The long-term efficacy and safety of rocuronium and sugammadex in patients undergoing renal transplantation

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Summary:
We investigated that consecutive 99 patients undergoing renal transplantation may benefit from use of rocuronium and sugammadex in a long period. During observational period, there were no adverse events. We concluded that in our observational period sugammadex was efficacious and safe in the patients undergoing renal transplantation.

Background and Goal of Study:

- Sugammadex reversed rocuronium by encapsulating rocuronium, creating a stable complex molecule that is mainly excreted by the kidneys.
- Previous studies showed that sugammadex clearance was reduced in renal impairment[1] and case reports about use of rocuronium and sugammadex in renal transplantation[2].
- And in view of prolonged sugammadex exposure in renal transplantation, the current safety data are insufficient.
- We investigated that patients undergoing renal transplantation may benefit from use of rocuronium and sugammadex in a long period.

Materials and Methods**:**

- Consecutive 99 patients diagnosed with severe renal failure who underwent renal transplantation under general anaesthesia from the period between March 2011 and June 2016 were eligible.
- We investigated efficacy of sugammadex and perioperative complications for 72 hours at the surgical ICU and following for more than 6 months.

Results (table 1):

- Dialysis episodes were that 53 patients lasted less than 1 month, 24 lasted less than 1 year, and 15 patients lasted more than I year.
- Before renal transplantation, renal function data were the creatinine level, 5.6 mg/dL, the blood urea nitrogen level (BUN), 30 mg/dL, and the estimated glomerular filtration rate (eGFR), 8 ml/min/1.73mm^3.
- Administration of rocuronium was 160 (130, 185) mg. Administration of sugammadex was less than 200mg for 3, 200mg for 88, more than 200 mg for 6, max 400mg for 2 patients.
- One patient was not extubated at the operation room because of deterioration of oxygenation.
- After renal transplantation, renal function data were the creatinine level, 1.2 mg/dL, the BUN, 17 mg/dL, and the eGFR, 45 ml/min/1.73mm^3 at discharge.
- During observational period, there were no adverse events.

Table 1 Patient characteristics and renal function

Before surgery		After surgery		
Age (years)	53 (43, 61)	Day 1	Creatinine	2.4(1.75, 3.45)
Height (m)	166 (158, 170)		BUN	21(17, 27)
Weight (kg)	59 (51, 69.5)		eGFR	22(14.5, 30.5)
BMI	22(20, 24)	Day 3	Creatinine	1.3(0.9, 1.6)
Sex (F/M)	63 ; 36		BUN	18(14, 24)
Creatinine (mg/dL)	5.6 (4.5, 7.5)		eGFR	48(35.5, 58)
BUN (mg/dL)	30 (24.5, 34.5)	Day 5	Creatinine	1.2(1.0, 1.5)
eGFR ml/min/1.73mm^3	8 (6, 11)		BUN	20(16, 28)
Dialysis episode (number)			eGFR	47(38.5, 57.5)
< 1 month	53	Discharge	Creatinine	1.2(1.0, 1.6)
< 12 months	19		BUN	17(13.5, 21)
≧ 12 months	27		eGFR	45(38, 55.5)
Anaesthesia (min)	425 (382, 459.5)	≧ 6 months	Creatinine	1.2(1.0, 1.6)
Surgery (min)	317 (290, 358)		BUN	17(13.5, 21)
Rocuronium dose (mg)	160 (130, 185)		eGFR	45(38, 55.5)
Sugammadex dose (mg)	200 (200, 200)	Complication with muscle relaxants		
		72hr in ICU		0
		Following period		0

Discussion:

- In our observational period, there were no adverse events and we concluded that sugammadex was efficacious and safe in the patients undergoing renal transplantation.
- We were afraid that recurarisation might cause respiratory failure, however, there were no such events in our cases.
- Approximately 3.3mg/kg sugammadex used in our 99 cases might be enough to obtain good recovery from muscle relaxant as compared that 4mg/kg was needed for reversal of deep neuromusclar block with severe renal impairment[1] and 9.5mg/kg was needed for both molecules bind in 1:1 molar ratio.
- Renal function was recovered to 22% at day1 and 48% at day3, respectively and this recover might cause good outcome.

References:
1. Panhuizen IF, et. al. Efficacy, safety and pharmacokinetics of sugammadex 4 mg kg^{-1} for reversal of deep neuromuscular blockage in patients with severe renal impairment. Br J Anaesth 2015; 114: 777-784
2. Carlos RV, et. Al. The use of rocuronium and sugammadex in paediatric renal transplantation. Two case reports. E Anaesthesiol 2016; 33:383-385

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