

Prostaglandin E₁ Reduces Blood Loss during and after Resection of Lumbar Herniated Disc

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Controlled hypotension was employed during resection of lumbar herniated disc on 10 patients. Prostaglandin E₁ (PG) was used as a hypotensive agent. The systolic blood pressure was lowered less than 100 mmHg in the hypotensive group. The average blood loss during surgery was 95 ± 41 ml for the hypotensive group compared with 154 ± 81 ml for the normotensive group ($P < 0.05$). The blood loss after surgery was also significantly less in the hypotensive group than in the normotensive group ($P < 0.05$). We conclude that PG is an effective hypotensive agent on blood loss during and after surgery. (Key words: blood loss, herniotomy, prostaglandin E₁)

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Hypotensive anesthesia is to reduce surgical blood loss thereby diminishing the need for blood transfusion, to improve quality of the operative field, and to reduce operative time. However, there are potential risks of cardiovascular complications affecting various vital organs. In order to minimize the risk of cardiovascular complications, controlled hypotension is generally considered not to be applied in patients with ischemic heart disease, cerebrovascular disorders, severe pulmonary, renal, and hepatic disorders, hypovolemia and severe anemia. It has been suggested that prostaglandin E₁ (PG) can be used safely to this group of patients¹.

Our study was designed to determine whether induction of hypotension by PG reduced blood loss during resection of lumbar herniated disc in the prone position.

Methods

We studied 20 ASA class I patients requiring resection of lumbar herniated disc. The patients were randomly assigned to two groups. Ten patients received PG (The hypotensive group). The other ten patients received no hypotensive drugs and acted as controls. All patients were premedicated with midazolam, 2 mg, and atropine, 0.5 mg, intramuscularly 30 min before induction of anesthesia. Anesthesia was induced with $5 \text{ mg}\cdot\text{kg}^{-1}$ sodium thiopental and $1 \text{ mg}\cdot\text{kg}^{-1}$ succinylcholine. After tracheal intubation, patients were mechanically ventilated with isoflurane and 66% nitrous oxide

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Table 1. Patient characteristics

	Control	PG
Age (years)	42.7 ± 18.7	49.1 ± 14.9
Height (cm)	162 ± 11	160 ± 10
Weight (kg)	61.1 ± 9.7	60.2 ± 14.9
Male	7	7
Female	3	3

in oxygen to maintain PaCO₂ between 35 and 40 mmHg. For the operation, patients were placed in prone position. Patients in the hypotensive group received an intravenous infusion of PG sufficient to control systolic blood pressure less than 100 mmHg (0.1–0.4 µg·kg⁻¹·min⁻¹). Ringer's lactate solution was administered at 5 ml·kg⁻¹·h⁻¹ to all patients during anesthesia. All operations were performed by the same surgeon. He was blinded regarding whether PG was in use. In the hypotensive group, arterial pressure was allowed to return to pre-hypotension values before wound closure to insure hemostasis. Blood loss was determined using volumetric and gravimetric methods. We measured blood loss after surgery as well as during

surgery. The days requiring drainage after surgery was also evaluated.

Hemodynamic values and blood loss in the two groups were compared using a Student's t-test. Changes were considered statistically significant when *P* < 0.05. Data were expressed as means ± SD.

Results

Within each group, there were no statistically significant differences in age, body weight and height (table 1). There were also no significant differences in systolic blood pressure (SBP) and heart rate (HR) before induction of anesthesia between the two groups. During surgery, however, the average of SBP in the PG group was significantly lower than that in the control group and the average of HR in the PG group was significantly higher than that in the control group (table 2).

Although there was no significant difference in the duration of surgery between the two groups, blood loss during and after surgery in the PG group was significantly less than that in the control group. In addition, the days that require drainage in the PG

Table 2. Hemodynamic changes, operation time, blood loss during and after surgery, days of drainage and urine during surgery

	Control	PG	significance
Systolic blood pressure (mmHg)			
Before induction	127 ± 15	127 ± 20	NS
During surgery	110 ± 11	93 ± 6	<i>P</i> < 0.001
Heart rate (beats·min ⁻¹)			
Before induction	78 ± 15	76 ± 17	NS
During surgery	75 ± 8	88 ± 13	<i>P</i> < 0.02
Duration of surgery (min)	155 ± 43	130 ± 38	NS
Blood loss (ml)			
During surgery	154 ± 81	95 ± 41	<i>P</i> < 0.05
After surgery	203 ± 108	108 ± 82	<i>P</i> < 0.05
Total	354 ± 150	203 ± 85	<i>P</i> < 0.02
Days of drainage (days)	7.6 ± 2.0	5.0 ± 2.2	<i>P</i> < 0.02
Urine during surgery (ml)	457 ± 184	253 ± 156	<i>P</i> < 0.02

NS; no significance

group were significantly shorter than those in the control group. No patients in both groups required blood transfusion. The volume of urine during surgery in the PG group was significantly less than that in the control group (table 2).

Discussion

These results indicate that PG effectively reduced blood loss during and after surgery. In this study, hemodynamic changes that we observed with PG are in agreement with previous reports²⁻⁴. However, total urine volume in the PG group was significantly less than that in the control group. This is not in agreement with the results of Goto et al.^{1,5} who have reported that PG increases urine flow during infusion.

Why did PG reduce blood loss after surgery? Arterial pressure was allowed to return to pre-hypotension values before wound closure to insure hemostasis. This fact may be related to the reduced blood loss after surgery. If arterial pressure were returned to normal level after the operation, postoperative bleeding in drains might have been larger than expected. In several studies where the total perioperative blood loss was given, the blood sparing effect was also maintained after surgery⁶⁻⁸. However, the magnitude of reduced blood loss was smaller in the postoperative than in the preoperative measurement period.

We conclude that PG is a relatively safe and effective hypotensive agent on

blood loss during and after surgery.

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