Anesthesiologist View on Safety Issues of ECT

Maija Kalliomäki
Title of Docent
Chief anaesthetist
Tampere University Hospital
Finland

The Wellbeing Services
County of Pirkanmaa

Ingredients

- What about the relaxant?
- How to choose the anaesthetic?
- Adjuvants?
- Patient-related factors?
  - Airway management
  - Pulmonary issues
  - Cardiac diseases
  - Pregnancy
  - Spinal cord stimulators

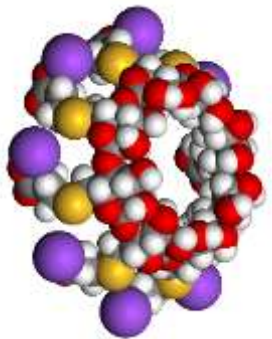
Without history there’s no now or future

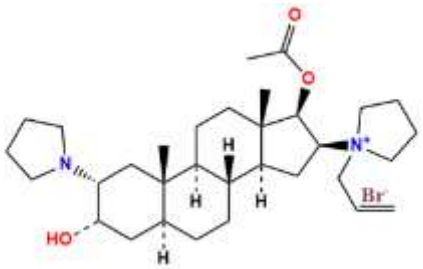
- Depression receded after epileptic seizures
- 1938 Cerletti and Bini
- 1942 curare
- Need for anaesthesia

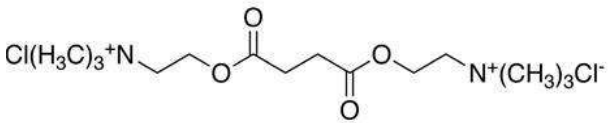
What about the relaxant?

	Non-depolarizing	Depolarizing
Fasciculations	NO	YES
Onset of action	Minutes (75 S)	
25% Recovery	33 s	
Myasthenics		
Side effects		pressure Malign hyperthermia Haemodynamic effects (anticholinerg)

- A thorough family history can alert anesthesiology and psychiatry providers involved in electroconvulsive therapy (ECT) to the possibility of pseudocholinesterase deficiency.
- Timely recognition of prolonged paralysis after succinylcholine should prompt supportive ventilation and the prevention of awake paralysis.
- Potential continuation of ECT can be facilitated using rocuronium with sugammadex reversal instead of succinylcholine. Pradhan BK, et al. BMJ Case Rep 2021;14:e239206.







Anaesthetic properties

- Rapid effect
- Short-acting
- Preferably not anticonvulsive
- No effect on haemodynamics
- No effect on respiratory force
- Analgesic?

M. Soehle, J. Bochem, S. Kayser et al.

Best Practice & Research Clinical Anaesthesiology 35 (2021) 181–189

Research agenda

- Additional research is needed to determine the exact mechanism of action of ECT
- The optimal combination of hypnotic and adjuvant drugs needs to be determined to achieve a maximum antidepressant effect and reduce the cognitive side effects
- The time lag between anesthesia and seizure induction, and the optimal anesthetic depth need to be determined

Golden standard?

- Lilly 1956
- Rapid onset ~20 s
- Short duration 5-7 min
- Least anticonvulsant?

	Metohexital	Propofol	Ketanest	Ketofol	Thiopental	Etomidate
Onset	20 s	30 s	30-60 s	30-60 s	20 s	30-40s
Duration	5-7 min	5-10 min	5-15 min	5-10 min	15-30 min	min
Anticonvulsant	+	+++	-	+/-	++	-
Haemodynamic variation	++	+	-	-	++	-
Respiratory depression	+	+++	-	-	++	-
Studied in ECT	+++	++	+	+	++	++
Analgesic effects	-	-	++	+	-	-
Side-effects	+	+	++	+	+	++

Sevoflurane?

Pain on injection

Salivation
Hallucinations
High blood pressure

Coughing
Hickups
Bronchospasm

Adrenocortical depression
Myoclonus
Hickups
Nausea
Pain on injection
Haemolysis

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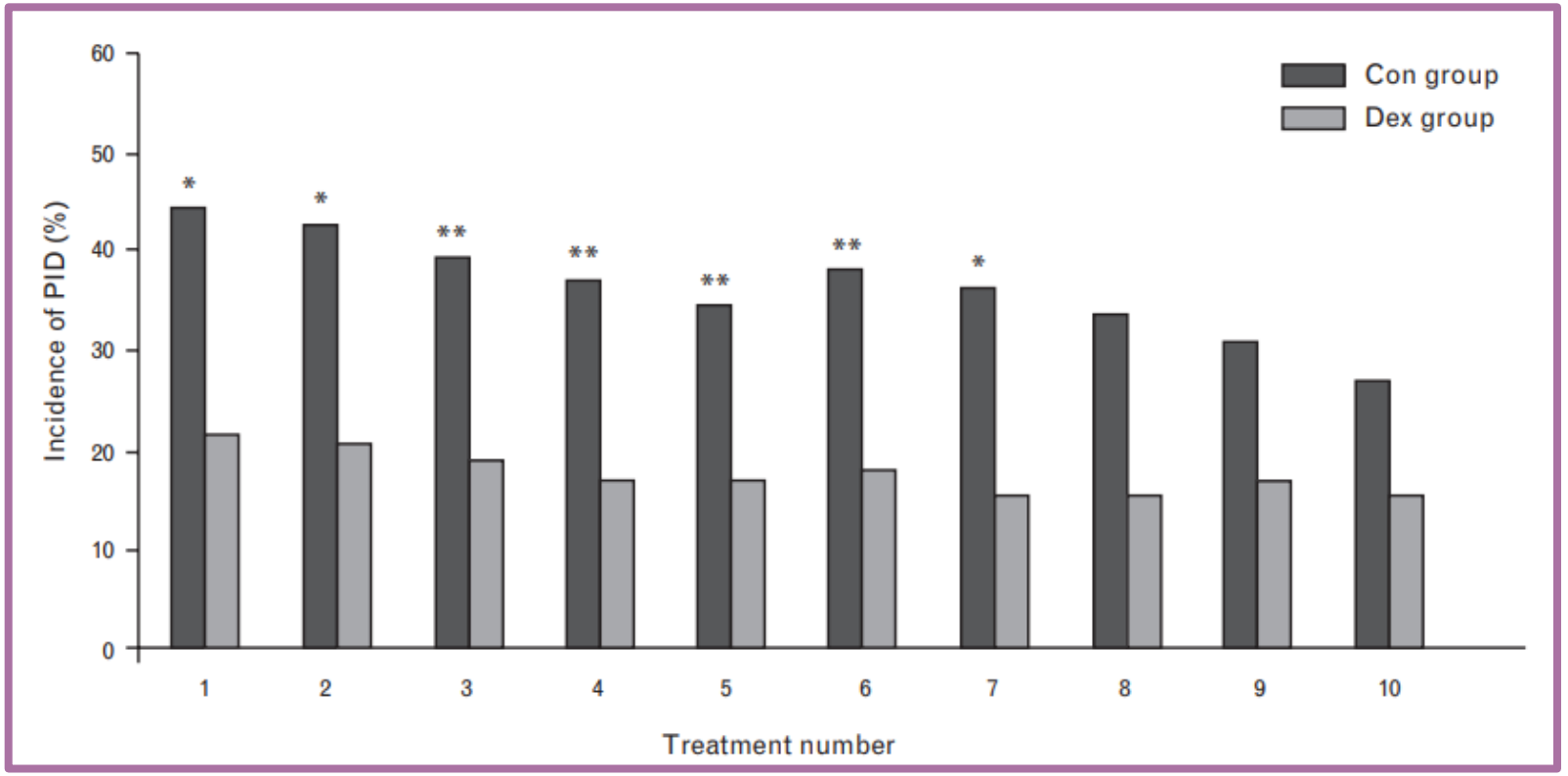
Do we need adjuvants, and if so, then what?

- Opioids?
  - Remifentanil
  - Alfentanyl
- Dexmedetomidine?

May reduce anaesthetic requirements
-> Better seizure quality?

111+111 patients
0,5ug/kg dex or NaCl
Propofol
Suxamethasone

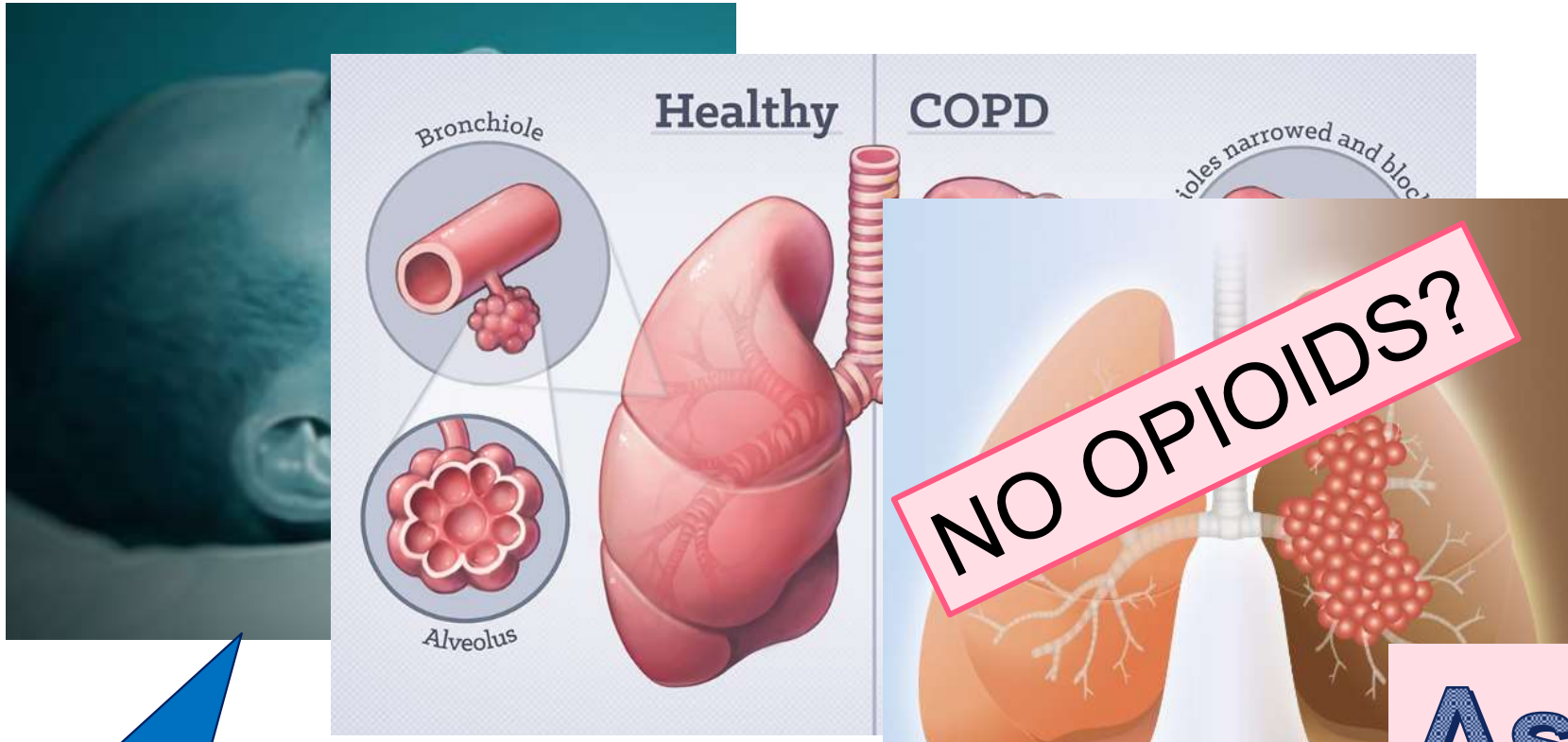


Qiu et al. Eur J anaesthesiol 2020; 37:5-13

Why do we talk about this? =Patient-related factors

- Airway management

Gas exchange



NO OPIOIDS?

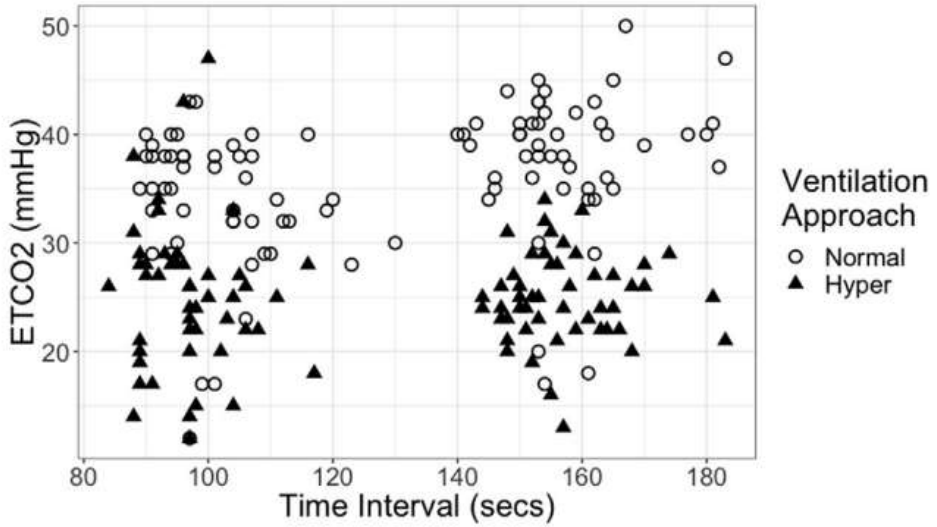
Sevoflurane?
Ketamine

Asthma

STOP-BANG

Hyperventilation, good or bad?

- ”Hypocapnia lowers the seizure threshold”
- Constriction of arteries (bad for the fetus)



Primary intention to treat analysis – mixed effects models examining impact of treatment and patient factors on ictal seizure quality.

Covariate/Dependent	*Amplitude (mm)*			*Post-ictal suppression (0–3)*			*Regularity (0–6)*			*GSQ (1–5)*			*Duration (sec)*			*Orientation score (0-10)*		
	Est	SE	p	Est	SE	p	Est	SE	p	Est	SE	p	Est	SE	p	Est	SE	p
Anaesthetic-ECT time interval (Short/Long)	−2.214	0.478	**0.000**	−0.316	0.075	**0.000**	−0.274	0.072	**0.000**	−0.327	0.072	**0.000**	−7.923	1.543	**0.000**	0.214	0.219	0.330
Ventilation approach (Norm/Hyper)	0.301	0.479	0.530	0.135	0.075	0.072	0.062	0.072	0.385	0.066	0.072	0.354	1.393	1.550	0.371	0.364	0.222	0.103
Age (years)	−0.237	0.034	**0.000**	−0.023	0.005	**0.000**	−0.027	0.005	**0.000**	−0.030	0.004	**0.000**	−0.113	0.132	0.398	−0.035	0.019	0.077
Thiopentone (mg)	−0.025	0.013	0.054	0.000	0.002	0.793	−0.000	0.002	0.954	−0.001	0.001	0.438	−0.061	0.047	0.192	−0.002	0.007	0.734
ECT type	–	–	0.082	–	–	0.359	–	–	0.485	–	–	0.964	–	–	0.104	–	–	0.433
- *BT brief*	−5.018	3.819	0.196	0.325	0.553	0.560	−0.671	0.524	0.207	−0.128	0.465	0.784	16.940	15.038	0.267	−2.764	2.142	0.204
- *BF brief*	−0.463	2.217	0.836	−0.109	0.321	0.737	0.034	0.304	0.913	−0.041	0.270	0.879	−1.551	8.731	0.860	1.250	1.239	0.319
- *RUL ultra-brief*	−2.818	1.156	0.019	−0.277	0.168	0.106	−0.157	0.159	0.326	0.052	0.141	0.713	10.629	4.554	0.025	−0.023	0.651	0.972
- *RUL brief*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

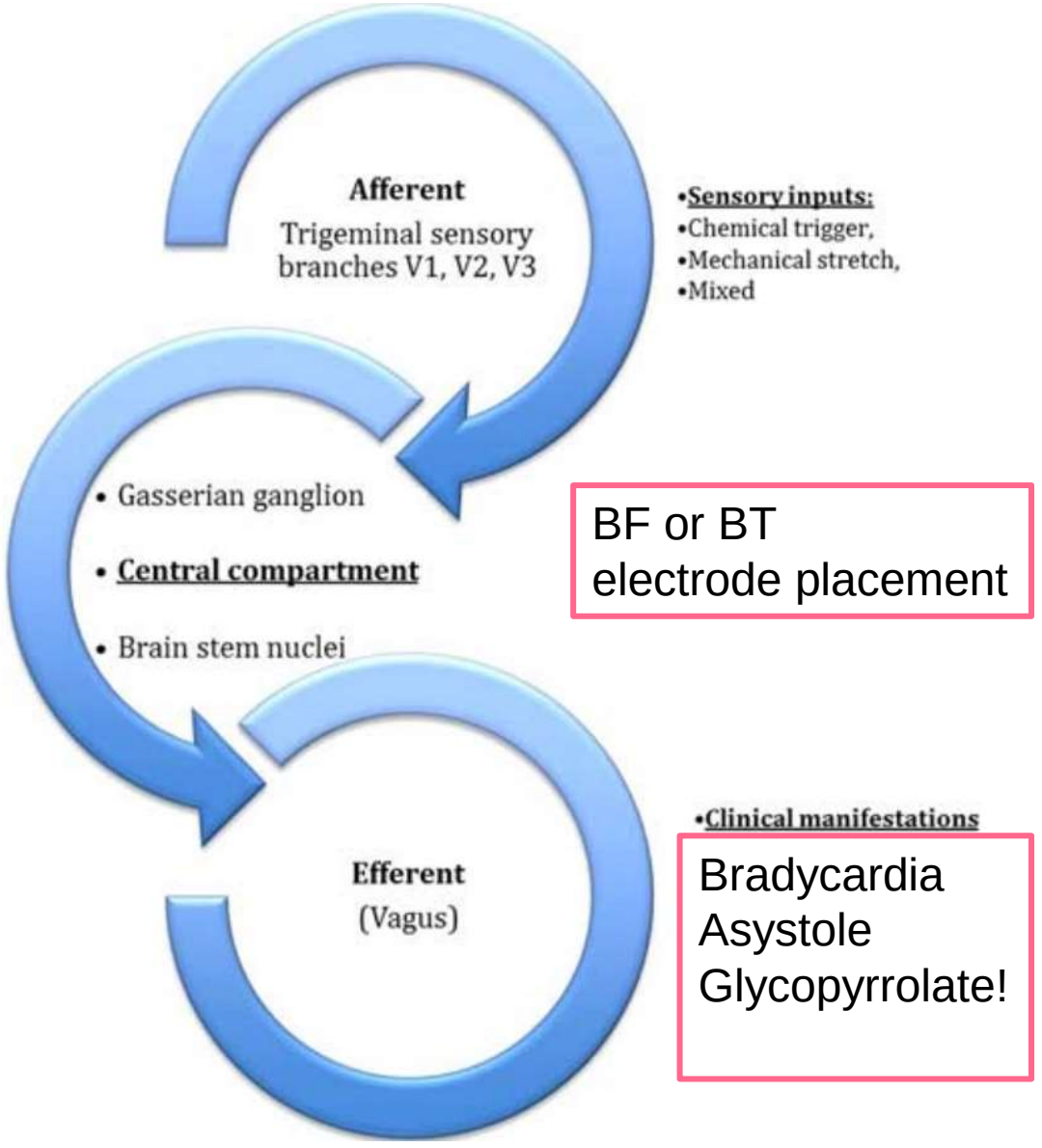
R. Taylor et al. / Brain Stimulation 13 (2020) 450–456

Cardiac manifestations

- Takotsubo cardiomyopathy
  - Stress-induced
  - Also ECT
- Any major cardiac complication 2%
  - Preventable? Betablockers?

OPIOIDS?

DEXMEDETOMIDINE?



BF or BT
electrode placement

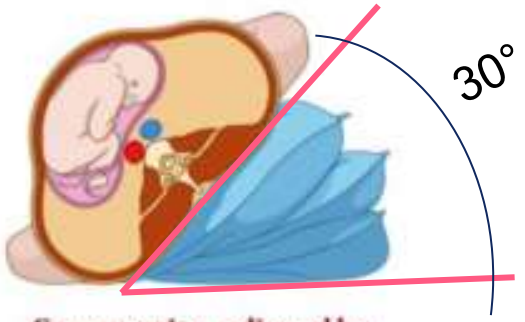
Nayeri et al Psychosom. 2018 59(3):220-6. Hartnett et al. *Journal of ECT* • Volume 39, Number 1, March 2023
Chowdhury et al. *J Neurosurg Anesthesiol* • Volume 34, Number 3, July 2022 Duma et al. Anesthesiology 2019 130(1):83-91

Pregnancy

- ECT is generally safe
- Airway management
- Aspiration
- Compression on aortocaval system during pregnancy
- Decreased utero-placental perfusion
- Possibility of fetal heart rate change
- Uterine contractions 3rd trimestre
- Other comorbidities

Sevoflurane?

Vena cava & aorta compressed by fetus



Compression relieved by tilting patient on left side

Rose et al. Obstetrical and gynecological survey 2020 75(3): 199-203
Chittaranjan J Clin Psychiatry 2021 82(4):e1-e3

Implanted electronic devices

- Spinal cord stimulators –case reports
- Cardiac pacemakers –systematic review Purohith et al. 2023
- Deep brain stimulation –case reports
- Hypoglossal nerve stimulator –case report

J ECT. 2023 Mar 1;39(1):46-52.

Am J Otolaryngol 39 (2018) 462–463

Brain Stimulation 13 (2020) 955–956

Journal of ECT • Volume 37, Number 2, June 2021

Miscellaneous

- Addison’s disease
- Intracranial hypertension –monitor cerebrospinal fluid open pressure
- Intraocular cavernoma

Any contraindications?

- Intracranial hemangioma or other vascular tumour
- Apparent or known airway difficulty
- Acute MCI? –wait for 90 days

Table 1 Pharmacologic effects of common psychotropic medications used for treatment of depression and anesthetic drugs used for electroconvulsive treatment.

Drugs / Intervention	Class	Heart Rate	Blood Pressure	Duration of Seizure	Cardiac Output	Dysrhythmia
Electroconvulsive Therapy	Treatment	↓, ↑↑	↑↑↑	↑	↑	↑
Thiopental	Hypnotic	↑	↓	↓↓	↓↓	←→
Brevital	Hypnotic	↑	↓	←→	←→	←→
Propofol	Hypnotic	←→	↓↓	↓	↑	←→
Ketamine	Hypnotic	↑	↑↑	←→	↑	↑
Etomidate	Hypnotic	↑	←→	←→	←→	←→
Succinylcholine	NMBD	↓	←→	←→	↓	↑↑
Esmolol	Beta-blocker	↓↓	↓	↓	↓	↓
Caffeine	Stimulant	↑↑	↑	↑↑	↑	↑↑
Tricyclic antidepressant (TCA)	Psych	↑↑	←→	←→	↑	↑↑
Serotonin-norepinephrine reuptake inhibitors (SNRI)	Psych	↑	↑↑	←→	↑	↑
Selective serotonin receptor inhibitors (SSRI)	Psych	↑	↑, ←→	←→	←→	←→

NMBD, Neuromuscular blocking drugs.

Pourafkari et al. J Clin Anesth. 2016;31:223-8

Individualized anaesthesia, strong recommendation for SOP!

	Metohexital	Propofol	Ketanest	Ketofol	Thiopental	Etomidate
Onset	20 s	30 s	30-60 s	30-60 s	20 s	30-40s
Duration	5-7 min	5-10 min	5-1 in	5-10 min	15 3 min	
Anticonvulsant	+	+++		+/-	+	
Haemodynamic variation	++	+		-	-	
Respiratory depression		+++	-	-	+	-
Studied in ECT	+++	++	+	+	++	++
Analgesic effects	-	-	++	+	-	-
Side-effects		+	++	+	+	++

Thank You!

Maija-Liisa.kalliomaki@pirha.fi