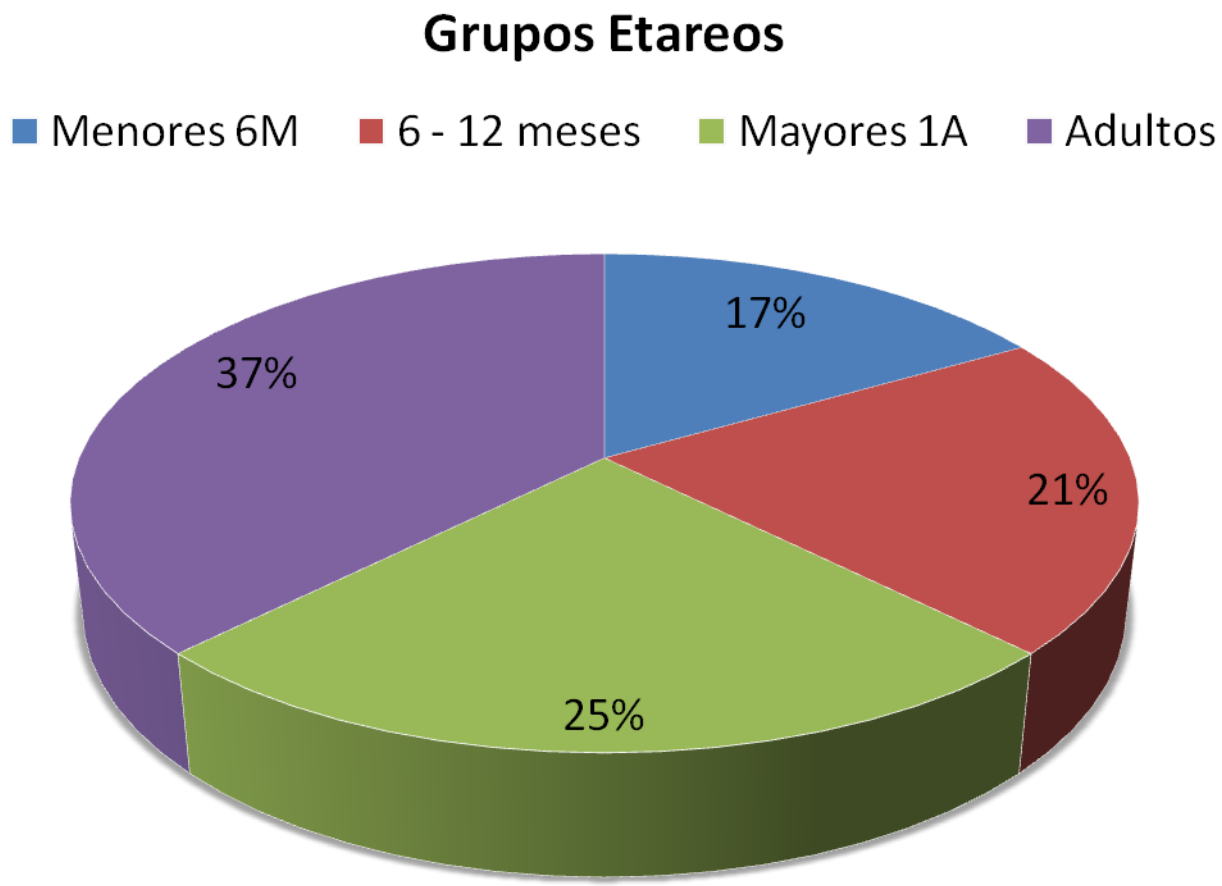
- *A medida que estas nuevas tecnologías se fueron incorporando en el endoscopio moderno, los neurocirujanos comenzaron a reconsiderar el campo de la neuroendoscopia.*



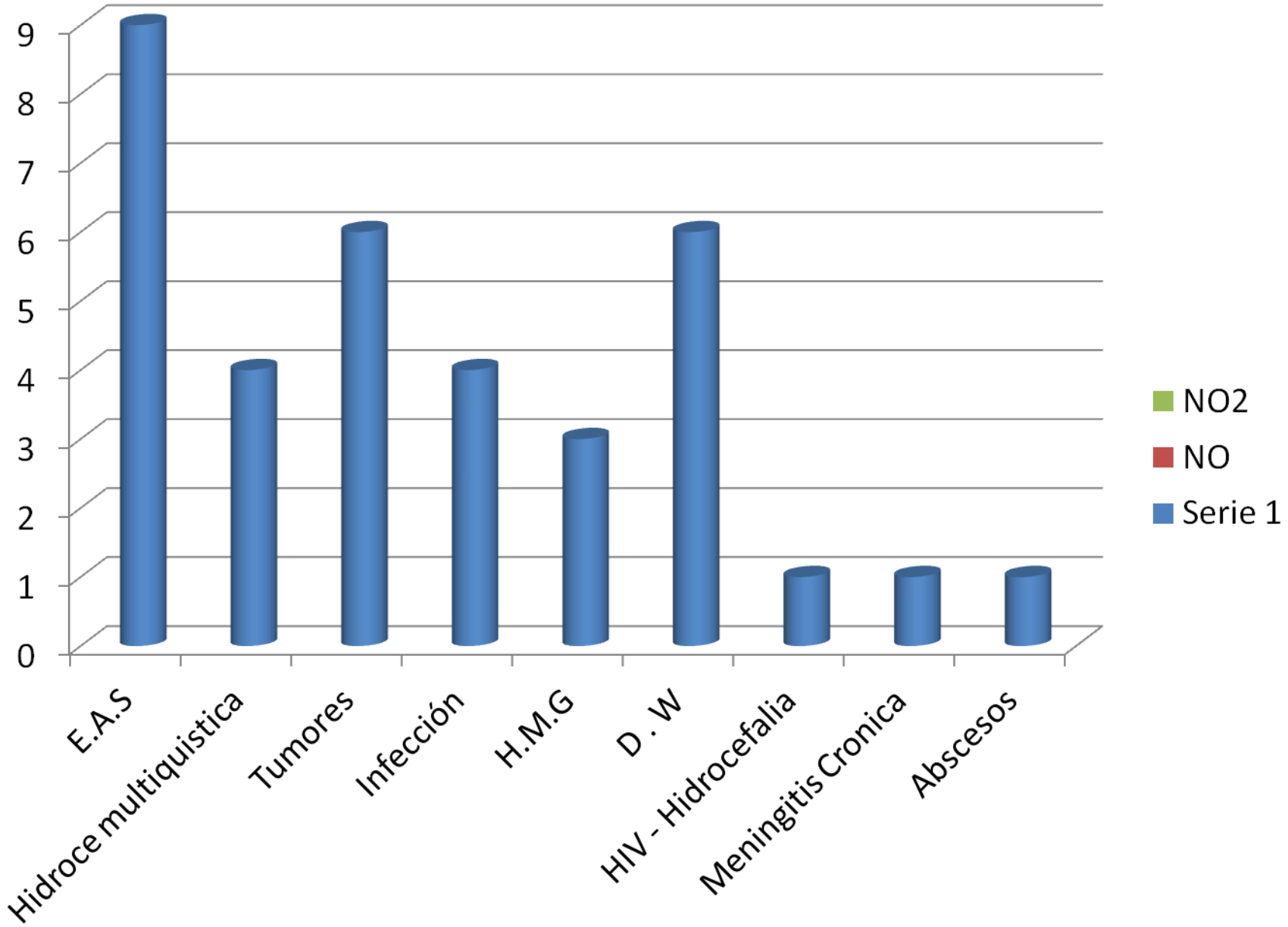
Turkish Neurosurgery 2011, Vol: 21, No: 3, 359-366

PACIENTES

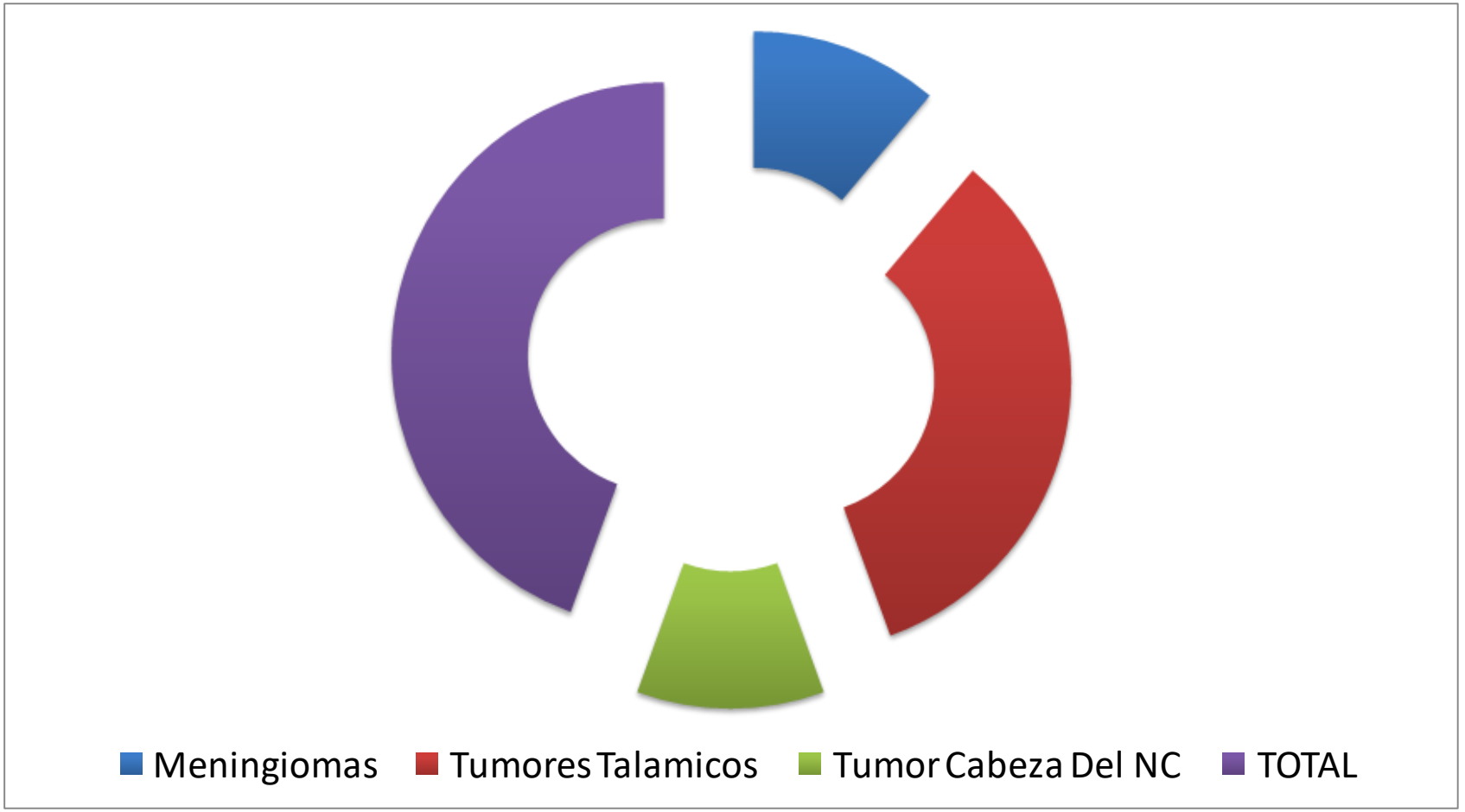
- Experiencia a lo largo de 1 año en dos instituciones
- HOSPITAL SIMÓN BOLÍVAR
- FUNDACIÓN CARDIOINFANTIL
- Número total de pacientes 34


Grupos Etareos
Menores 6M
6 - 12 meses
Mayores 1A
Adultos
17%
21%
25%
37%

DIAGNÓSTICOS

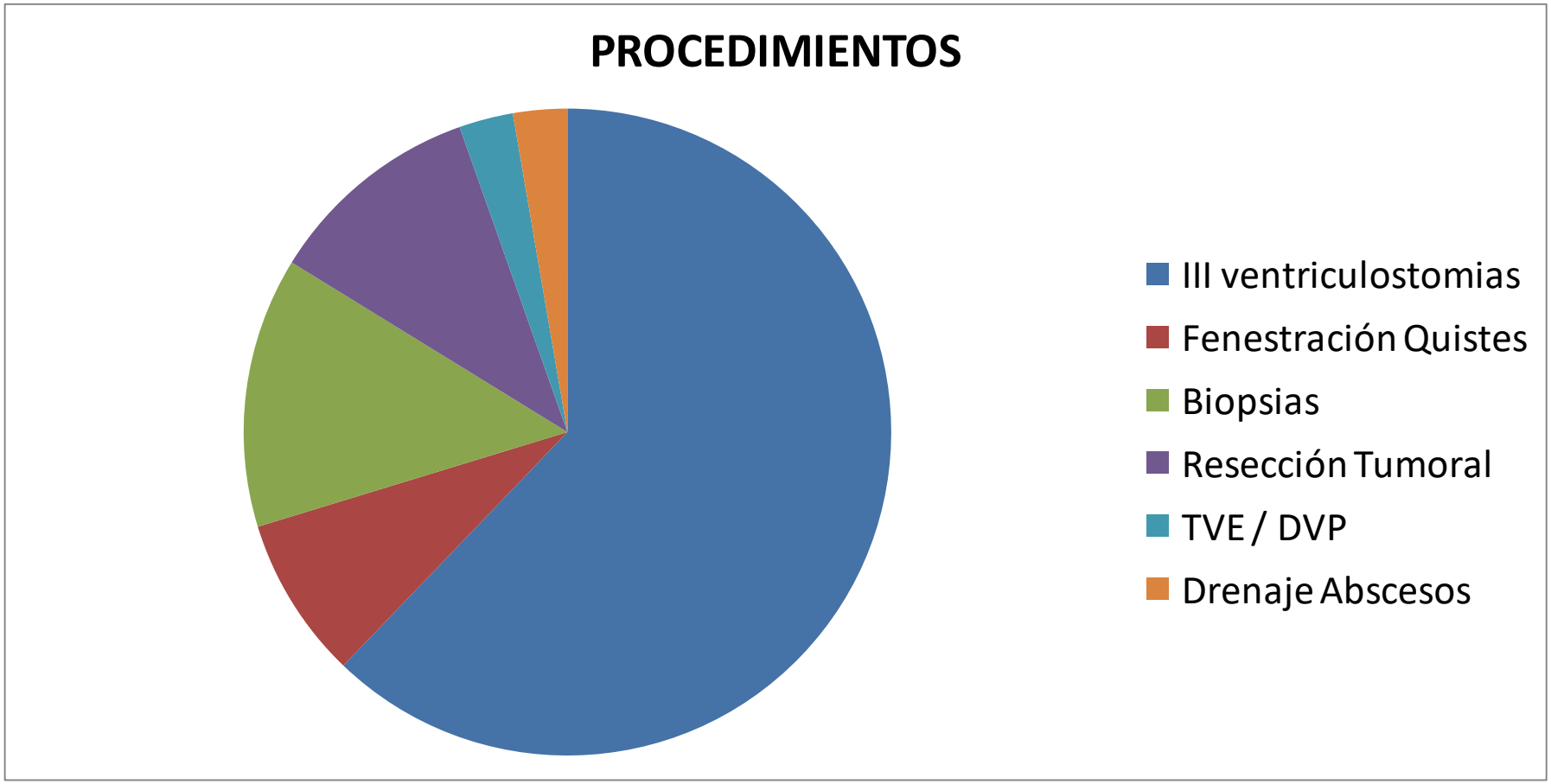


TIPOS DE TUMORES

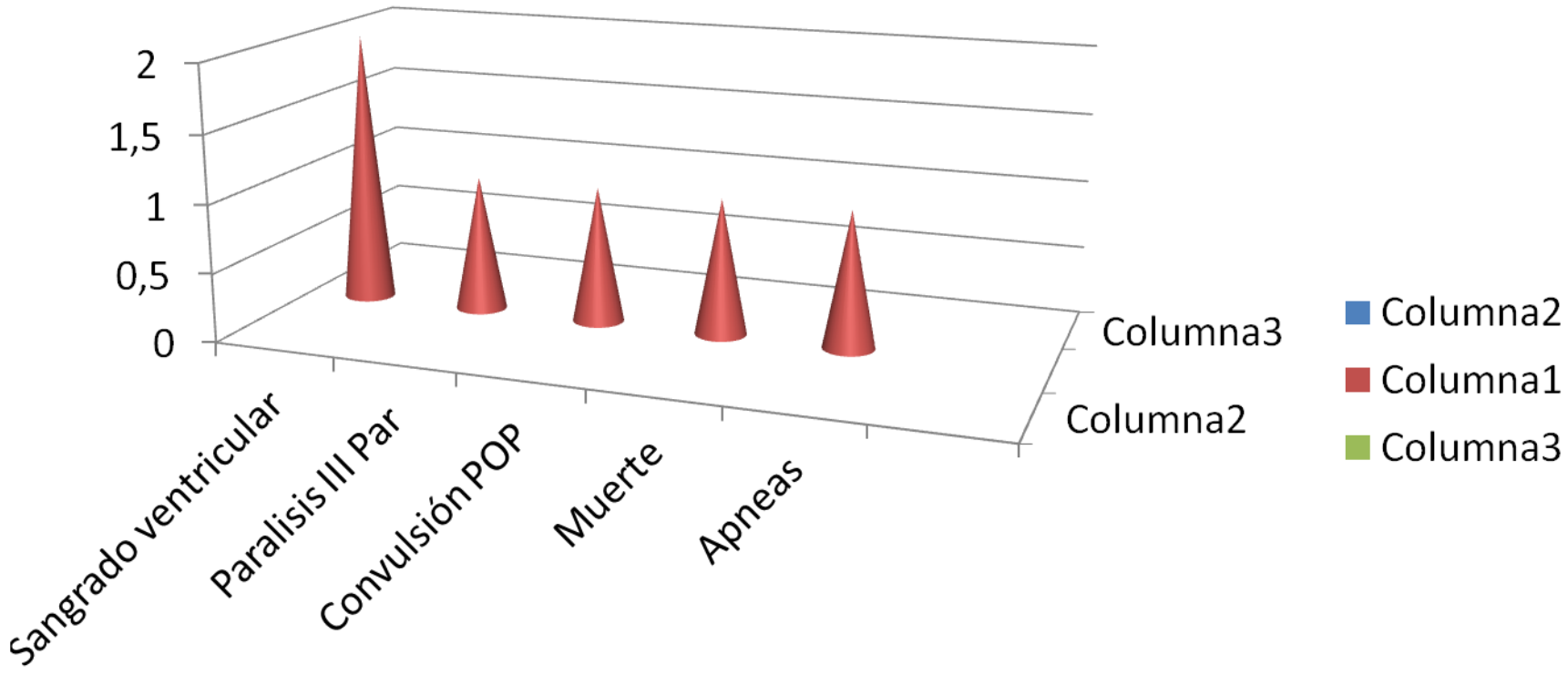


Germinoma, GBM, Gangioglioma.

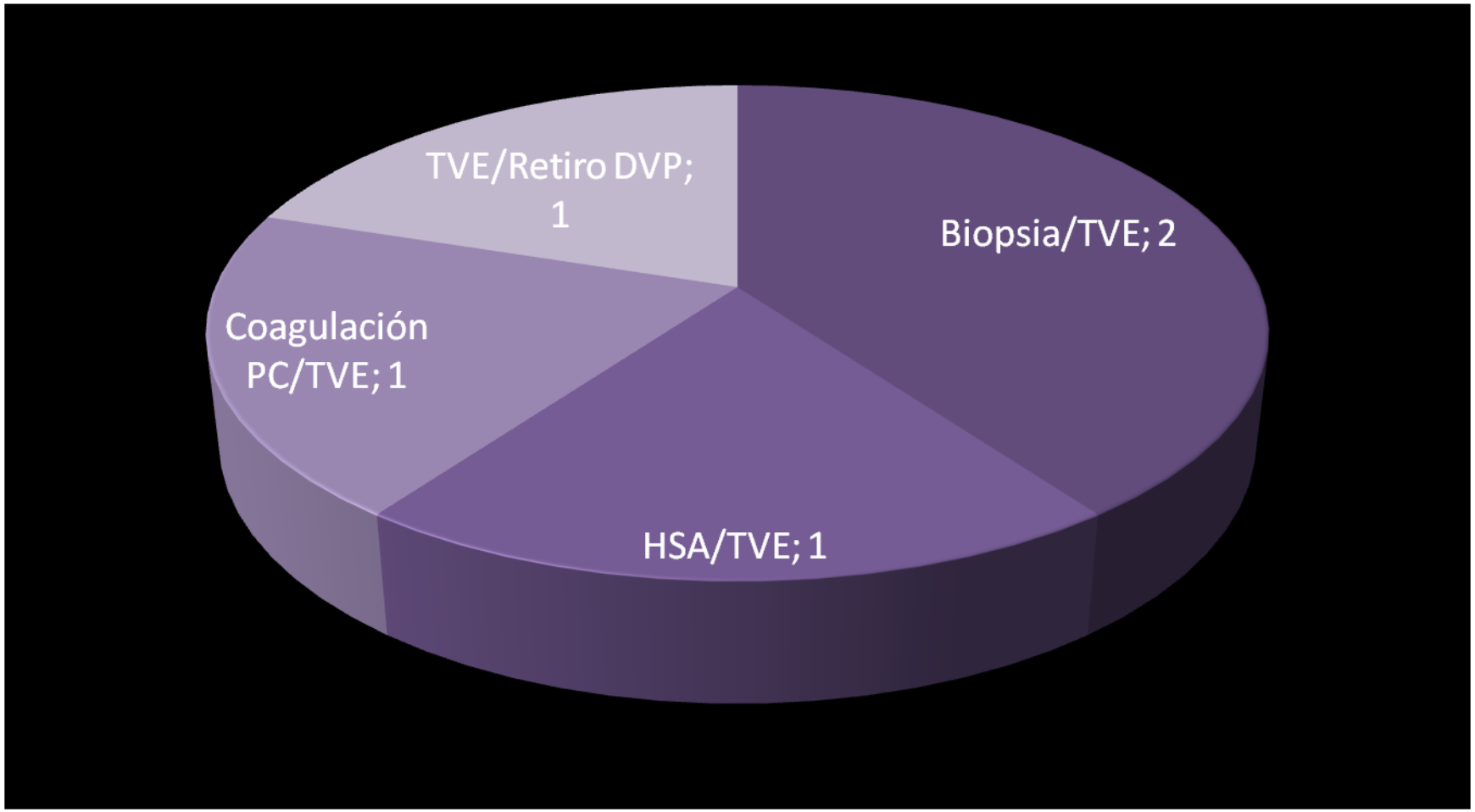
NEUROENDOSCOPIAS



COMPLICACIONES



OTROS PROCEDIMIENTOS



HIDROCEFALIA OBSTRUCTIVA 137 CASOS
HIDROCEFALIA MULTIQUÍSTICA 53 CASOS

QUISTES ARACNOIDEOS 29
TUMOR INTRAVENTRICULAR 12

NÁPOLES, ITALIA

6 AÑOS

Pathology	Procedure	Number	Complications
Obstructive hydrocephalus (137 cases)	Endoscopic third ventriculostomy (ETV)	51	12
	ETV + ICP monitoring	45	3
	ETV + shunt removal (+ICP monitoring)	27	5
	Repeated ETV (+ICP monitoring)	11	
	Repeated ETV + shunt removal	1	
	Lamina terminalis fenestration	1	
	Catheter disobstruction + ICP	1	
Multiloculated hydrocephalus (53 cases)	ISF + placement of ventricular catheter across fenestration	15	2
	Settopellucidostomy	6	2
	Settopellucidostomy + catheter	5	1
	Septostomy	7	
	Aqueductoplasty	1	
	Aqueductoplasty + stenting	4	
	Redo ETV + aqueductoplasty	1	
	Aqueductoplasty + septostomy + catheter	2	
	Monro foraminal plasty	2	
	Catheter positioning	2	
	Catheter removal	1	
	ETV + ICP + septostomy	2	
	ETV + ICP + septostomy + shunt removal	1	1
	ETV + septostomy	2	
	Redo ETV + septostomy	1	
	ETV + septostomy + catheter	1	
Arachnoid cysts (29 cases)	Ventriculo-cystostomy	7	2
	Cyst-cisternostomy	8	
	Ventriculo-cyst-cisternostomy	9	3
	Ventriculo-cyst-cisternostomy + ICP + shunt removal	4	
	Cyst-ventriculostomy+ cath. placem	1	
Intraventricular tumors (12 cases)	ETV + biopsy	2	1
	Redo ETV + shunt removal + biopsy	1	
	ETV + ventriculocystostomy + biopsy + shunt removal	1	
	Biopsy + septostomy + catheter	1	
	ETV + ICP + biopsy	3	
	Drainage of cystic tumor + biopsy	3	
	Gross total removal of third ventricular tumor	1	
Total		231	32

Complications following endoscopic intracranial procedures in children. Childs Nerv Syst (2007) 23:633–644

TERCER VENTRICULOSTOMÍA 355
FENESTRACION QUISTES 72

FENESTRACIÓN SEPTUM PELUCIDUM 33
BIOPSIA TUMORAL 19

TABLE 1

*Neuroendoscopic procedures and relative complications in 450 pediatric patients**

Procedure	No. of Procedures	Complications
ETV	355	26 (7.3%): 5 IVHs, 1 IPH, 2 subdural hygromas, 11 CSF leaks, 6 aborted, 1 transient oculomotor impairment & aborted procedure in same patient
septum pellucidotomy for loculated lat ventricle	33	2 (6.06%): 1 aborted procedure, 1 IPH
cyst wall fenestration into ventricles or cisternal spaces	72	6 (8.3%): 1 transient hemiparesis, 5 subdural hygroma
tumor biopsy	19	2 (10.5%): 1 diffuse brain edema (death), 1 subdural hemorrhage & IPH in same patient
catheter insertion	11	2 (18.2%): 1 oculomotor transient impairment, 1 IVH
aqueductoplasty	5	NA
total	495	38 (7.6%)

* IPH = intraparenchymal hemorrhage; NA = not applicable.

TURÍN, ITALIA

10 AÑOS

Complications and pitfalls of neuroendoscopic surgery in children J Neurosurg (3 Suppl Pediatrics) 105:187–193, 2006

HIDROCEFALIA OBSTRUCTIVA 112
ESTENOSIS ACUEDUCTAL 76

HIDROCEFALIA PRESION NORMAL 11
QUISTES 20

TABLE 1

Results of neuroendoscopic procedures in adults

Diagnosis	No. of Ops	No of Patients	No. of Repeated Ops	Success Rate (%)*
triventricular hydrocephalus	112	111	1	71
aqueductal stenosis	76	76	0	71
w/ tumor	29	28	1	70
w/ other disorder	7	7	0	71
normal-pressure hydrocephalus	11	11	0	45†
isolated ventricles	7	7	0	100
cysts	20	20	0	90
temporal	4	4	0	100
suprasellar	5	5	0	80
intraventricular	5	5	0	100
septum pellucidum	5	5	0	80
other	1	1	0	100
colloid	3	3	0	100
total	153	152	1	73.5

BUDAPEST, HUNGRIA

8 AÑOS

EDAD 11d – 89 AÑOS

Retrospective analysis of 400 neuroendoscopic interventions: the Hungarian experience . Neurosurg Focus 19 (6):E10, 2005

HIDROCEFALIA OBSTRUCTIVA 150
ESTENOSIS ACUEDUCTAL 108
QUISTES 40

HIDROCEFALIA MULTIQUÍSTICA 11
POSTINFECCIOSA POST HEMORRÁGICA 35

*Results of neuroendoscopic procedures in children**

Diagnosis	No. of Ops	No. of Patients	No. of Repeated Ops	Success Rate (%)†	Mean Age (mos)
triventricular hydrocephalus	150	138	12	68.0	63
aqueductal stenosis (presumed)‡	108	97	11	63.0	59
w/ tumor	27	26	1	84.0	84
w/ other disorder	15	15	0	78.0	62.4
PHMHC	35	29	6	13.7	13.1
PMHC	13	11	2	38.0	44
isolated ventricles	9	8	1	44.0	28
cysts	40	35	5	66.0	69.8
suprasellar	15	12	3	57.0	
intraventricular	8	8	0	100.0	
quadrigeminal	7	6	1	28.0	
septum pellucidum	4	3	1	75.0	
other	6	6	0	83.0	
total	247	221	26	57.5	52.6

Retrospective analysis of 400 neuroendoscopic interventions: the Hungarian experience . Neurosurg Focus 19 (6):E10, 2005

Equipo endoscopia

Neurosurg. Focus / Volume 19 / December, 2005

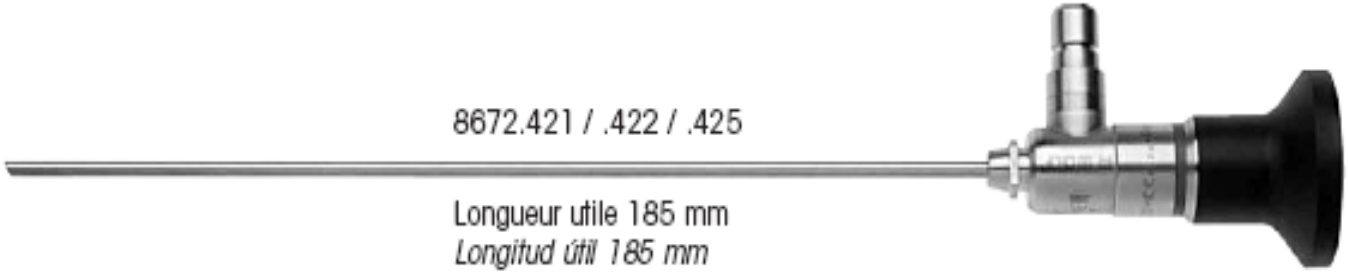
Panel de control

Endoscopio
Cánula ventricular

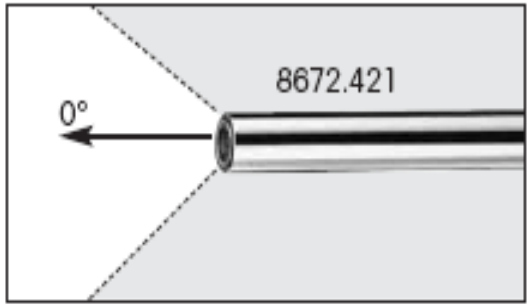
Riego de la bomba

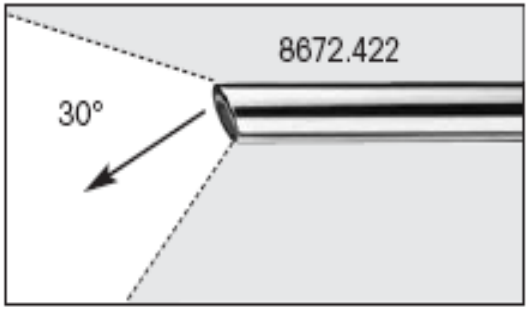
- **Irrigación bajo gravedad.**
- **Caudal inferior a 15 ml / minuto.**

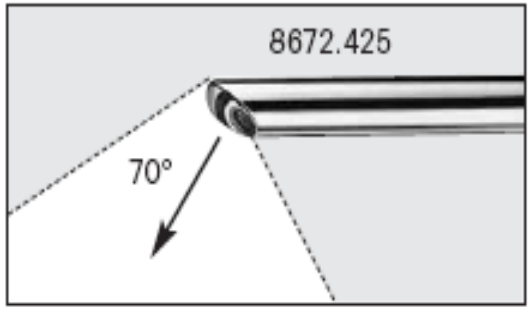
SISTEMA ÓPTICO



AUTOCLAVE
134° C / 273° F



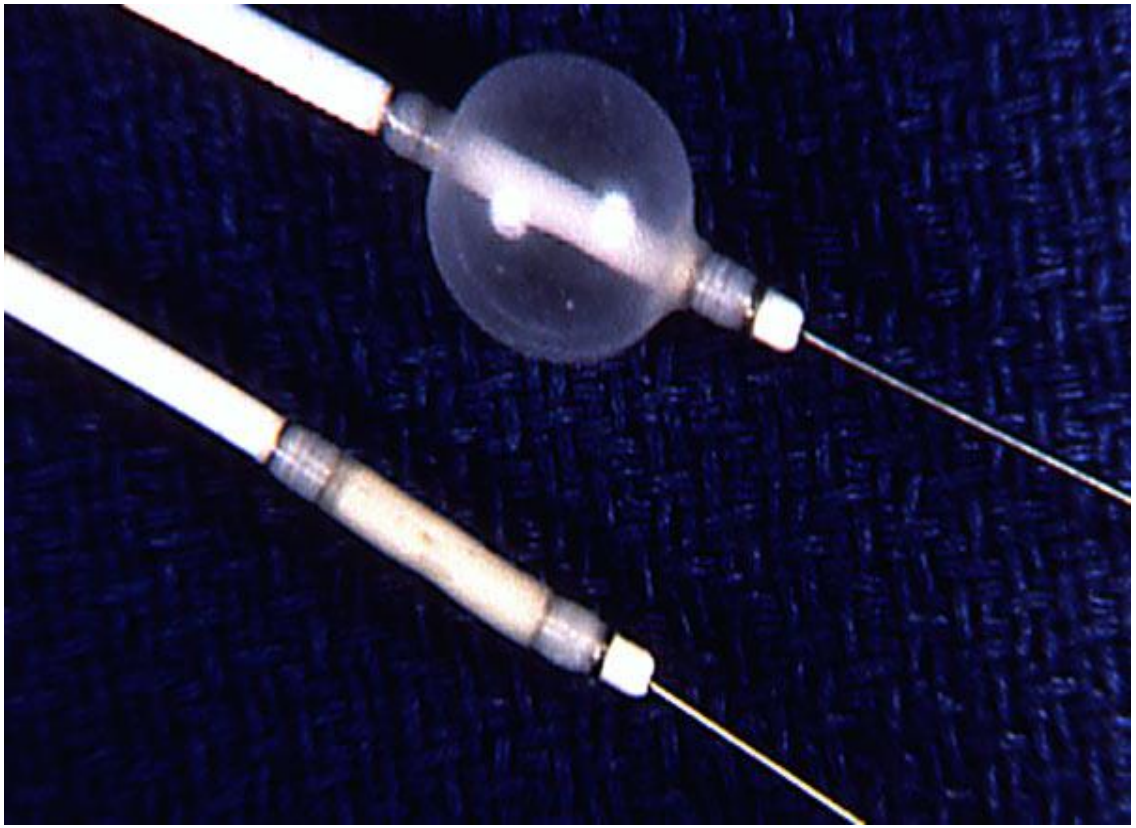




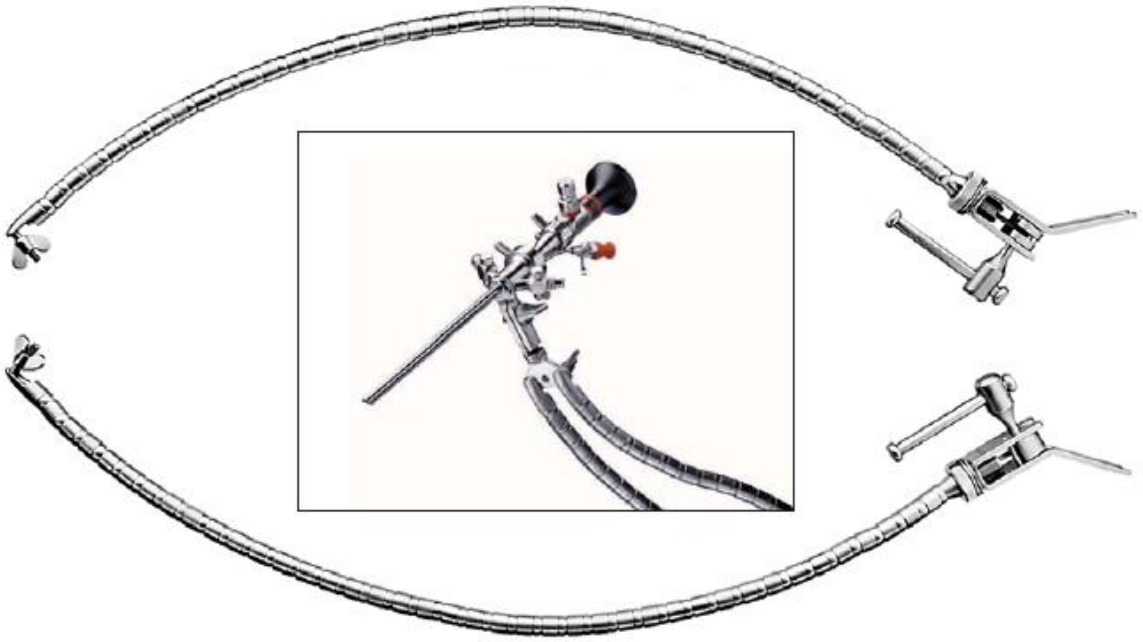
* Department of Neurosurgery - University of Mainz, Germany

FOGARTY

- Globo sonda.
- Catéter con balón.



BRAZO ARTICULADO



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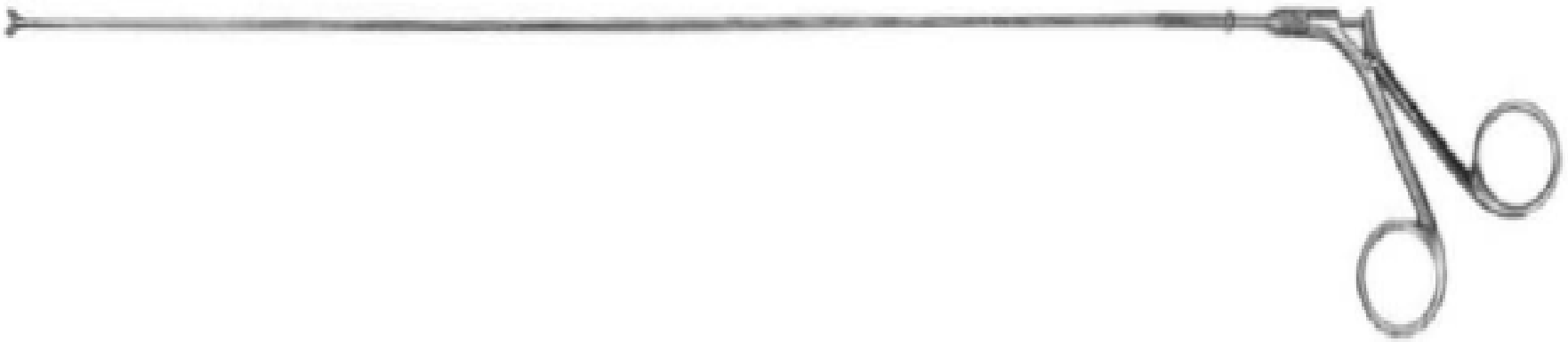
PINZAS FLEXIBLES



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	Ø	L. u. *Longitud útil*
 **Pince à préhension pour corps étrangers,** flexible ***Pinza de agarre para cuerpos extraños,*** *flexible*	1 mm (3 Charr.)	260 mm
 **Pince à préhension pour corps étrangers,** flexible ***Pinza de agarre para cuerpos extraños,*** *flexible*	1,7 mm (5 Charr.)	365 mm
 **Pince à biopsie,** flexible ***Pinza para biopsias,*** *flexible*	1 mm (3 Charr.)	260 mm
 **Pince à biopsie,** flexible ***Pinza para biopsias,*** *flexible*	1,7 mm (5 Charr.)	315 mm

PINZAS PARA AGARRE

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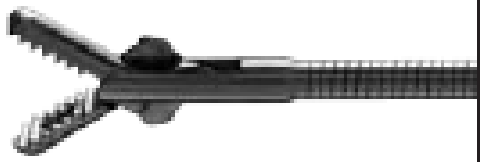
 **Pince à préhension**, flexible ***Pinza de agarre, flexible***	1 mm (3 Charr.)	230 mm
 **Pince à préhension**, flexible ***Pinza de agarre, flexible***	1,7 mm (5 Charr.)	375 mm
 **Pince à préhension**, flexible ***Pinza de agarre, flexible***	2,2 mm (7 Charr.)	375 mm

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 Pince à biopsie, flexible *Pinza para biopsias, flexible*	1 mm (3 Charr.)	230 mm
 Pince à biopsie, flexible *Pinza para biopsias, flexible*	1,7 mm (5 Charr.)	375 mm
 Pince à biopsie, flexible *Pinza para biopsias, flexible*	2,2 mm (7 Charr.)	375 mm

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ELECTRODOS BIPOLARES

- Sonda roma de cauterio monopolar.
- Alambre Bugbee

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Electrode annulaire bipolaire, flexible
Electrodo anular bipolar, *flexible*

Electrode à bouton bipolaire, flexible
Electrodo de botón bipolar, *flexible*

Electrode à boule graduée bipolaire,
flexible
Electrodo de bola escalonado bipolar,
flexible

Electrode-aiguille graduée bipolaire,
flexible
Electrodo de aguja escalonado bipolar,
flexible

2 mm
(6 Charr.)

400 mm

Electrode-aiguille *Electrodo de aguja*	0,8 mm (2,4 Charr.)	255 mm
Electrode à crochet *Electrodo en forma de gancho*	2 mm (6 Charr.)	600 mm

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TIJERAS

* Department of Neurosurgery - University of Mainz, Germany

Pince à préhension
Pinza de agarre

Pince à biopsie
Pinza para biopsias

Ciseaux
Tijeras

2,1 mm
(7 Charr.)

375 mm

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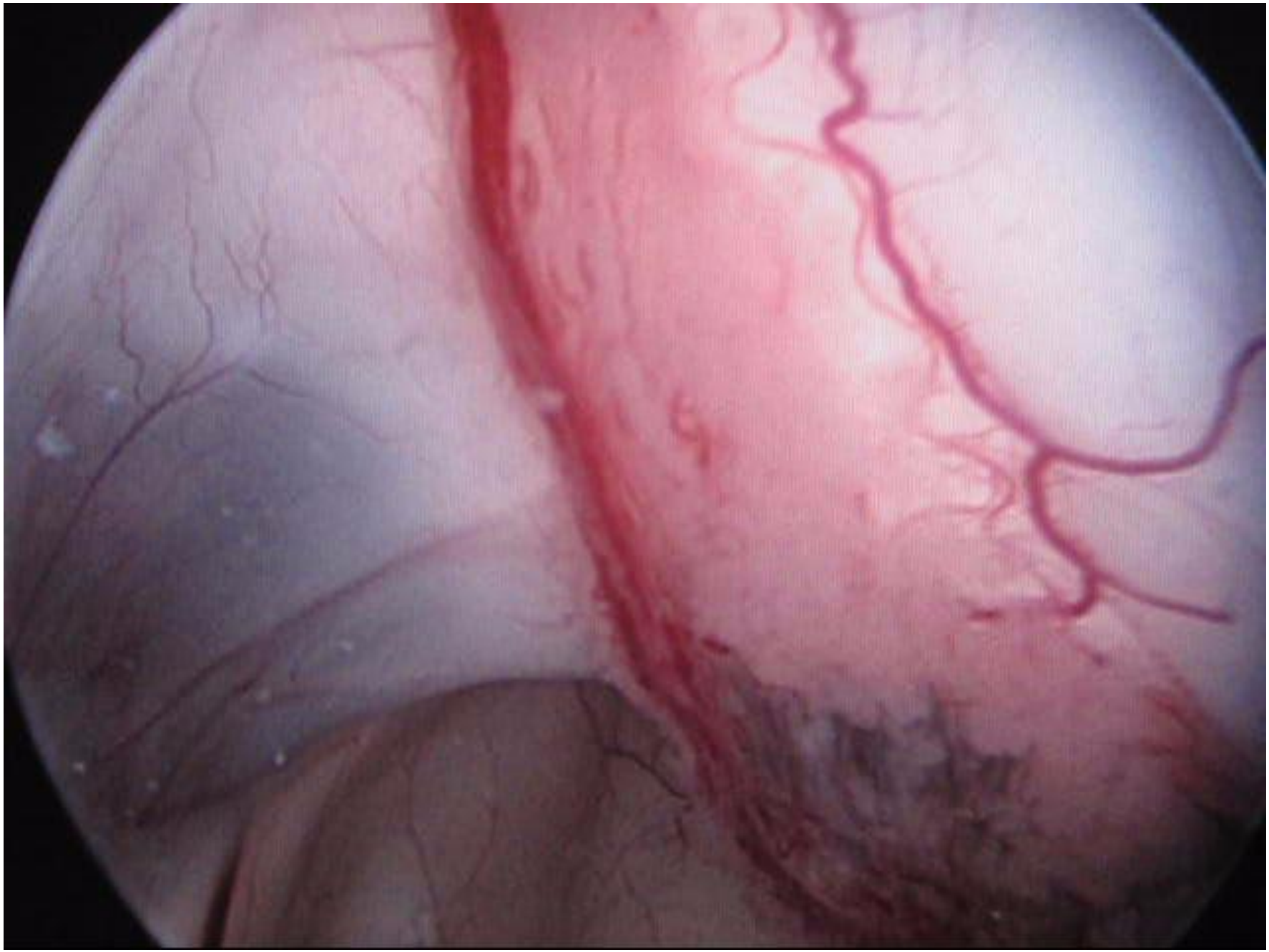
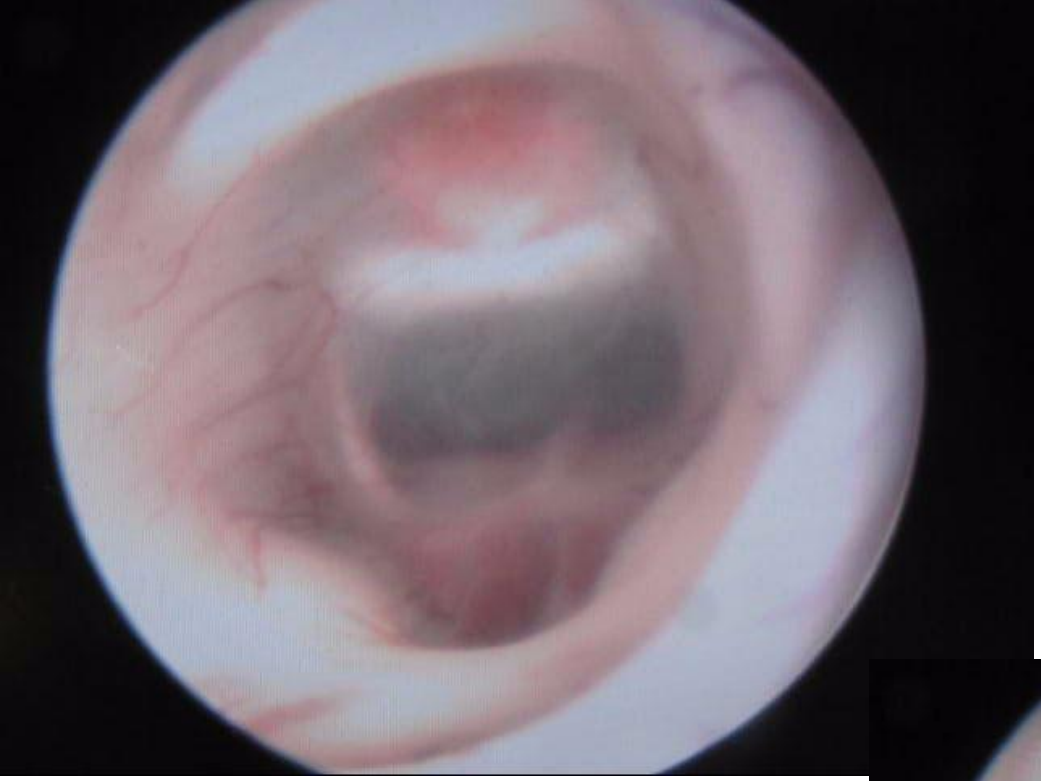
Endoscopio flexible

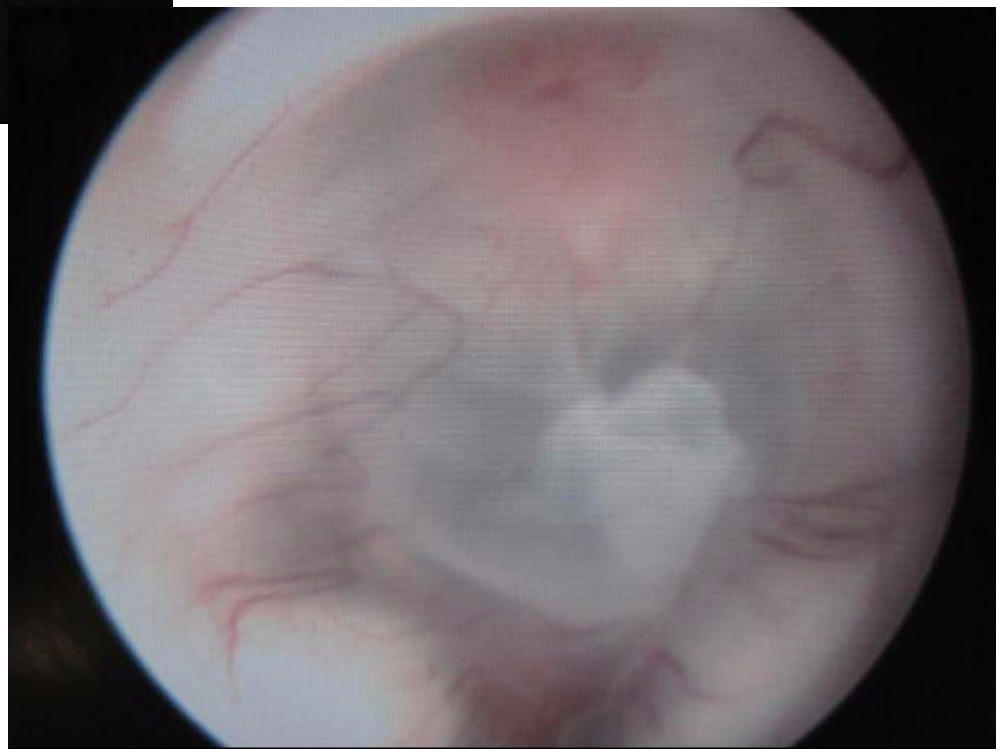
- *Excelente reproducción de imagen*
- *Fácil manejo*
- *Acodamiento activo de 130° hacia arriba y hacia abajo*

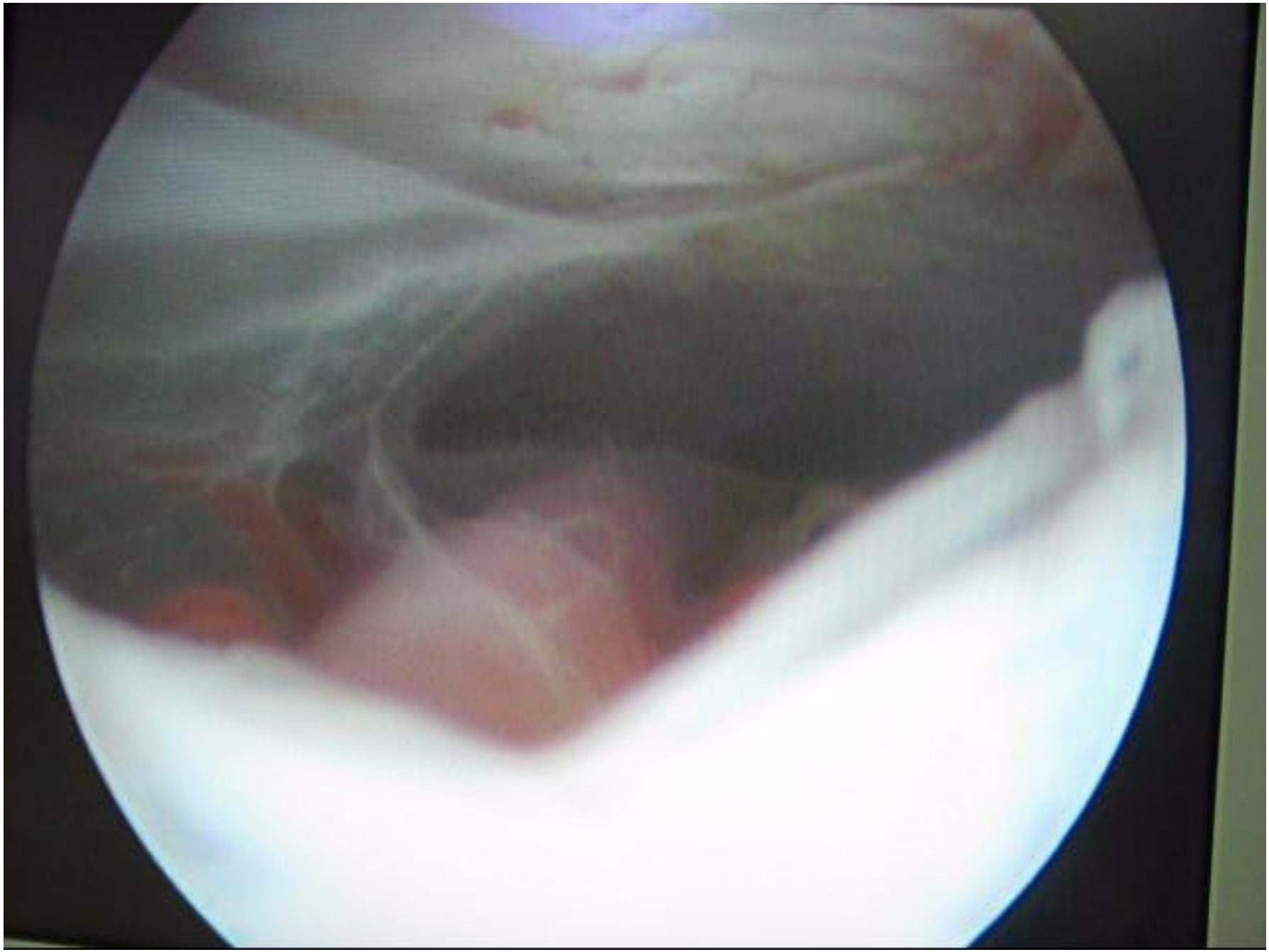
* Department of Neurosurgery - University of Mainz, Germany

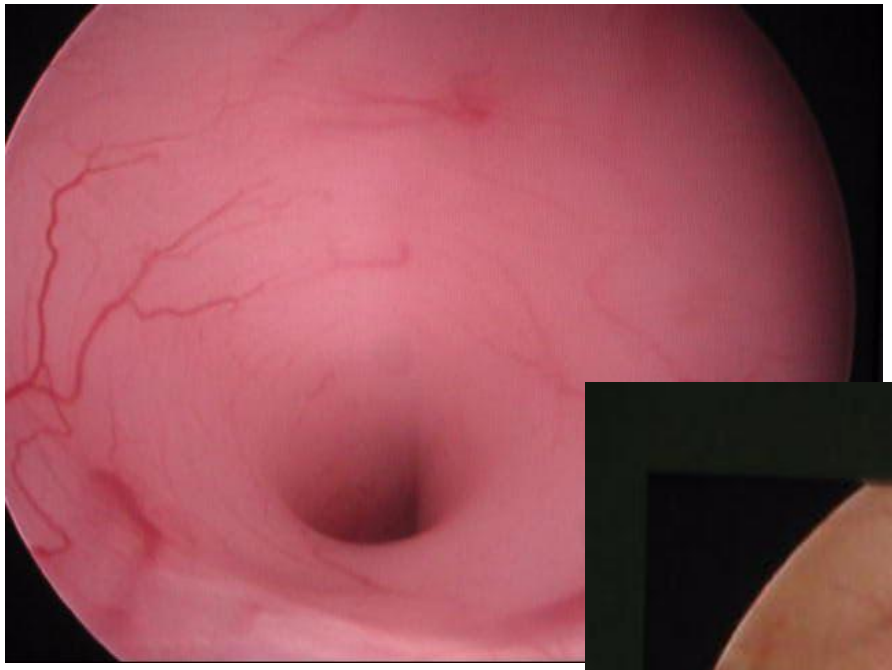
TERCER VENTRICULOSTOMÍA

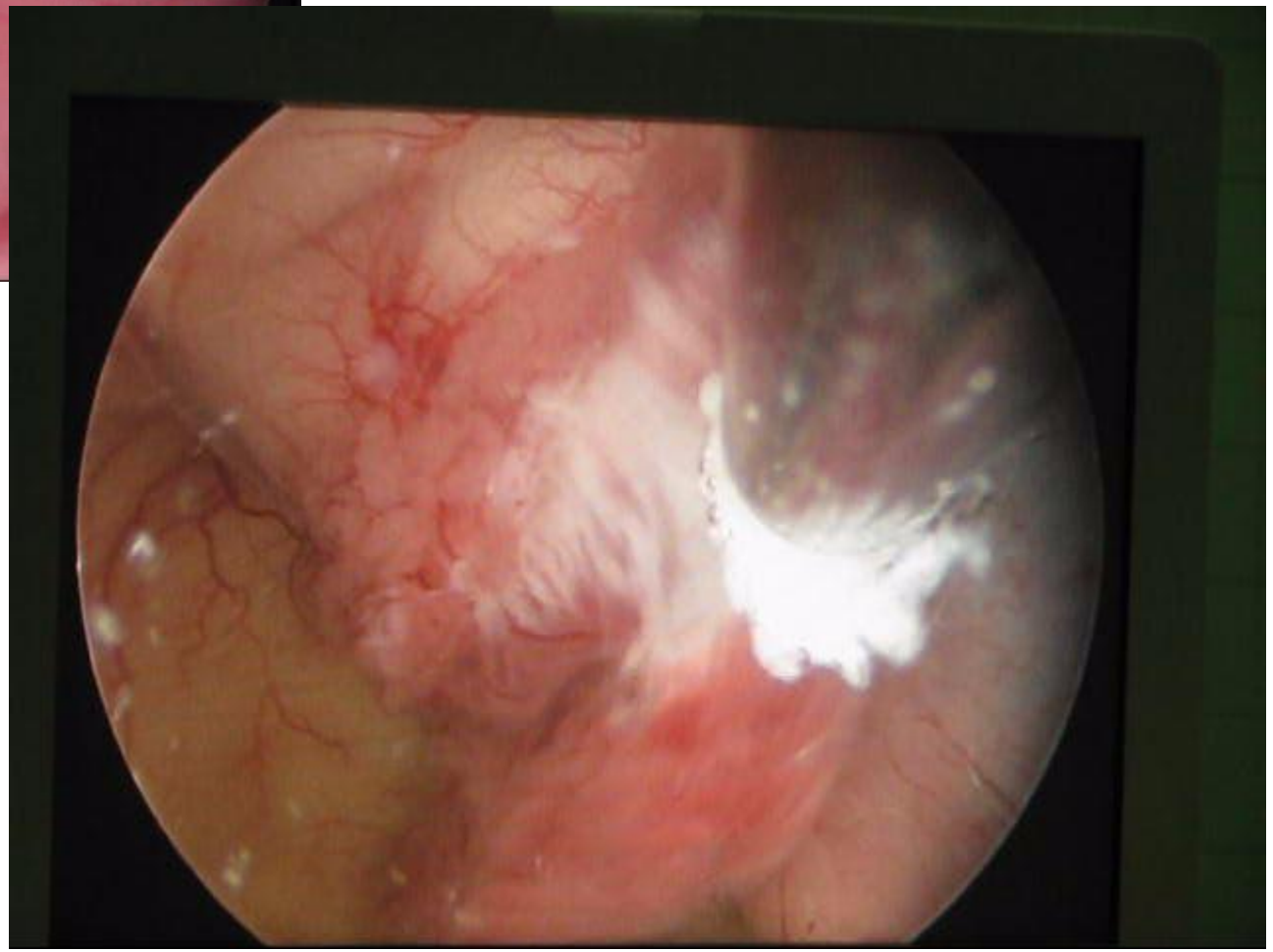


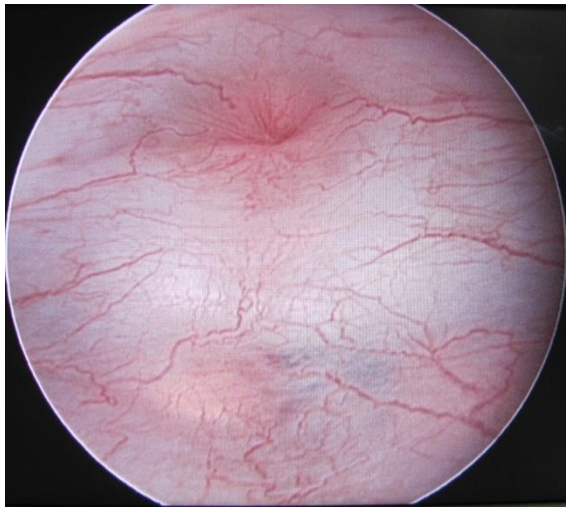
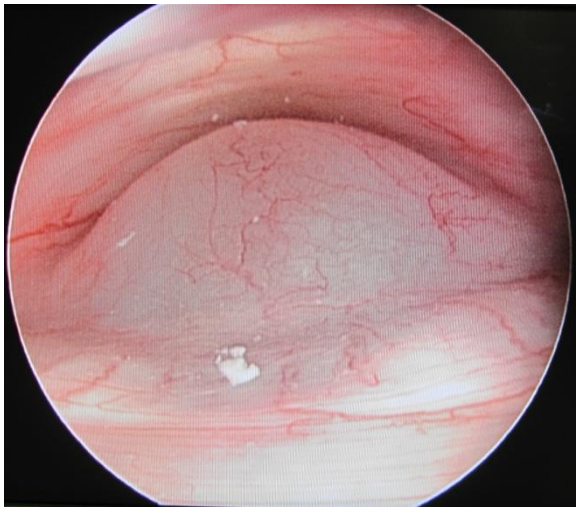
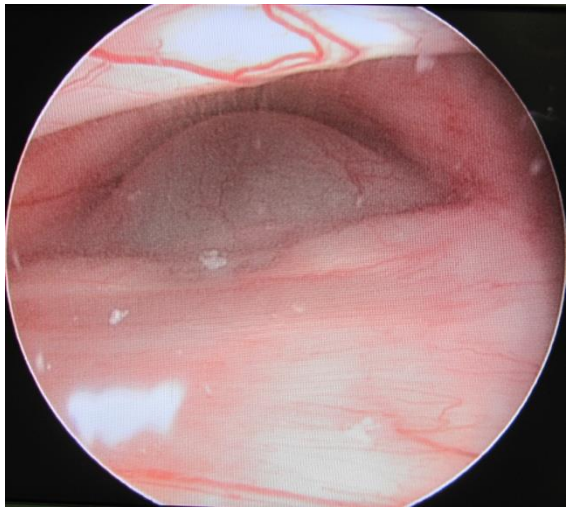
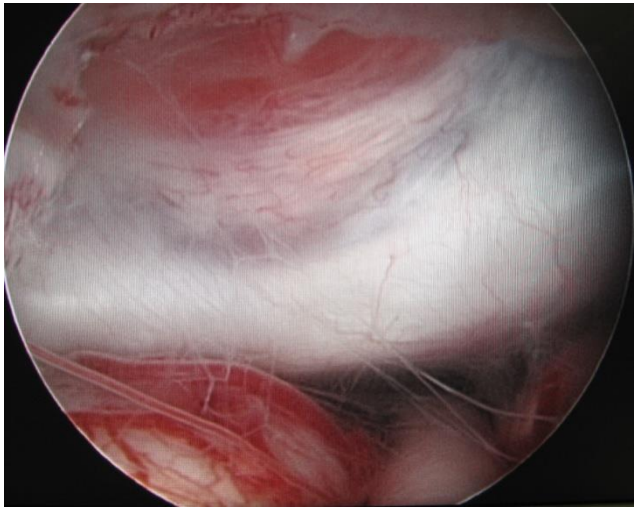
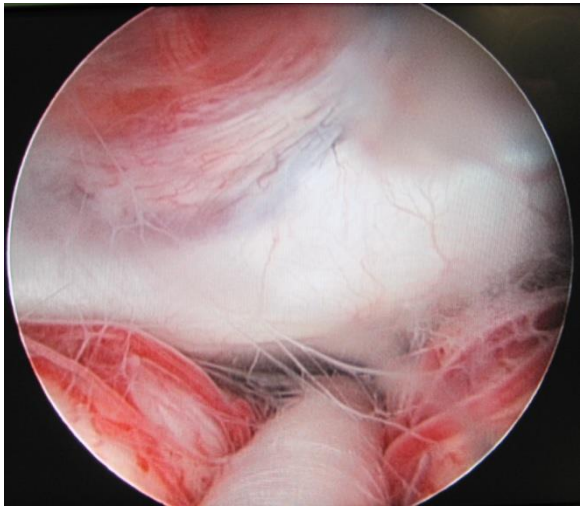


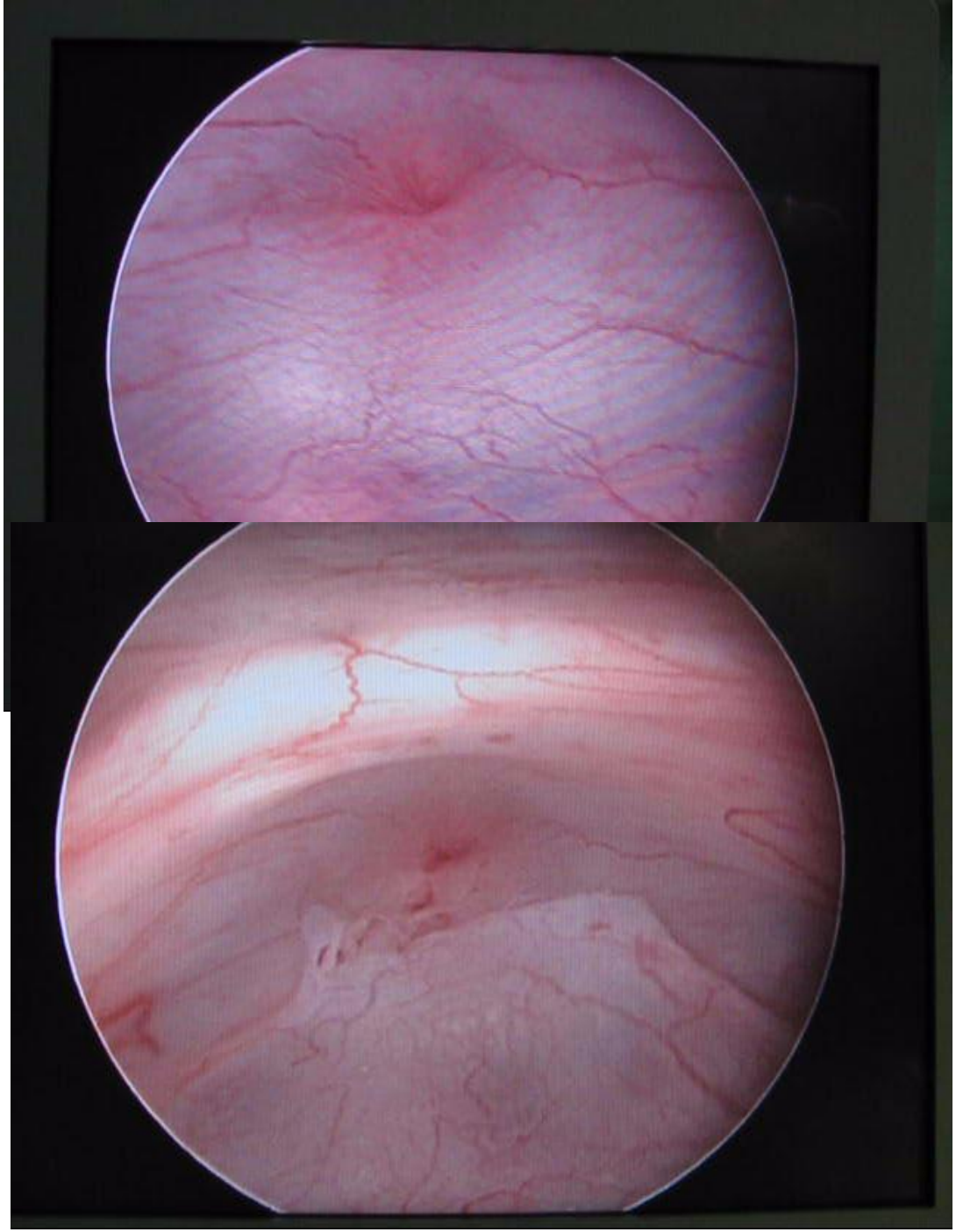


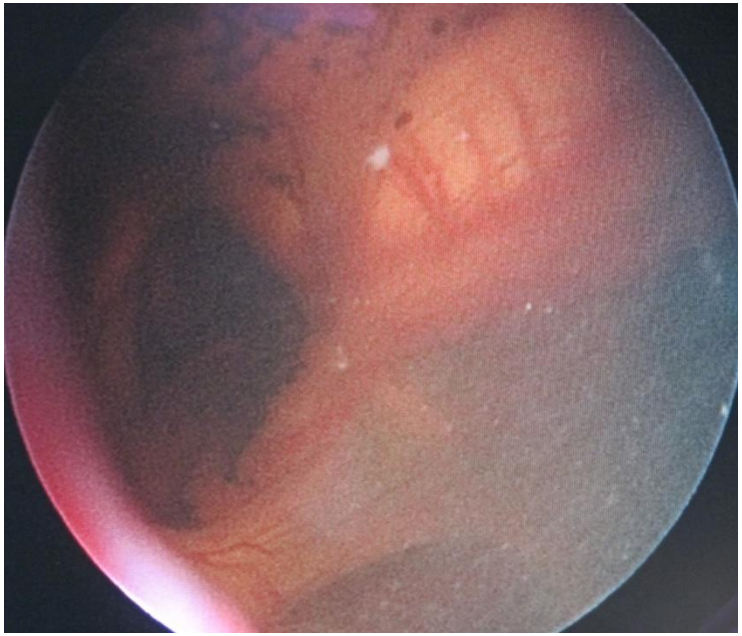


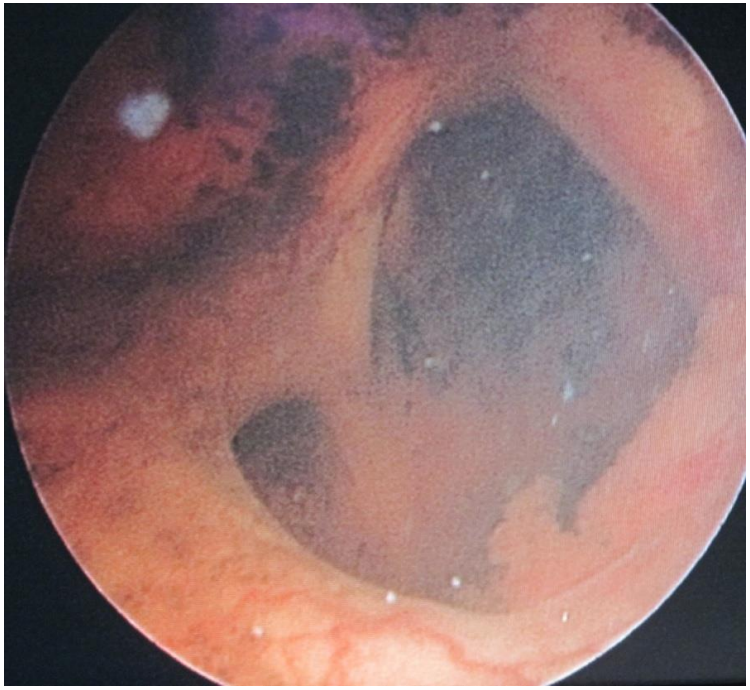


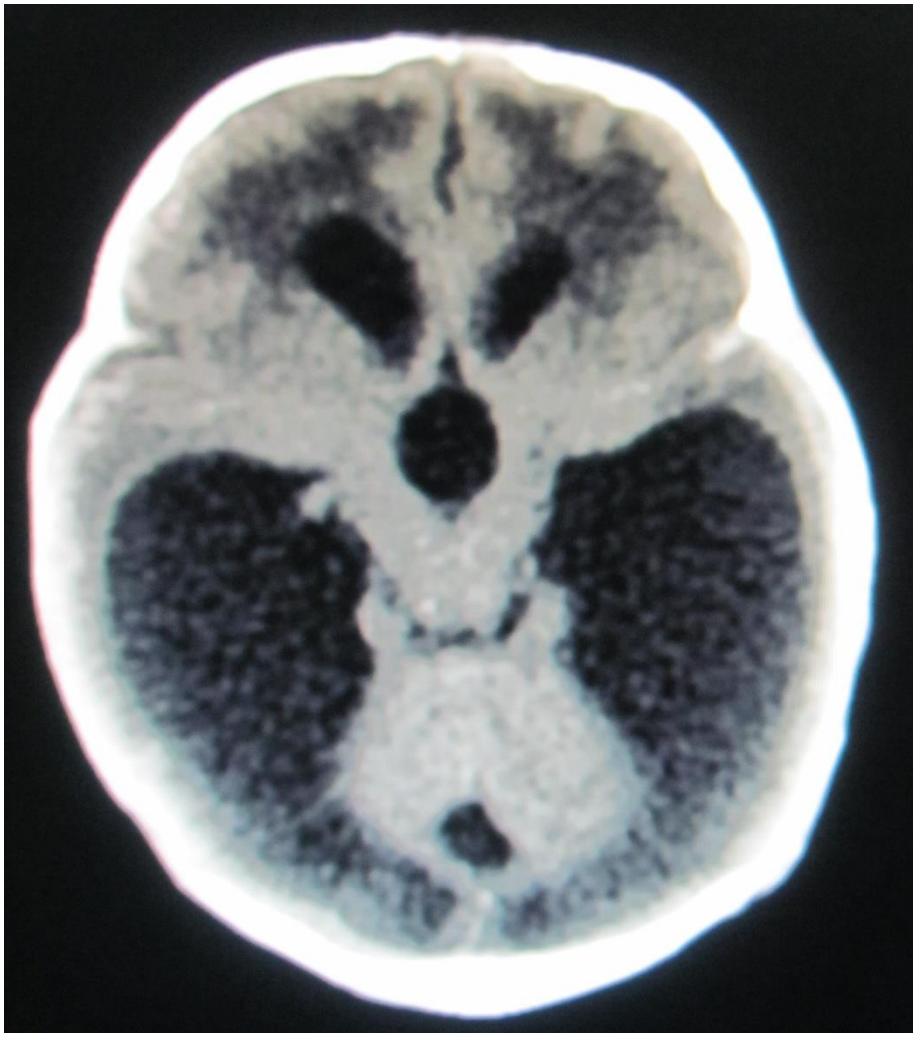


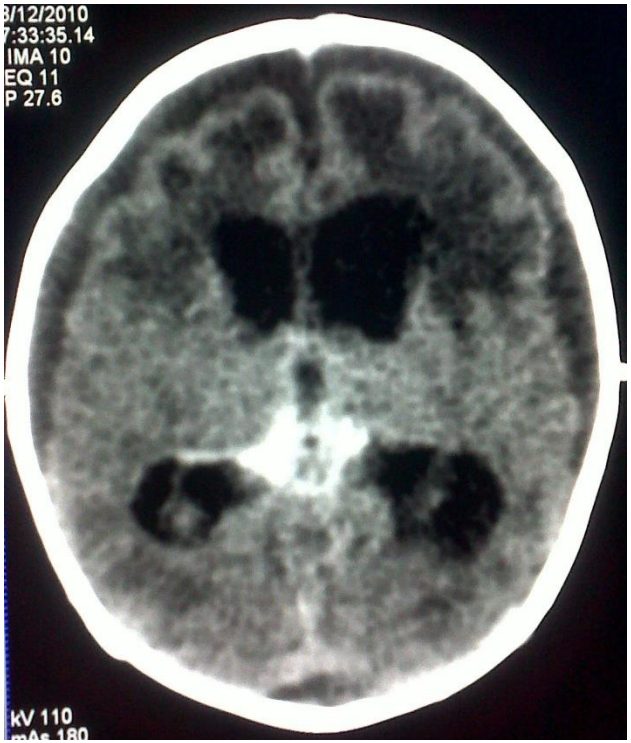












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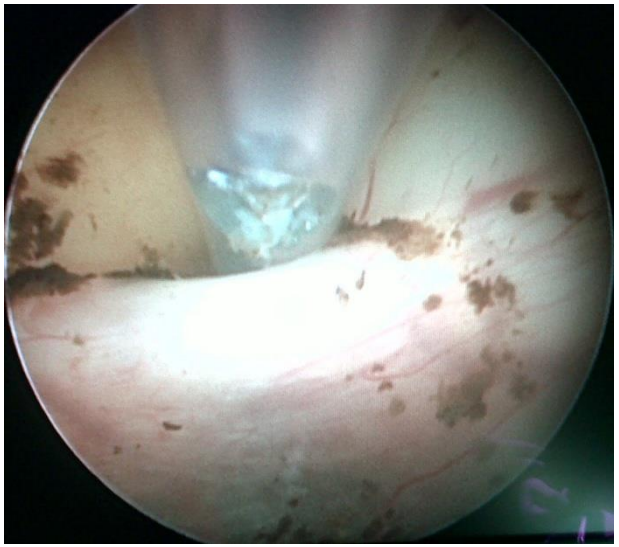
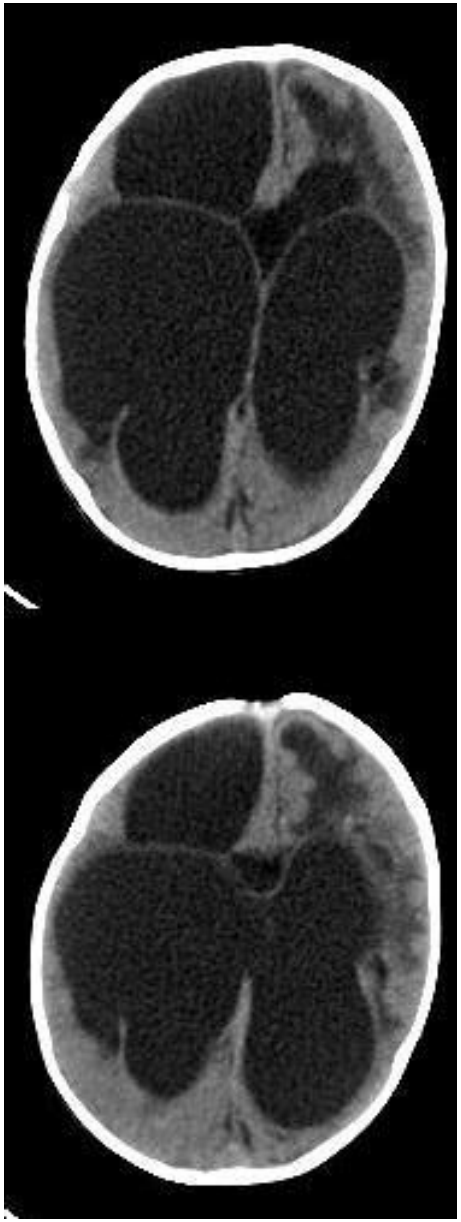
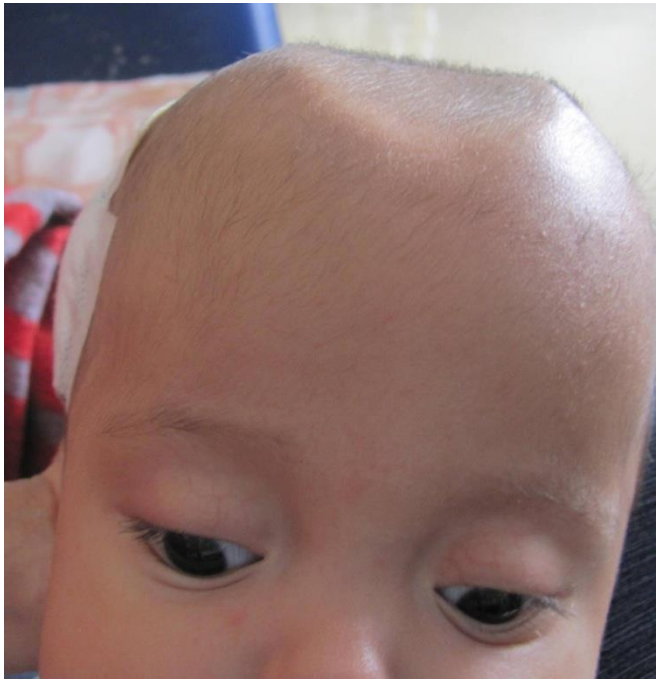
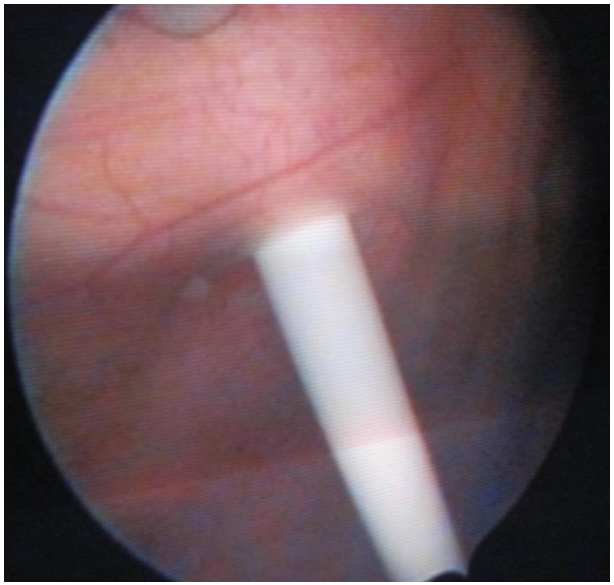
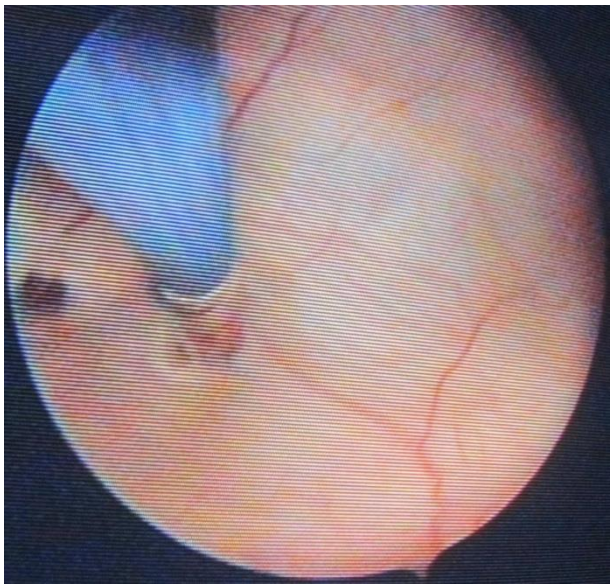
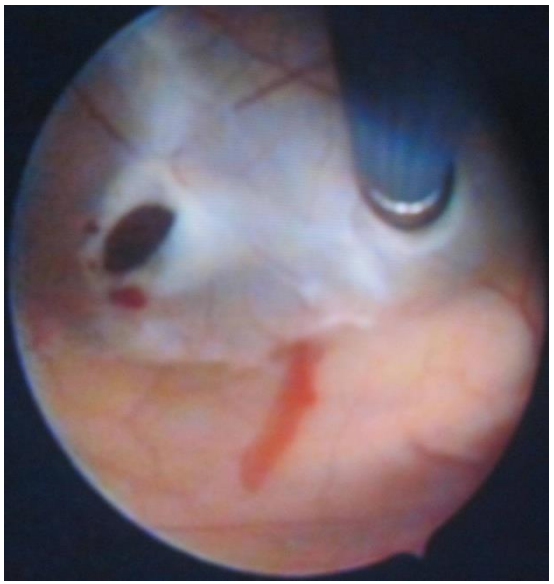
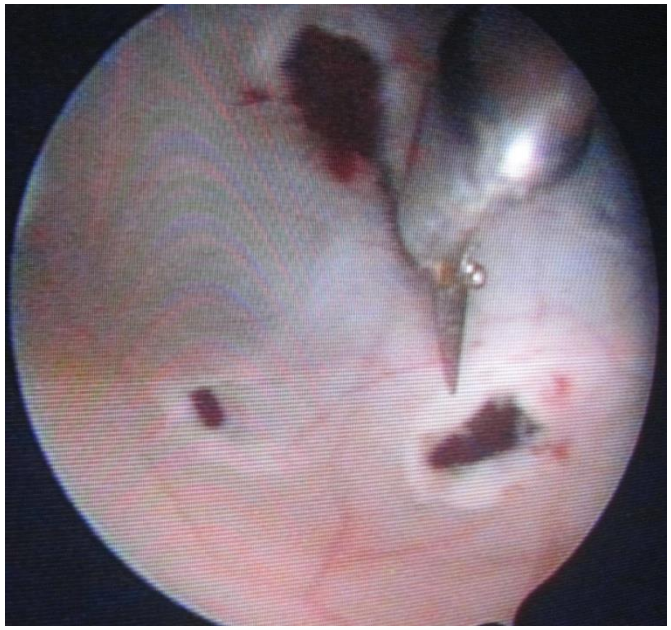
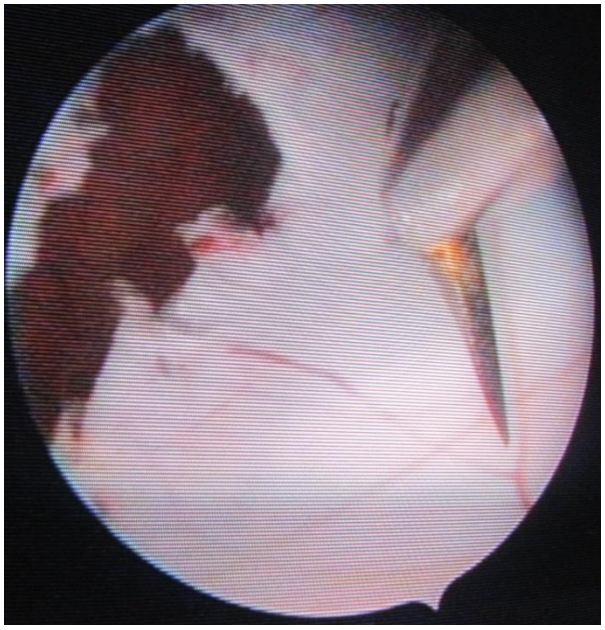






INDICACIONES

- Estenosis Acueductal Primaria
- Hidrocefalia Ventricular Lateral aislada
- Estenosis Idiopática del foramen de Luschka y Magendie
- Malformación de Dandy-Walker
- Hidrocefalia secundaria a Tumores intraventriculares, tectales o pineales

TABLE 3: Success rate of ETV according to the causes of hydrocephalus

Cause of Hydrocephalus (no. of cases)	Successful ETV*	No. of Procedures
primary aqueductal stenosis (64)	47 (61%)	77 (21%)
posterior fossa tumors (107)	99 (75%)	132 (36%)
vestibular schwannomas (22)		
3rd ventricular & thalamic tumors (16)	13 (81%)	16 (4.35%)
suprasellar tumors (5)	4 (80%)	5 (1.35%)
tectal glioma (18)	17 (85%)	20 (5.4%)
pineal tumors (17)	17 (100%)	17 (4.6%)
arachnoids cysts (15)	12 (80%)	15 (4.1%)
posthemorrhagic in the premature (7)	2 (28.5%)	7 (1.9%)
other posthemorrhagic (40)	25 (62.5%)	40 (10.8%)
CM-II (9)	3 (33%)	9 (2.4%)
postmeningitis (3)	1 (33%)	3 (0.8%)
idiopathic chronic hydrocephalus (23)	10 (43%)	23 (6.2%)
others (4)	2 (50%)	4 (1.1%)
total (350 patients)	252/368 (68.5%)	368

100% EFECTIVIDAD EN TUMORES PINEALES

85 % GLIOMAS TECTALES

75% TUMORES DE FOSA POSTERIOR

Endoscopic third ventriculostomy: outcome analysis in 368 Procedures. J Neurosurg Pediatrics 5:68–74, 2010

Table 1 Two series representing typical ETV success rates (%) in the under-1-year age group from different aetiological groups causing hydrocephalus

Type of hydrocephalus	Success rate (%)	
	Javadpour et al. (2001), *N*=21	Koch and Wagner (2004), *N*=16
Aqueduct stenosis	71	57
Tumour-related hydrocephalus		
Dysraphism	0	
Post- haemorrhagic hydrocephalus	10	0
Post-infection hydrocephalus	0	33
Arachnoid cyst	100	
Dandy–Walker cyst	0	
Other		0

Note small patient numbers

Is there an indication for ETV in young infants in aetiologies other than isolated aqueduct stenosis?. Childs Nerv Syst (2006) 22:1565–1572

TABLE 1

*Origins of hydrocephalus in 43 children who underwent ETV**

Tumor Location	No. of Patients†	No. w/ Success	% Success	No. of Txs Failed	No. of Txs Abandoned
midbrain	4	4	100	0	0
posterior fossa	9	4	44	5	0
brainstem	14	11	79	3	0
thalamus	6	4	67	0	2
pineal	3	3	100	0	0
3rd ventricle (incl arachnoid cyst)	2	2	100	0	0
other (diffuse, frontal, CPA)	5	4	80	1	0
total	43	32	74	9	2

* CPA = cerebellopontine angle; incl = including; Tx = treatment.
† Includes two in whom the operation was abandoned.

Endoscopic third ventriculostomy for tumor-related hydrocephalus in a pediatric population. Neurosurg Focus 19 (6):E8, 2005

Table 2 Outcomes after endoscopic 3rd ventriculostomy

Author		No. of patients	Success rate (%)	Failure rate (%)	Mortality rate (%)
Beems et al. [18]	**2004**	339	80 (>5 years)	20	None
Brockmeyer et al. [24]	**1998**	92	76 (24.2 months)	24	None
Choi et al. [43]	**1999**	71	91.5	8.5	None
Cinalli et al. [45]		213	72 long-term (6 years)	28	0.7
Feng et al. [76]		58	86.2	13.8	10.3 (1 pulmonary infection, 1 ventriculitis, 4 tumor progress)
Gangemi et al. [91]	**1999**	125	86.4	13.6	None
Grunert et al. [104]	**2003**	171	76.7	23.3	None
Scarrow et al. [230]		54	74 (6 years)	26	None
Schroeder et al. [235]		193	66	34	1 subarachnoid hemorrhage, 1 infection
Tisell et al. [256]		18	50	50	None

Endoscopic third ventriculostomy for obstructive hydrocephalus. Neurosurg Rev (2005) 28: 1–34

TABLE 1: Calculation of the ETVSS for a given patient*

Score	Age	Etiology	Previous Shunt
0	<1 mo	postinfectious	yes
10	1 to <6 mo		no
20		myelomeningocele, IVH, nontectal tumor	
30	6 mo to <1 yr	aqueductal stenosis, tectal tumor, other	
40	1 to <10 yrs		
50	10 yrs to <19 yrs		

* Based upon Kulkarni et al., 2009. Abbreviation: IVH = intraventricular hemorrhage.

>80
50-70
<40

CORRELACIÓN CON PREDICCIÓN ALTA TASA DE ÉXITO

Endoscopic third ventriculostomy in the treatment of childhood hydrocephalus: validation of a success score that predicts long-term outcome
J Neurosurg Pediatrics 8:489–493. 2011

MENORES DE 6 MESES

TABLE 4: Crude and adjusted HRs, 95% CIs, and p value of risk factors associated with ETV failures

Factor	Bivariate Analysis			Multivariate Analysis		
	HR	95% CI	p Value	HRa	95% CI	p Value
female	1.0	0.7–1.5	0.93			
age						
>18 yrs	1.0			1.0		
2–18 yrs	1.1	0.7–1.7	0.77	1.5	0.9–2.6	0.17
6–24 mos	1.3	0.7–2.4	0.47	1.7	0.8–3.4	0.16
<6 mos	3.6	2.0–6.4	<0.001	5.0	2.4–10.4	<0.001

Endoscopic third ventriculostomy: outcome analysis in 368 Procedures. J Neurosurg Pediatrics 5:68–74, 2010

TVE MENORES DE UN AÑO

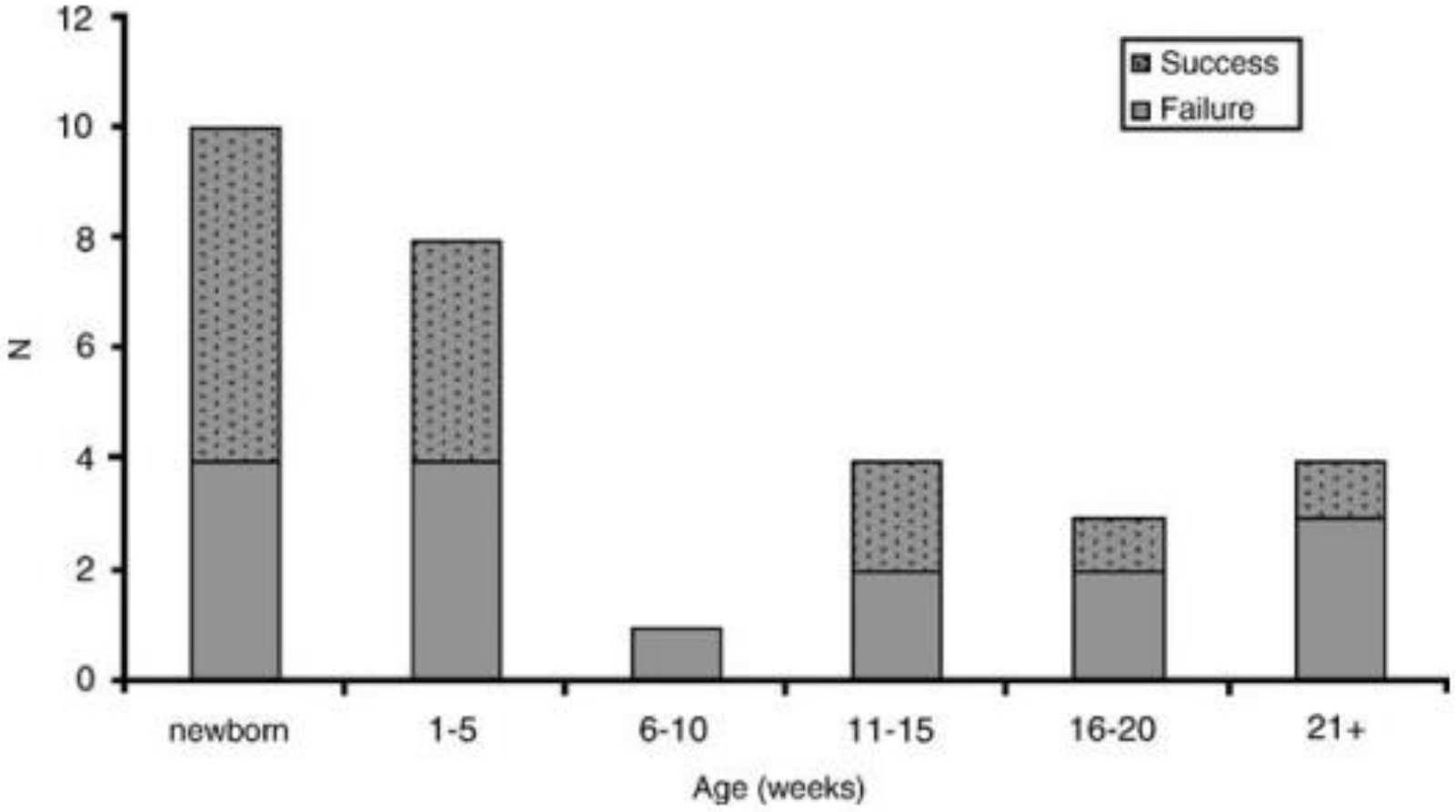
Table 2 Aetiological categories within this patient series in the under-1-year age group and their rates of successful outcome

Diagnosis	Patient number, *N* (success rate, %)
Aqueduct stenosis	10 (50)
Arachnoid cyst	6 (100)
Post-haemorrhagic hydrocephalus	11 (18)
Infection	2 (0)
Tumour	1 (100)
Others (Dandy–Walker cyst, developmental anomalies, etc.)	7 (42)
Total	37 (46)

The success rate is the percentage of the number *N* in each category which had a successful outcome

Is there an indication for ETV in young infants in aetiologies other than isolated aqueduct stenosis?. Childs Nerv Syst (2006) 22:1565–1572

TVE MENORES DE UN AÑO



Is there an indication for ETV in young infants in aetiologies other than isolated aqueduct stenosis?. Childs Nerv Syst (2006) 22:1565–1572

TABLE 2

Successful ETV in the three patient subgroups by age

Group	Total No. of Patients	No. of Patients W/ Successful ETV (%)		
		Total	≤15 Yrs of Age	>15 Yrs of Age
infection	42	27 (64.3)	15 of 27 (55.6)	12 of 15 (80.0)
hemorrhage	46	28 (60.9)	20 of 36 (55.6)	8 of 10 (80.0)
combined	13	3 (23.1)	1 of 10 (10.0)	2 of 3 (66.7)
total	101	58 (57.4)	36 of 73 (49.3)	22 of 28 (78.6)

ESTENOSIS ACUEDUCTAL CONGENITA 56% **ADQUIRIDA 33%**
PROCEDIMIENTO EXITOSO EN 61% **PROMEDIO COMPLICACIONES 14%**

TABLE 1

Results in a series of 36 adult patients with hydrocephalus who underwent ETV

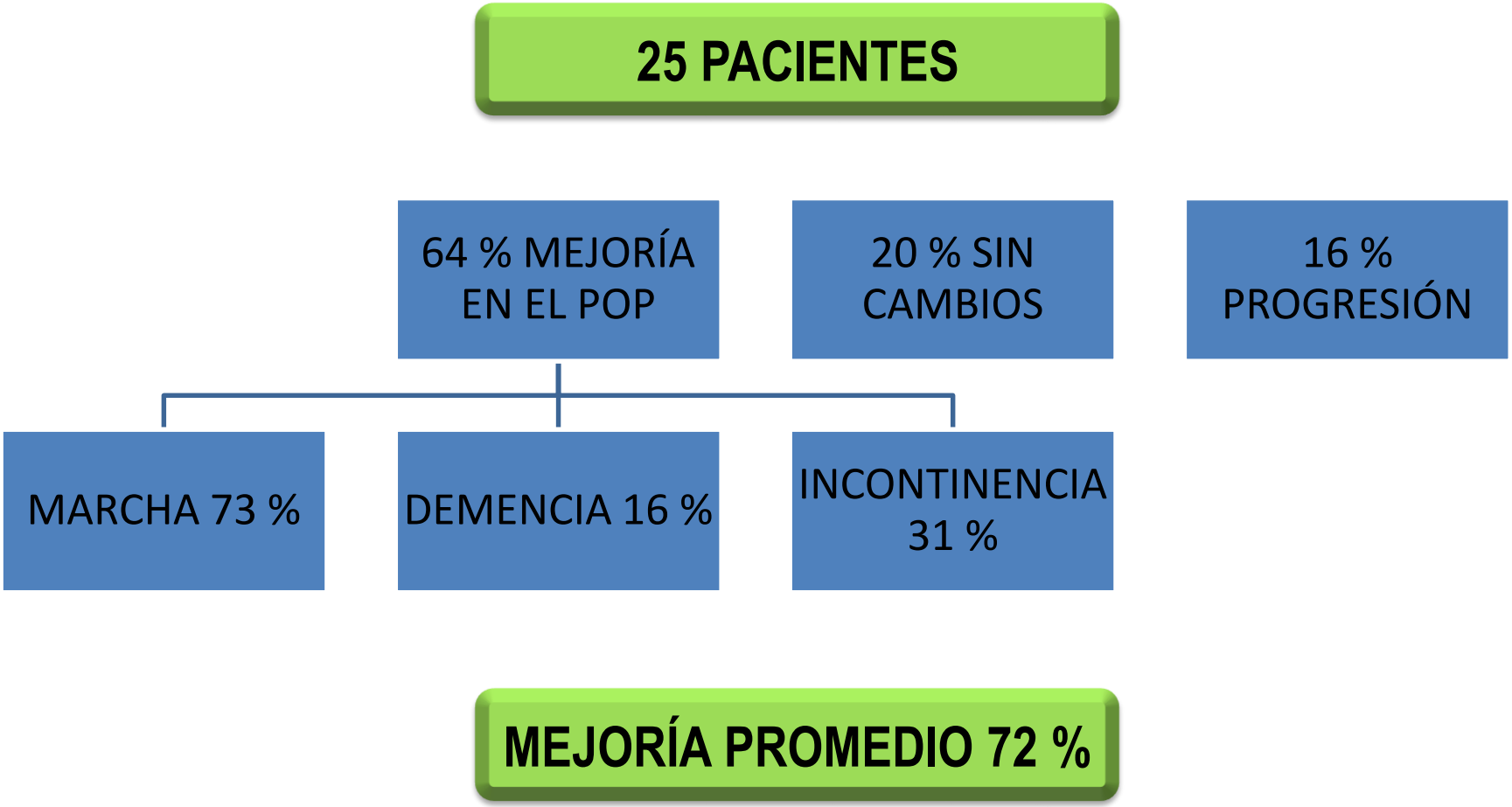
Factor	No. of Patients (%)
diagnosis	
congenital AS	20 (56)
acquired AS	12 (33)
posterior fossa tumor	3 (8)
cysticercosis	1 (3)
ventricular floor	
translucent	17 (47)
opaque	19 (53)
vascular anatomy	
normal	22 (61)
abnormal	14 (39)
opaque & abnormal	8 (22)
outcome	
shunt free	22 (61)
shunt dependent	14 (39)
complications	
memory problems	1 (3)
unsuccessful ETV	1 (3)
infection	1 (3)
minimal hemorrhage	1 (3)
CSF leak	1 (3)
overall	5 (14)

22% OBSTRUCCIÓN POSTERIOR A PRIMERA TV EXITOSA

MAYOR SEGUIMIENTO A LOS 6 AÑOS (1 PACIENTE)

Endoscopic third ventriculostomy in adult patients. Neurosurg Focus 19 (6):E9, 2005

HIDROCEFALIA DE PRESIÓN NORMAL



Endoscopic third ventriculostomy in idiopathic normal pressure hydrocephalus. Neurosurgery 55:129-134, 2004

EFECTIVIDAD

485 PROCEDIMIENTOS

Table 5 Numbers of procedures with clinical success and failure

	Clinical success	Clinical failure	
ETV	258/339	82/339	76%
ETV with biopsy	35/41	6/41	85%
Arachnoid/intraventricular cyst fenestration	52/59	7/59	
Colloid cyst resection	20/25	5/25	
Septum pellucidum fenestration	20/21	1/21	

Long-term complications and definition of failure of neuroendoscopic procedures. Childs Nerv Syst (2004) 20:868–877

REVISIÓN SISTEMÁTICA TVE

TABLE 2: Summary of intraoperative events*

Type of Event	Rate (%)	No. of Cases
bleeding	3.72	66/1775
severe hemorrhage	0.60	14/2344
basilar rupture	0.21	5/2344
neural injury	0.24	8/2344
thalamic	0.12	3/2344
forniceal	0.04	1/2344
hypothalamic	0.04	1/2344
midbrain	0.04	1/2344
anesthesia-related	0.10	2/2344

* The rate of procedure abandonment was 4.16% (76 of 1826 procedures).

Complications of endoscopic third ventriculostomy . J Neurosurg Pediatrics 7:643–649, 2011

TABLE 3: Rates of postoperative complications*

Complication	Rate (%)	No. of Cases
hematoma	0.81	24/2985
subdural	0.30	9/2985
intraventricular	0.30	9/2985
intracerebral	0.15	4/2985
epidural	0.07	2/2985
subdural hygroma	0.27	8/2985
CNS infection	1.81	44/2427
meningitis	1.60	39/2427
ventriculitis	0.21	5/2427
sepsis	0.08	2/2427
CSF leak	1.61	48/2985
systemic complication	2.34	70/2985
deep vein thrombosis	NA	NA
pneumonia	NA	NA
pulmonary embolism	NA	NA
urinary infection	NA	NA
urinary retention	NA	NA
renal failure	NA	NA
hyponatremia	NA	NA
hypotension	NA	NA
bradycardia	NA	NA
other	1.73	52/2985

* NA = data not available (not reported).

Complications of endoscopic third ventriculostomy . J Neurosurg Pediatrics 7:643–649, 2011

TABLE 4: Permanent morbidity rates in 2985 cases

Morbidity	Rate (%)	No. of Cases
neurological	1.44	43/2985
gaze palsy	0.60	18/2985
decreased consciousness	0.34	10/2985
hemiparesis	0.34	10/2985
memory disorders	0.17	5/2985
hormonal	0.94	28/2985
diabetes insipidus	0.64	19/2985
weight gain	0.27	8/2985
precocious puberty	0.04	1/2985
overall	2.38	71/2985

TABLE 5: Summary of fatal complications*

Pt Age	Hydrocephalus Etiology	Cause of Death	Timing Post ETV
<1 mo	NA	sepsis, oculomotor palsy	early
60 yrs	tumor	meningitis, sepsis, multiorgan failure	early
17 yrs	AVM	rupture of AVM	early
NA (adult)	thalamic anaplastic astrocytoma	intracerebral hematoma	early
NA (adult)	thalamic anaplastic astrocytoma	intraventricular hematoma	early
63 yrs	tumor	basilar tear, SAH	early
14 yrs	aqueductal stenosis	late stoma occlusion	late (25 mos)
9 yrs	shunt malfunction (congenital hydrocephalus)	late stoma occlusion	late (5 yrs)

* AVM = arteriovenous malformation; SAH = subarachnoid hemorrhage.

Complications of endoscopic third ventriculostomy . J Neurosurg Pediatrics 7:643–649, 2011

TVE EN PACIENTES DERIVADOS

TABLE 2

Comparison of VP shunt–treated with non-VP shunt–treated patients

Tx	Total No. of Patients	No. of Patients (%)	
		Success	Failure
VP shunt	12	7 (58)	5 (42)
non-VP shunt	31	21 (68)	10 (32)

Endoscopic third ventriculostomy for tumor-related hydrocephalus in a pediatric population. Neurosurg Focus 19 (6):E8, 2005

Table 2 Complications of endoscopic third ventriculostomy

	Type of complication	Incidence (%)
Surgical mortality		0.5–1
Long-term mortality		Occasional reports
Significant complications	Haemorrhage, severe bradycardia, hemiparesis, memory disfunction, diabetes insipidus, epilepsy, infection, CSF fistula	0–7.8
Non-significant complications	Minor bleeding, ventricular wall contusion, transient neurological deficit	4.7–13
Specific complications	Vascular	0–1
	Neurological	0–4
	Hypothalamic[a]	0–1
	Obstruction of the stomy	1–25

Table 3 Shared complications

CSF shunt	Percentage	ETV	Percentage
Infections	1–20[b]	Infections	1–11
Overdrainage	5.2–43	Overdrainage	0.5–1.5
CSF leakage	0.1–5.5	CSF leakage	2–18
Haemorrhages[a]	0–30	Haemorrhages	1–6
Seizures	15–40	Seizures	0–1
Pneumocephalus	<1	Pneumocephalus	<1

Shunts vs endoscopic third ventriculostomy in infants: are there different types and/or rates of complications? .Childs Nerv Syst (2006) 22:1573–1589

CONSIDERACIONES TÉCNICAS

- Familiarización con la anatomía endoscópica
- Se prefiere el uso de endoscopio rígido
- No atravesar el balón de Fogarty inflado
- Eliminar membranas aracnoideas
- No hacer una exploración agresiva de la cisterna
- Observar oscilaciones del piso del III ventrículo
- Colocar catéter ventricular por 48h en casos de sangrado

RECOMENDACIONES

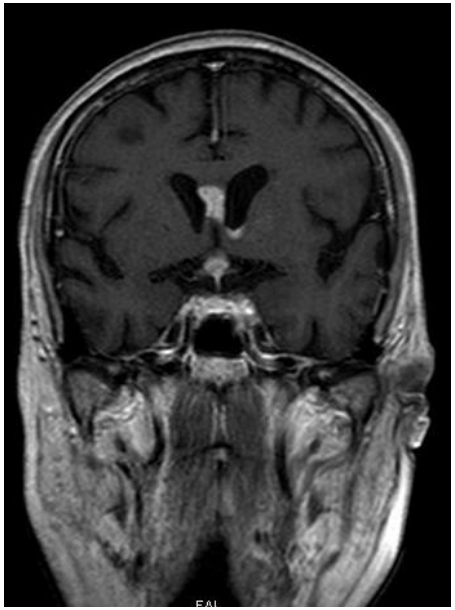
Posición semisentado con flexión cefálica (LCR)	Uso de una vaina desprendible (irrigación)	Doppler microvascular (localización A. Basilar)

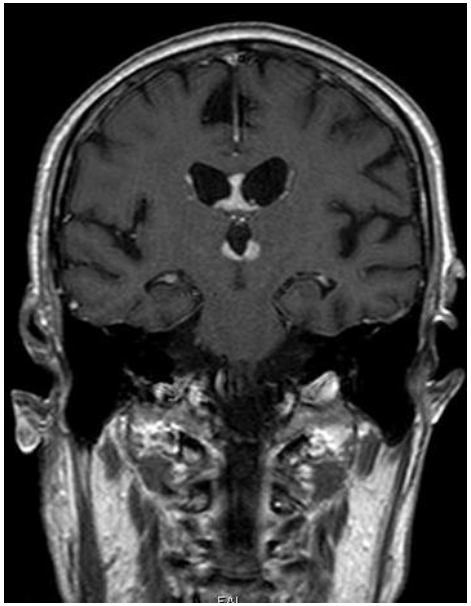
36 pacientes

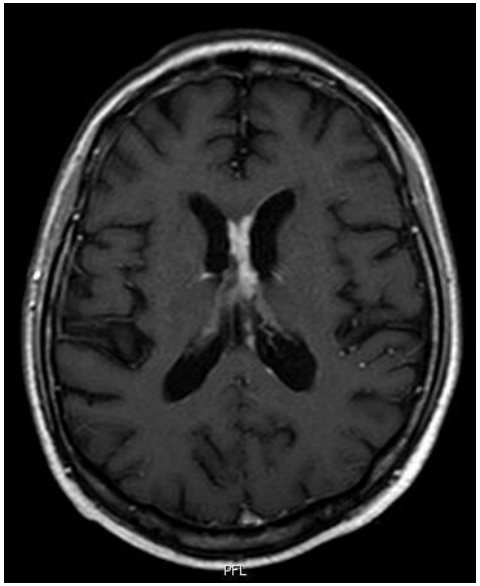
- 39 % VARIACIÓN POSICIÓN ARTERIA BASILAR
- 53 % SIN TRANSLUCIDEZ DEL PISO III VENTRICULO
- 19 % COMBINACIÓN

Endoscopic third ventriculostomy in adult patients. Neurosurg Focus 19 (6):E9, 2005

TUMORES



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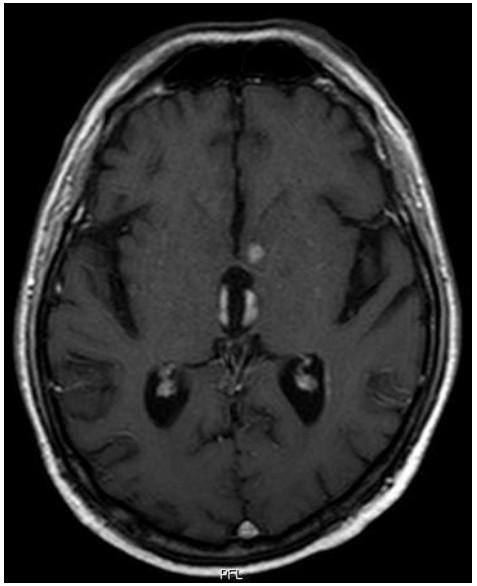
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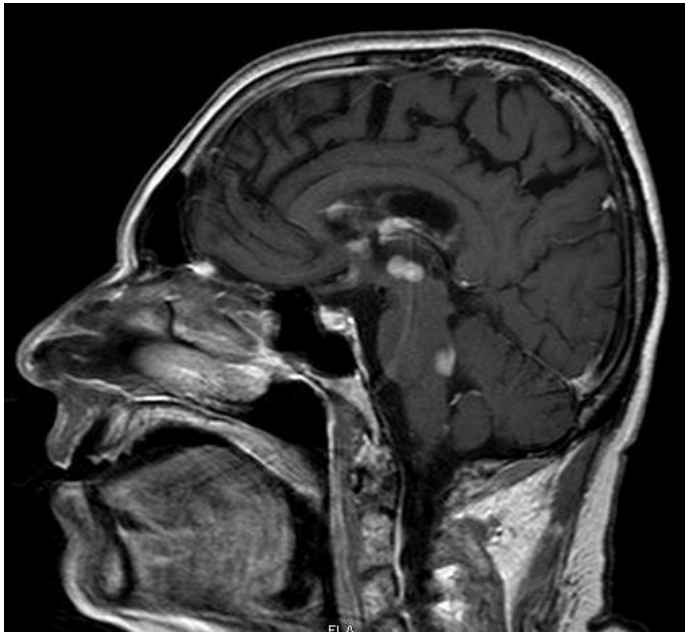
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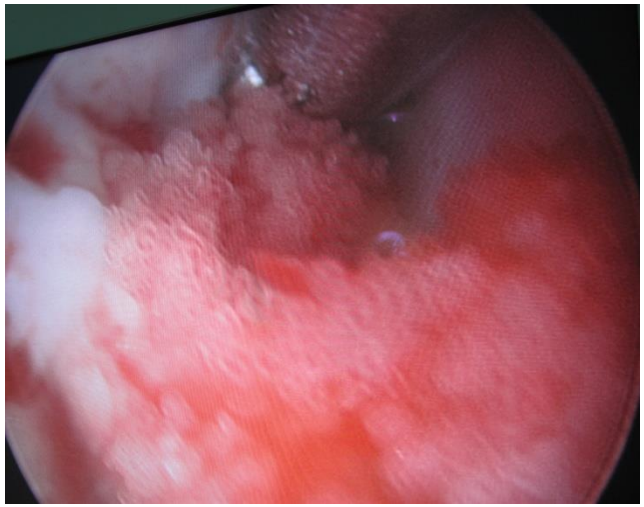

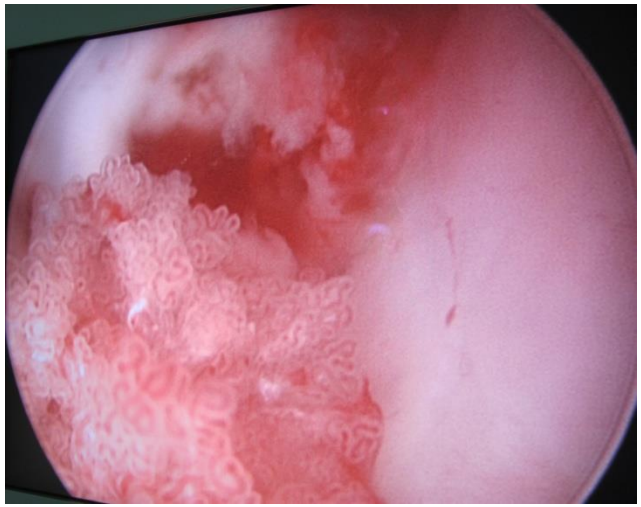

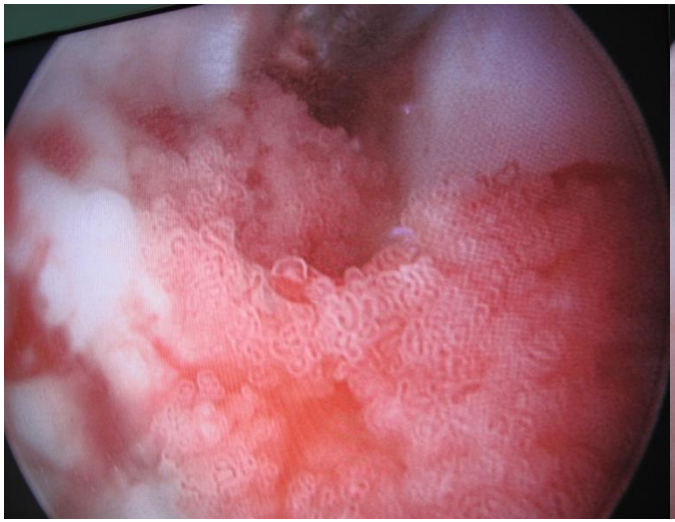

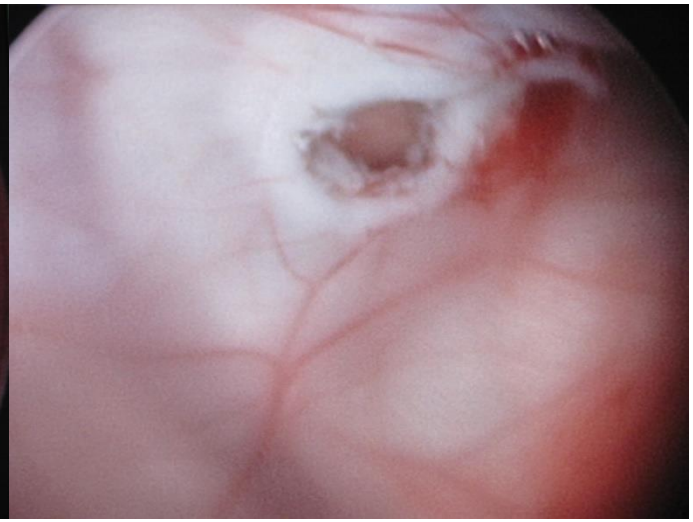

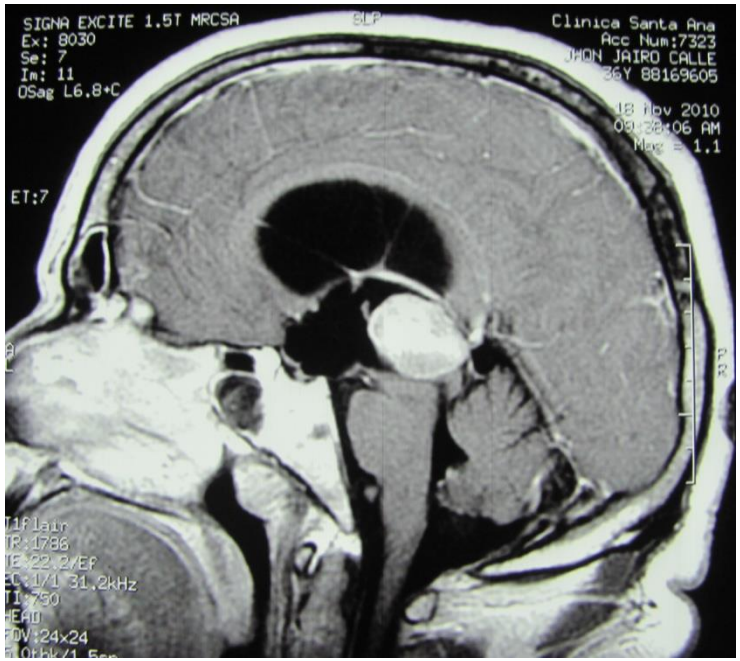
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HEAD
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5thk/1.5sp


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ASL
Clinica Sant
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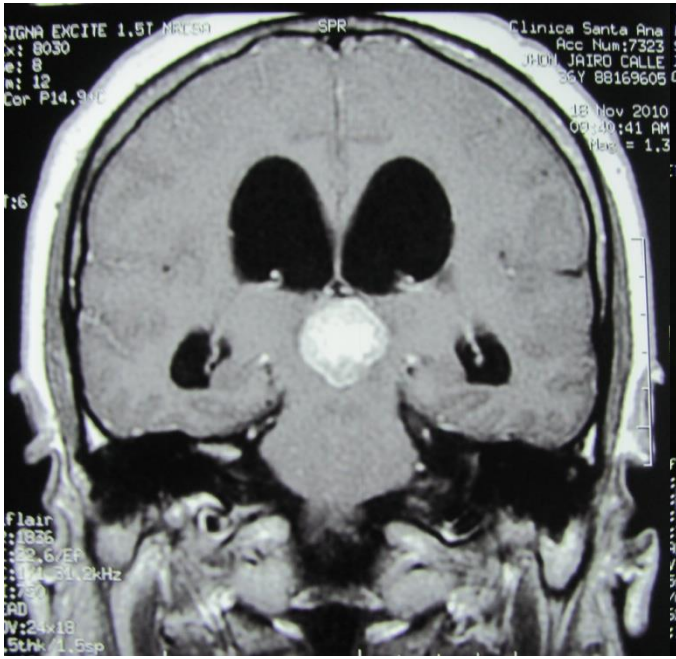
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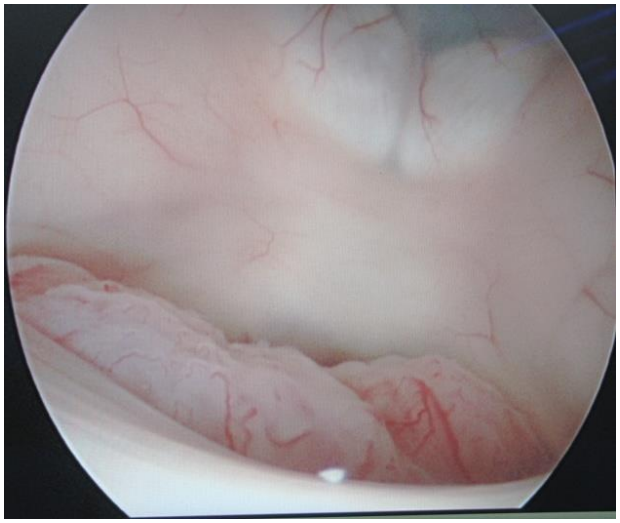
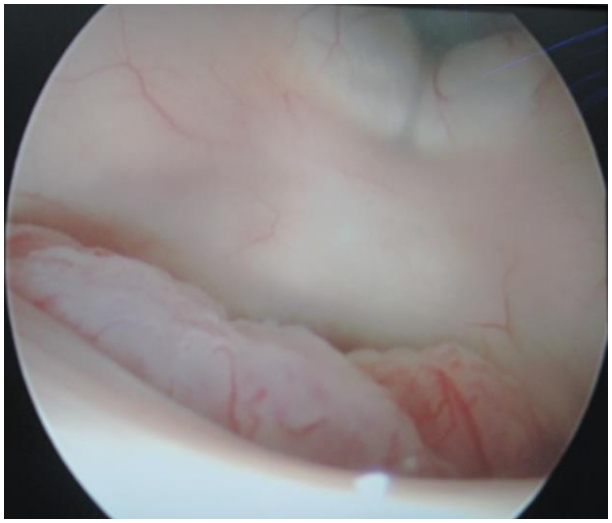
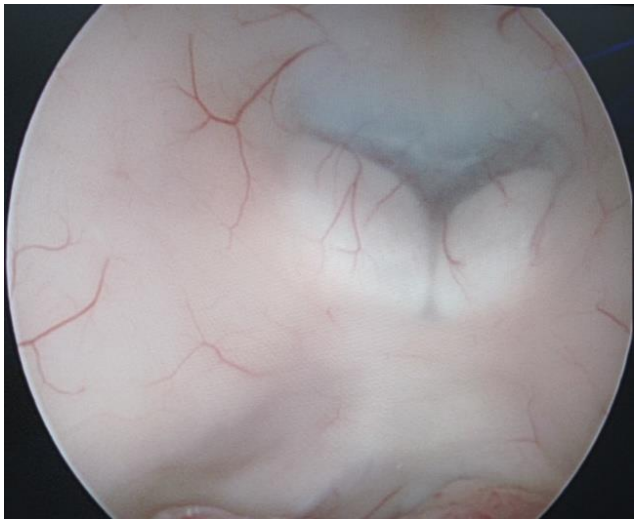
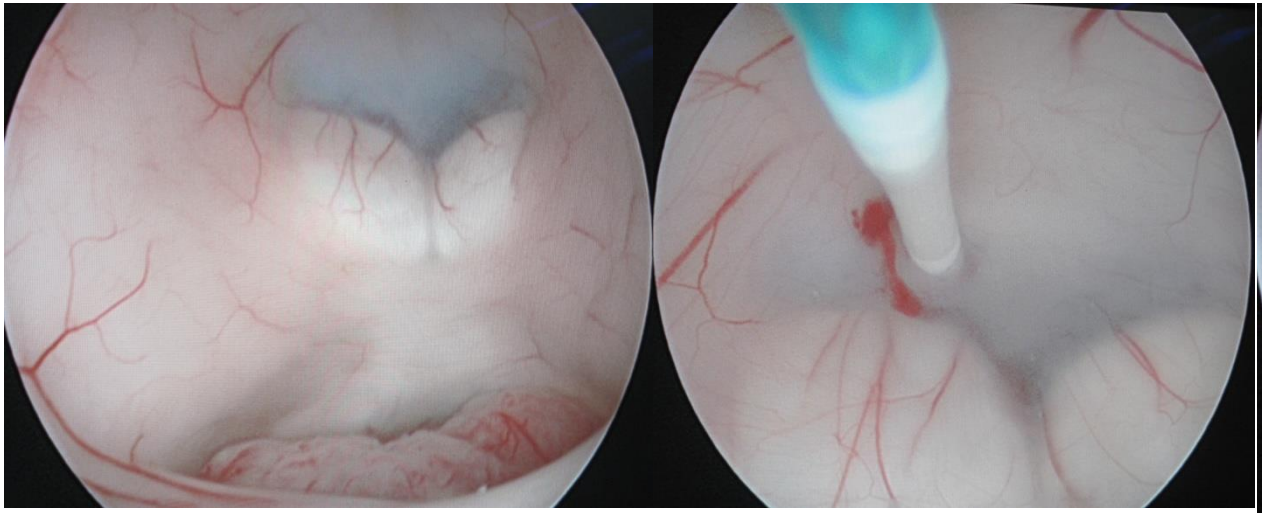
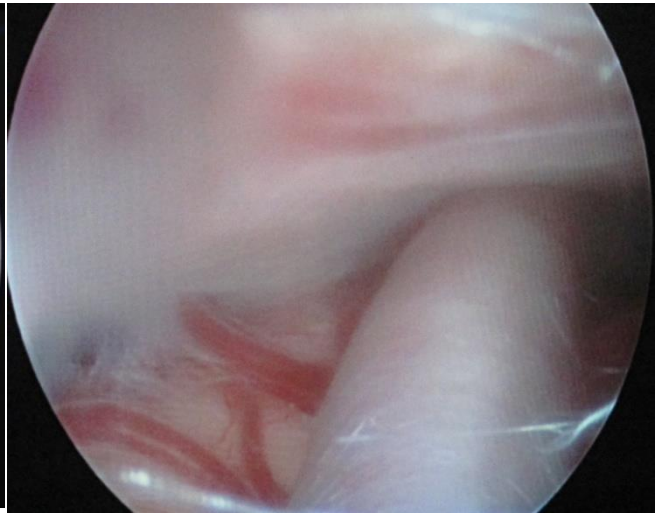
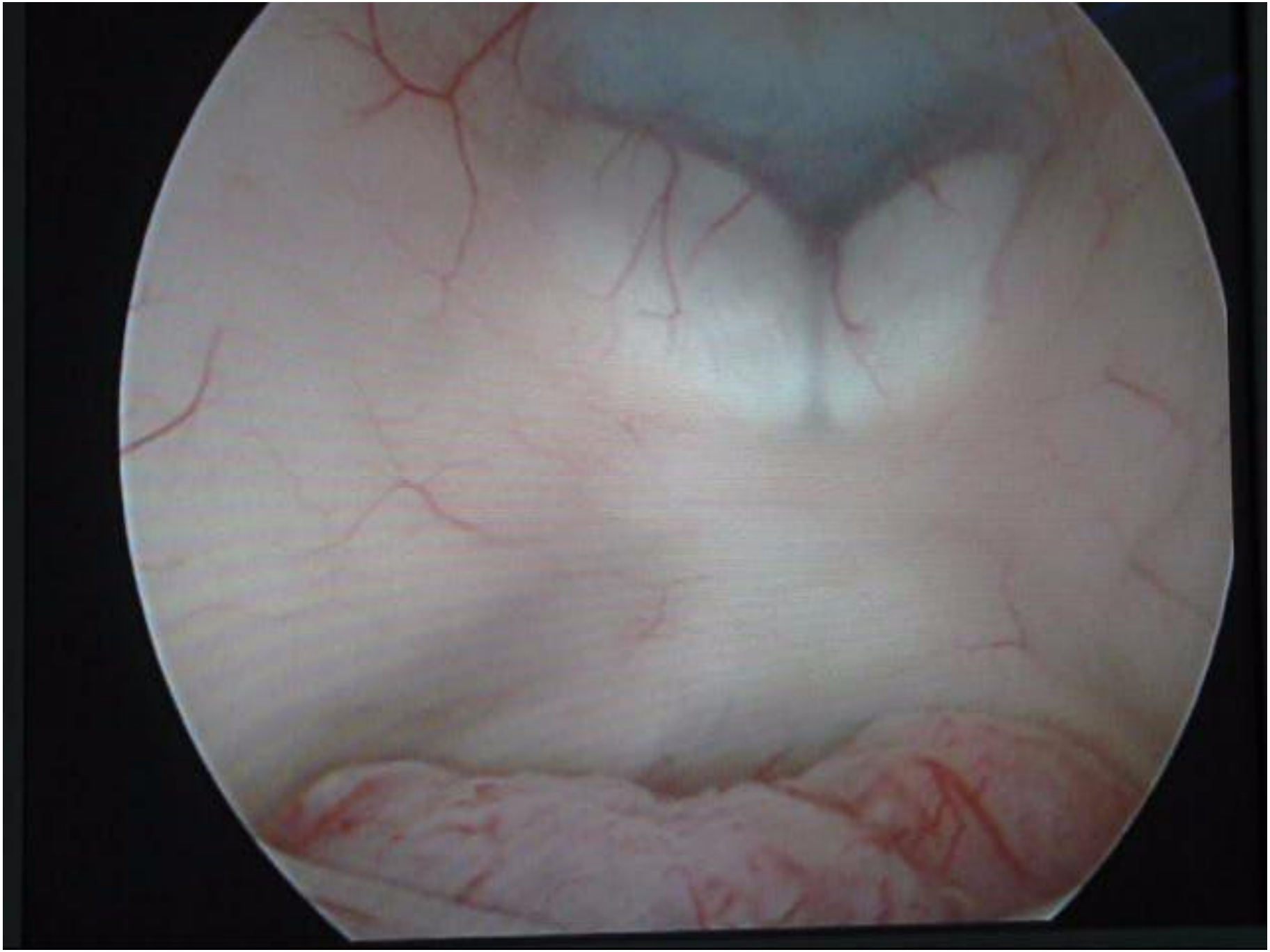








TUMORES

BIOPSIA

Tasa de éxito del 50 % en establecer DX

RESECCIÓN

Éxito en remoción de lesiones menores de 3 cm

TABLE 2

*Procedures undertaken and therapeutic outcomes in 20 patients with pineal region tumors**

Pathological Diagnosis	No. of Cases	Procedures			No. of Cases	Outcome (no. of cases)				
						Follow-Up Results on Imaging				
		Initial	Second	Third		TCD	TSR	TSU	TD	Died
germinoma	8	NEO	chemo	GKRS/SRT	3	3				
		NEO	WBRT	chemo	1	1				
		STBx	chemo	GKRS/SRT	1	1				
		STBx	WBRT	chemo	1	1				
		RO	GKRS/SRT		1	1				
		rad test	WNRT		1	1				
malignant germ cell tumors	3	RO	chemo	WBRT	2	1	2		1	1
		RO	chemo	pending†	1		1		1	1
pineoblastoma	2	NEO	WBRT	chemo	1	1				
		NEO	chemo	GKRS/SRT	1		1			
glioblastoma	1	RO	WBRT	chemo	1					1
metastatic brain tumor	1	WBRT			1			1		1
unverified	5	close obs			5			5		
total	20				20	10	4	6	2	4

* GKRS/SRT = gamma knife radiosurgery/frameless stereotactic RT; NEO = neuroendoscopic operation; obs = observation; rad test = radiation test; RO = radical operation; SO = spinal operation; STBx = stereotactic biopsy; TCD = tumor completely disappeared; TD = tumor disseminated; TSR = tumor size reduced; TSU = tumor size unchanged; WSRT = whole-spine RT.

† WBRT or SO+WSRT.

Efficacy of neuroendoscopic procedures in minimally invasive preferential management of pineal region tumors:a prospective study. J Neurosurg 93:245–253, 2000

TABLE 1

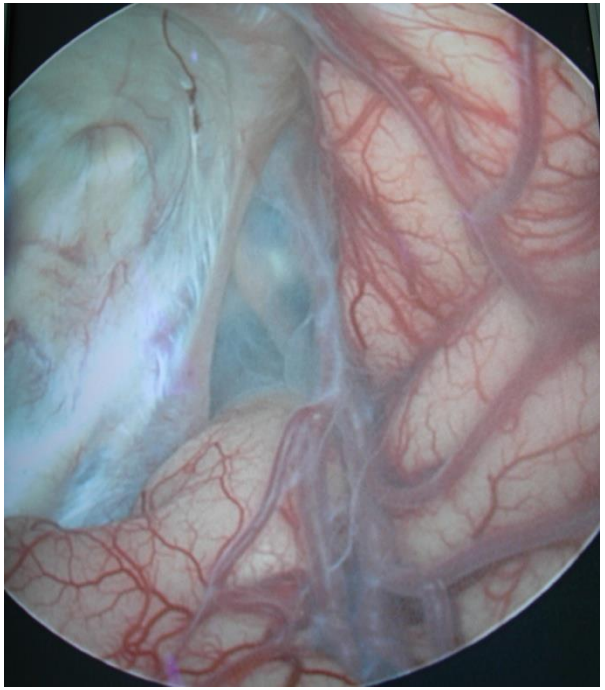
*Origins of hydrocephalus in 43 children who underwent ETV**

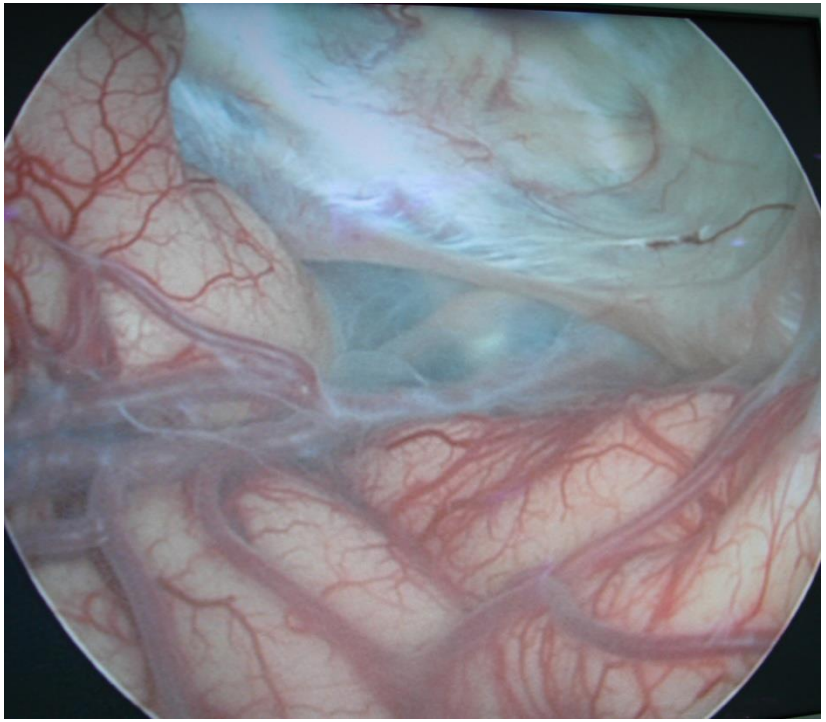
Tumor Location	No. of Patients†	No. w/ Success	% Success	No. of Txs Failed	No. of Txs Abandoned
midbrain	4	4	100	0	0
posterior fossa	9	4	44	5	0
brainstem	14	11	79	3	0
thalamus	6	4	67	0	2
pineal	3	3	100	0	0
3rd ventricle (incl arachnoid cyst)	2	2	100	0	0
other (diffuse, frontal, CPA)	5	4	80	1	0
total	43	32	74	9	2

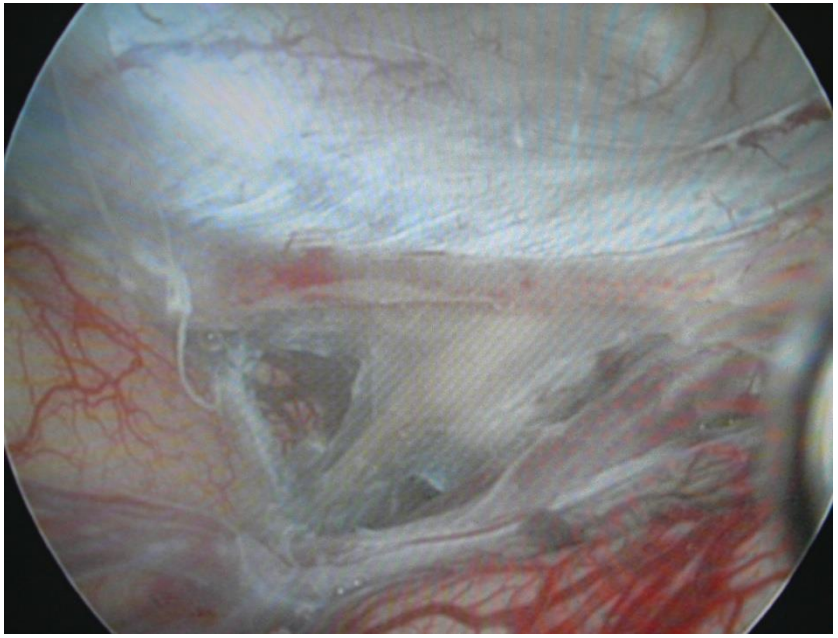
* CPA = cerebellopontine angle; incl = including; Tx = treatment.
† Includes two in whom the operation was abandoned.

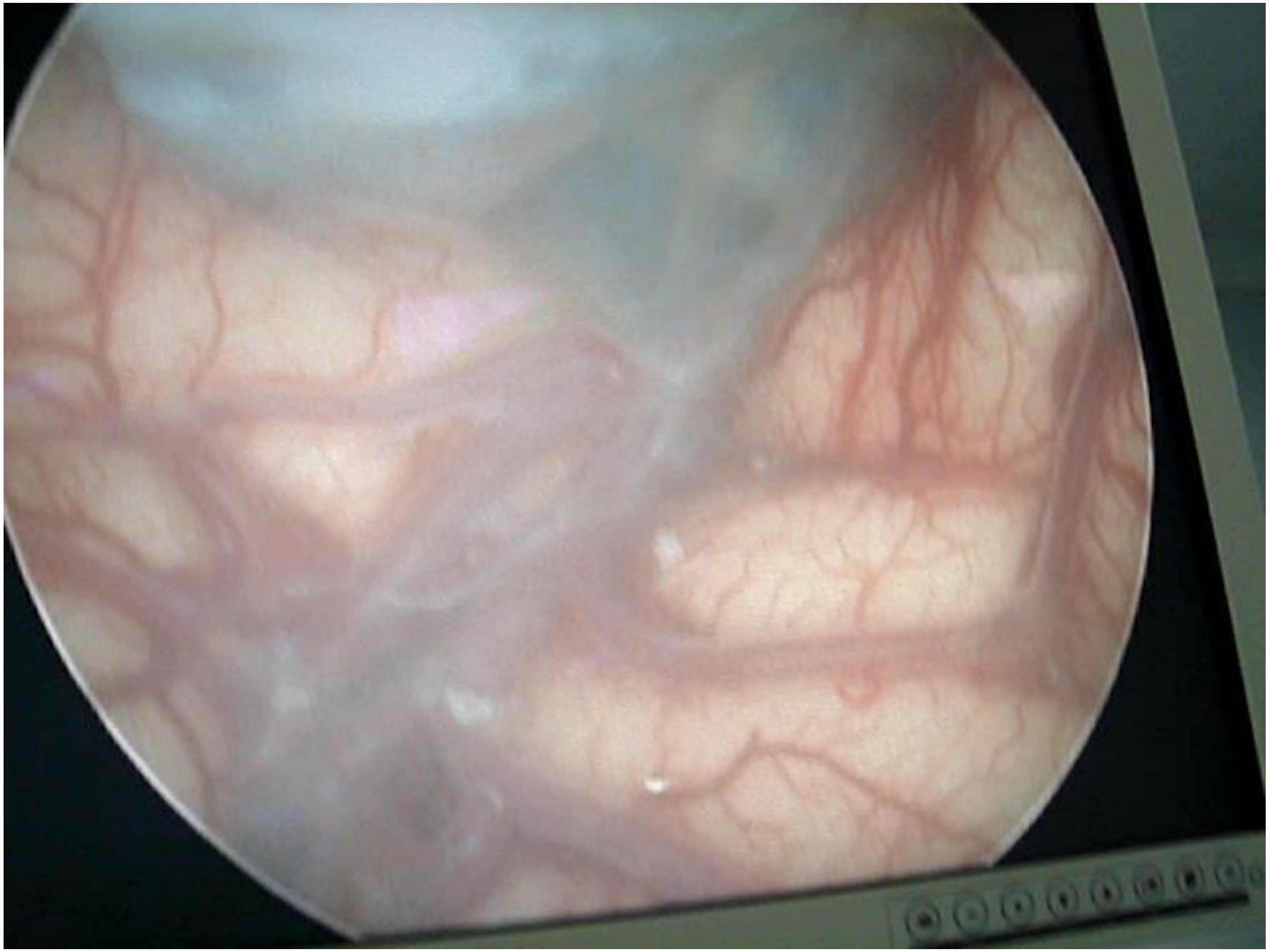
Endoscopic third ventriculostomy for tumor-related hydrocephalus in a pediatric population. Neurosurg Focus 19 (6):E8, 2005

QUISTES









APLICACIONES

QUISTES SUPRASELARES

QUISTES PINEALES

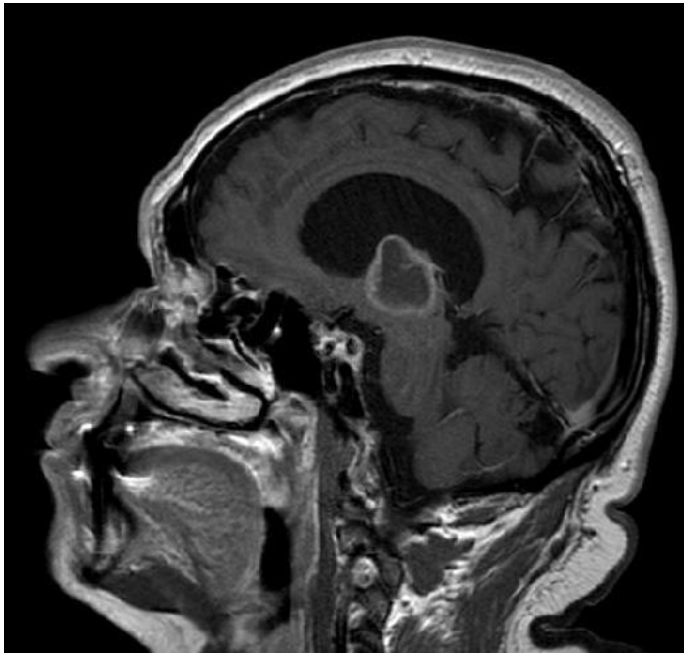
EFECTIVIDAD

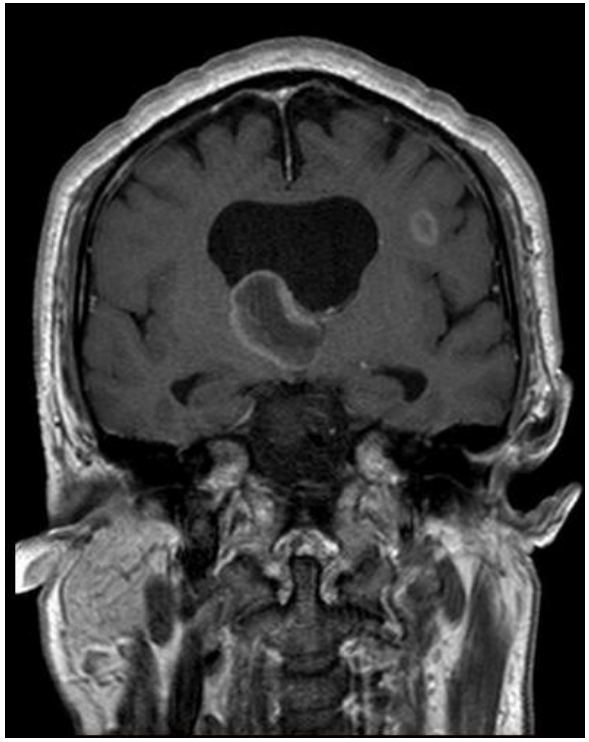
Table 5 Numbers of procedures with clinical success and failure

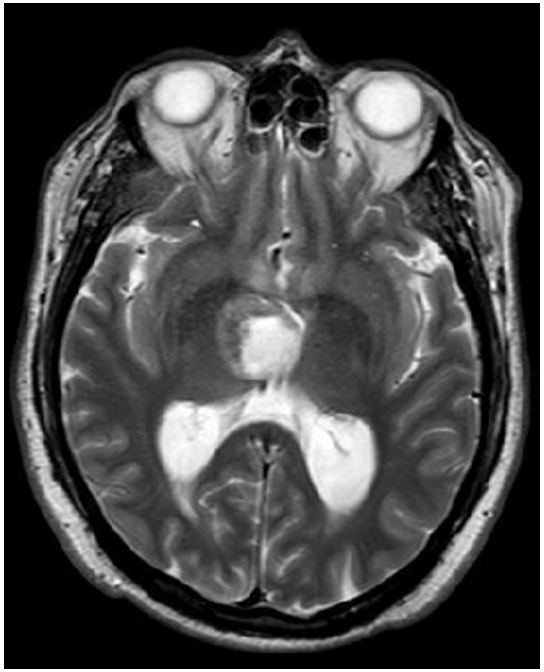
	Clinical success	Clinical failure	
ETV	258/339	82/339	
ETV with biopsy	35/41	6/41	
Arachnoid/intraventricular cyst fenestration	52/59	7/59	88%
Colloid cyst resection	20/25	5/25	80%
Septum pellucidum fenestration	20/21	1/21	

Long-term complications and definition of failure of neuroendoscopic procedures. Childs Nerv Syst (2004) 20:868–877

INFECCIONES





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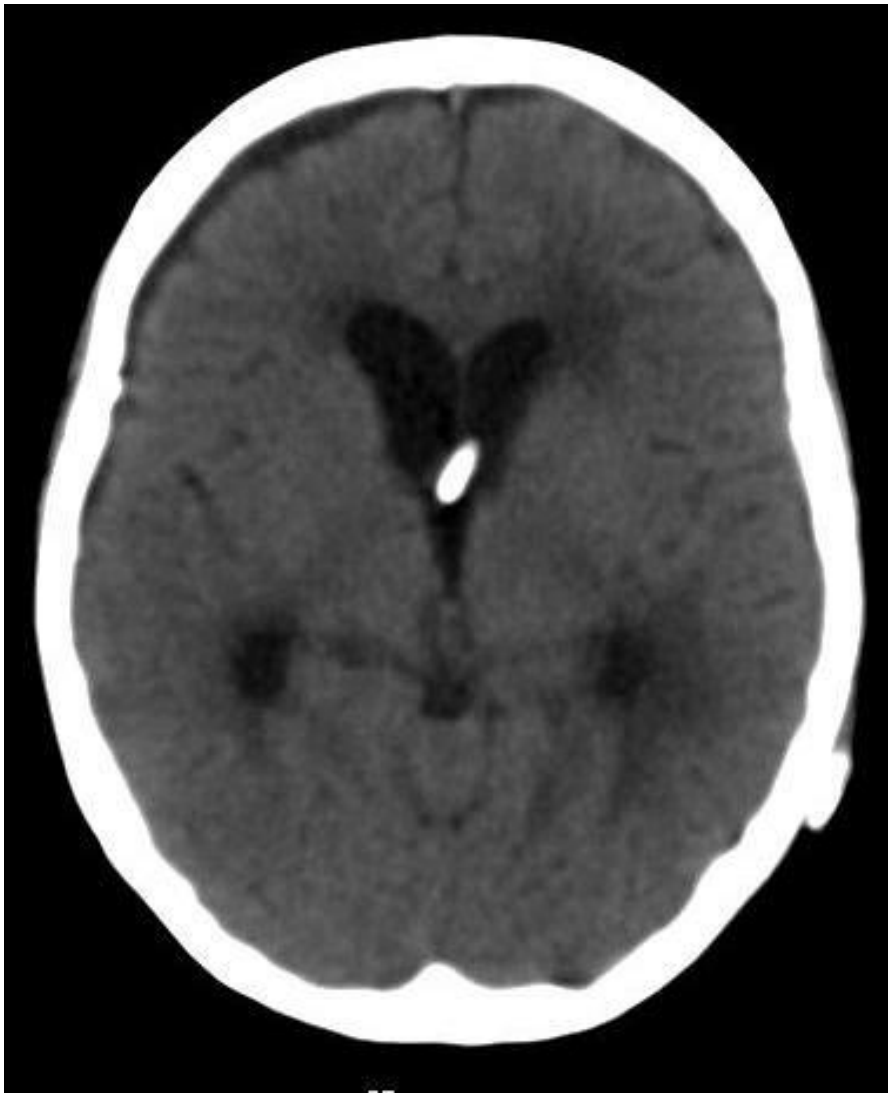
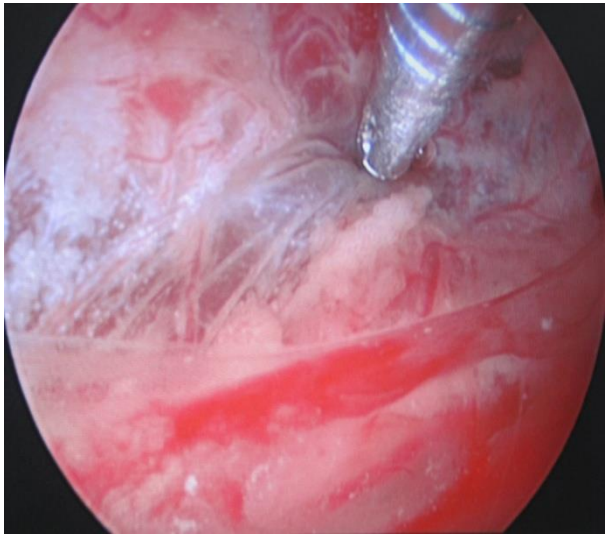
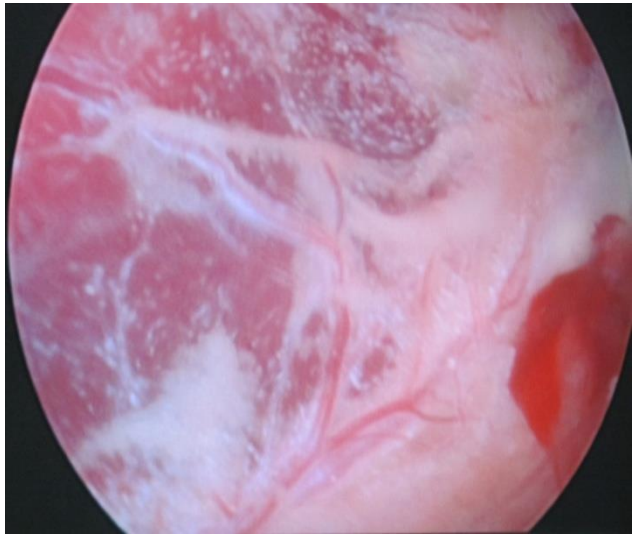
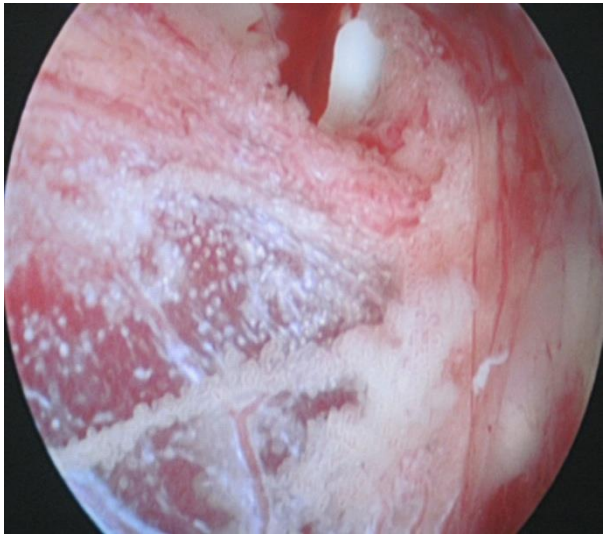
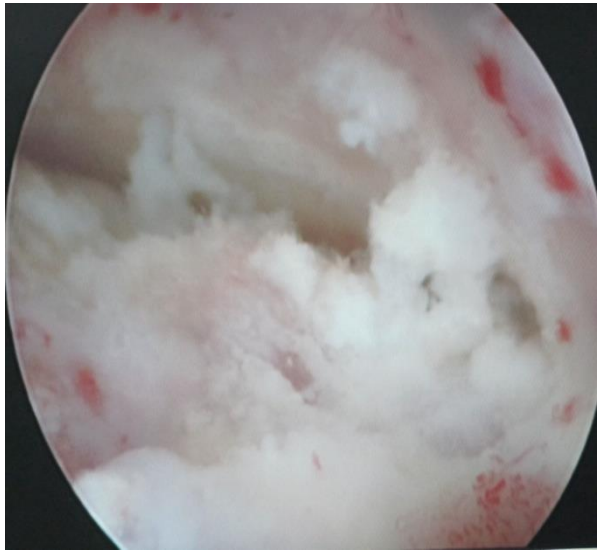
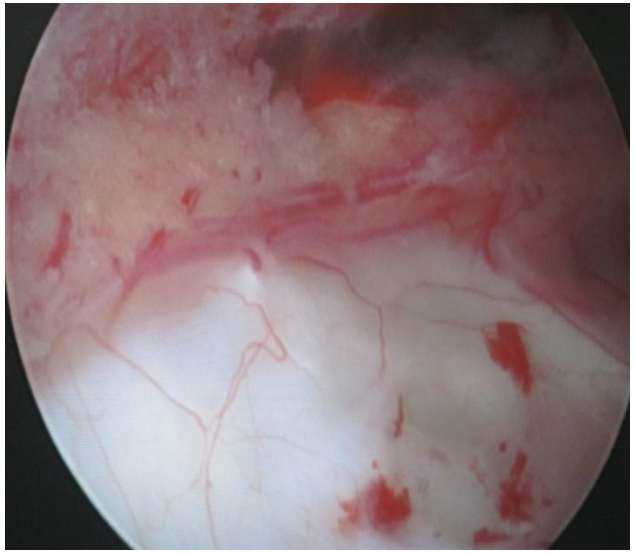
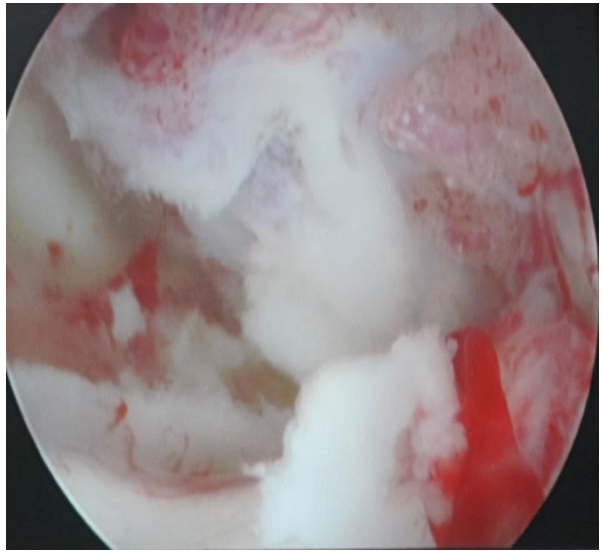


INFECCIONES

Table 2 Aetiological categories within this patient series in the under-1-year age group and their rates of successful outcome

Diagnosis	Patient number, *N* (success rate, %)
Aqueduct stenosis	10 (50)
Arachnoid cyst	6 (100)
Post-haemorrhagic hydrocephalus	11 (18)
Infection	2 (0)
Tumour	1 (100)
Others (Dandy–Walker cyst, developmental anomalies, etc.)	7 (42)
Total	37 (46)

The success rate is the percentage of the number *N* in each category which had a successful outcome

Is there an indication for ETV in young infants in aetiologies other than isolated aqueduct stenosis?. Childs Nerv Syst (2006) 22:1565–1572

TABLE 4

*Impact of infection variables on success rate in 42 patients**

Infection Variable	No. of Patients (%)	
	Total	Successful ETV
severe infection	13 (31)	8 (61.5)
no. of infections (>2 infections)	7 (16.7)	3 (42.9)
location of infection		
meningitis or ventriculitis	26 (61.9)	16 (61.5)
shunt infection	16 (38.1)	11 (68.8)
type of infection		
bacterial	29 (69.0)	17 (58.6)
yeast	5 (11.9)	4 (80.0)
negative or unknown culture	8 (19.0)	6 (75.0)

* None of these variables appears to affect outcome with any statistical significance.

TASA GENERAL DE ÉXITO EN HSA

PATOLOGÍA	No. Pacientes	Tasa De Éxito
HSA y/o HIV	46 (45.5%)	60.9 %
Neuroinfección	42 (41.5%)	64.4%
Ambos	13 (12%)	1%.
Total	110	

TASA DE COMPLICACIONES 14.9%

J. Neurosurg. / Volume 97 / September, 2002

TABLE 4: Crude and adjusted HRs, 95% CIs, and p value of risk factors associated with ETV failures

Factor	Bivariate Analysis			Multivariate Analysis		
	HR	95% CI	p Value	HRa	95% CI	p Value
female	1.0	0.7–1.5	0.93			
age						
>18 yrs	1.0			1.0		
2–18 yrs	1.1	0.7–1.7	0.77	1.5	0.9–2.6	0.17
6–24 mos	1.3	0.7–2.4	0.47	1.7	0.8–3.4	0.16
<6 mos	3.6	2.0–6.4	<0.001	5.0	2.4–10.4	<0.001
origin of hydrocephalus						
primary aqueductal stenosis	1.0					
tumors	0.7	0.4–1.2	0.17	1.2	0.6–2.3	0.58
hemorrhage	1.9	1.0–3.6	0.05	4.0	1.9–8.5	<0.001
meningitis	2.2	0.5–9.6	0.29	1.6	0.3–7.3	0.57
chronic hydrocephalus	2.4	1.2–5.0	0.01	6.3	2.6–15.0	<0.001
other	1.7	0.8–3.4	0.16	2.7	1.2–6.3	0.02

Endoscopic third ventriculostomy: outcome analysis in 368 Procedures. J Neurosurg Pediatrics 5:68–74, 2010

GUIADA POR NEURONAVEGACIÓN

Tabla 1. Indicaciones de neuroendoscopia guiada por neuronavegación

Hidrocefalias
- Anatomía distorsionada
- Orificio de Monro pequeño
- Multitabicadas
- Ventrículo excluído
- LCR turbio o hemorrágico

Quistes aracnoideos (QA)
- Para localizar punto de entrada en QA temporales
- Comunicar QA supraselares, cuadrigeminales y ependimarios a ventriculos pequeños
- Quistes de septum pellucidum sintomáticos

Tumores
- Biopsia o resección
- Comunicación de quistes ventriculares

Epilepsia
- Implante de electrodos en el asta temporal del ventrículo lateral.
- Callosotomía
- Desconección de hamartomas hipotalámicos.

COMPLICACIONES

Esperables en procedimientos convencionales

SANGRADO

INFECCIÓN

DÉFICIT NEUROLÓGICO

1988

- Serie de 109 procedimientos
- No hemorragia intraoperatoria
- 2 pacientes con HIC

1994

- Serie de 24 pacientes con Tercer Ventriculostomía
- 1 paciente con hemorragia
- 1 paciente con HSD

COMPLICACIONES TVE

- Incidencia reportada 0-20%
- Tasa de mortalidad mas alta es del 1%

- Perforación Arteria Basilar o sus ramas
- Sangrado
  - Plexo coroide
  - Pared ventricular
  - Cisterna
  - Intraparenquimatoso
  - Subdural
- Infecciones
- Endocrinopatías
- Compromiso del III y VI par

TABLE 4

*Complications in nine patients who underwent ETV for hydrocephalus**

Complication	No. of Patients
venous bleeding	3
decreased consciousness	2
diabetes insipidus	1
EOM limitation	2
infection	1
total (rate)	9 (20.9%)

* EOM = extraocular muscle.

Endoscopic third ventriculostomy for tumor-related hydrocephalus in a pediatric population. Neurosurg Focus 19 (6):E8,2005

DISMINUCIÓN DE LA TASA DE EFECTIVIDAD

RADIACIÓN PREVIA

MENINGITIS

ALTAS TASAS DE ÉXITO

ESTENOSIS ACUEDUCTAL DE INICIO TARDÍO

Type of endoscopic procedure	Number of procedures performed
ETV	339
ETV with biopsy of intraventricular/paraventricular tumour	41
Endoscopic colloid cyst removal	25
Endoscopic fenestration of arachnoid or intraventricular cyst	59
Endoscopic septum pellucidum fenestration, with/without ETV	21
Total number of procedures	485

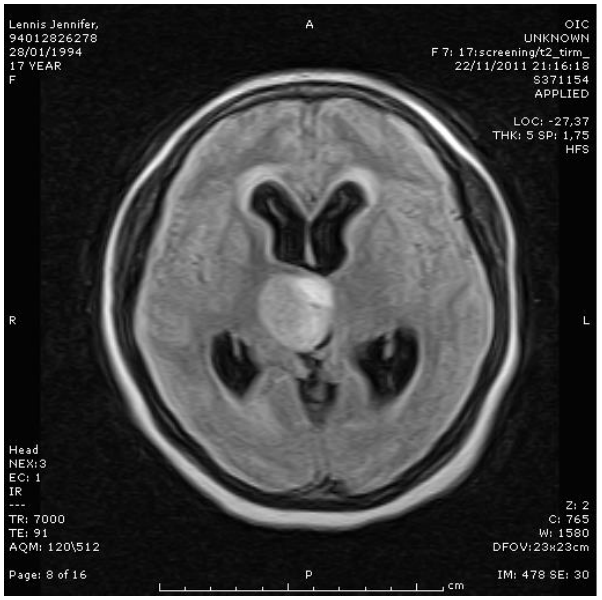
- TASA DE COMPLICACIONES **9.3 %**
- TASA DE MORBILIDAD **9.1 %**
- TASA DE MORTALIDAD **0.2 %**

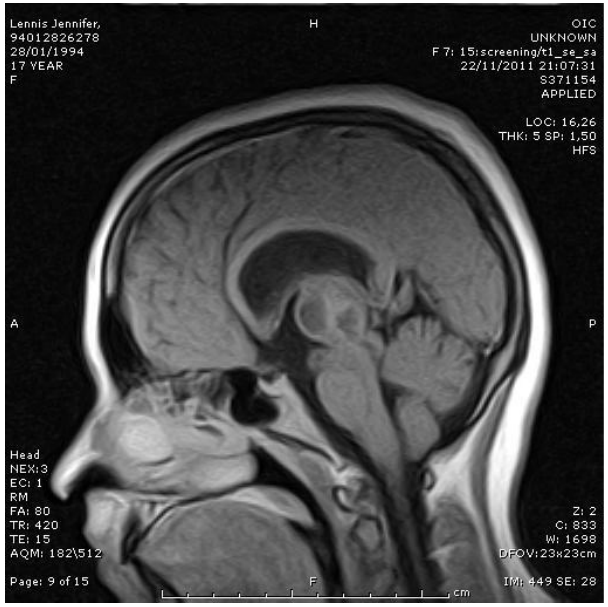
Long-term complications and definition of failure of neuroendoscopic procedures. Childs Nerv Syst (2004) 20:868–877

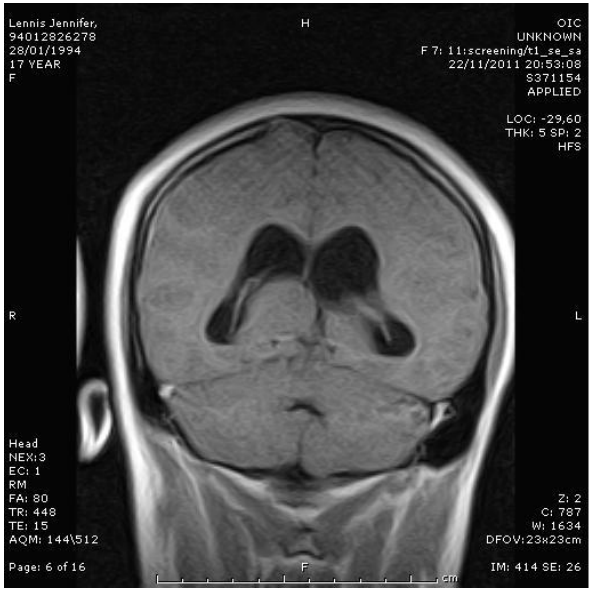
COMPLICACIONES TRANSITORIAS 20 %

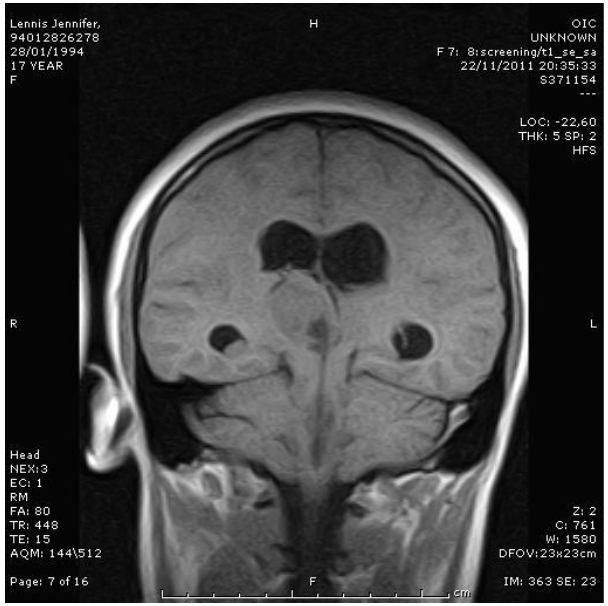
	Short-term complication	Long-term complication
Superficial wound infection	4	
Ventriculitis	3	
Subdural haematoma/hygroma	4	
Oculomotor palsy	2	
Hemianopia		1
Diabetes insipidus	1	1
Late arousal	4	
Respiratory dysfunction	1	
Pseudomeningocele	1	
CSF leakage	4	
Hemiparesis	1	2
Parinaud syndrome	2	
Intraventricular haematoma	5	
Intratumoral with intraventricular haematoma		1 (fatal)
Persistent low level of consciousness	2	1
Intracerebral haematoma	2	
Confusion		1
Memory loss		2
Total number	36	9

Long-term complications and definition of failure of neuroendoscopic procedures. Childs Nerv Syst (2004) 20:868–877









¿USTEDES QUÉ CONDUCTA TOMARÍAN?