

The predictive performance of propofol target-controlled infusion during CO₂ pneumoperitoneum in patients in the head down position

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Background and Goal of Study

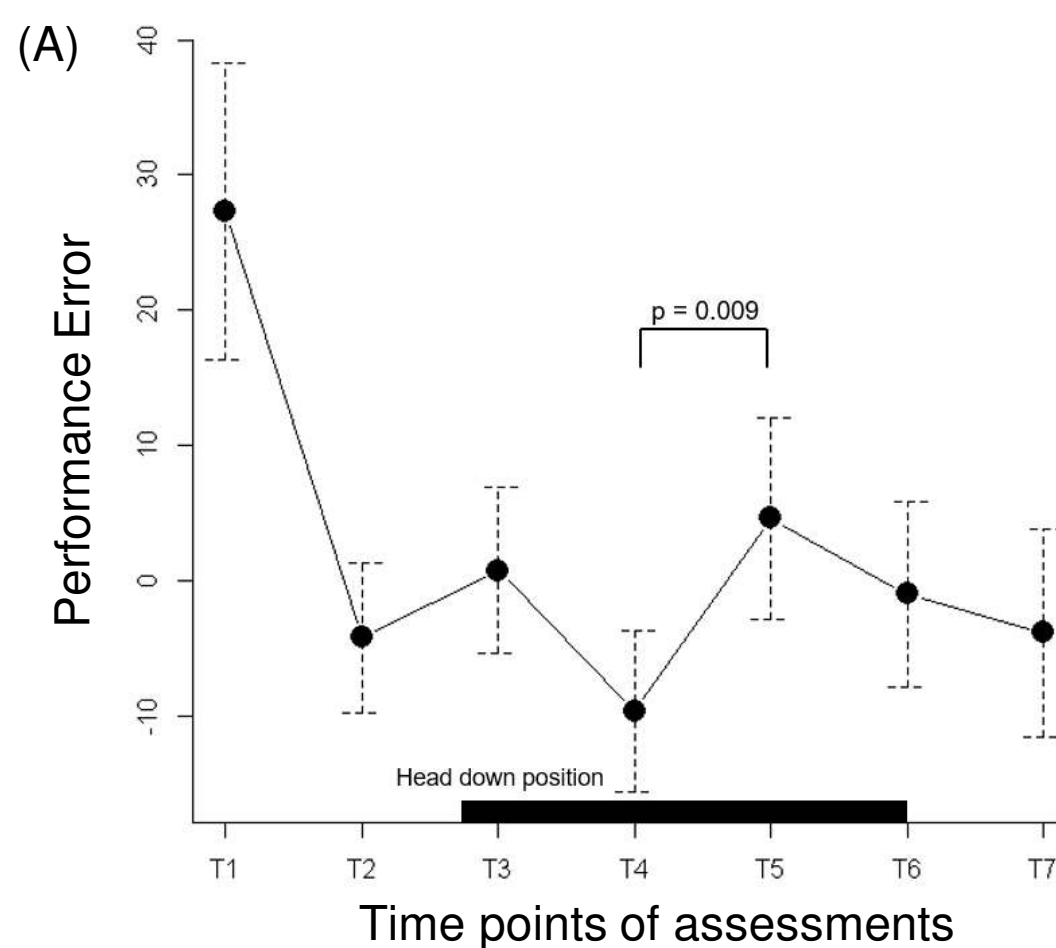
Propofol clearance is reduced when the hepatic blood flow (HBF) is decreased, which can be caused by pneumoperitoneum in patients in the head down position (HDP)[1]. This may alter the pharmacokinetics of propofol and worsen the predictive performance of target-controlled infusion (TCI). We investigated the predictive performance of propofol TCI during CO₂ pneumoperitoneum in patients who underwent robotic-assisted radical prostatectomy in the head down position.

Material and Methods

This study was approved by institutional review board and registered at the UMIN-CTR(UMIN000011268). Fifteen male patients received propofol TCI using the Diprifusor model. Propofol concentrations and cardiac output (CO) obtained using FloTrac system 4.0 (Edwards Lifesciences, Irvine, USA) were measured at seven time points: T1) 15 min after anesthesia induction; T2) before the insufflation; T3), T4), and T5) 15, 60, and 90 min, respectively, after insufflation in the HDP; and T6) and T7) before and 15 min after the release of pneumoperitoneum in the HDP, respectively. The predictive performance of TCI was evaluated by calculating the performance errors (PE; [measured – predicted]/predicted) in propofol concentrations for each data point. Overall PE and CO values were analyzed using a repeated-measures one-way analysis of variance (ANOVA) and multiple comparisons (Holm's method). A value of P < 0.05 was considered significant. Furthermore, median PE (MDPE) and median absolute PE (MDAPE)[2] were calculated as measures of bias and accuracy, respectively.

Table 1 . Characteristics of enrolled patients

ASA I/II	(n)	7 / 8
Age	(yo)	68 [54 - 75]
Height	(cm)	167.7 [157.7 - 178.4]
Weight	(kg)	70.2 [56.0 - 77.7]
Body Mass Index	(kg/m ²)	24.1 [20.7 - 27.9]
Hypertension (yes / no)	(n)	5 / 10
Renal function disorder (yes / no)	(n)	0 / 15
Diabetes Mellitus (yes / no)	(n)	0 / 15
Chronic heart disease (yes / no)	(n)	2 / 13



Results and Discussion

Table 1 shows the characteristics of enrolled patients. A total of 104 blood samples were analyzed. ANOVA revealed significant differences in overall PE values and no differences in overall cardiac output (Figure 1). The multiple comparison analysis showed a significant difference in PE values between time points T4 and T5. The predictive performance of propofol TCI during pneumoperitoneum in the HDP was acceptable when the MDPE and MDAPE were -1.5% and 18.8%, respectively (Table 2). Theoretically, the propofol concentrations could be approximately twice as those targeted in TCI due to the reduced HBF[1,3]. In this study, the anesthesia procedure properly maintained the blood pressure and cardiac output, and thus the HBF may have been maintained.

Conclusion

The prediction performance of propofol TCI during CO₂ pneumoperitoneum was acceptable in patients in the HDP.

Acknowledgement:

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References

1. Yang Liu et al. BMC Anesthesiol 2017:45
2. Varvel JR et al. J Pharmacokinet Biopharm. 1992:63–94.
3. Peeters MY et al. Eur J Clin Pharmacol 2008. 329-34

Table 2. Predictive performance of target controlled infusion

	MDPE	MDAPE
Supine · non-pneumoperitoneum	1.6% [-11.4%, 17.1%]	20.4% [12.0%, 30.7%]
HDP · pneumoperitoneum	-1.5% [-14.5%, 11.4%]	18.8% [10.9%, 26.8%]
All of the above	-1.7% [-13.6%, 10.1%]	18.6% [11.5%, 25.5%]

[95% CI]; MDPE = median performance error; MDAPE = median absolute performance error
HDP = head down position

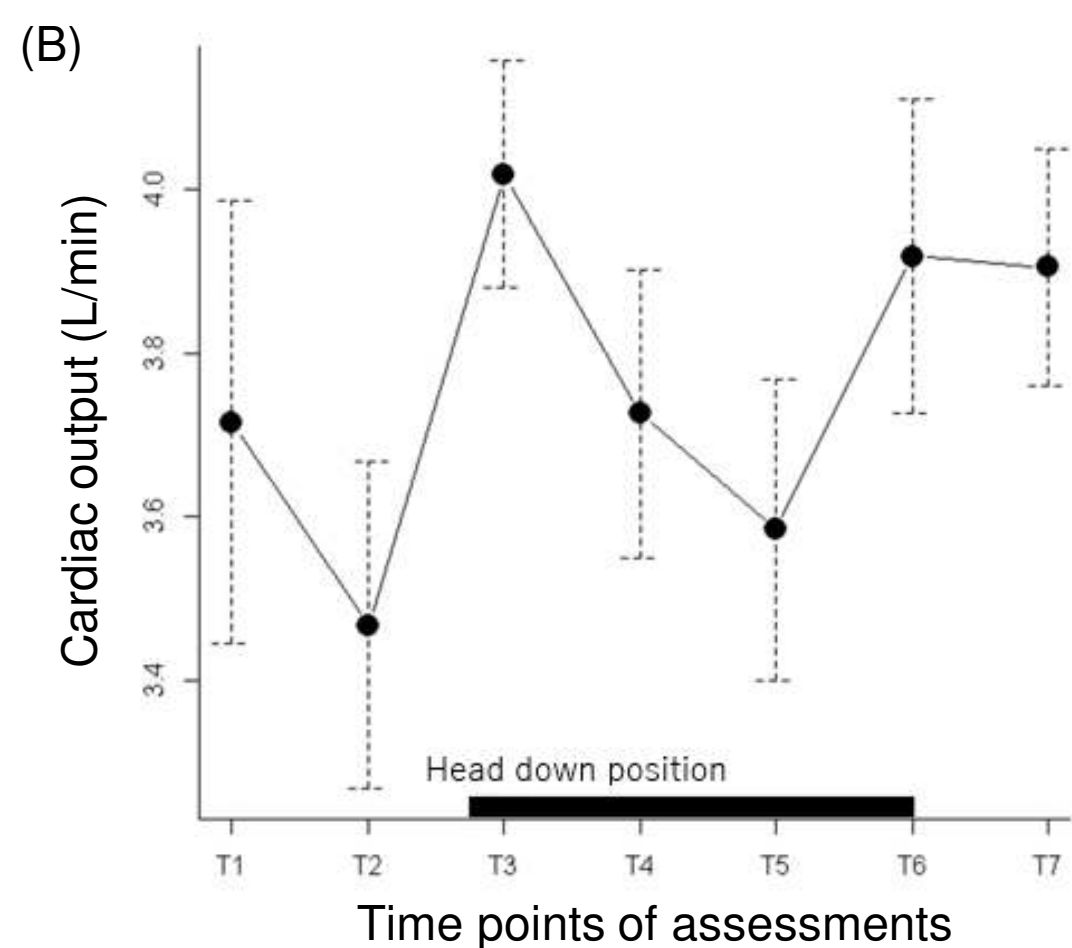


Figure 1. Time courses of performance error (A) and cardiac output (B). Data are means ± S.E. Tn: see 'material and methods'