

Chapter 4

Results



Group 1

The renal and systemic hemodynamics are shown in table 2 and table 3 respectively. The first ARG infusion caused no significant changes in renal and systemic hemodynamics during infusion and sixty minutes after infusion, when compared with the control period. IND reduced RPF ($p < .01$) by increasing RVR ($p < .01$) without significant changes in GFR, CO and TPR. The filtration fraction (FF) was increased ($p < .05$). Comparing with the IND-treated period, GFR and RPF were increased by 40% and 47% ($p < .05$ for both) respectively during the second infusion of ARG and returned to the IND-treated values after cessation of ARG. There were no significant changes in CO, RVR and TPR during the second ARG infusion. Both the first and second ARG infusion increased urine volume (V), osmolar clearance (C_{osm}), fractional excretion of sodium (FENa) and fractional excretion of potassium (FEK) (Table 4). IND reduced urine volume, FENa and FEK although the values were not statistically significant, comparing with the values of the previous period (period B). The mean arterial pressure (MAP), heart rate (HR), and hematocrit (Hct) did not change significantly throughout the experiment.

Group 2

The renal and systemic hemodynamics are shown in table 5 and table 6 respectively. The first ARG infusion increased CO ($p < .01$) and reduced TPR ($p < .05$) whereas GFR, RPF and RVR showed no significant changes during infusion and sixty minutes after infusion, comparing with the control period. IND reduced RPF ($p < .01$) and CO ($p < .01$) by increasing RVR ($p < .05$) and TPR ($p < .05$) respectively whereas GFR had no significant change, resulting in an increase in FF ($p < .05$). Comparing with IND-treated period, both GFR and RPF were increased approximately two folds ($p < .05$ for both) during the second infusion of ARG and returned to the IND-treated values after cessation of ARG infusion. CO was also significantly increased ($p < .05$) during the second ARG infusion while RVR was decreased ($p < .05$), comparing with the IND-treated period. Significant change of TPR during the second ARG infusion was not observed. Both the first and second ARG infusions increased urine volume, Cosm, FENa and FEK during the infusion period (table 7). IND reduced urine volume, FENa and FEK although the values were not statistically significant, comparing with the values of the previous (period B). MAP, HR and Hct did not change significantly throughout the experiment.

Table 2 Renal hemodynamics of group 1 dogs

| | Control (-- min --) | ARG (-- 0-30 --) | A [#] (- 30-60 -) | B [#] (- 60-90 -) | IND (- 90-120 -) | ARG (-120-150-) | C ^{##} (-150-180-) | D ^{##} (-180-210-) |
|-----------------------------------|------------------------|---------------------|-------------------------------|-------------------------------|---------------------|--------------------|--------------------------------|--------------------------------|
| GFR [#] (ml/min) | 18.86±0.78 | 21.39±1.69 | 20.47±1.02 | 18.56±0.80 | 16.00±1.30 | 22.59±2.87 | 18.05±1.35 | 17.77±1.06 |
| RPF [#] (ml/min) | 82.30±5.73 | 91.42±8.30 | 82.77±7.69 | 75.06±5.60 | 46.21±4.32 | 67.57±6.75 | 51.93±2.87 | 47.96±4.86 |
| RBF [#] (ml/min) | 122.29±11.85 | 135.69±14.89 | 123.97±14.71 | 122.00±10.91 | 68.53±5.55 | 99.09±10.94 | 76.58±2.11 | 71.44±7.25 |
| FF (%) | 22.88±0.98 | 23.62±1.10 | 25.30±1.49 | 23.19±1.30 | 35.08±2.05 | 33.83±2.96 | 35.64±4.48 | 34.59±4.23 |
| RVR [#] (mmHg.min/ml) | 1.04±0.13 | 0.99±0.18 | 1.00±0.20 | 1.08±0.16 | 1.93±0.21 | 1.44±0.17 | 1.81±0.08 | 2.03±0.28 |

Values are expressed in MEAN±SEM

[#] Values from one kidney

period after the first ARG infusion

period after the second ARG infusion

★ P<.05 ; ★★ P<.01 compared with control

● P<.05 compared with IND

Table 3 Systemic hemodynamics of group 1 dogs

| | Control <-- min --> | ARG <-- 0-30 --> | A* <- 30-60 -> | B* <- 60-90 -> | IND <- 90-120 --> | ARG <-120-150-> | C** <-150-180-> | D** <-180-210-> |
|-----------------------|------------------------|---------------------|-------------------|-------------------|----------------------|--------------------|--------------------|--------------------|
| HR (beat/min) | 150±7 | 155±10 | 149±9 | 149±9 | 146±12 | 145±9 | 142±8 | 144±9 |
| MAP (mmHg) | 121±9 | 125±13 | 112±13 | 113±9 | 127±4 | 136±4 | 139±4 | 137±4 |
| CO (L/min) | 2.15±0.38 | 1.76±0.30 | - | - | 1.56±0.23 | 1.67±0.30 | - | - |
| TPR (mmHg.min/ml.) | 0.06±0.01 | 0.08±0.01 | - | - | 0.09±0.01 | 0.09±0.01 | - | - |
| Hct (Vol%) | 32±2 | 32±2 | 32±2 | 33±2 | 33±2 | 32±2 | 32±2 | 33±2 |

Values are expressed in MEAN±SEM

period after the first ARG infusion

period after the second ARG infusion

Table 4 Urine volume, FENa, FEK, Cosm and C_{H₂O} of group 1 dogs

| | Control | ARG | A [#] | B [#] | IND | ARG | C ^{##} | D ^{##} |
|--|-------------|-----------------|-----------------|----------------|--------------|-------------------|------------------|-----------------|
| | <-- min --> | <-- 0-30 --> | <- 30-60 -> | <- 60-90 -> | <- 90-120 -> | <-120-150-> | <-150-180-> | <-180-210-> |
| V ^a (ml/min) | 0.39±0.09 | 1.15±0.12 ★★ | 0.78±0.09 ★ | 0.54±0.08 | 0.28±0.03 | 1.06±0.19 ★★● | 0.79±0.05 ●●★ | 0.42±0.20 |
| FENa (%) | 3.70±0.80 | 6.04±1.29 ★ | 4.61±0.95 | 4.12±0.89 | 2.92±0.48 | 4.99±1.06 ● | 3.72±0.62 | 1.73±0.35 |
| FEK (%) | 14.04±1.39 | 29.41±4.53 ★ | 32.87±4.48 ★ | 26.32±4.18 | 21.18±3.26 | 34.16±5.97 ●★ | 38.83±5.89 ★ | 19.87±3.68 |
| Cosm ^a (ml/min) | 0.93±0.14 | 2.02±0.25 ★★ | 1.55±0.21 ★ | 1.13±0.16 | 0.74±0.08 | 1.94±0.25 ●●★★ | 1.36±0.08 ●●★ | 0.75±0.10 |
| C _{H₂O} ^a (ml/min) | -0.54±0.01 | -0.87±0.19 ★ | -0.77±0.15 ★ | -0.59±0.12 | -0.46±0.08 | -0.88±0.17 ●●★ | -0.56±0.11 | -0.49±0.09 |

Values are expressed in MEAN±SEM

^a Values from one kidney

period after the first ARG infusion

period after the second ARG infusion

★ P<.05 ;★★P<.01 compared with control

● P<.05 ; ●●P<.01 compared with IND

Table 5 Renal hemodynamics from group 2 dogs

| | Control <-- min --> | ARG <-- 0-30 --> | A [#] <- 30-60 -> | B [#] <- 60-90 -> | IND <- 90-120 -> | ARG <-120-150-> | C ^{##} <-150-180-> | D ^{##} <-180-210-> |
|------------------------------------|------------------------|---------------------|-------------------------------|-------------------------------|---------------------|----------------------|--------------------------------|--------------------------------|
| GFR ^a (ml/min) | 14.42±1.30 | 16.30±1.03 | 13.25±0.88 | 13.64±1.66 | 9.89±2.08 | 21.17±2.26 ● ★ | 13.57±1.52 | 12.66±1.69 |
| RPF ^a (ml/min) | 76.79±5.71 | 92.83±5.79 | 73.60±6.85 | 70.08±1.84 | 29.07±5.66 ★★ | 67.66±10.23 ● | 42.83±6.67 ★★ | 37.07±5.31 ★★ |
| RBF ^a (ml/min) | 111.58±10.88 | 134.73±10.77 | 106.98±10.93 | 102.89±5.30 | 42.11±8.18 ★★ | 99.15±16.96 ● | 62.97±10.08 ★★ | 54.34±8.12 ★★ |
| FF (%) | 18.85±1.43 | 17.68±0.94 | 18.27±1.06 | 19.34±2.06 | 33.57±1.83 ★★ | 32.21±1.76 ★★ | 33.06±2.89 ★★ | 34.38±2.07 ★★ |
| RVR ^a (mmHg.min/ml.) | 1.17±0.11 | 1.02±0.08 | 1.28±0.14 | 1.22±0.12 | 3.87±0.80 ★ | 1.64±0.28 | 2.49±0.42 | 2.43±0.25 |

Values are expressed in MEAN±SEM

^a Values from one kidney

period after the first ARG infusion

period after the second ARG infusion

★ P<.05 ;★★P<.01 compared with control

● P<.05 compared with IND

Table 6 Systemic hemodynamics of group 2 dogs

| | Control <-- min --> | ARG <-- 0-30 --> | A [#] <- 30-60 -> | B [#] <- 60-90 -> | IND <- 90-120 -> | ARG <-120-150-> | C ^{##} <-150-180-> | D ^{##} <-180-210-> |
|-----------------------|------------------------|---------------------|-------------------------------|-------------------------------|---------------------|--------------------|--------------------------------|--------------------------------|
| HR (beat/min) | 147±8 | 152±8 | 149±9 | 144±8 | 144±8 | 150±5 | 148±6 | 152±4 |
| MAP (mmHg) | 126±1 | 134±4 | 131±7 | 124±10 | 141±9 | 144±7 | 140±8 | 129±17 |
| CO (L/min) | 1.46±0.08 | 2.14±0.11 ★★ | - | - | 1.10±0.12 ★★ | 1.48±0.19 ● | - | - |
| TPR (mmHg.min/ml.) | 0.08±0.004 | 0.06±0.004 ★ | - | - | 0.14±0.02 ★ | 0.10±0.01 ★ | - | - |
| Hct (Vol%) | 30±2 | 31±2 | 31±2 | 32±2 | 31±2 | 31±2 | 31±2 | 31±2 |

Values are expressed in MEAN±SEM

period after the first ARG infusion

period after the second ARG infusion

★ P<.05 ;★★P<.01 compared with control

●P<.05 compared with IND



Table 7 Urine volume, FENa, FEK, Cosn and C_{H2O} of group 2 dogs

| | Control <-- min --> | ARG <-- 0-30 --> | A [#] <- 30-60 -> | B [#] <- 60-90 -> | IND <- 90-120 -> | ARG <-120-150-> | C ^{##} <-150-180-> | D ^{##} <-180-210-> |
|---|------------------------|---------------------|-------------------------------|-------------------------------|---------------------|-----------------------|--------------------------------|--------------------------------|
| V ^a (ml/min) | 0.40±0.14 | 1.70±0.54 ★ | 1.52±0.30 ★★ | 0.46±0.12 | 0.14±0.04 | 1.20±0.16 ●● ★★ | 1.26±0.25 ● ★★ | 0.35±0.10 |
| FENa (%) | 5.02±1.41 | 8.84±2.79 ★ | 8.76±2.80 ★ | 3.15±1.56 | 1.36±0.68 | 2.35±0.74 ● | 5.03±1.17 ● | 1.35±0.68 |
| FEK (%) | 17.03±3.31 | 43.59±6.60 ★★ | 71.54±11.01 ★★ | 43.45±8.58 ★★ | 25.11±4.30 | 38.02±6.22 ● ★ | 55.64±9.07 ● ★ | 29.17±7.90 |
| Cosn ^a (ml/min) | 0.88±0.16 | 2.12±0.37 ★ | 1.95±0.26 ★ | 0.86±0.20 | 0.38±0.10 | 1.85±0.10 ●● ★★ | 1.72±0.19 ●● ★★ | 0.77±0.14 |
| C _{H2O} ^a (ml/min) | -0.48±0.07 | -0.66±0.08 ★ | -0.55±0.13 | -0.39±0.12 | -0.25±0.08 ★ | -0.64±0.13 ●● ★ | -0.46±0.14 ● | -0.42±0.05 ● |

Values are expressed in MEAN±SEM

^a Values from one kidney

period after the first ARG infusion

period after the second ARG infusion

★ P<.05 ;★★P<.01 compared with control

● P<.05 ; ●●P<.01 compared with IND

Figure B Percent changes in GFR and RPF during the second ARG infusion (compared with IND period)

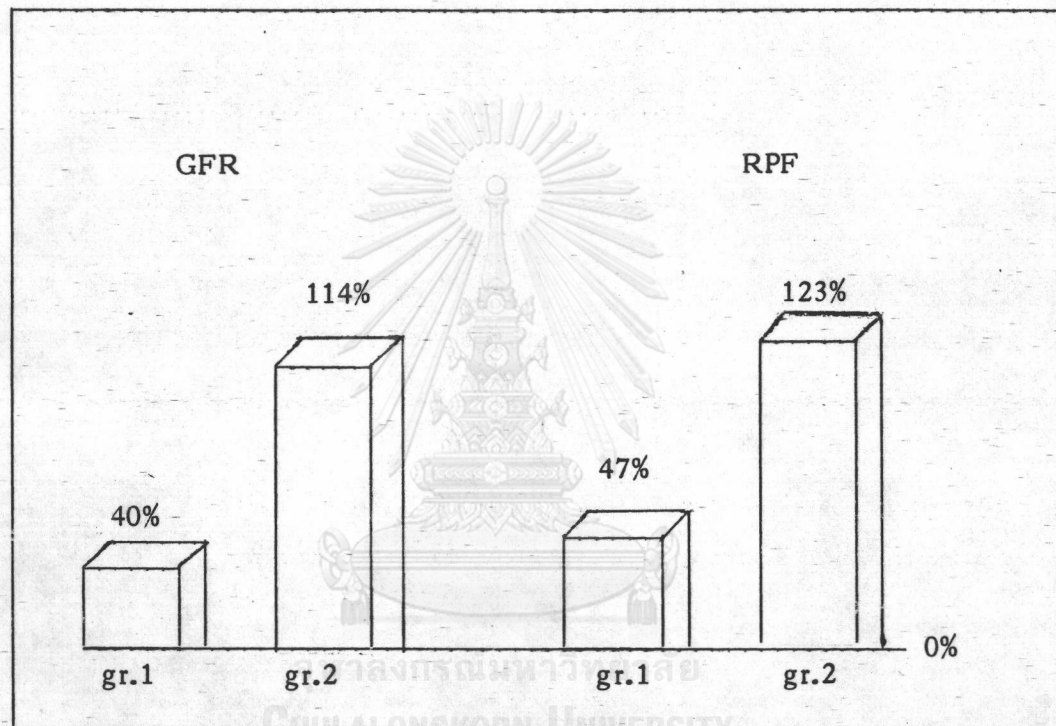
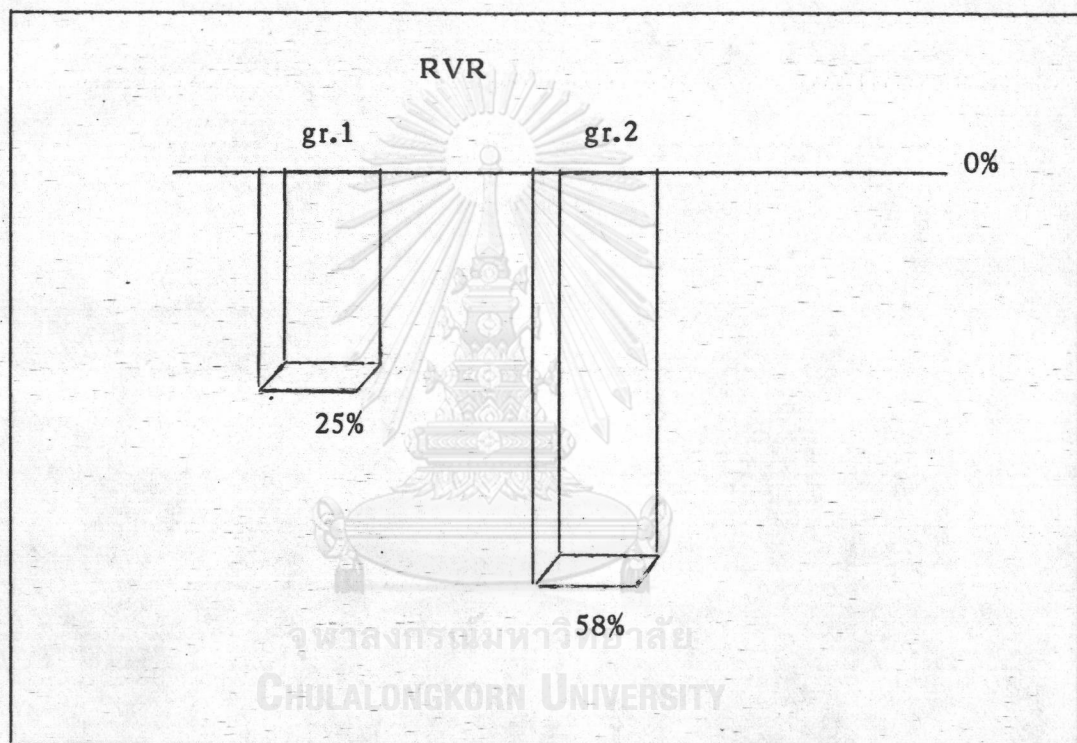


Figure C Percent changes in RVR during the second ARG infusion (compared with IND period)



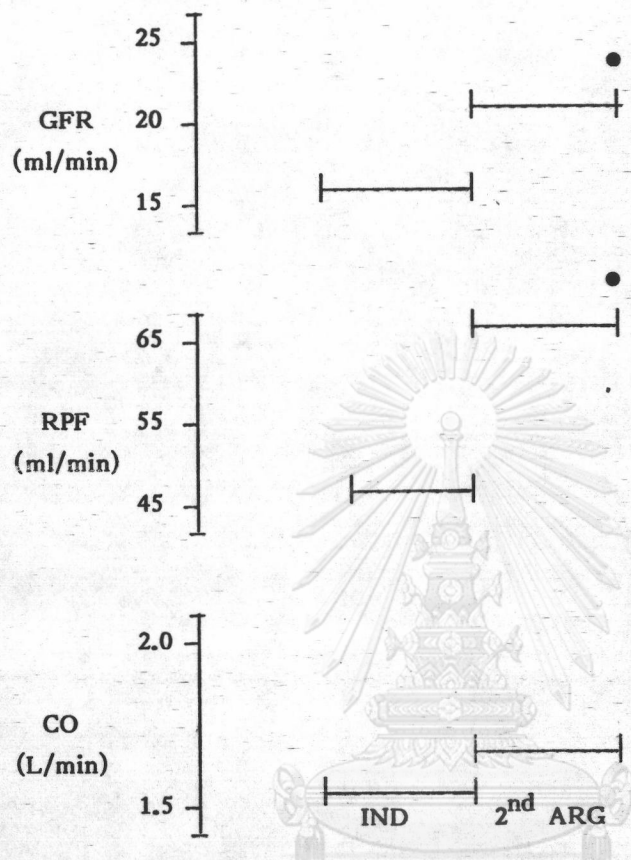


Figure D Comparison of GFR, RPF and CO in group 1 dogs between IND period and the second ARG period

Values are expressed in MEAN

● p < .05

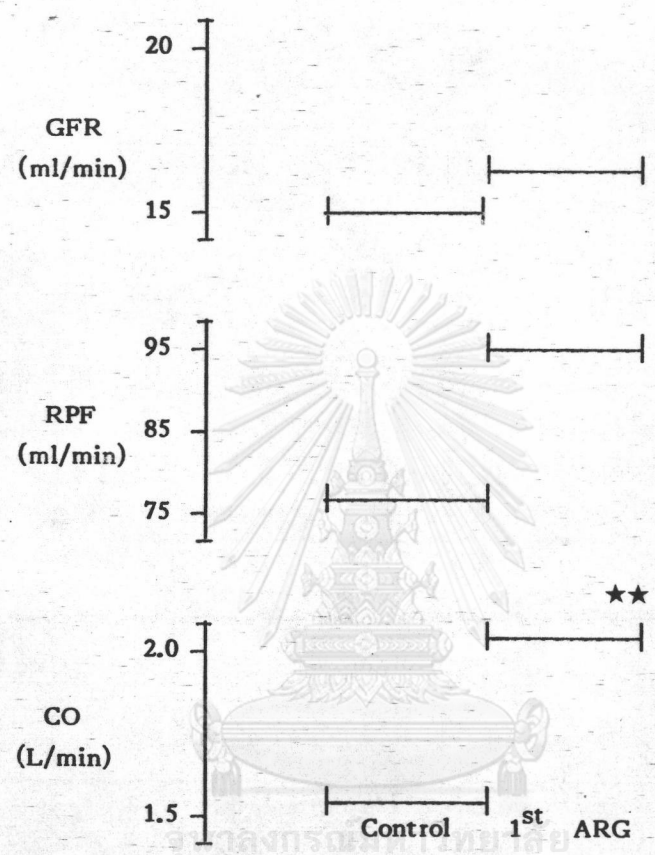


Figure E Comparison of GFR, RPF and CO in group 2 dogs between control and the first ARG infusion

Values are expressed in MEAN

** p. < .01