International League Against Epilepsy

Proposed Epilepsy Surgery Curriculum

Domains:

1.0 Diagnosis

Competencies:

1.1 Demonstrate working knowledge of etiologies for focal and generalized epilepsies in children and adults

Learning Objectives:

1.1.1 Describe the common structural etiologies amenable to surgery (e.g. hippocampal sclerosis, tumors, malformations of cortical development, vascular lesions, traumatic brain injury, etc.) (L1)
1.1.2 Describe other common etiologies (e.g. genetic, infectious, metabolic, immune, neurodegenerative causes) (L2)

1.2 Identify and describe seizure semiology using standardized ILAE terminology and classification systems

Learning Objectives:

1.2.1 Recognize the semiology of epileptic seizures and distinguish it from the semiology of non-epileptic events (L1)
1.2.2 Extract semiological information from patient history (L1)
1.2.3 Extract semiological information from video recordings (L1)
1.2.4 Interpret semiological signs and symptoms to form hypotheses on the localization of focal seizures (L2)
1.2.5 Interpret semiological signs and symptoms that distinguish focal vs. generalized seizure onset (L2)

1.3 Accurately diagnose and classify epilepsies and epilepsy syndromes using the most recent ILAE classifications

Learning Objectives:

1.3.1 Demonstrate knowledge regarding candidacy for epilepsy surgery based on epilepsy and syndrome classification (L1)
1.3.2 Correctly diagnose focal epilepsies (L1)
1.3.3 Correctly diagnose generalized epilepsies (L1)
1.3.4 Correctly classify focal epilepsies (L2)
1.3.5 Correctly classify generalized epilepsies (L2)

1.4 Describe common EEG patterns in children and adults

Learning Objectives:

1.4.1.1 Determine which patients benefit from EEG based on its diagnostic yield (L1)
1.4.1.2 Interpret EEG reports and apply them to specific clinical contexts (L1)
1.4.2 Recognize and describe the main types of EEG recordings (e.g. routine scalp, ambulatory, video-EEG, intracranial EEG) (L1)

1.4.3 Recognize and describe the main epileptiform and non-epileptiform interictal abnormalities on scalp EEG (L3)

1.4.4 Recognize and describe the basic interictal and ictal patterns on scalp EEG (L2)
1.4.5 Recognize and describe the advanced interictal and ictal patterns on intracranial EEG recordings (L3)

1.5 Accurately interpret neuroimaging as it pertains to epilepsy
Learning Objectives:

1.5.1 Recognize and describe the optimum MRI sequences recommended for epilepsy (L1)
1.5.2 Define, interpret and apply the results of specialized neuroimaging accurately in the clinical context (e.g. functional, metabolic, postprocessing, etc) (L1)

2.0 Counseling

Competencies:

2.1 Understand and address the culturally appropriate aspects and consequences of the diagnosis of epilepsy, including stigma, and its implications for pre-surgical and surgical decision-making

2.2 Provide guidance on the surgical treatment of epilepsy
Learning Objectives:

2.2.1 Communicate to patients and families the concept of drug-resistant epilepsy (L1)

2.2.2 Communicate to patients and family the concept and rationale of candidacy for epilepsy surgery (L1)

2.2.3 Communicate to patients and family the rationale for different types of surgery for epilepsy (L1)
2.2.4 Communicate to patients and family the rationale, risks and benefits of intracranial EEG (L1)
2.2.5 Provide guidance to patients and family regarding risks and benefits of epilepsy surgery (L1)

2.2.6 Communicate to patients and families the benefits of timely surgical intervention (L1)

2.2.7 Identify and provide counseling on issues related to comorbidities as they may impact epilepsy surgery (L1)

3.0 Presurgical Work-up

Competencies:

3.1 Demonstrate working knowledge of the indications for pre-surgical evaluation
Learning Objectives:

3.1.1. Define drug-resistant epilepsy and how to establish drug-resistance and drug-responsiveness (L1)
3.1.2. Demonstrate knowledge regarding candidacy for epilepsy surgery (L1)

3.1.3. Demonstrate knowledge of semiology, interpret results and apply them to surgical decisions (L2)
3.1.4 Demonstrate knowledge of video-EEG, interpret results and apply them to surgical decisions (L2)
3.1.5 Demonstrate knowledge of advanced structural and functional imaging, interpret results and apply them to surgical decisions (e.g. functional MRI, SPECT, PET) (L2)
3.1.6 Demonstrate knowledge of specialized imaging methods (e.g. MEG, network models, etc) (L3)
3.1.7 Demonstrate knowledge of neuropsychological testing, interpret results and apply them to surgical decisions (L2)

3.2 Demonstrate working knowledge on the differences between lesional and non-lesional epilepsy
Learning Objectives:

3.2.1 Demonstrate knowledge on different etiologies amenable to surgical treatment (L1)
3.2.2 Demonstrate knowledge on the impact of the etiology of epilepsy on surgical prognosis (L1)

3.3 Describe the importance of early surgical intervention regarding seizure control, neuro-developmental, cognitive, behavioral and social integration aspects

3.4 Demonstrate knowledge of brain and vascular anatomy including structural and functional connectivity
Learning Objectives:

3.4.1 Demonstrate knowledge of cortical anatomy and white matter pathways. (L1)
3.4.2. Demonstrate knowledge of the gross anatomical substrates of seizure onset and seizure propagation (e.g. mesial temporal structures, cortical areas, white matter pathways) and surrounding structures. (L1)

3.6 Demonstrate working knowledge on aspects of structural and functional imaging as they pertain to epilepsy surgery
Learning Objectives:

3.6.1 Recommend and interpret the main functional neuroimaging modalities as they pertain to epilepsy surgery (functional MRI, interictal and ictal SPECT, and PET) (L1)

3.6.2. Interpret the results of structural and functional imaging with regard to the surgical approach and risks of surgery (L1)

3.5 Demonstrate knowledge of neuropsychological evaluation, including language and memory lateralization
Learning Objectives:

3.5.1 Recommend and interpret results of neuropsychological testing as they pertain to surgical planning (L1)
3.5.2 Demonstrate knowledge about the impact of surgery on neuropsychological outcomes (L1)

3.5.3. Demonstrate knowledge of surgical approaches to address risks of neuropsychological deficits (L2)

3.7 Demonstrate working knowledge of evaluation of intracranial EEG (depth and subdural electrodes)

Learning Objectives:

3.7.1 Understand and describe the risks, benefits and indications of depth and subdural electrodes (L1)

3.7.2 Demonstrate ability to integrate results of the intracranial EEG evaluation with anatomical data to advice on the surgical plan (L2)

3.8 Demonstrate knowledge of the importance of the multidisciplinary team in epilepsy surgery and their individual roles

4.0 4.0 Surgical Techniques

Competencies:

4.1 Demonstrate knowledge of surgical techniques for implantation of subdural EEG electrodes

Learning Objectives:

4.1.1 Demonstrate knowledge and the ability to choose different types of subdural EEG electrodes (L2)

4.1.2. Demonstrate the ability to discuss surgical details and techniques in the implantation of subdural EEG electrodes (L2)

4.1.3 Demonstrate knowledge about the risks of using subdural EEG electrodes (L2)

4.1.4 Demonstrate knowledge of the appropriate medical and surgical management of complications of subdural EEG electrodes(L2)

4.2 Demonstrate knowledge of surgical techniques for implantation of depth electrodes (i.e., frame-based, frameless, robot-assisted methods)

Learning Objectives:

4.2.1 Demonstrate knowledge about different methods of depth EEG electrode implantation (L2)

4.2.2 Understand and describe advantages and limitations of different implantation methods for depth EEG electrodes (L2)

4.2.3. Demonstrate the ability to discuss surgical details in the implantation of depth EEG electrodes (L2)

4.2.4 Demonstrate knowledge about the risks of using depth EEG electrodes (L2)

4.2.5 Demonstrate knowledge of the appropriate medical and surgical management of complications of depth EEG electrodes (L2)

4.3 Demonstrate knowledge of invasive mapping and monitoring of motor and language areas extraoperatively and intraoperatively

Learning Objectives:

4.3.1 Demonstrate knowledge about the advantages and disadvantages of extraoperative monitoring of motor and language function (L2)
4.3.2 Demonstrate knowledge about the advantages and disadvantages of intraoperative monitoring of motor and language function (L1)
4.3.3 Demonstrate knowledge about the techniques of cortical and subcortical white matter pathways mapping using monopolar or bipolar stimulation (L1)
4.3.4 Demonstrate knowledge about the application and interpretation of techniques to map the central sulcus, including the phase reversal technique (L2)
4.3.5 Demonstrate knowledge of extraoperative language mapping techniques as well as their advantages and limitations (L2)
4.3.6 Demonstrate knowledge of intraoperative language mapping techniques as well as their advantages and limitations (L1)

4.4 Comprehend advantages and limitations of electrocorticography

Learning Objectives:

4.4.1 Demonstrate knowledge of the indications for electrocorticography (L1)
4.4.2 Demonstrate knowledge about the effect of general anaesthetics on electrocorticography (L1)
4.4.3 Demonstrate ability to interpret electrocorticographic findings as they pertain to the surgical strategy (L1)

4.5 Describe differences between disconnection versus resection techniques

Learning Objectives:

4.5.1 Describe the rationale for performing disconnection versus resection techniques (functional versus anatomical hemispherectomy, hemispherotomy, temporo-parieto-occipital disconnection versus resection) (L1)

4.5.2 Describe the potential limitations of disconnection techniques (L2)

4.6 Demonstrate working knowledge of indications, technique, outcome and complications of resective surgery for temporal lobe epilepsy (including selective and non-selective approaches)

Learning Objectives:

4.6.1 Demonstrate knowledge of the differences of epilepsy surgery in the dominant versus non-dominant temporal lobe (L1)

4.6.2 Describe and discuss the concept of selective and non-selective surgical approaches in temporal lobe epilepsy (L1)
4.6.3 Describe key surgical steps of the different types of selective resections in temporal lobe epilepsy (L1)
4.6.4 Describe key surgical steps in non-selective resections in temporal lobe epilepsy (L1)
4.6.5 Demonstrate knowledge of expected outcomes after surgical resections for temporal lobe epilepsy (L1)
4.6.6 Demonstrate knowledge of complications with different surgical approaches in temporal lobe epilepsy (L1)

4.7 Demonstrate working knowledge of indications, technique, outcome and complications of resective extratemporal lobe surgery for epilepsy

Learning Objectives:

4.7.1 Describe and discuss the indications, risks and likelihood of seizure freedom with extratemporal lobe resective surgery for epilepsy (L1)

4.7.2 Demonstrate knowledge of the surgical techniques, anatomical aspects, expected outcomes and potential complications of frontal lobe epilepsy surgery (L1)

4.7.3 Demonstrate knowledge of the surgical techniques, anatomical aspects, expected outcomes and potential complications of occipital lobe epilepsy surgery (L1)

4.7.4 Demonstrate knowledge of the surgical techniques, anatomical aspects, expected outcomes and potential complications of parietal lobe epilepsy surgery (L1)

4.7.5 Demonstrate knowledge of the surgical techniques, anatomical aspects, expected outcomes and potential complications of central lobe (rolandic) epilepsy surgery (L2)

4.7.6 Demonstrate knowledge of the surgical techniques, anatomical aspects, expected outcomes and potential complications of epilepsy surgery of the insula (L3)

4.8 Demonstrate working knowledge on indications, technique, outcome and complications of anatomical and functional hemispherectomy for epilepsy

Learning Objectives:

4.8.1 Demonstrate knowledge of the indications of anatomical and functional (disconnective) hemispherectomy for epilepsy (L2)

4.8.2 Describe key surgical steps and technical challenges involved in anatomical and functional hemispherectomy for epilepsy (L2)

4.8.3 Demonstrate knowledge of the expected outcomes after anatomical and functional hemispherectomy for epilepsy (L2)

4.8.4 Demonstrate knowledge of the surgical complications of anatomical and functional hemispherectomy for epilepsy and how to manage them (L2)

4.8.5 Demonstrate knowledge and provide advise on postsurgical care of hydrocephalus (L2)

4.9 Demonstrate knowledge of indications, technique, outcome and complications of hemispherotomy for epilepsy, including vertical and lateral techniques

Learning Objectives:

4.9.1 Demonstrate knowledge of the indications and limitations of hemispherotomy for epilepsy (L2)

4.9.2 Describe the techniques of lateral and vertical hemispherotomy (L1)

4.9.3 Demonstrate knowledge of the different lateral hemispherotomy techniques and discuss their rationale (L2)

4.9.4 Describe key surgical steps of the lateral hemispherotomy technique (L2)

4.9.5 Identify and describe the complications after lateral hemispherotomy (L1)

4.9.6 Describe key surgical steps of the vertical hemispherotomy technique (L2)

4.9.7 Identify and describe the complications after vertical hemispherotomy (L2)

4.9.8 Demonstrate ability to manage and advise on postoperative care after hemispherotomy (L2)

4.10. Demonstrate knowledge of indications, technique, outcome and complications of callosotomy for epilepsy, including anterior two thirds, posterior and complete disconnections

Learning Objectives:

4.10.1 Demonstrate knowledge on how to select among disconnective procedures for different epilepsy syndromes (including age, neurological and cognitive function) for which callosotomy is indicated (L1)

4.10.2 Understand and describe the different approaches for callosotomy including complete, incomplete, anterior and posterior techniques (L1)
4.10.3 Describe key surgical steps in anterior 2/3 and complete callosotomy (L1)
4.10.4 Describe key surgical steps in posterior callosotomy (L1)
4.10.5 Demonstrate knowledge of complications of callosotomy and how to manage them (L1)
4.10.6 Describe the expected outcomes of callosotomy, including differences expected with various surgical techniques (L1)

4.11 Demonstrate knowledge of indications, technique, outcome and complications of neuromodulation techniques for epilepsy, including (Vagus Nerve Stimulation, Responsive Neurostimulation, Deep Brain Stimulation)

Learning Objectives:

4.11.1 Demonstrate knowledge of indications for different neuromodulation procedures for epilepsy (L1)
4.11.2 Describe key surgical steps for vagus nerve stimulation implantation (L1)
4.11.3 Describe the surgical steps for deep brain stimulation implantation (L2)
4.11.4 Describe the surgical steps for RNS implantation (L2)
4.11.5 Demonstrate knowledge of surgical complications and expected outcome of vagus nerve stimulation (L1)
4.11.6 Demonstrate knowledge of surgical complications and expected outcome of deep brain stimulation (L1)
4.11.7 Demonstrate knowledge of surgical complications and expected outcome of responsive neurostimulation (L1)

4.12 Demonstrate knowledge of indications, technique, outcome and complications of ablative procedures for epilepsy, including laser interstitial thermal therapy, radiofrequency thermocoagulation, radiosurgery, focused ultrasound

Learning Objectives:

4.12.1 Demonstrate knowledge about the advantages and limitations of ablative procedures for epilepsy (L1)
4.12.2 Demonstrate knowledge about the surgical technique of laser interstitial thermal therapy for epilepsy (L2)
4.12.3 Demonstrate knowledge about the surgical techniques of radiofrequency thermocoagulation for epilepsy (L2)
4.12.4 Demonstrate knowledge about the radiosurgery method for epilepsy (L2)

4.12.5 Demonstrate knowledge about the focused ultrasound method for epilepsy (L3)
4.12.6 Demonstrate knowledge about the risks and benefits of laser interstitial thermal therapy for epilepsy (L2)
4.12.7 Demonstrate knowledge about the risks and benefits of radiofrequency thermocoagulation for epilepsy (L2)
4.12.8 Demonstrate knowledge about the risks and benefits of radiosurgery for epilepsy (L3)

4.13 Demonstrate knowledge of the anaesthetic, surgical and postoperative care differences between pediatric and adult epilepsy surgery
Learning Objectives:

4.13.1 Demonstrate knowledge of the hemodynamic challenges related to surgery in young children (L1)
4.13.2 Demonstrate knowledge of the differences in patient positioning and head fixation between children of different age groups and adults (L1)
4.13.3 Demonstrate knowledge of adequate immediate and long-term postoperative care in children and adults (L1)