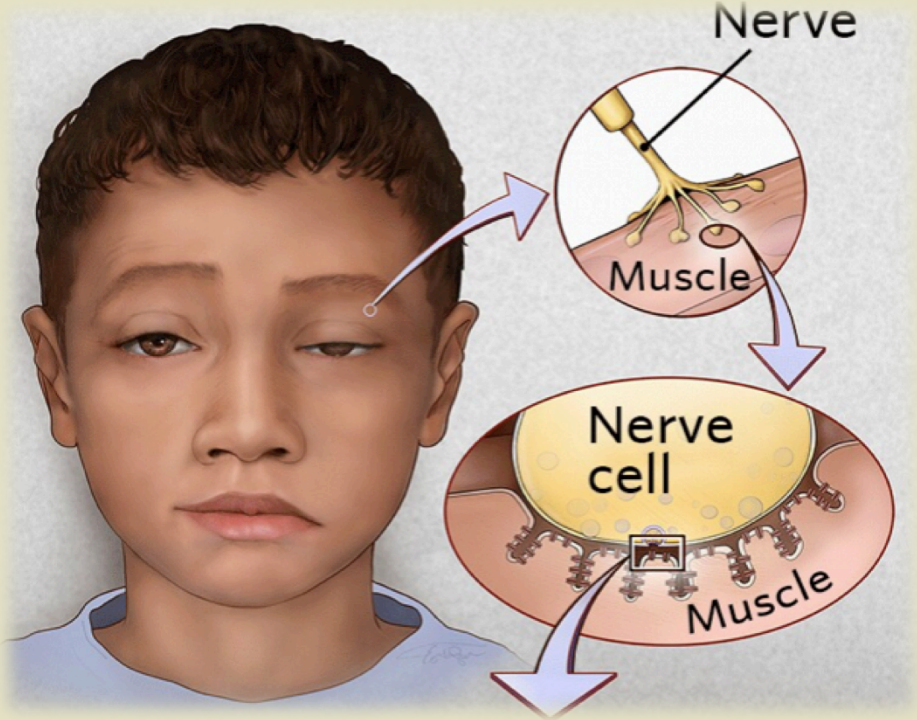
INTERESTING CASE

Myasthenia gravis and thymoma



R2 เกียรติศักดิ์/อ.ธีรวัฒน์

CASE

- Case : Female 22 years old
- Diagnosis : Generalized MG with MG crisis
- Operation : Sternotomy for thymectomy

Female 22 years old

Chief complaint

อ่อนแรง หอบเหนื่อยมากขึ้น

R1 History

History

- Present illness : - 1 month PTA ลิ้นแข็งพูดไม่ชัด กินอาหารแล้วสำลัก หนังตาตกข้างซ้าย อ่อนแรงกล้ามเนื้อต้นแขนขามากกว่าปลายแขนขา อาการเป็นมากขึ้นตอนออกแรง
- Dx. MG crisis with aspiration pneumonitis
- CT chest : mild enlarge thymus gland with mild bulging contour with thymic hyperplasia

History

- 1 day PTA หอบเหนื่อย กลืนลำบาก สำลักน้ำ หนังตาซ้ายตก อ่อนแรงกล้ามเนื้อต้นแขนขามากกว่าปลายแขนขา มีอาการประมาณ 1 ชั่วโมง รับประทานยาอาการดีขึ้น [prednisolone, pyridostigmine] เดินได้ปกติ หายใจได้ดี นอนราบได้ จึงไม่ได้มา รพ.
- 7 hrs PTA 07.00 น. หลังจากตื่นนอน ไม่สามารถลุกจากเตียงได้ อ่อนแรงแขนขาทั้ง 2 ข้าง พูดไม่ชัด ไม่มีท้องเสีย ไม่มีไอ ไม่มีเสมหะ จึงมา รพ.
- At OPD ผู้ป่วยหอบเหนื่อยมากขึ้น [ไม่ได้รับประทานยามา : กลืนไม่ได้]

  O_2 sat RA 75-80% >> Intubation, IVIG x 5 days

Past History

- History of MG crisis with respiratory failure
- No Allergic history
- No smoking
- No alcohol drinking
- No previous surgery

Past History

- No underlying disease
- Current medication
  - Prednisolone [5] 4 x 3 o pc >> 60 mg/day
  - Pyridostigmine [60] ½ x 3 o pc >> 90 mg/day
  - Azathiopine [50] 1 x 1 o pc
  - Omeprazole [20] 1 x 1 o ac
  - Vitamin D_2 [20,000] 1 x 1 weekly

R1 Physical examination

Physical examination [At OR]

- Vital Signs : BT 36 ^{o}c HR 72 bpm RR 16 b/min BP 123/61 mmHg

  BW 68 kg Height 160 cm BMI 26.56 kg/m^{2}
- GA : A Thai female, good consciousness
- HEENT : no ptosis, mild pale conjunctivae, anicteric sclerae,

  no thyroid gland enlargement
- Respiratory : lung clear and equal, no adventitious sound

Physical examination

- CVS : normal S_1,S_2, no murmur, no heaving, no thrill
- Extremities : no pitting edema
- Neuro : $E_4V_TM_6$, motor grade V/V all extremities
- Airway : ETT No. 7.5 mark 19 cm.
  - No note difficult intubation

Myasthenia gravis

- Autoimmune disorder
- Antibody to α-subunit of postsynaptic nicotinic acetylcholine receptor

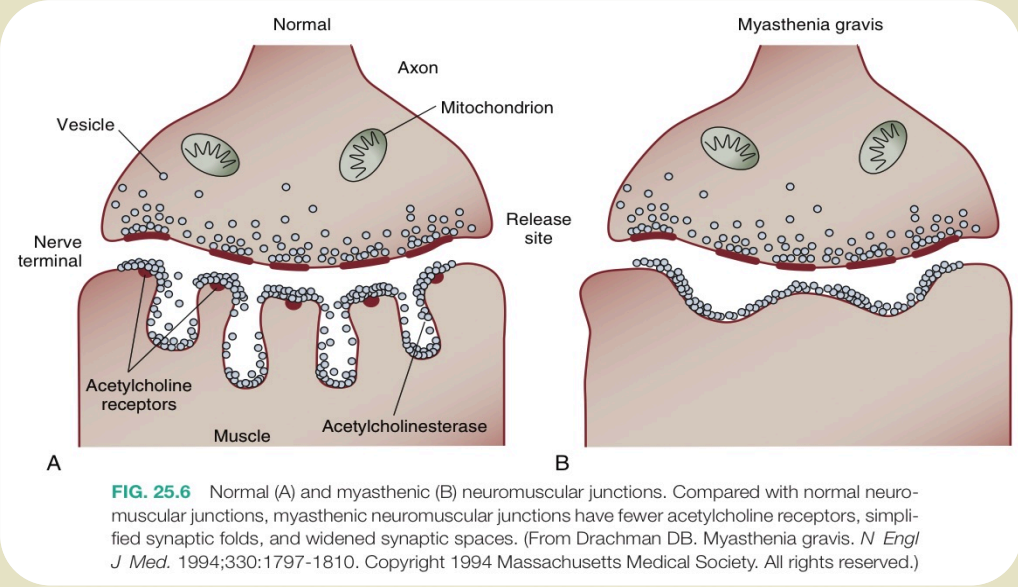


FIG. 25.6 Normal (A) and myasthenic (B) neuromuscular junctions. Compared with normal neuromuscular junctions, myasthenic neuromuscular junctions have fewer acetylcholine receptors, simplified synaptic folds, and widened synaptic spaces. (From Drachman DB. Myasthenia gravis. *N Engl J Med.* 1994;330:1797-1810. Copyright 1994 Massachusetts Medical Society. All rights reserved.)

Stoelting's anesthesia and co-existing disease 7th edition

Myasthenia gravis

- Weakness and fatigability of voluntary muscle

  [worse on exertion , improve following rest]

- Most common is ocular [ptosis, diplopia]

- Generalized involve bulbar muscle : CN 9-12

  [breathing, speaking, swallowing and

  mastication] , proximal > distal group

- Female 20-30 yr , Male 60-80 yr

Symptoms

First noticeable sign (in most cases)

- Weakness of the eye muscles

Other possible first signs

- Difficulty swallowing
- Slurred speech

Symptoms, variable in type and severity

- Drooping of one or both eyelids (ptosis)
- Blurred or double vision (diplopia)
- Unstable or waddling gait
- Change in facial expression
- Difficulty in swallowing
- Shortness of breath
- Impaired speech (dysarthria)
- Weakness in the arms, hands, fingers, legs, and neck.

Yao & Artusio's anesthesiology 9th edition

Myasthenia gravis

- Associated with thymus gland abnormalities
  - 50-60 % of MG patient : Thymic hyperplasia
  - 10-15 % of MG patient : Thymoma
- Associated other autoimmune disease
  - Thyroid disease, rheumatoid arthritis, pernicious anemia, SLE

Yao & Artusio's anesthesiology 9th edition

Classification of myasthenia gravis

- Osserman classification
- Myasthenia Gravis foundation of America clinical classification

BOX 31.13 Osserman Classification System for Myasthenia Gravis Clinical Classification System

Class I: Ocular myasthenia

Class IIA: Mild generalized myasthenia with slow progression: no crises, responsive to drugs

Class IIB: Moderately severe generalized myasthenia: severe skeletal and bulbar involvement but no crises; drug response less than satisfactory

Class III: Acute fulminating myasthenia: rapid progression of severe symptoms, with respiratory crises and poor drug response

Class IV: Late severe myasthenia, same as III but progression over 2 years from class I to II

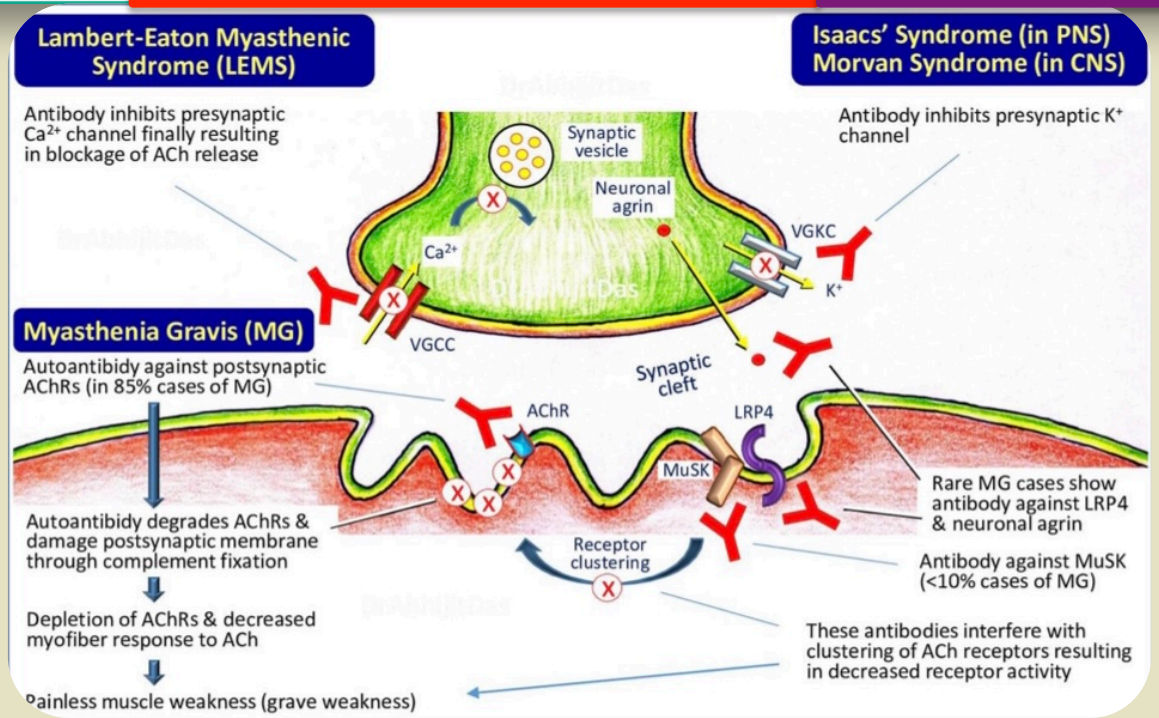
Data from Osserman KE, Genkins G. Studies in myasthenia gravis: review of a twenty-year experience in over 1200 patients. *Mt Sinai J Med*. 1971;38:497–537.

Myasthenia Gravis foundation of America clinical classification

Class	Clinical symptoms
I	Any ocular weakness
II	Mild Weakness. May also have ocular muscle weakness of any severity
II A	Predominantly affecting limb, axial muscles, or both. May also have lesser involvement of oropharyngeal, respiratory muscles or both
II B	Predominantly affecting orорpharyngeal, respiratory muscles, or both. May also have lesser or equal involvement of limb, axial muscles or both
III	Moderate weakness affecting other than ocular muscles. May also have ocular muscle weakness of any severity
III A	Predominantly affecting limb, axial muscles, or both. May also have lesser involvement of oropharyngeal, respiratory muscles or both
III B	Predominantly affecting orорpharyngeal, respiratory muscles, or both. May also have lesser or equal involvement of limb, axial muscles or both
IV	Severe weakness affecting other than ocular muscles. May also have ocular muscle weakness of any severity
IV A	Predominantly affecting limb, axial muscles, or both. May also have lesser involvement of oropharyngeal, respiratory muscles or both
IV B	Predominantly affecting orорpharyngeal, respiratory muscles, or both. May also have lesser or equal involvement of limb, axial muscles or both
V	Defined by intubation, with or without mechanical ventilation, except when employed during routine postoperative management

TABLE 25.6 Comparison of Myasthenic Syndrome and Myasthenia Gravis

Characteristic	Myasthenic Syndrome	Myasthenia Gravis
Manifestations	Proximal limb weakness (legs more than arms), exercise improves strength, muscle pain common, reflexes absent or decreased	Extraocular, bulbar, and facial muscle weakness; exercise causes fatigue; muscle pain uncommon; reflexes normal
Gender	Affects males more often than females	Affects females more often than males
Co-existing pathologic conditions	Small cell lung cancer	Thymoma
Response to muscle relaxants	Sensitive to succinylcholine and nondepolarizing muscle relaxants Poor response to anticholinesterases	Resistant to succinylcholine, sensitive to nondepolarizing muscle relaxants Good response to anticholinesterases



R1 investigation

Investigation

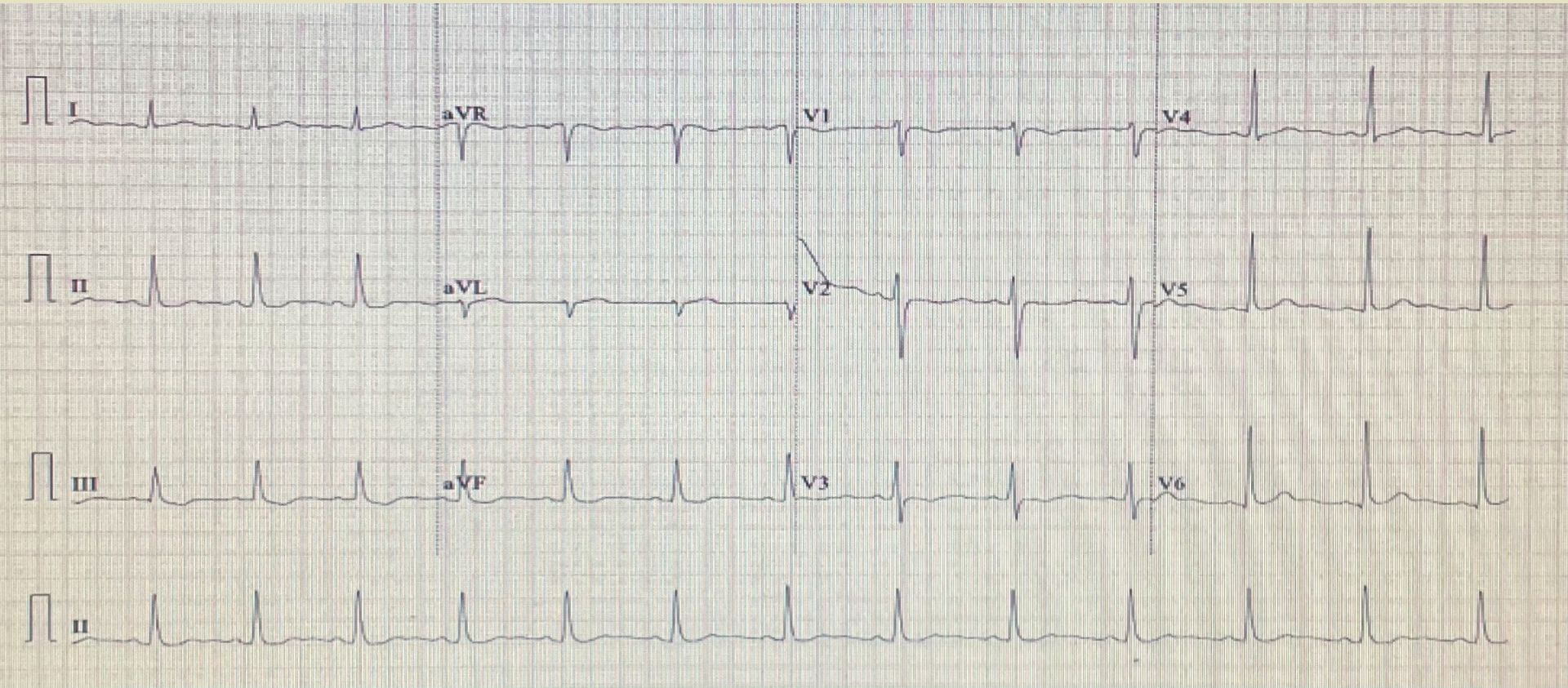
- CBC : Hb 11.5 %, Hct 35.5 %, platelet 328,000 /mm^3
- BUN 20.4 Cr 0.53 mg/dl GFR 109.95 ml/min/1.73m^2
- Electrolytes : Na 136.8 K 4.46 Cl 99.1 HCO_3 28
- Ca^{2+} 9.44 mg/dL, Po_4^- 4.3 mg/dL, Mg^{2+} 2.06 mg/dL
- TFT : TSH 1.02 , FT_3 2.14, FT_4 1.33 [normal]

Investigation

- Anti acetylcholine receptor [ELISA] positive
- Repetitive nerve stimulation : positive
    - Conclusion : post synaptic neuromuscular junction disorder
- CXR : No cardiomegaly, airway patent, proper position ETT
- CT chest : mild enlarged thymus gland with mild bulgy contour with thymic hyperplasia

EKG

Normal sinus rhythm rate 70 bpm, no significant ST-T change



R1 Problem list and ASA classification

Problem list

1. Myasthenia crisis with respiratory failure

2. Thymus gland hyperplasia

ASA Class III E

R2 Preoperative evaluation and preparation

Preoperative evaluation

- Patient factor
- Surgical factor
- Anesthetic factor

Patient factor

- Myasthenia crisis with respiratory failure
  - Severity of disease
  - Previous treatment
  - Associated disease
  - Risk of postoperative ventilation support

Severity of disease

- Osserman class III
- Myasthenia gravis foundation of America clinical class V
- Intubation with mechanical ventilation

Table 2 The Common Therapies Used for the Management of MG, Side Effects, and Complications

Therapy and Type	Dosage	Efficacy	Relevant Complications
Neostigmine: anticholinesterase	7.5–10 mg every 4–6 hours	Symptomatic improvement	Bradycardia, gut stimulation, increased secretions
Pyridostigmine: anticholinesterase	15–60 mg every 4–6 hours	Symptomatic improvement	Same as neostigmine
Prednisone: corticosteroid	0.8 to 1 mg/kg initially, then tapering	May slow progression to generalized MG	Increased weakness, myopathy. infection. immunosuppression
Dexamethasone: corticosteroid	Up to 0.5 mg/kg/d	Next-step therapy used with anticholinesterases	Same as prednisone
Azathioprine: antimetabolite	2 to 3 mg/kg/d tapering to $\leq$1 mg/kg/d	Efficacy >50% in elderly patients	Hepatotoxicity. bone marrow suppression requiring monitoring. teratogenicity
Cyclosporine: immunosuppressive agent	3 to 4 mg/kg/d	Used in patients in whom azathioprine is contraindicated	Creatinine elevation, hypertension, various malignancies, tremor
Mycophenolate mofetil: immunosuppressive agent	1 g every 12 hours	In refractory MG, efficacious in most patients	Diarrhea, other gastrointestinal symptoms
Methotrexate: disease-modifying antirheumatic drug	Weekly IM or oral dosage	Allows decreasing corticosteroids	Upper respiratory tract infections, headache, nausea, stomatitis
IVIg: short-term immunomodulation	400 mg/kg per day for 5 consecutive days	May be as effective as plasmapheresis	Hyperviscosity, allergy, thromboembolic events, migraines, aseptic meningitis
Rituximab: specific antibody to CD20	375 mg/m^2 IV q w times four weeks	Efficacious in one anecdotal report	Unknown
Plasmapheresis: short-term immunomodulation	May be daily to occasionally	Used in exacerbations, as effective as IVIg	Vascular access-associated, anticoagulation, infection
Thymectomy: surgical immunomodulation	One-time therapy	In younger patients induces remission in 60–90%	Those of surgery and anesthesia

IVIg, immune globulin; IM, intramuscular; MG, myasthenia gravis.

Anesthesia issues in perioperative management of MG seminars in neurology 2004

Previous treatment

- IVIG 25 g/day x 5 days
- Prednisolone [5] 4 x 3 o pc : 60mg/day > 3 weeks
  - Dexamethasone 4 mg IV q 12 hr
- Pyridostigmine [60] ½ x 3 o pc : total 90 mg/day
- Azathiopine [50] 1 x 1 o pc

HPA suppression

1) Secondary adrenal insufficiency
   - ➢ Diagnosis : short acting ACTH test
2) High risk HPAA suppression
   - ➢ Glucocorticoid equivalent dose [Prednisolone] 20 mg/day > 3 weeks
   - ➢ Clinical cushing syndrome

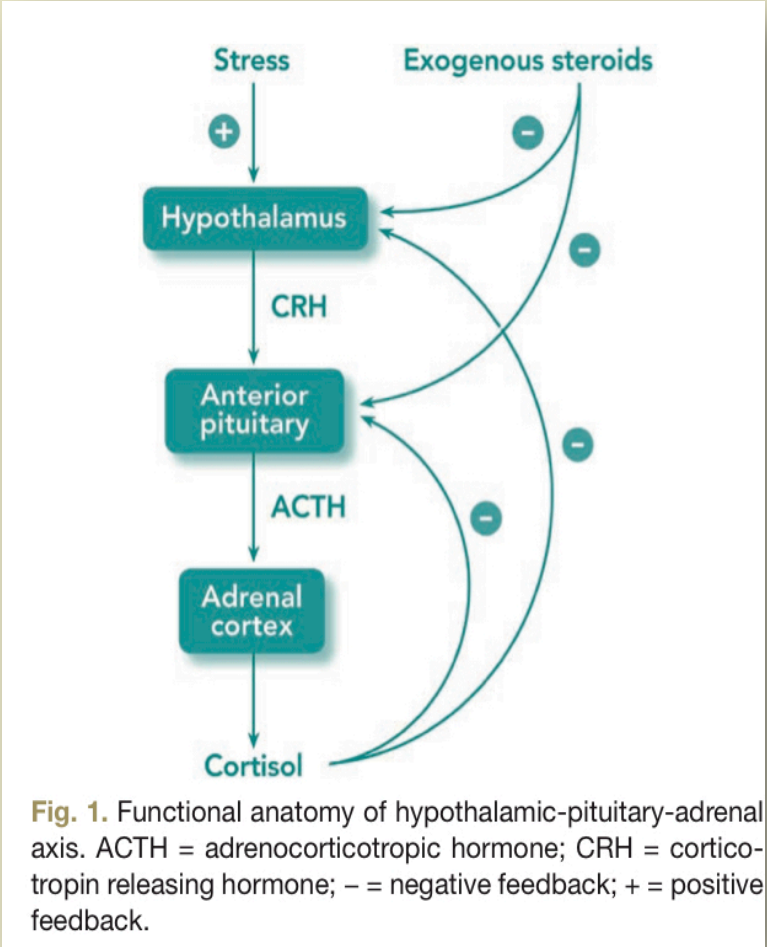


Fig. 1. Functional anatomy of hypothalamic-pituitary-adrenal axis. ACTH = adrenocorticotropic hormone; CRH = corticotropin releasing hormone; – = negative feedback; + = positive feedback.

Melanie M.Liu,M.D. Perioperative steroid management : anesthesiology 2017

HPA suppression

Recovery 6-12 months

3) Low risk HPAA suppression
   - ➢ Any dose Glucocorticoid < 3 weeks
   - ➢ Morning dose prednisolone
     - ➢ 5 mg/day or less
     - ➢ 10 mg/ day every other day

4) Intermediate risk HPAA suppression
   - ➢ Chronic steroid [not in criteria 2,3]
   - ➢ Judgment perioperative condition
     - ➢ Degree of hemodynamic stable

- More than 2 g/day of tropical steroids
- More than 0.8 g/day of inhaled steroid

>> Stoelting's anesthesia

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Steroid equivalent dose

Table 3. Steroid Choices, Potency, Dosages, and Their Conversion Charts[1,2]

Steroid	Glucocorticoid Activity	Mineralocorticoid Activity	Equivalent Dose (IV/PO)	Half-Life, h
Cortisol (hydrocortisone)	1	1	20	8–12
Cortisone	0.8	0.8	25	8–12
Prednisone	4	0.8	5	18–36
Prednisolone	4	0.8	5	12–36
Methylprednisolone	5	0.5	4	18–36
Dexamethasone	30–40	0	0.5–0.75	36–54

IV = intravenous; PO = per os.

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TABLE 31.15 Recommendations for Perioperative Corticosteroid Coverage

Surgical Stress	Target Hydrocortisone Equivalent	Preoperative Corticosteroid Dose	Perioperative Corticosteroid Dose
Superficial procedure (e.g., biopsy, dental procedure)	8–10 mg/day	Usual daily dose	▪ Then usual daily dose
Minor (e.g., inguinal hernia repair, colonoscopy, hand surgery)	50 mg/day	Usual daily dose	▪ Hydrocortisone 50 mg IV before incision ▪ Hydrocortisone 25 mg IV every 8 h for 24 h ▪ Then usual daily dose
Moderate (e.g., colon resection, total joint replacement, lower extremity revascularization)	75–150 mg/day	Usual daily dose	▪ Hydrocortisone 50 mg IV before incision ▪ Hydrocortisone 25 mg IV every 8 h for 24 h ▪ Then usual daily dose
Major (e.g., esophagectomy, pancreatoduodenectomy, major cardiac, major vascular, trauma)	75–150 mg/day	Usual daily dose	▪ Hydrocortisone 100 mg IV before incision ▪ Continuous IV infusion of 200 mg of hydrocortisone over 24 h ▪ Then usual daily dose OR ▪ Hydrocortisone 50 mg IV every 8 h for 24 h ▪ Taper dose by 50% per day until usual daily dose is reached* ▪ Then usual daily dose

*Administer continuous IV fluids with 5% dextrose and 0.2% to 0.45% sodium chloride (based on degree of hypoglycemia).

IV, Intravenous.

From Liu MM, Reidy AB, Saatee S, et al. Perioperative steroid management: approaches based on current evidence. *Anesthesiology*. 2017;127:166–172.

Associated disease

- Autoimmune disease
  - Thyroid abnormalities
  - Rheumatoid arthritis
  - SLE
  - Pernicious anemia

No associated disease

Risk of postoperative ventilation support

Table 3 Leventhal and Colleagues' Scheme for Predicting the Need for Postoperative Mechanical Ventilatory Support after Transsternal Thymectomy

Factor	Points Allocated
Duration of diagnosis of MG 6 years or greater	12
History of chronic respiratory disease, other than that attributable to MG	10
Pyridostigmine dosage greater than 750 mg/d	8
FVC less than 2.9 L	4
Maximum possible	**34**

Total 4

Scores of 0 to 9 predict immediate (within 3 hours) postoperative extubation. Scores of 10 to 34 predict the need for postoperative mechanical ventilatory support. Adapted with permission from reference 4: Leventhal R, Orkin F, Hirsch R. Prediction of the need for postoperative mechanical ventilation in myasthenia gravis. Anesthesiology 1980;53:26–30.
MG, myasthenia gravis; FVC, forced vital capacity.

Score ≥ 10 points : predict need postoperative mechanical ventilation > 3 hr

BOX 35.8 Risk Factors of Postoperative Ventilation for Patients with Myasthenia Gravis[396]

Vital capacity <2-2.9 L
Duration of MG >6 years
Pyridostigmine dosage >750 mg/day
History of chronic pulmonary disease
Preoperative bulbar symptoms
History of myasthenic crisis
Intraoperative blood loss >1000 mL
Serum antiacetylcholine receptor antibody >100 nmol/mL
Pronounced decremental response on low frequency repetitive nerve stimulation

High risk

Miller 9th edition

Risk of postoperative ventilation support

- Advanced staging of the MG
  - Bulbar involvement, rapid progression
- History of prior myasthenic crisis
- Duration of symptoms > 2 years
- Association with a pulmonary resection
- BMI > 28 kg/m^2

High risk

Yao & Artusio's anesthesiology 9th edition

Other

- Advice risk postoperative intubation and mechanical ventilation
- Set OR first case of the day
  - Elective case : stop pyridostigmine ! MG crisis

Preoperative preparation

General preparation

- Informed consent
- NPO
- Antibiotic : cefazolin 2 gm IV
- Large bore IV excess
- Warm IV fluids
- G/M PRC 2 unit
- Standard monitoring
- IV anesthetic drugs
- Anesthetic machine
- Intubation equipment
- Force air warmer
- postop ICU

Specific preparation

- Monitor TOF
- Hydrocortisone 100 mg IV before transfer to OR
- Anesthetic drug promptly to use in situation
  - MG crisis : anticholinesterase drug [Edrophonium, neostigmine]
    - IVIG, PLEX if available [post op]
  - Cholinergic crisis : anticholinergic drug [Atropine, glycopyrrolate]

Anesthetic consideration
R3

Anesthetic consideration

- Anesthetic technique & drug management in MG
- Intraoperative maintenance and monitoring
- Myasthenia crisis VS cholinergic crisis
- Postoperative pulmonary concern

Anesthetic consideration

- Anesthetic technique
  - IV induction VS Inhalation induction
  - Muscle relaxant VS Non muscle relaxant technique
    - SCH
    - Non depolarizing NMBAs
    - Avoid long acting

Anesthetic consideration

- Anesthetic drugs
  - IV anesthetic agents : Barbiturate and propofol can be used in MG patient without untoward effect
  - Opioid induced central respiratory depression
    - Short acting opioid with titrate dose

Anesthetic consideration

- Anesthetic drugs : Potent inhaled anesthetic drugs
  - Sevoflurane is suitable as a sole anesthetic for thymectomy
  - MG patient more sensitive to neuromuscular depressant effects of the potent inhaled agent

Anesthetic consideration

- Anesthetic drugs : Neuromuscular blocking agents [NMBAs]
  - Non-depolarized NMBAs : ⬆ sensitivity, Avoid long acting
  - Small titrate 10% of usual dose with neuromuscular monitoring
  - Reverse : titration technique of neostigmine [TOF guide] to avoid cholinergic crisis [prefer sugammadex > Neostigmine]

Anesthetic consideration

- Anesthetic drugs : Neuromuscular blocking agents [NMBAs]
  - Depolarized NMBAs [succinylcholine] : resistant
  - More likely to develop Phase II block than normal
  - ED_{95} of SCH in MG is > 2.6 times : usual dose can use with adequate for intubation [may not seen fasciculation]
  - Pyridostigmine and plasmapheresis [cholinesterase depletion] may effect the SCH >> prolong block

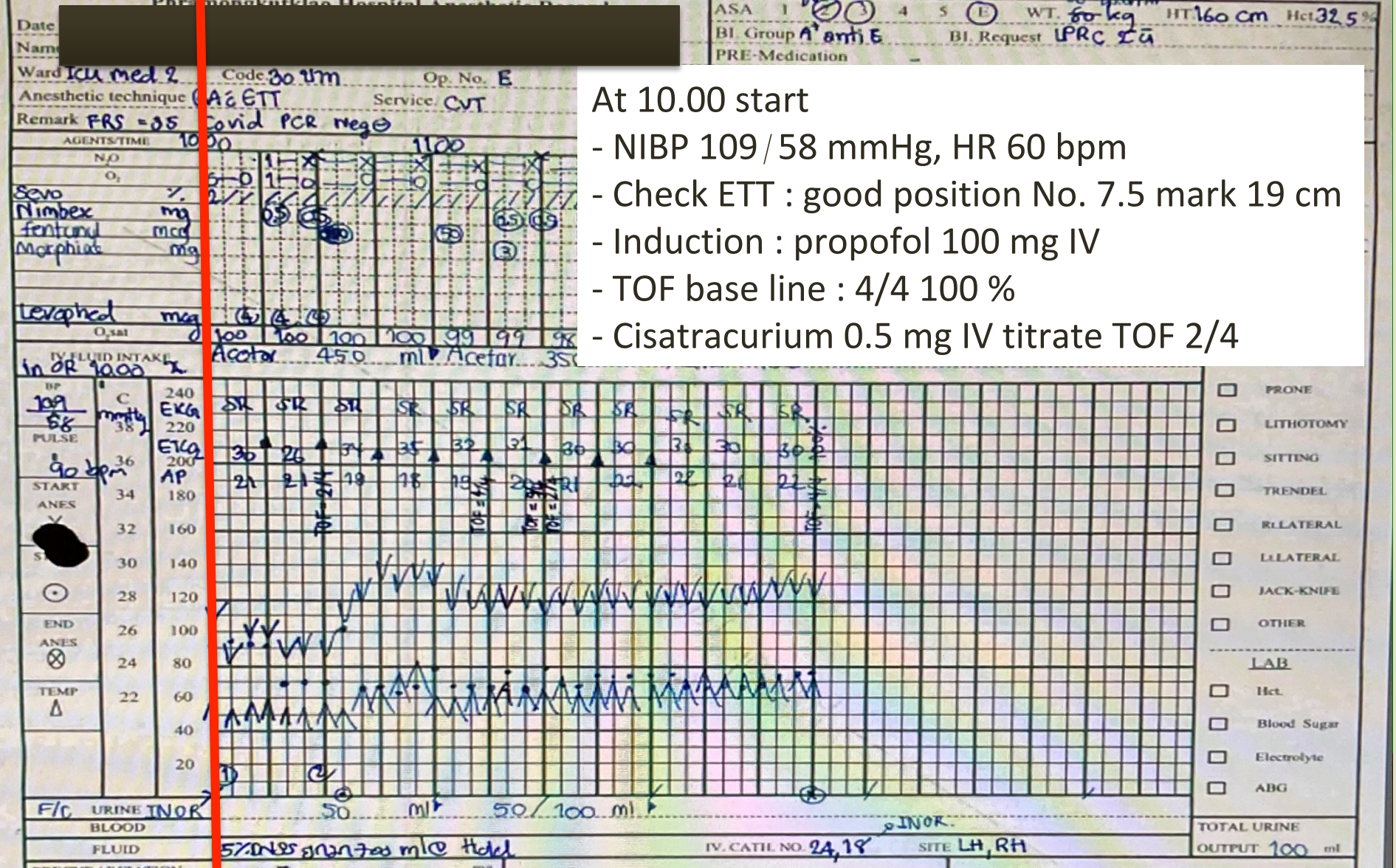
Anesthetic consideration

- Anesthetic drugs : Local anesthetic agent
  - Patient who take anticholinesterase
    - IV infusion : Prefer Amide group [liver] > Ester group
  - local infiltration or regional anesthesia : no case report of weakness

Anesthetic consideration

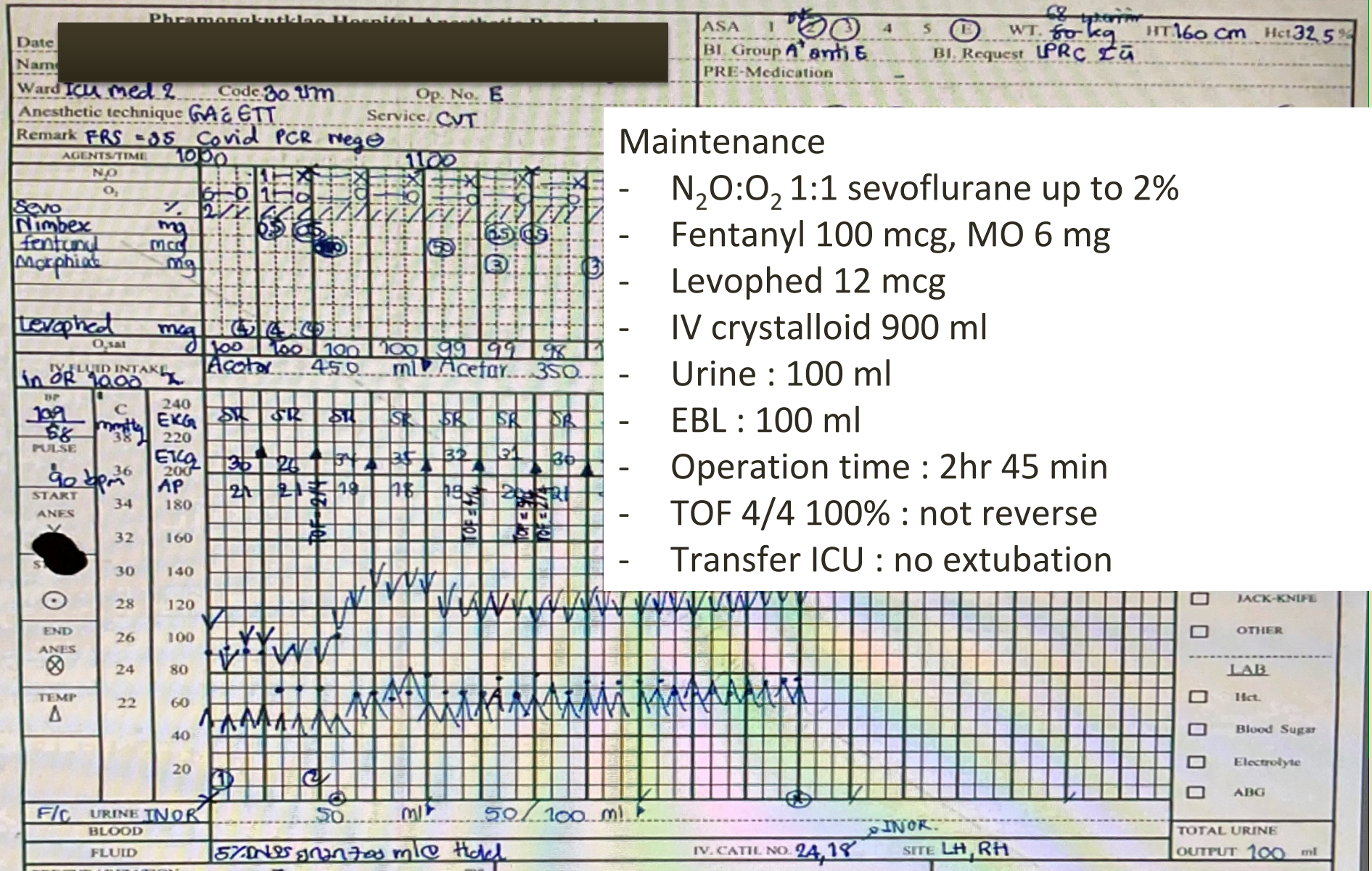
- Other drugs : can increase weakness
  - Aminoglycosides
  - Cardiac drug [beta blockers, procainamide, quinidine]
  - Magnesium
  - antiepileptics [gabapentin, phenytoin]
  - Intravenous local anesthetics [large or continuous dose]

OPERATION



At 10.00 start

- NIBP 109/58 mmHg, HR 60 bpm
- Check ETT : good position No. 7.5 mark 19 cm
- Induction : propofol 100 mg IV
- TOF base line : 4/4 100 %
- Cisatracurium 0.5 mg IV titrate TOF 2/4



Maintenance

- N_2O:O_2 1:1 sevoflurane up to 2%
- Fentanyl 100 mcg, MO 6 mg
- Levophed 12 mcg
- IV crystalloid 900 ml
- Urine : 100 ml
- EBL : 100 ml
- Operation time : 2hr 45 min
- TOF 4/4 100% : not reverse
- Transfer ICU : no extubation

Phramongkutklao Hospital Anesthetic Record

[redacted]

Date

Name

Ward ICU med 2 Code 30 นาที Op. No. E

Anesthetic technique GA & ETT Service CVT

Remark FRS = 05 Covid PCR neg ⊖

ASA 1 2 3 4 5 E WT. ~~80~~ 68 kg HT 160 cm Hct 32.5 %

BI. Group A+ anti E BI. Request LPRC 2 U

PRE-Medication –

Monitoring NIBP, O2Sat, EKG, ETCO2, A-line, CVP, PAP, TEMP.

Other force air warmer, ToF ROOM No. 9

AGENTS/TIME 1000 1100 1200 1300 1400

N2O 6 6 6 6 6 6 6 6 6 6 6 6

O2 1 1 1 1 1 1 1 1 1 1 1 1

Sevo 2 2 2 2 2 2 2 2 2 2 2 2 %

Nimbex 5 5 5 5 5 5 5 5 5 5 5 5 mg

fentanyl 200 50 50 50 50 50 50 50 50 50 50 50 mcg

Morphine 3 3 3 mg

Levophed 4 4 4 mcg

O2sat 100 100 100 100 99 99 98 100 100 100 100 100

IV FLUID INTAKE in OR 1000 cc

Acetar 450 ml Acetar 350 ml Acetar 100 ml

BP 109/58 PULSE 90 bpm

C mmHg

EKG

ETCO2

AP

START ANES

END ANES

TEMP

F/C URINE INOR 50 ml 50/100 ml

BLOOD

FLUID 5%DNSS 1000+500 ml @ 40 ml/hr

IV. CATH. NO. 24, 18 SITE LH, RH

INOR.

CONSENT ☑ YES ☐ NO

PRE-OP VISIT ☑ YES ☐ NO

POSITION ☑ SUPINE ☐ PRONE ☐ LITHOTOMY ☐ SITTING ☐ TRENDEL ☐ R.LATERAL ☐ L.LATERAL ☐ JACK-KNIFE ☐ OTHER

LAB ☐ Hct. ☐ Blood Sugar ☐ Electrolyte ☐ ABG

TOTAL URINE OUTPUT 100 ml

Post operative concern

- Weakness or respiratory compromised after surgery
  - Residual effect of anesthetic drug
  - Myasthenia crisis
  - Cholinergic crisis

Myasthenia crisis

- Cinical : severe MG + respiratory failure
- Incidence 10-20% : Most occur in the first few years after diagnosis
- Risk factor
  - Bulbar symptoms, History of preoperative MG crisis
  - Preoperative serum anti Ach receptor level > 100 mmol/L
  - Intraoperative blood loss > 1000 ml

European Journal of Cardio-Thoracic Surgery 45 (2014) e76–e88
doi:10.1093/ejcts/ezt641 Advance Access publication 12 February 2014

Thymectomy in myasthenia gravis: proposal for a predictive score of postoperative myasthenic crisis†

Table 3: Score assigned to each variable associated with POMC

Variables associated with POMC	Assigned points [range: 0.0–8.5]
Osserman-stage	
Stage: I–IIA	0
Stage: IIB	1
Stage: III–IV	3
Duration of MG	
<1 year	0
1–2 years	1
>2 years	2
Lung resection	
No	0
Yes	2.5
Body mass index	
<28	0
≥28	1

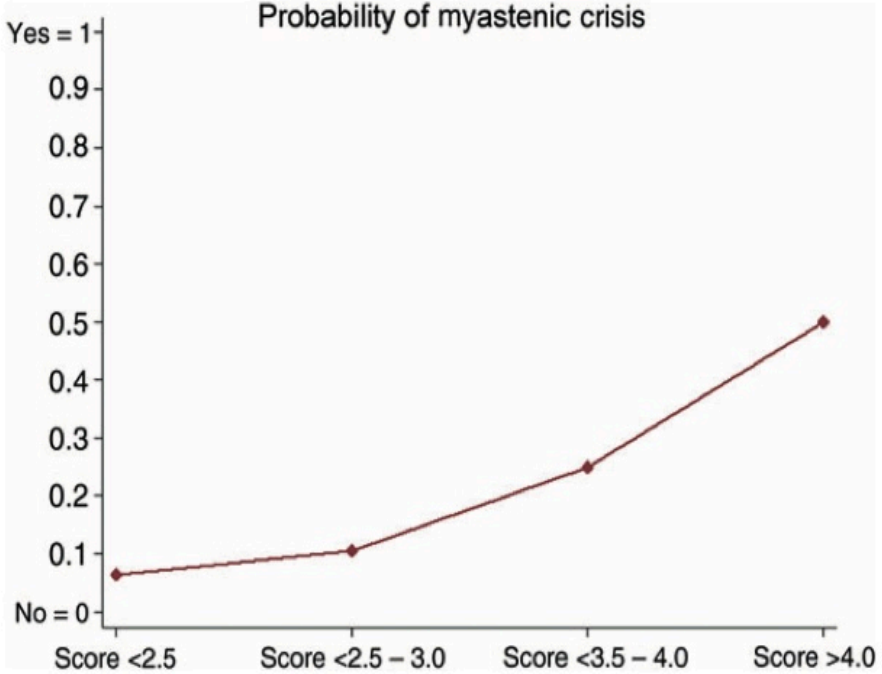
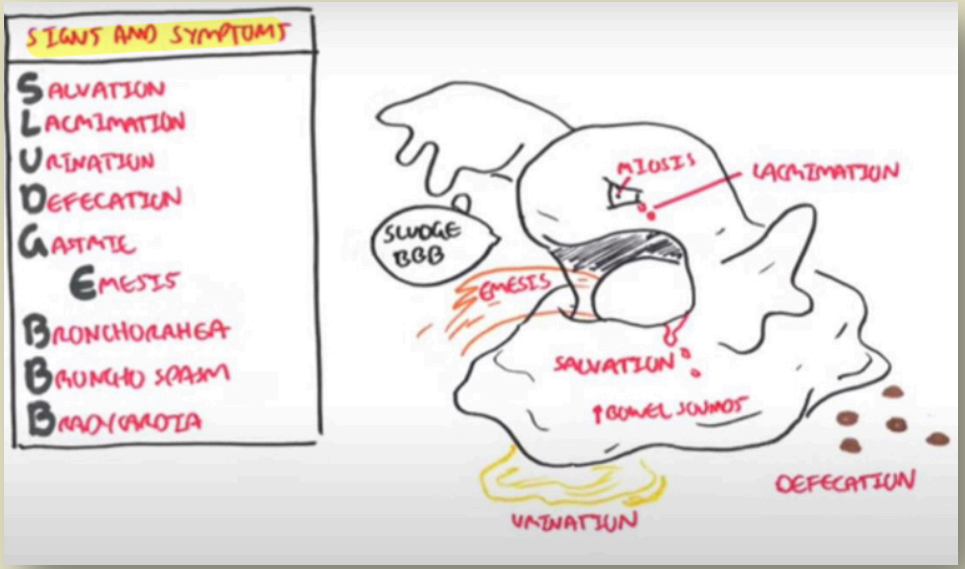


Figure 1: The increasing risk of developing POMC according to the four groups.

Cholinergic crisis



- Excess anticholinesterase drug
- Clinical
  - SLUDGE BBB, miosis

[salivation, lacrimation, urinary incontinence, diarrhea, GI upset,

and hypermotility, emesis, bradycardia, bronchorrhea, bronchospasm]

Myasthenic Crisis	Cholinergic Crisis
Under medication	Overmedication
Temporary improvement of symptoms with administration of Edrophonium	Symptoms improve with administration anticholinergics (Atropine)
Heart rate increased	Heart rate decrease
Respiratory distress	Abdominal cramps
Pupil : Mydriasis	Pupil: Miosis
Increased Blood pressure	Decreased blood pressure
Normal secretion	Increased secretion

- Differentiate with edrophonium test (Tensilon test) : 2 mg q 60 sec up to 10 mg
  - Equivalent dose [mg/kg] : edrophonium 0.5, neostigmine 0.043, pyridostigmine 0.21
- Clinical improved >> Myasthenia crisis
- Clinical worsen >> Cholinergic crisis

Postoperative day 0 [at ICU]

S : ตื่นดี หายใจได้ดี ไม่อ่อนแรง ไม่ซึม ปวดแผลเล็กน้อย [PS3/10] ICD 10 ml

O : V/S BT 36.9 ^{o}C BP 131/63 mmHg HR 80 bpm RR 16 b/m

Neuro : $E_4V_TM_6$, no weakness

Respiratory : on PSV mode PS 10 PEEP 5 Fio_2 0.3 [NIF -16 cmH_2O]

Abdomen : soft , not tender , hypoactive bowel sound

A+P : MG with thymus gland hyperplasia S/P thymomectomy post op day 0

-Fentanyl 50 mcg IV q 4 hr

-Fentanyl 25 mcg IV q 2 hr for severe pain

Postoperative day 2 [at ward]

S : ตื่นดี หายใจได้ดี ไม่อ่อนแรง ไม่ซึม ปวดแผลเล็กน้อย [PS1-2/10]

O : V/S BT 36.5 ^{o}C BP 126/70 mmHg HR 72 bpm RR 16 b/m

Neuro : $E_4V_TM_6$, no weakness

Respiratory : on PSV mode PS 6 PEEP 5 Fio_2 0.3 [NIF -20 cmH_2O]

Abdomen : soft , not tender , hypoactive bowel sound

A+P : MG with thymus gland hyperplasia S/P thymomectomy post op day 2

- Extubation >> หายใจได้ปกติ ไม่มีหอบเหนื่อย อ่อนแรง
- prednisolone [5] 12x1 o pc, Azathiopine [50] 1x1 o pc, mestinon [60] 1x3 o pc
- D/C post op day 3 >> F/U opd CVT 1 wk

Thank you