

# 복강경 대장절제술에서 기복이 고혈압 환자의 심박수, 평균동맥압 및 심박출량에 미치는 영향

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<sup>1</sup>, <sup>2</sup>

## The Effects of Pneumoperitoneum on Heart Rate, Mean Arterial Blood Pressure and Cardiac Output of Hypertensive Patients during Laparoscopic Colectomy

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**Purpose:** This study was performed to identify effects of pneumoperitoneum on hemodynamic changes of hypertensive patients undergoing laparoscopic colectomy under general anesthesia. **Methods:** Data collection was done from January 2 to June 10, 2008. Seventy-six patients, including 38 hypertensive patients, who had taken antihypertensive drugs more than 1 month and 38 normotensive patients undergoing laparoscopic colectomy were enrolled in this study. The hemodynamic parameters were heart rate (HR), mean arterial pressure (MAP) and cardiac output (CO) which were measured 7 times from before induction of anesthesia to 5 min after deflation of the pneumoperitoneum. Collected data were analyzed using Repeated Measures ANOVA and Bonferroni comparison method. **Results:** HR in the hypertensive group was significantly decreased at deflation of the pneumoperitoneum and 5 min after deflation of the pneumoperitoneum ( $p=.012$ ). MAP in the hypertensive group was not different from the normotensive group ( $p=.756$ ). CO in hypertensive group was significantly lower than normotensive group ( $p<.001$ ) from immediately after pneumoperitoneum to 5 min after deflation of the pneumoperitoneum. **Conclusion:** The results indicate that pneumoperitoneum during laparoscopic surgery does not lead to clinically negative hemodynamic changes in heart rate, mean arterial pressure or cardiac output of hypertensive patients, who have taken antihypertensive drugs for more than 1 month.

**Key words:** Pneumoperitoneum, Hypertension, Heart rate, Blood pressure, Cardiac output

### 서 론

(Kang et al., 2005; Noh et

al., 2000; Yoon & Oh, 2005).

#### 1. 연구의 필요성

1990

(Kang, Yoon,

Kim, Lee, & Kim, 2007; Lacy et al., 2002).

주요어 : 기복, 고혈압, 심박수, 평균동맥압, 심박출량

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(Gerges, Kanazi, & Jabbour- Khoury, 2006).

(Gerges et al., 2006).

(Alfonsi et al., 2006; Meininger et al., 2008).

12 mmHg

(Kang et al., 2005; Lee & Lee, 2006; Rist, Hemmerling, Rauh, Siebzehnriibl, & Jacobi, 2001).

5 , 20 (Artuso et al., 2005; Hein et al., 1997; Lee & Lee, 2006; Meininger et al., 2008).

(Piccirillo et al., 1996). Park, Baek, Hong, Park Kim (1990) 140 mmHg 90 mmHg

(Marik & Varon, 2007; Pierson & McSwiney, 2008).

(Gerges et al., 2006; Henny & Hofland, 2005; Lee & Lee, 2006; Yoon & Oh, 2005)

(Lee, 2004; Yoon & Oh, 2005).

(Alfonsi et al., 2006; Meininger et al., 2008),

(Artuso et al., 2005; Lee & Lee, 2006; Rist, Hemmerling, Rauh, Siebzehnriibl, & Jacobi, 2001),

(Kang et al., 2005; Kim et al., 2007)

(Korean Accreditation Board of Nursing, 2007)

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2. 연구 목적

15 , 10 , 20 , 5 7

15 , 10 , 20 , 5 7

15 , 10 , 20 , 5 7

3. 용어 정의

1) 기복

(pneumoperitoneum)

(Gerges et al., 2006)

12 mmHg

2) 고혈압

90 mmHg

140 mmHg

(Chobanian et al., 2003)

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2. 연구 대상 및 기간

2008 1 6

1

76

, 45

ology, ASA)

(American Society of Anesthesi-

I

II

(I

, II

.)

1

140 mmHg

90 mmHg

Y

140 mmHg

90 mmHg

3.6±0.5 L/m,

20

3.9±0.8 L/m,

83.6±12.6

beats/m,

20

79.2±8.3 beats/m

Lee Lee (2006)

0.42

0.05,

0.8

35

38

76

38

54

, 55- 59

, 60- 64

, 65- 69

, 70- 74

, 75- 79

3. 연구 도구

1) 심박수

(Model 88s, Hewlett

Packard, Wallingford, CT, USA, 2001)

2) 평균 동맥압

(Model 88s, Hewlett Packard)

1 (mean arterial pressure, MAP)

“ = ( + 2 ×

)/3”

80 mmHg

3) 심박출량

(Non- Invasive Cardiac Output Monitor 7900, Nova-

metrix Medical System, Böblingen, Baden- Württemberg,

Germany, 1999)

(L/min)

#### 4. 연구 진행 절차

##### 1) 자료 수집 절차

2008 1 2 6 10  
 400 N 2

1

(Model 88s, Hewlett Packard)

100% O<sub>2</sub> (8 L/min)

thiopental sodium 5 mg/kg, vecuronium 0.15 mg/kg

sevoflurane

1.0- 1.5 MAC (Minimum Alveolar Concentration)

remifentanil 3 mg/kg

O<sub>2</sub> Air 1 L/min

35 mmHg

Y

, Verres

36.5°C

mmHg

38.9°C

20

##### 2) 종속변수 측정 방법 및 측정시기

2

(Model 88s,

Hewlett Packard)

15 , 10 , 20 ,

5 7

(rebreathing nonin-

vasive cardiac output)

(Non- Invasive Cardiac Output Monitor 7900, Novametric Medical System) 15

10 , 20 ,

5 7

#### 5. 자료 분석 방법

SPSS (version 13.0)

t- test

15 , 10

20 , 5

7

15 , 10 ,

20 , 5 7

t- test,

Bonfer-

roni

#### 연구 결과

##### 1. 연구 대상자의 생리적 특성

(Table 1).

##### 2. 고혈압군과 정상혈압군 간의 심박수 비교

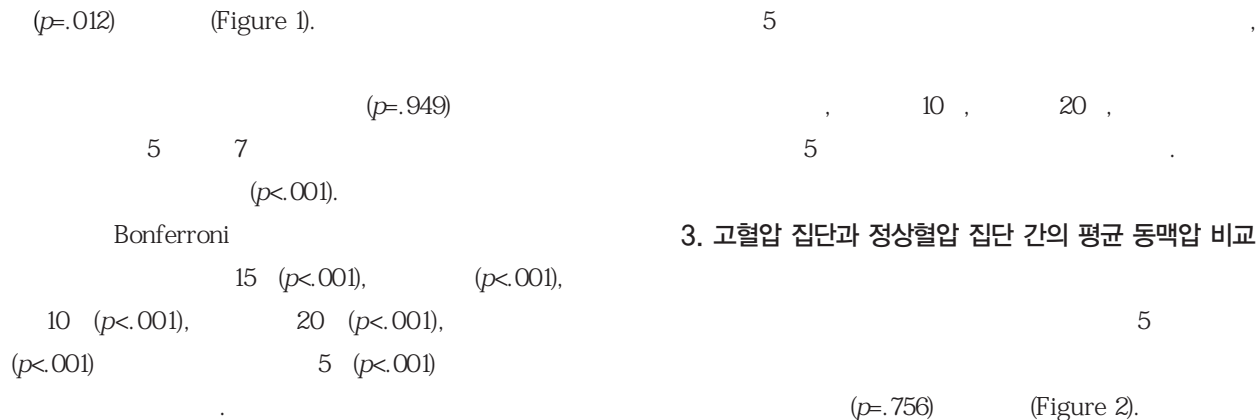
5

Table 1. Homogeneity Test for Physiological Characteristics

(N=76)

Variables	Hypertensive group (n=38)		Normotensive group (n=38)		t	p
	Mean ±SD or n (%)		Mean ±SD or n (%)			
Age (yr)	62.9 ± 8.75		60.6 ± 9.73		1.13	.263
Gender	Male	19 (50.0)	19 (50.0)		-	-
	Female	19 (50.0)	19 (50.0)			
BMI (kg/m <sup>2</sup> )	24.1 ± 2.96		24.3 ± 3.24		-0.84	.404
Body temperature (°C)	36.1 ± 0.28		36.1 ± 0.39		-0.07	.947
Heart rate (beats/min)	78.6 ± 12.53		74.2 ± 10.74		1.57	.122
	<60	1 (2.6)	-			
	60-80	24 (63.2)	30 (78.9)			
	>80	13 (34.2)	8 (21.1)			
Mean arterial pressure (mmHg)	97.8 ± 10.65		94.5 ± 13.56		1.16	.251
	<80	3 (7.9)	4 (10.5)			
	≥80	35 (92.1)	34 (89.5)			
Cardiac output (L/min)	3.69 ± 0.699		3.85 ± 1.282		-0.63	.528
	<3.0	4 (10.5)	14 (36.8)			
	3.0-6.0	34 (89.5)	23 (60.5)			
	>6.0	-	1 (2.6)			
ASA class	I	25 (65.8)	28 (73.7)		0.56	.454
	II	13 (34.2)	10 (26.3)			
	III, IV, V	-	-			
Antihypertensives	10 (26.3)		-			
	Ca channel blocker	8 (21.1)				
	β blocker	16 (42.1)				
	ACE inhibitor or ARB blocker	4 (10.5)				
	Diuretics with ACE inhibitor, ARB or β blocker	5 (18.4)				
Duration of hypertension (yr)	6.9 ± 5.15		-			
	<5	14 (36.8)				
	5-9	13 (34.2)				
	10-14	4 (10.5)				
	≥15	4 (10.5)				
	Unknown	3 (8.0)				
Diabetes mellitus	No	36 (94.7)	37 (97.4)			
	Yes	2 (5.3)	1 (2.6)			
Chronic bronchitis	No	38 (100.0)	36 (94.7)			
	Yes	-	2 (5.3)			

BMI=Body mass index; ASA=American Society of Anesthesiology; ACE=angiotensin converting enzyme; ARB=Angiotensin II Receptor Blocker.



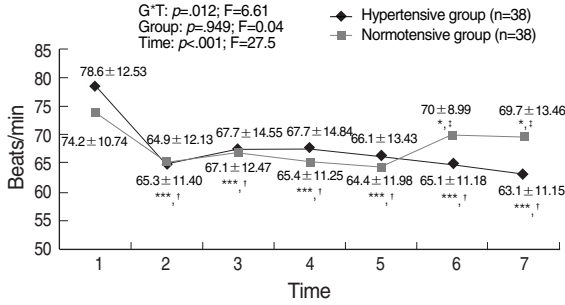


Figure 1. Heart rate between hypertensive and normotensive group (N=76).

\*\*\* $p < .001$ ; † comparison between before induction and each time; ‡ comparison between hypertensive and normotensive group; G\*T=Group\*Time.

Time 1=before induction; Time 2=15 min after induction; Time 3=right after pneumoperitoneum; Time 4=10 min after pneumoperitoneum; Time 5=20 min after pneumoperitoneum; Time 6=right after deflation; Time 7=5 min after deflation; Score=Mean ± SD.

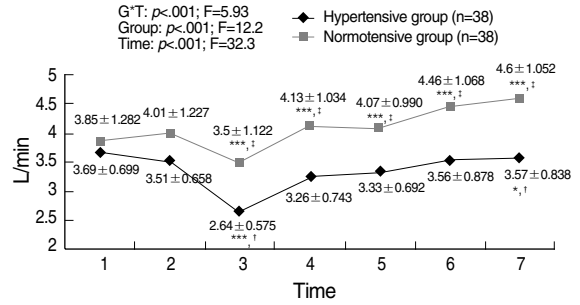


Figure 3. Cardiac output between hypertensive and normotensive group (N=76).

\* $p < .05$ ; \*\*\* $p < .001$ ; † comparison between before induction and each time; ‡ comparison between hypertensive and normotensive group; G\*T=Group\*Time.

Time 1=right after induction; Time 2=15 min after induction; Time 3=right after pneumoperitoneum; Time 4=10 min after pneumoperitoneum; Time 5=20 min after pneumoperitoneum; Time 6=right after deflation; Time 7=5 min after deflation; Score=Mean ± SD.

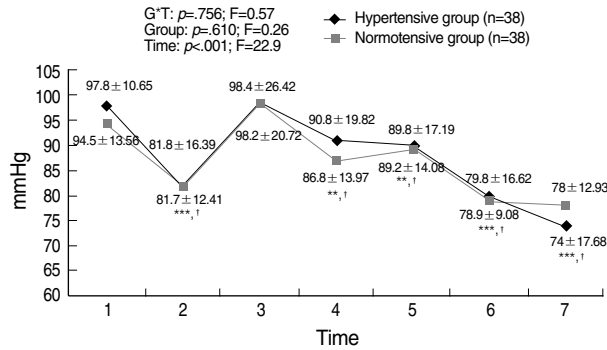


Figure 2. Mean arterial pressure between hypertensive and normotensive group (N=76).

\*\* $p < .01$ ; \*\*\* $p < .001$ ; † comparison between before induction and each time; G\*T=Group\*Time.

Time 1=before induction; Time 2=15 min after induction; Time 3=right after pneumoperitoneum; Time 4=10 min after pneumoperitoneum; Time 5=20 min after pneumoperitoneum; Time 6=right after deflation; Time 7=5 min after deflation; Score=Mean ± SD.

4. 고혈압 집단과 정상혈압 집단 간의 심박출량 비교

			5	
	( $p < .001$ )	(Figure 3).		
	( $p < .001$ )		5 7	
	( $p < .001$ ).			
		( $p < .001$ ),		
10	( $p < .001$ ),	20	( $p < .001$ ),	
		5	( $p < .001$ )	
		Bonferroni		
		( $p < .001$ ),		
	5	( $p < .05$ )		
		5		
5			10	
	( $p < .001$ ).			
Bonferroni				
	15	( $p < .001$ ),	10	( $p < .01$ ),
	20	( $p < .01$ ),		( $p < .001$ )
	5	( $p < .001$ )		
	15	,	10	,
	5	,	20	,
				논 의

				(Ishizuka, Kudo, Amemiya, Tanii, & Aoki, 2000; Joris et al., 1999; Nishikawa & Naito 1996).	
					Yoon
				Oh (2005)	
20					
	Meininger (2008)			thiopental sodium, sevoflurane, propofol,	Yoon Oh (2005) enflurane N <sub>2</sub> O
				(Fang, Guo, Davies, & Maze, 1997)	
				propofol	(Coste, Guignard, Menigaux, & Chauvin, 2000)
		(Rist et al., 2001)			
			5	Lee Lee (2006)	4.3 L/min
				10 3.6 L/min	Noh
				(2000)	5.0 L/min
				3.4 L/min	
		(Kang et al., 2005)		Rist (2001)	15 mmHg
	Noh (2000)	Hein (1997)			
				(Rist et al., 2001)	
				(Itoh et al., 1995; Piccirillo et al., 1996)	
					2.64 L/min
					3.0- 6.0 L/min
					98.4 mmHg
15					
					1
				Sood, Jayaraman,	
	Kumra Chowbey (2006)				

## 결론

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1

1

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