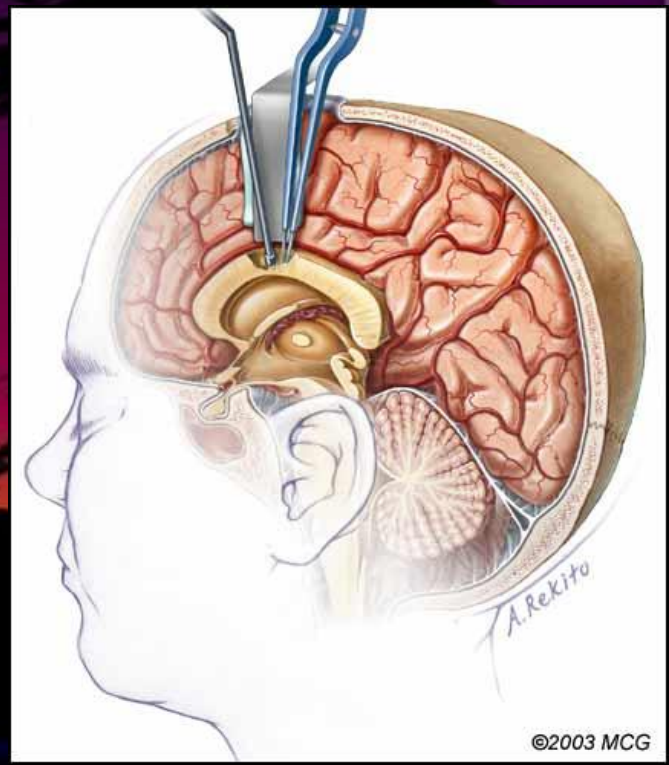
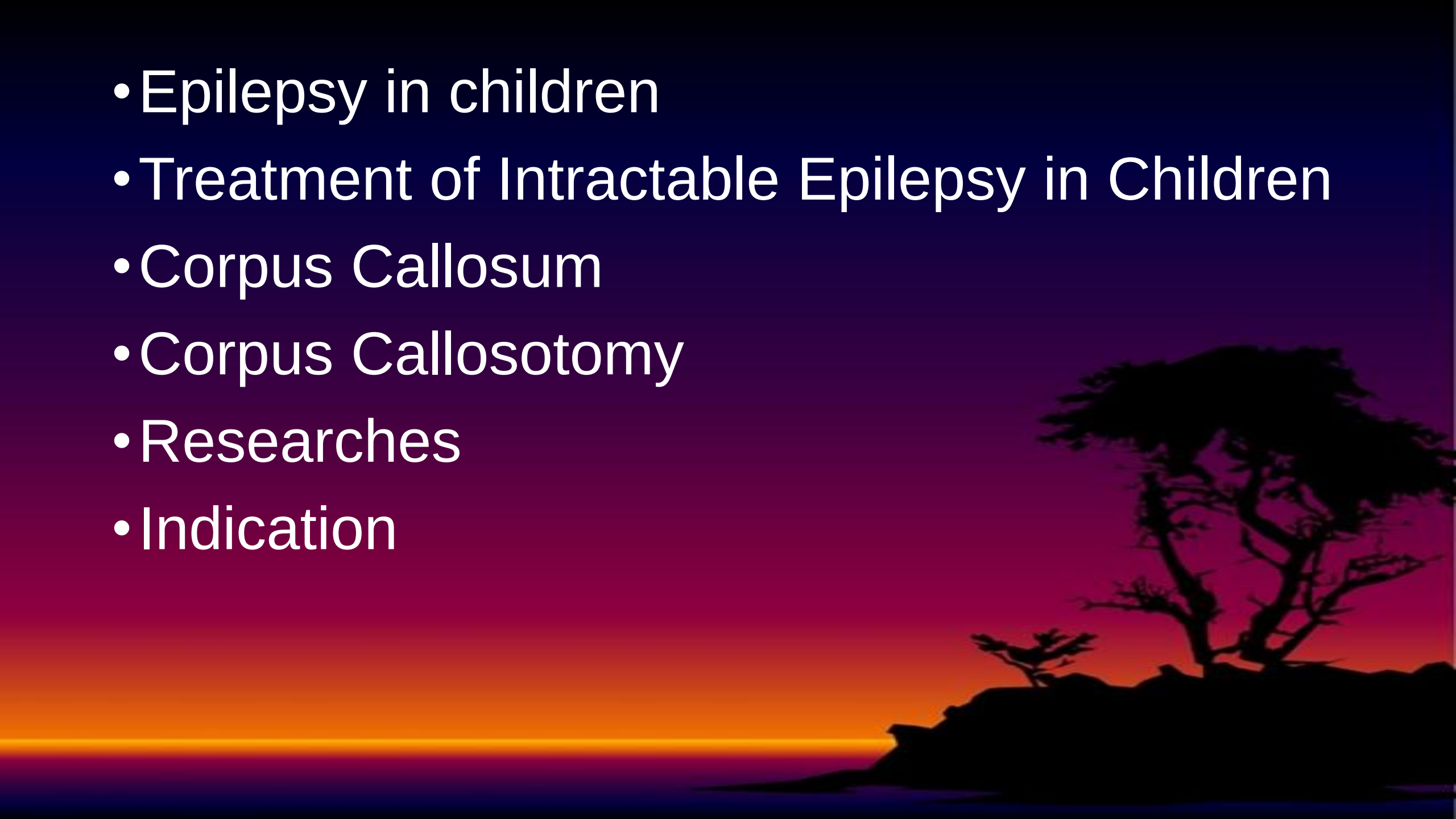
CORPUS CALLOSOTOMY FOR PEDIATRIC EPILEPSY SURGERY

Dr. Nguyen Ngoc Pi Doanh
Pediatric Neurosurgery Deparment



- Epilepsy in children
- Treatment of Intractable Epilepsy in Children
- Corpus Callosum
- Corpus Callosotomy
- Researches
- Indication



PEDIATRIC EPILEPSY

- Seizures: # 10% of children → 1/3 epilepsy
- General seizures: 45,4 % (51% idiopathic, 36% cryptogenic)

(ILAE Classification 2010)

- Epilepsy Syndromes:
  - Seizure Syndromes with onset in the first year of life
  - Lenox-Gastaut Syndrome.
  - Landau-Kleffner Syndrome.
  - …

PEDIATRIC EPILEPSY

- 10-40% pediatric patients : ***intractable seizure***.
  → impair cognitive and psychosocial development.
- Medical Intractable Epilepsy:
  - Inadequate seizure control >= 2 EADs 18-24 months.
  - Adequate seizure control with unacceptable drug-related side effect.

PEDIATRIC EPILEPSY
Diagnostic Work-up

- EEG and Video EEG
- Neuroimaging:
  - CT/ MRI
  - PET/ SPECT
- Functional MRI
- Wada test
- Neurocognitive testing

EPILEPSY SURGERY TEAM

- Epileptologists
- Neurosurgeons
- Radiologists
- EEG technicians
- Neuropsychologists
- Pediatricians
- Therapists
- ….

EPILEPSY SURGERY

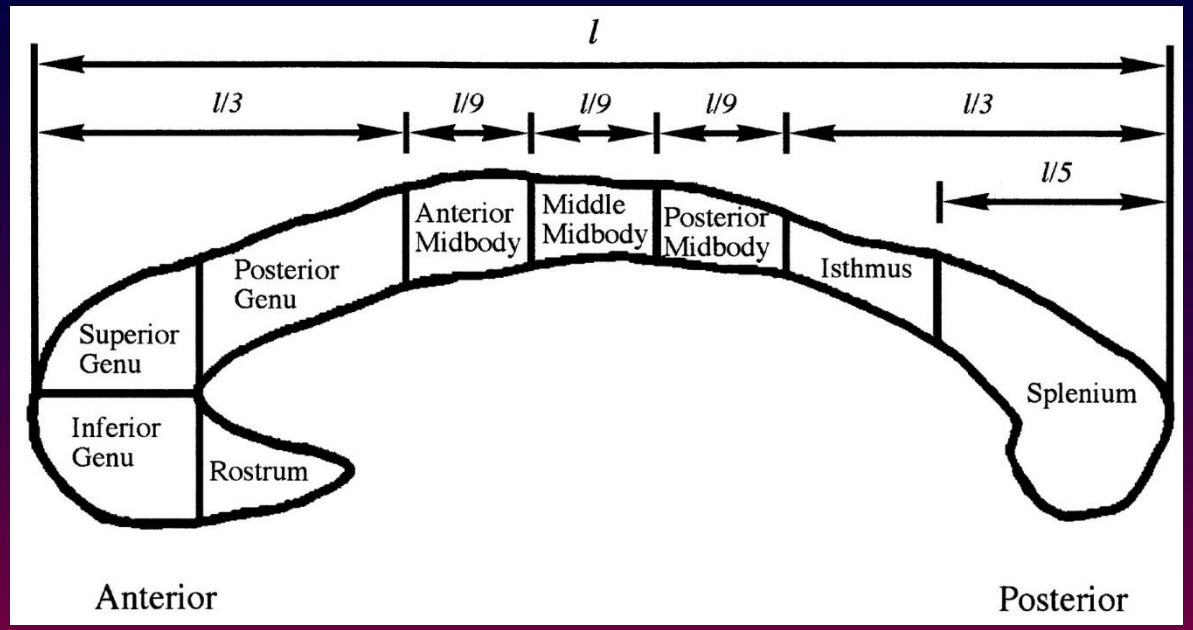
Curiable Surgery

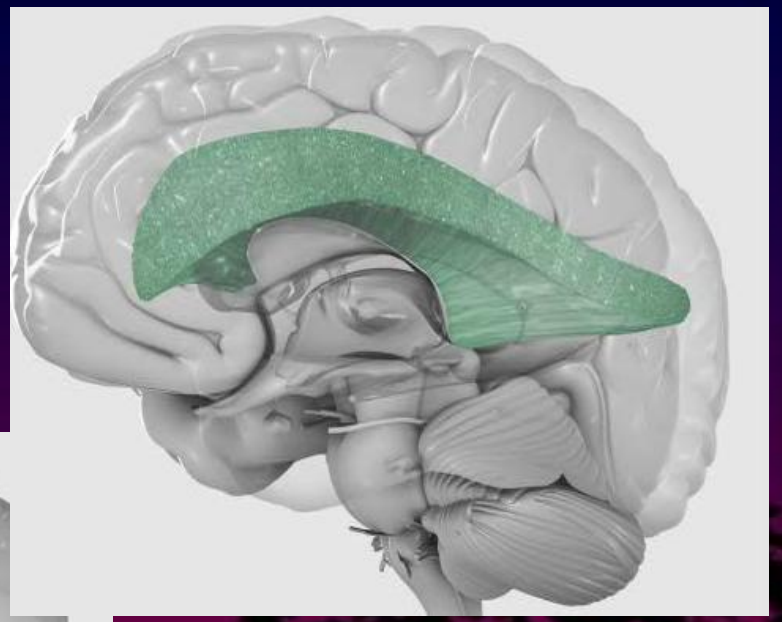
- Temporal Lobectomy
- Extratemporal Cortical Resection

Palliative surgery

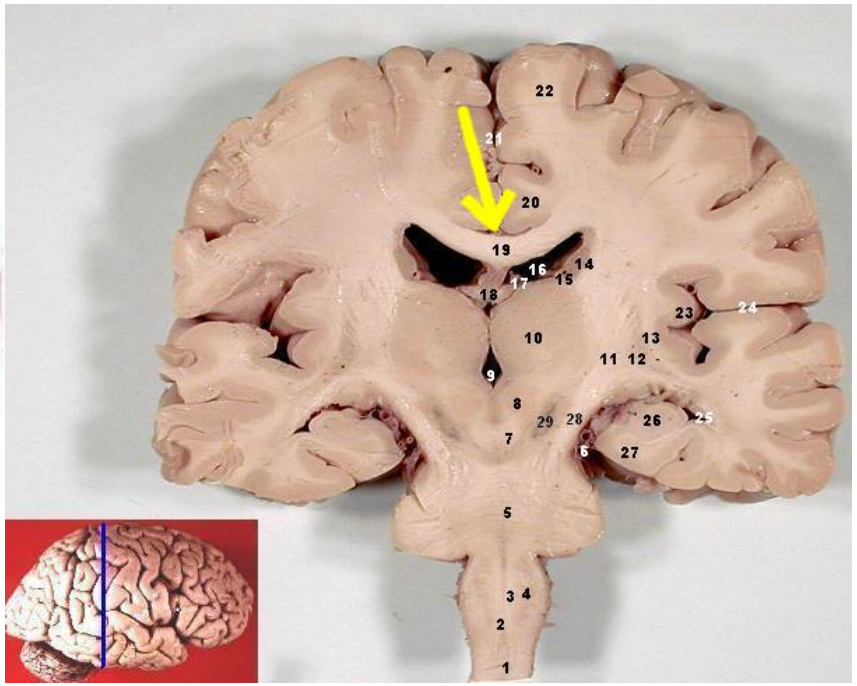
- **Corpus Callosotomy**
- Hemispherectomy

Corpus Callosum





- 200 M fibers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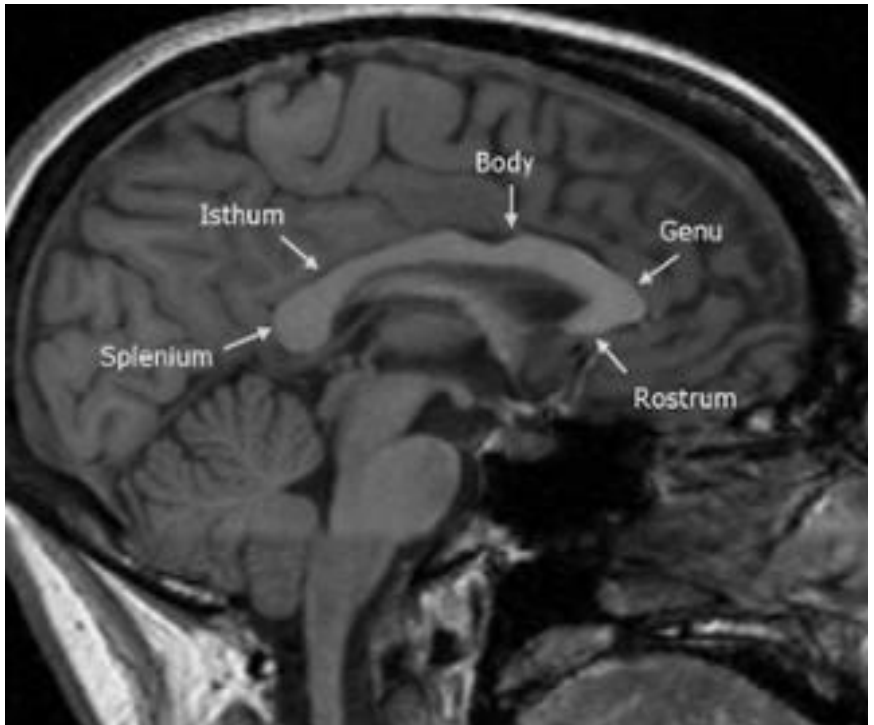
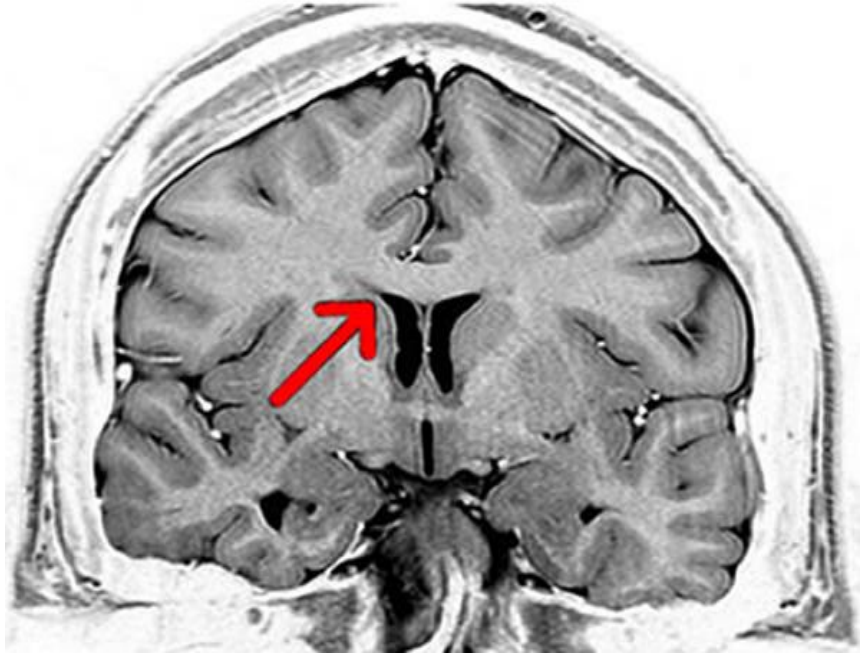
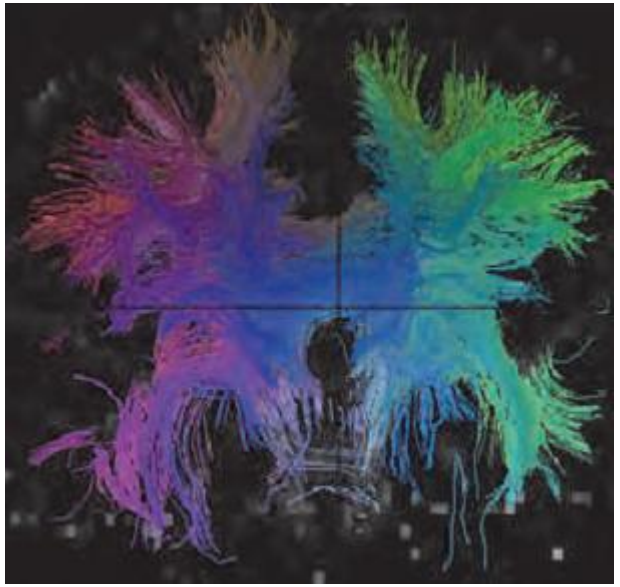
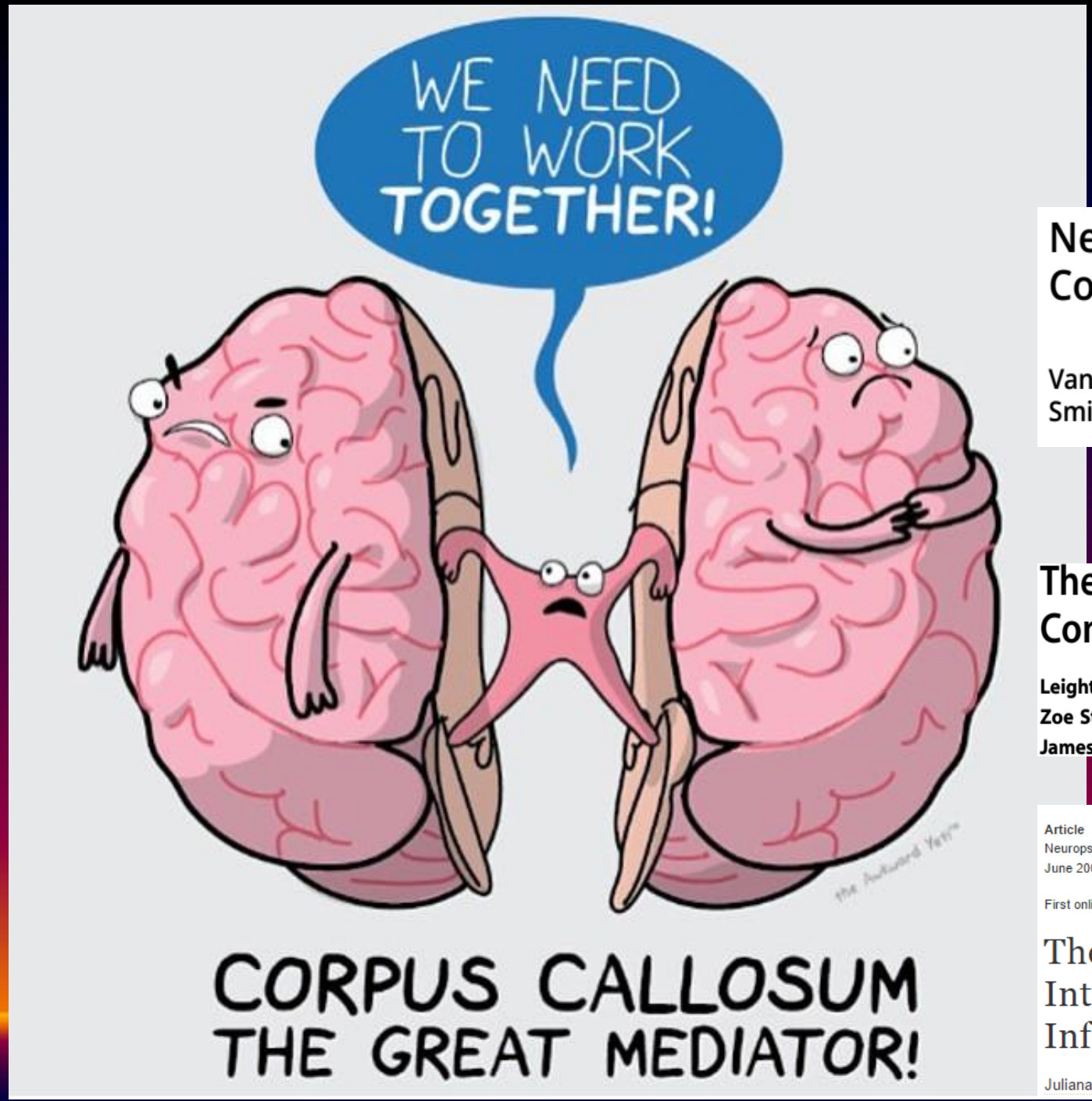

Body
Isthum
Genu
Splenium
Rostrum







Neuropsychological Profile of Agenesis of the Corpus Callosum: A Systematic Review

Vanessa Siffredi , Vicki Anderson , Richard J. Leventer & Megan M. Spencer-Smith

The Role of Corpus Callosum Development in Functional Connectivity and Cognitive Processing

Leighton B. N. Hinkley[1✉], Elysa J. Marco[2,3✉], Anne M. Findlay[1], Susanne Honma[1], Rita J. Jeremy[3], Zoe Strominger[2], Polina Bukshpun[2], Mari Wakahiro[2], Warren S. Brown[4], Lynn K. Paul[4,5], A. James Barkovich[1,2,3], Pratik Mukherjee[1], Srikantan S. Nagarajan[1*], Elliott H. Sherr[2,3*]

Article
Neuropsychology Review
June 2005, Volume 15, Issue 2, pp 59-71

First online:

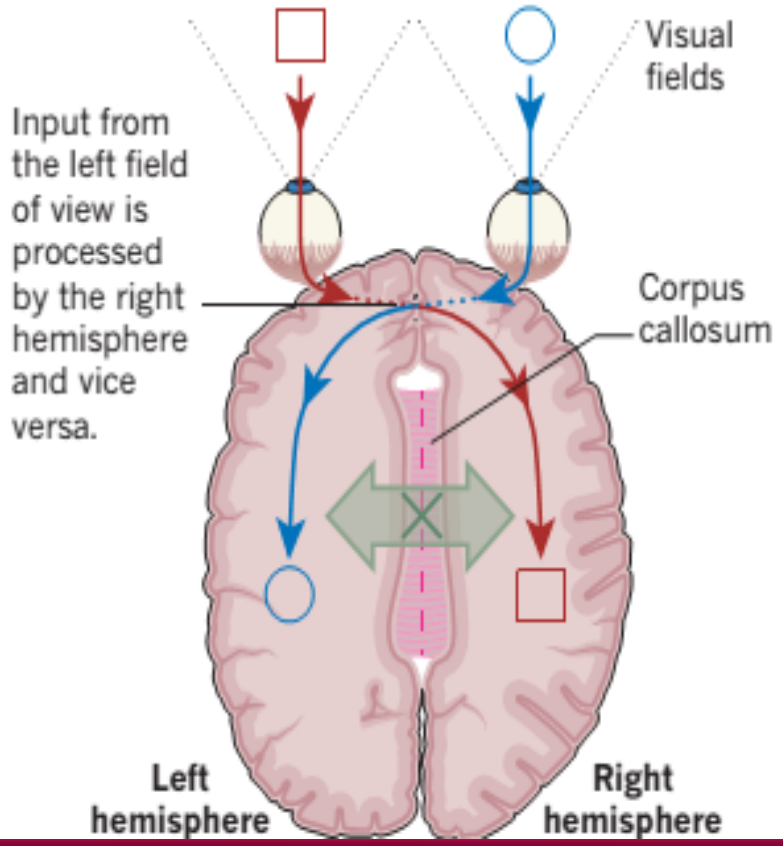
The Role of the Corpus Callosum in Interhemispheric Transfer of Information: Excitation or Inhibition?

Juliana S. Bloom ✉ , George W. Hynd

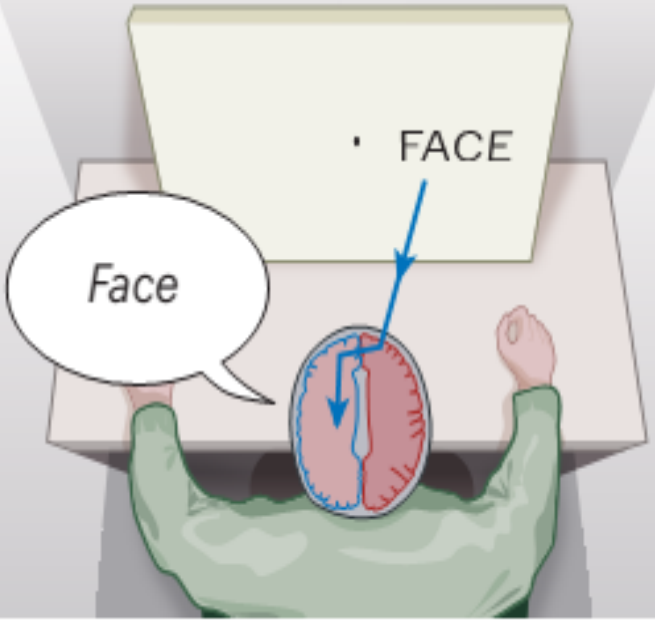
OF TWO MINDS

Experiments with split-brain patients have helped to illuminate the lateralized nature of brain function.

Split-brain patients have undergone surgery to cut the corpus callosum, the main bundle of neuronal fibres connecting the two sides of the brain.

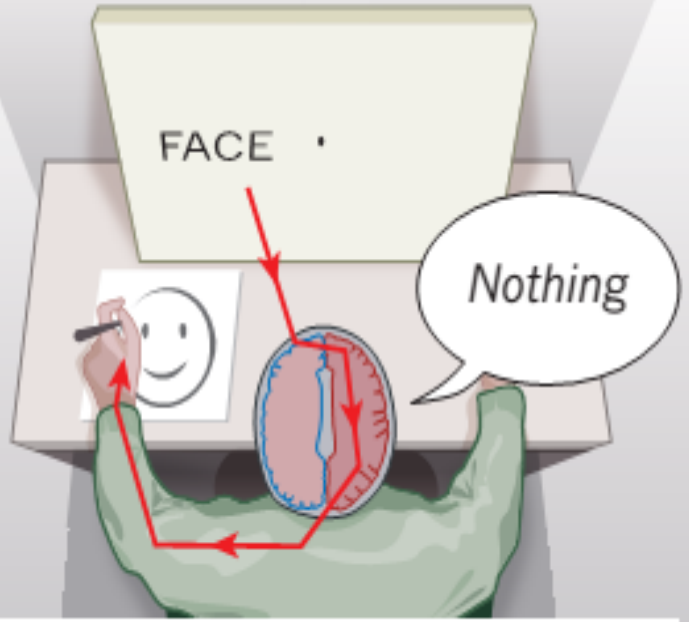


A word is flashed briefly to the right field of view, and the patient is asked what he saw.

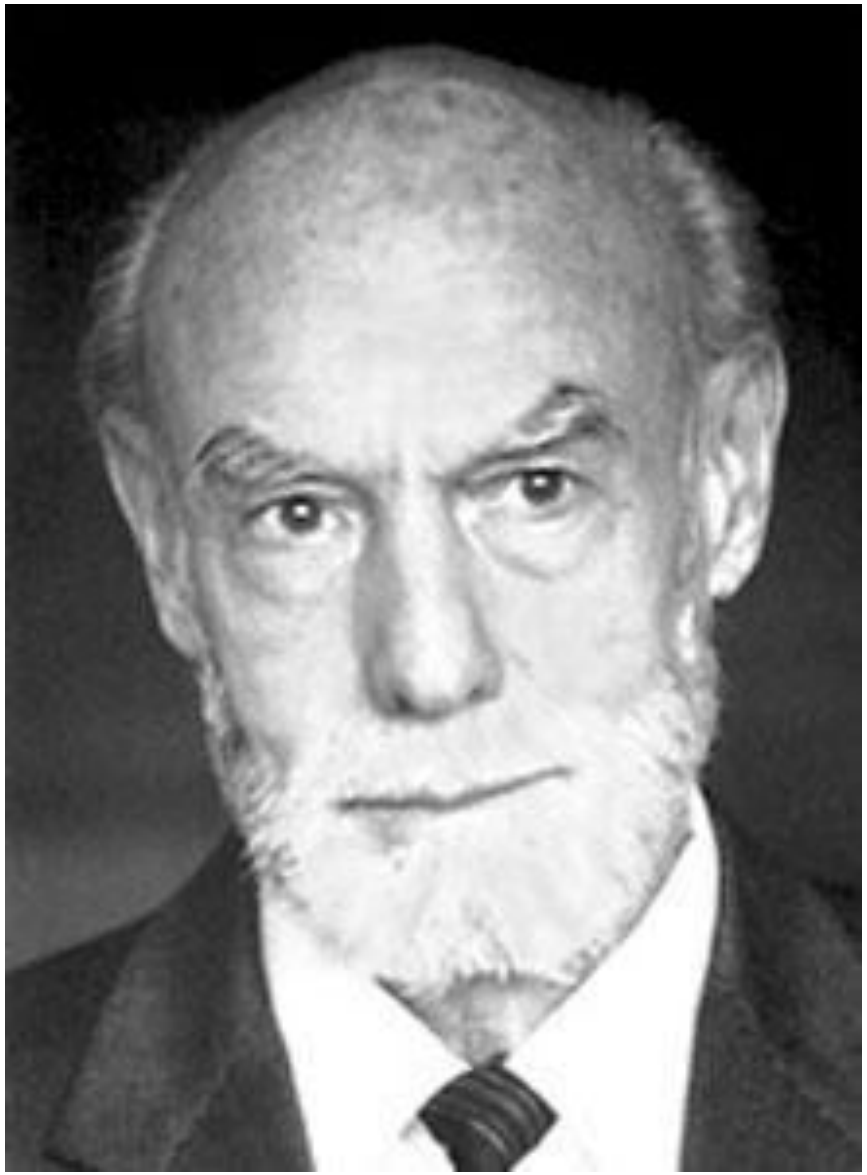


Because the left hemisphere is dominant for verbal processing, the patient's answer matches the word.

Now a word is flashed to the left field of view, and the patient is asked what he saw.



The right hemisphere cannot share information with the left, so the patient is unable to say what he saw, but he can draw it.



Roger Wolcott Sperry

1913-1994

Neuropsychology

1981 Nobel Prize in Physiology and Medicine

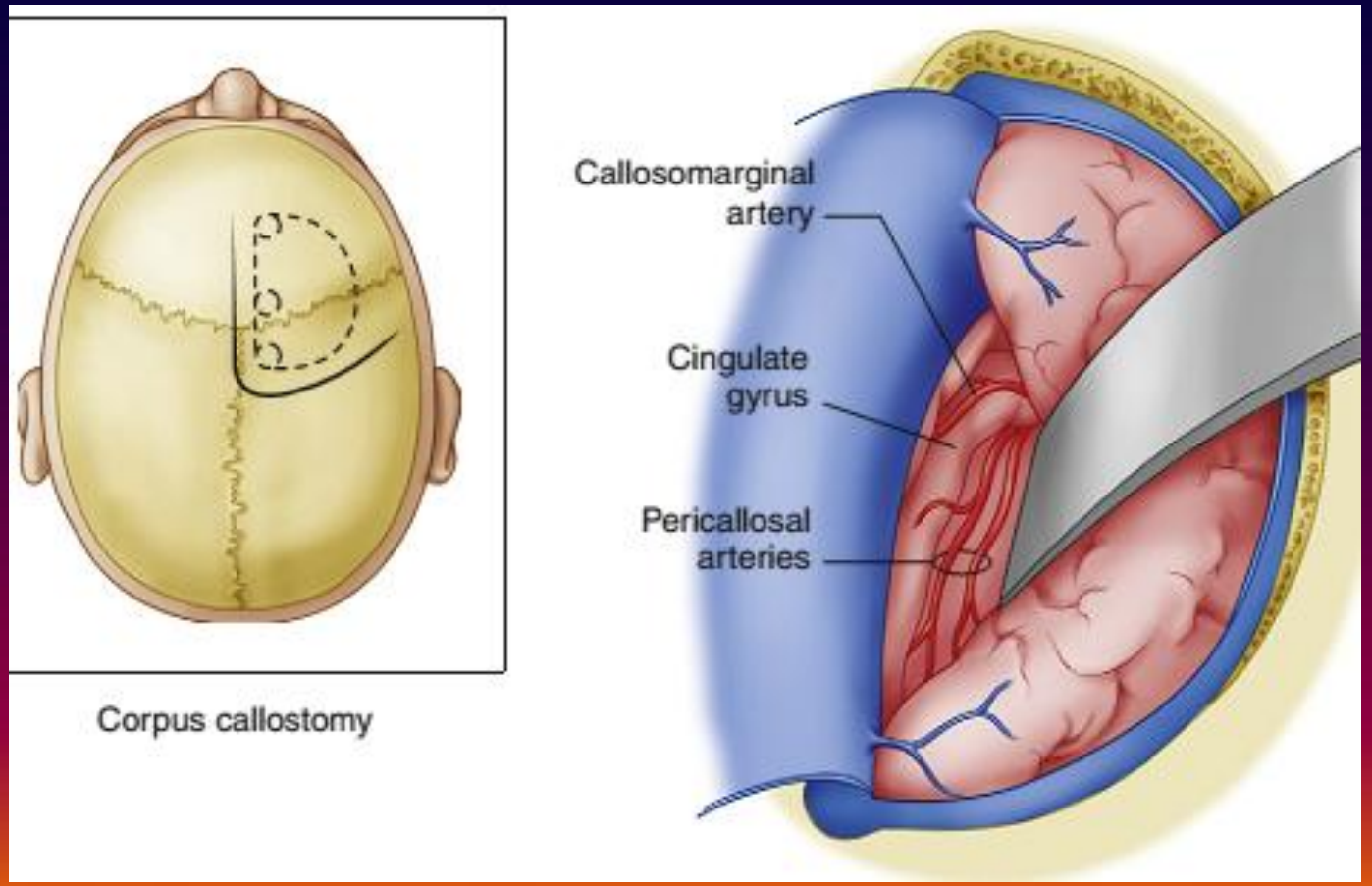
Split- Brain Syndrome

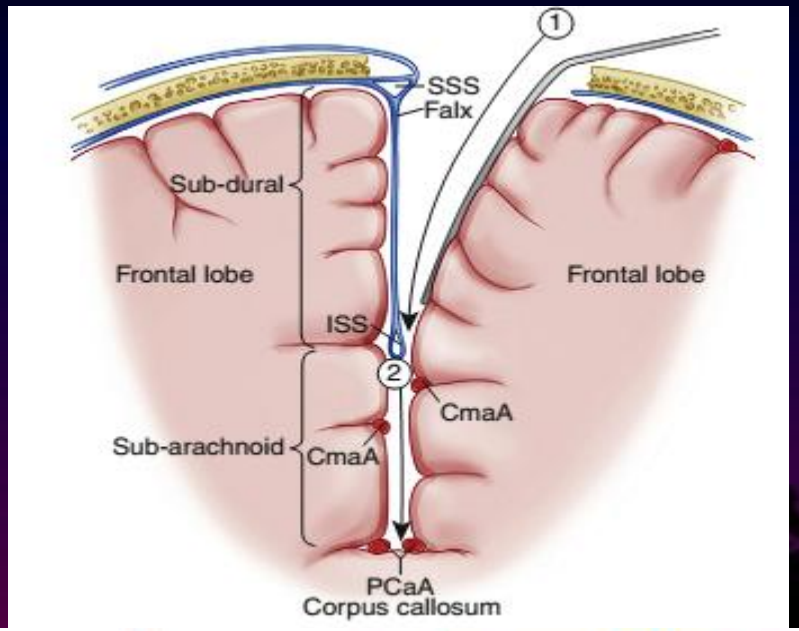
Corpus Callosotomy

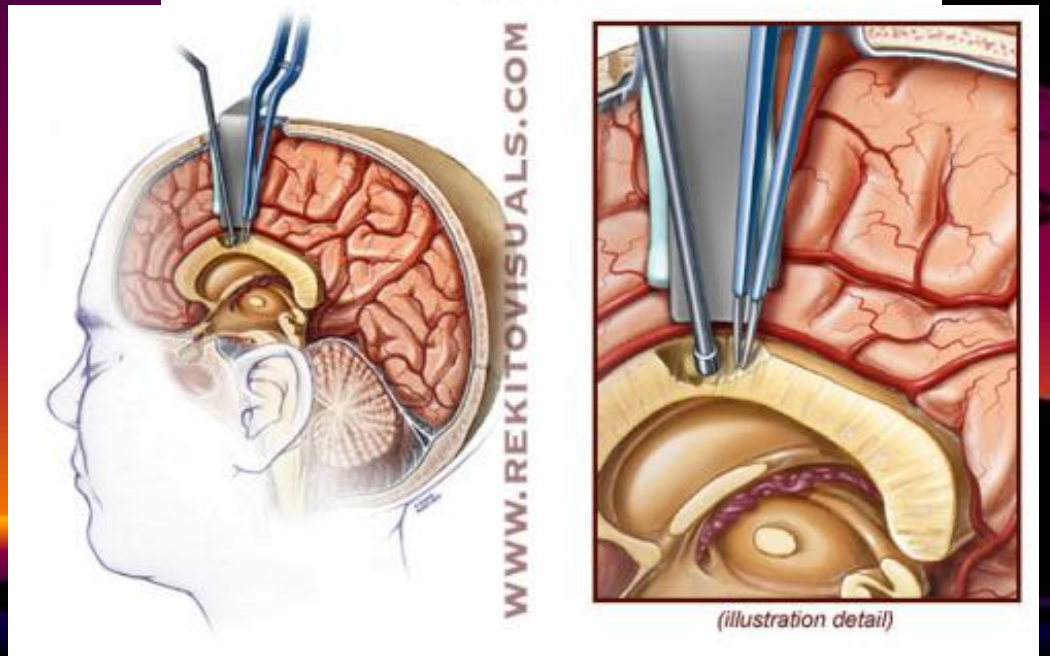
FIG. 1. Photograph of Dr. William P. van Wagenen (1897–1961). Reprinted with permission from the Society of Neurological Surgeons.

- Palliative surgery
- 1940s, *Dr. William P. van Wagenen*,10pts.
- 1960s, *Bogen & Vogel*: Clinical and neuropsychological outcome of the surgery
- 1970, *Luessenhop*: The corpus callosotomy could replace the hemispherectomy

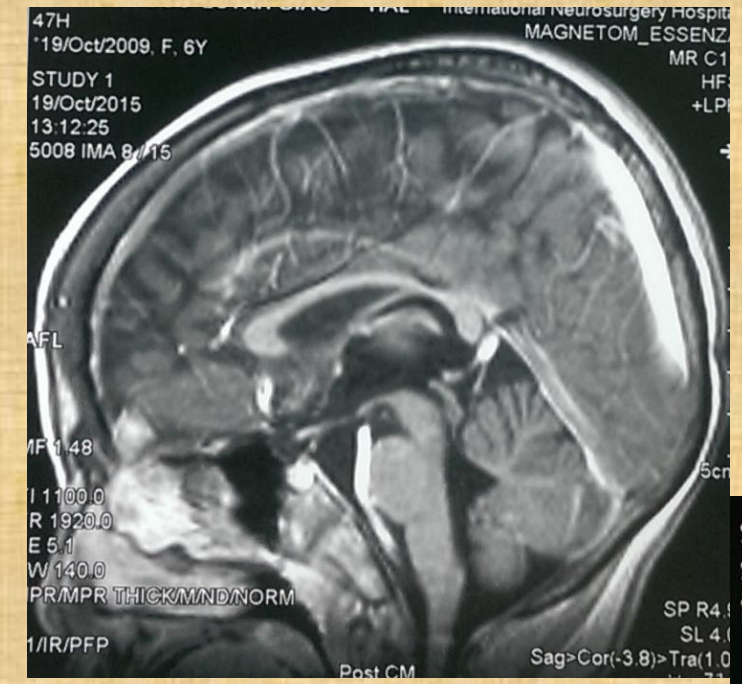
Corpus Callosotomy Technique

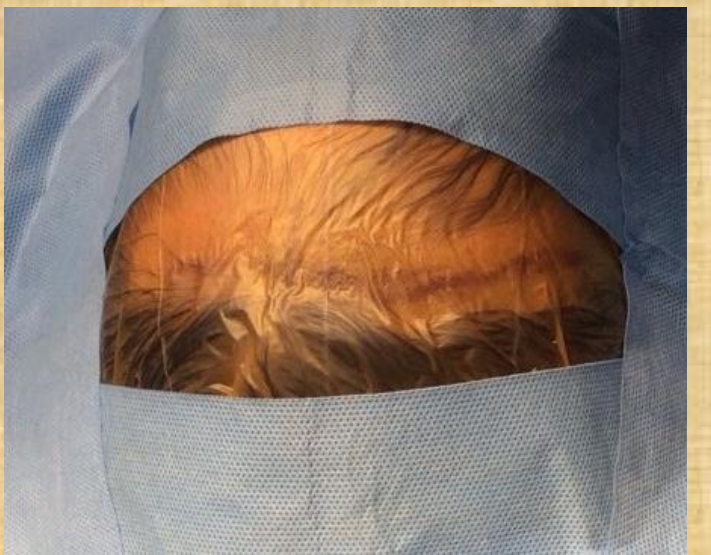


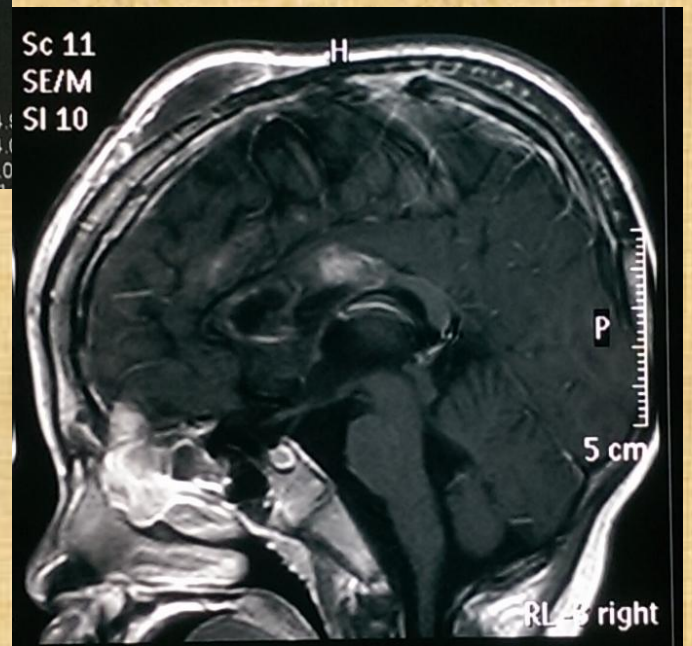




Corpus Callosotomy Technique







Complete remission of seizures after corpus callosotomy

Masaki Iwasaki, M.D.,[1] Mitsugu Uematsu, M.D.,[2] Yuko Sato, M.D.,[2]
Tojo Nakayama, M.D.,[2] Kazuhiro Haginoya, M.D.,[3] Shin-ichiro Osawa, M.D.,[1]
Hisashi Itabashi, M.D.,[4] Kazutaka Jin, M.D.,[4] Nobukazu Nakasato, M.D.,[4]
and Teiji Tominaga, M.D.[1]

- 13 pts, infantile or childhood onset epilepsy, 1,5yrs- 24yrs (M:7yrs)
  11 West syndrome, 2 Lennox- Gastaut syndrome
- 1-stage ***total corpus callosotomy***.
- F.U: 8- 35 months (M: 19 months)
- Seizure free: **4** - ↓>50%: **3** – unchanged: **6** (**9** : ↓ seizure intensity)
- No *drop attacks:* ***8***, *↓>90%:* ***5***

J Neurosurg Pediatrics 10:7–13, 2012

Seizure (2006) 15, 621–629

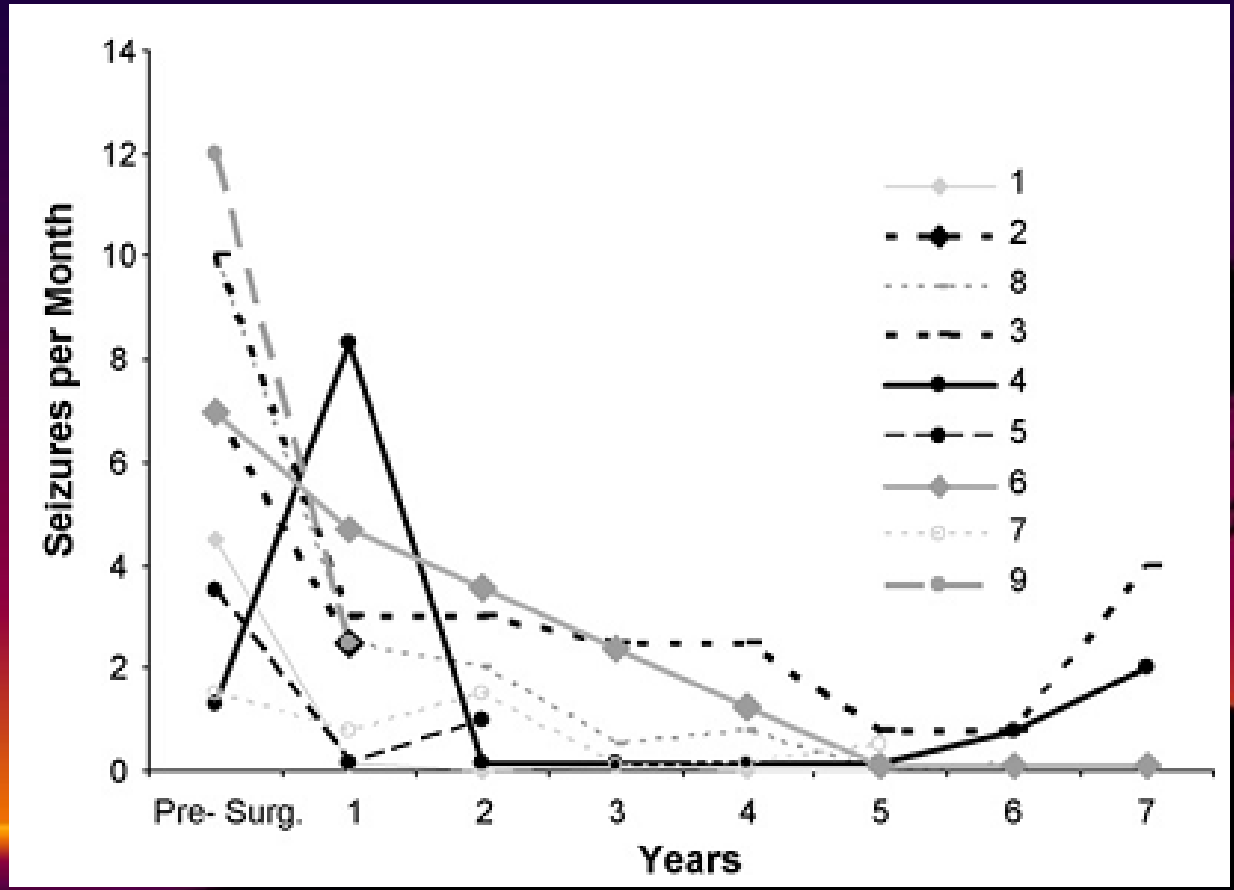
ELSEVIER

Corpus callosotomy in refractory idiopathic generalized epilepsy

Sigmund Jenssen *, Michael R. Sperling, Joseph I. Tracy, Maromi Nei, Liporace Joyce, Glosser David, Michael O'Connor

Table 2 Demographic data

ID	Age	Sex	Epilepsy onset
1	46	m	9
2	22	m	18
3	39	m	15
4	31	m	15
5	44	f	2
6	37	m	5
7	40	m	14
8	48	m	12
9	34	f	15



Long-term follow-up of seizure outcomes after corpus callosotomy

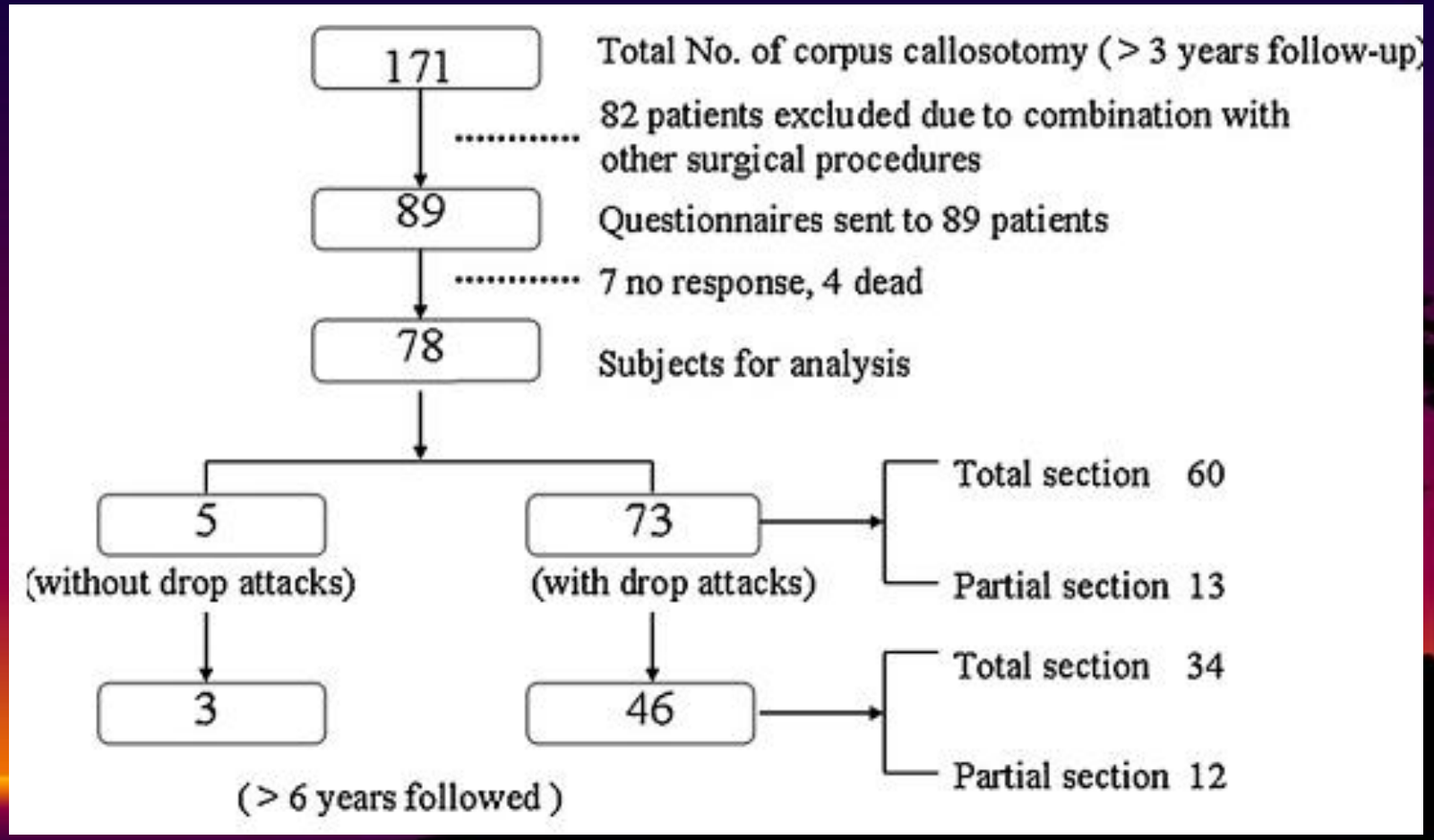
Shigeki Sunaga *, Hiroyuki Shimizu, Hidenori Sugano

Department of Neurosurgery, Tokyo Metropolitan Neurological Hospital, 2-6-1 Musashidai, Fuchu, Tokyo 183-0042, Japan

Seizure 18 (2009) 124–128

Clinical data of 78 patients

	n (%)	Range
Sex		
Male	50 (64)	
Female	28 (36)	
Age at seizure onset (year)		0–31
Seizure duration (year)		0–38
Age at surgery (year)		0–39
Pediatric patients	51	≤16
Adult patients	27	17–39
Preoperative seizure type		
Drop attack	73 (41)	
GTCS	45 (25)	
Absences	32 (18)	
Complex partial	14 (8)	
Simple partial	15 (8)	



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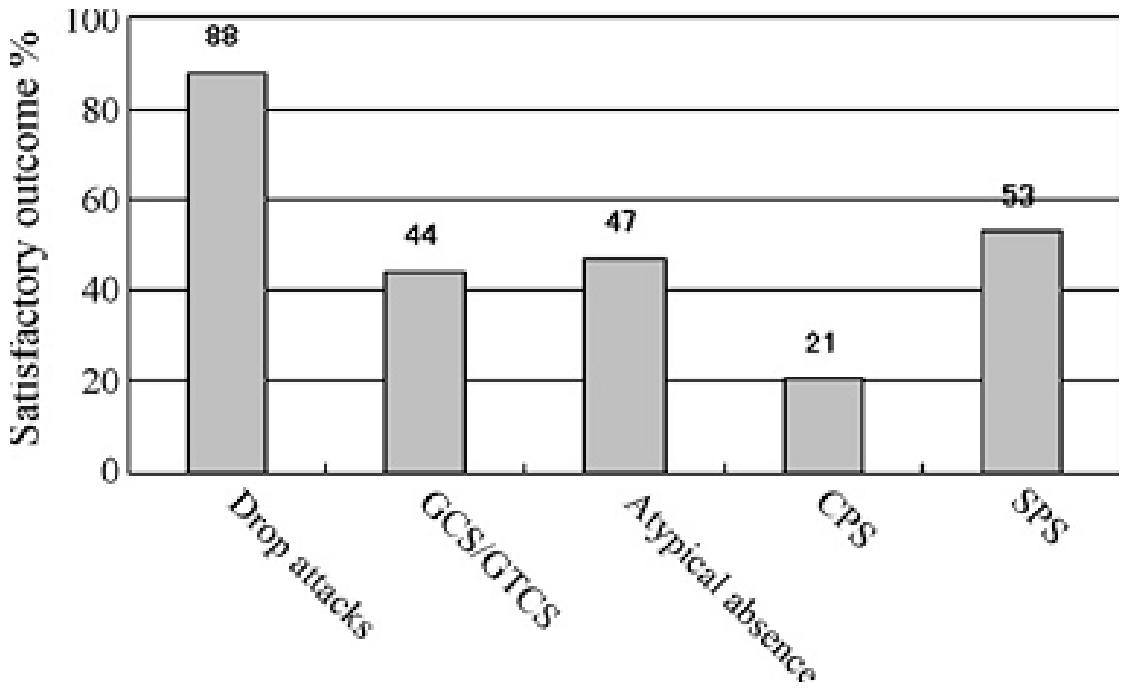
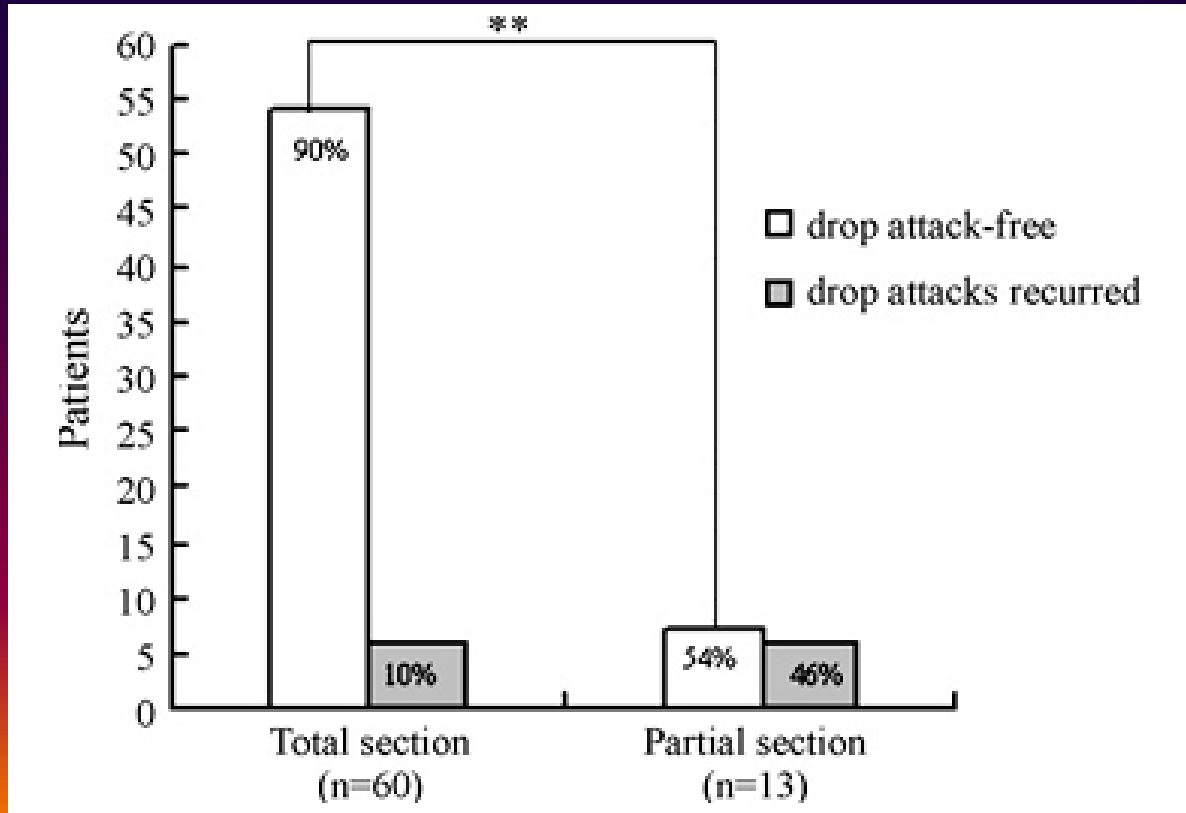


Fig. 2. Rate of satisfactory outcomes for each seizure types.



Long-term seizure outcome after corpus callosotomy: a retrospective analysis of 95 patients

Clinical article

J Neurosurg 110:332–342, 2009

Taner Tanriverdi, M.D.,[1] André Olivier, M.D., Ph.D.,[1] Nicole Poulin, R.N., M.Ed.,[1] Frederick Andermann, M.D.,[2] and François Dubeau, M.D.[2]

- Canada, 1981-2001
- 95 patients, F.U > 5 years

(M: 17,2 years)

Combination	No. of Patie
drop attacks + GTCS + atyp abs	16
drop attacks + GTCS	15
drop attacks + GTCS + SPS	7
drop attacks + GTCS + atyp abs + myoclonic sz	7
drop attacks + GTCS + CPS	6
drop attacks + GTCS + myoclonic sz	6
GTCS + atyp abs	4
GTCS + CPS	4
GTCS + SPS	4
drop attacks + atyp abs + myoclonic sz	3
drop attacks + GTCS + GTS + atyp abs	3
drop attacks + GTCS + CPS + myoclonic sz	3
drop attacks + CPS	2
GTCS + myoclonic sz	2
drop attacks + atyp abs + CPS	2
drop attacks + GTCS + atyp abs + SPS	2

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Clinical article

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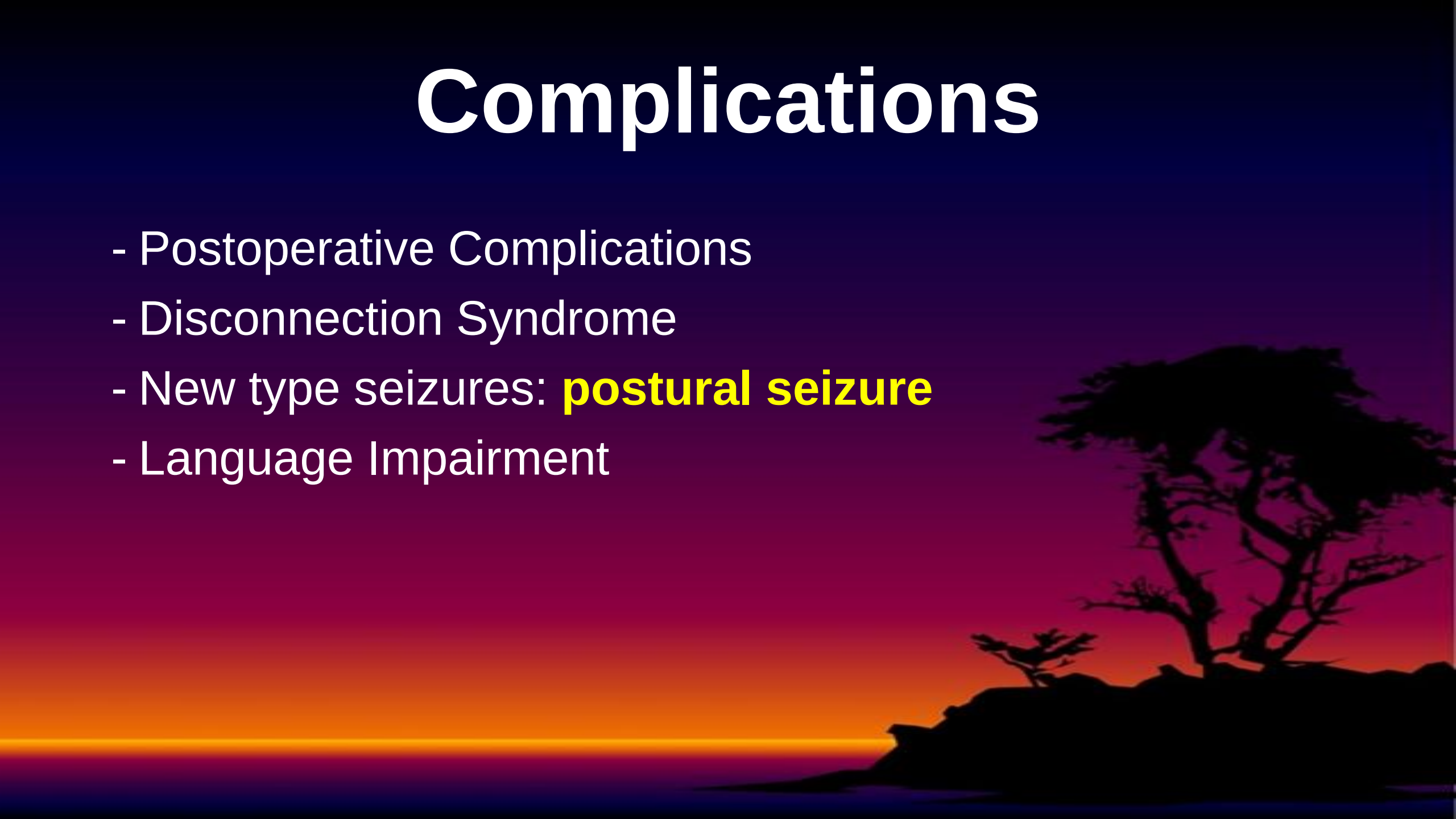
TABLE 3: Overall outcome according to each patient's most disabling seizure type*

Seizure Type	Class A	Class B	FO (%)	Class C	Class D	Class E	UFO (%)	Total
drop attacks	24	22	74.1	15	1	0	25.8	62
GTCS	10	7	73.9	3	0	3	26.08	23
GTS	2	1	75	0	0	1	25	4
tonic adv sz	0	1	33.3	1	1	0	66.6	3
myoclonic abs	0	3	100	0	0	0	0	3
total	36	34	73.6	19	2	4	26.3	95

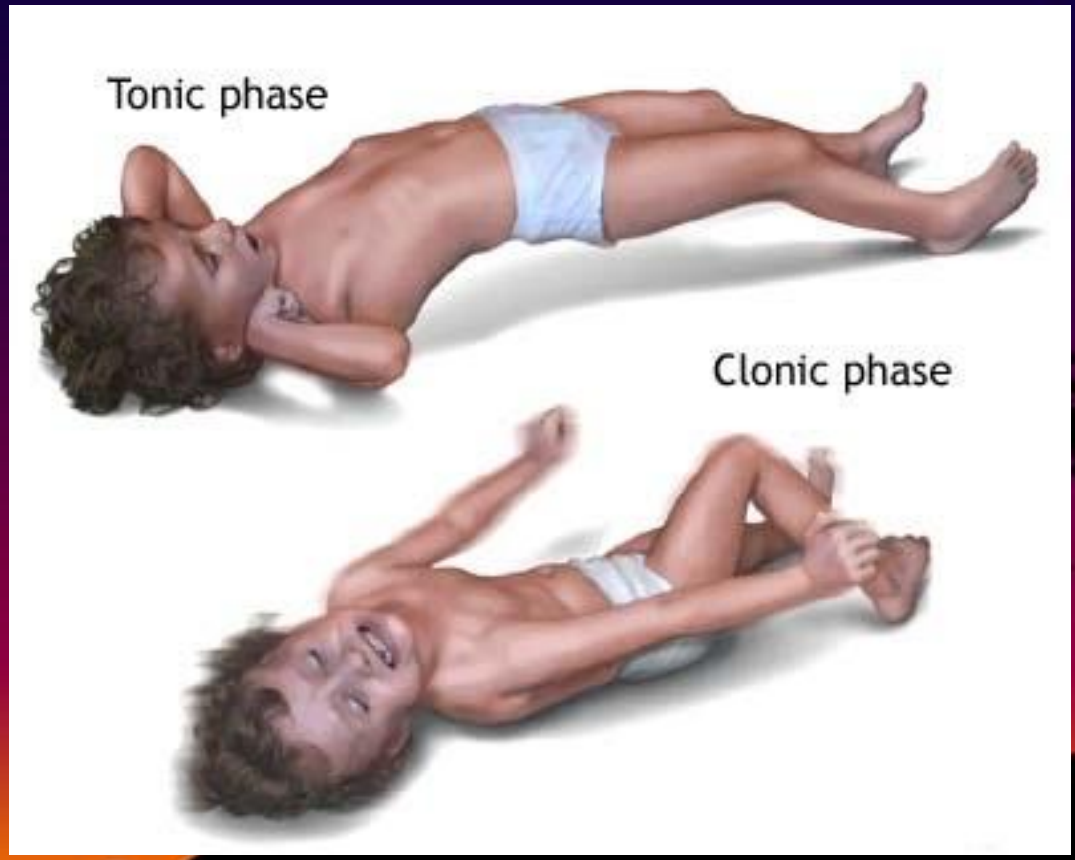
Complications

- Postoperative Complications
- Disconnection Syndrome
- New type seizures: **postural seizure**
- Language Impairment



Indications

- Generalized seizures:
  - ***Drop attacks***
  - Tonic
  - Clonic
  - Tonic- Clonic
  - Absence Seizures



Conclusions

- *Functional Neurosurgery- Palliative surgery*

- Corpus callosotomy is a disconnection procedure that is highly effective for drop attacks and atonic seizures.

- One-stage, complete corpus callosotomy may be indicated for patients with severe neurologic deficits or neurocognitive/ speech impairment

- Anterior two-thirds callosotomy may be appropriate for patients who can read or are expected to be able to read in the future.

Referrences

- Principle and Practice of Pediatric Neurosurgery 3rd.
- Schmidek & Sweet Operative Neurosurgical Technique
- William P. van Wagenen and the first corpus callosotomies for epilepsy

Thanks for your attention