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# Anesthetic Management in Laminectomy: The Role of Position

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**Abstract.** Twenty-two patients of both sexes with various spinal surgical conditions underwent laminectomy. All patients had a balanced general anesthesia with controlled ventilation using a non-depolarizing muscle relaxant and variable concentrations of halothane. Patients were assigned randomly into two groups; group A patients were placed in a prone position while group B patients were placed in a modified knee–chest position. The modified knee–chest position provided a perfect exposure of the field, minimal blood loss, short operative time, and greater ease for the anesthesiologist and the surgeon. There were no significant differences in the other monitored parameters, and no complications were encountered in either group.

**Key Words:** Anesthesia—Laminectomy.

## Introduction

Laminectomy is now a common procedure performed by orthopedic and neurosurgeons because of the increasing number of patients having spinal problems including disc prolapse, cord compression, abscess, and tumour. Numerous postures have been proposed for this procedure, including a prone position, lateral position, knee–chest, and jack-knife positions. None of these positions had satisfied the anesthesiologist and the surgeon in terms of controlling excessive oozing, inadequate ventilation, difficult access to the patient's arms, and inadequate exposure of the relevant area [1,2].

In this study, a modified knee–chest position was introduced since it has the advantages of complete exposure of the field, the promotion of adequate cardiovascular and respiratory functions, easy accessibility to arms for the anesthesiologist, and minimal blood loss. This special position provided free movement of the abdomen during respiration, with the resultant relief of pressure on the inferior vena cava. It also corrected the accentuated lordosis which was noticed in the prone position. Legs and arms were also arranged to be below body level for further reduction of venous engorgement. The modified knee–chest position was evaluated during surgery and compared with the most commonly used prone position.

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## Materials and Methods

### *Patients*

This study was performed on 22 patients undergoing laminectomy for various spinal conditions. None of the patients had any evidence of cardiac or pulmonary disease and all were of class I and II, according to the American Society of Anesthesiologists (ASA) classification. They were randomly assigned into two groups. Patients in group A had laminectomy in the prone position, while patients in group B had laminectomy in the modified knee–chest position. The characteristics of patients in each group are summarized in Table 1.

### *Anesthesia Technique*

All patients were premedicated with atropine 0.6 mg intravenously (IV) prior to induction of anesthesia. A sleep dose of 2.5% intravenous sodium thiopentone was then administered on the basis of absence of eye lid reflex. Succinylcholine was given in a dose of 1 mg/kg IV. Intubation was carried out following spraying of the cords with a 10% lidocaine solution. Patients were maintained with halothane and 50% nitrous oxide in oxygen. All patients were artificially ventilated with the aid of 0.075 mg/kg pancuronium bromide. After ascertaining the stability of vital signs, patients were placed in position for surgery.

Patients in group A were put into a prone position with chest and pelvis supported on pillows to keep the abdomen free. Patients in group B were put in the modified knee–chest position, in which the patient was supported with three pillows: a small one below his buttocks to prevent sitting on the calves and kinking the popliteal artery, one below his chest, and the last under his head. The head was tilted laterally, arms were placed on arm boards at the head of the table. The position of the shoulders and arms appeared comfortable and the ulnar nerves were protected. The table was adjusted to make the legs partly dependent and place the patient's back in a horizontal position (Fig. 1). The endotracheal tube was fixed and eyes were closed and protected from injury. Halothane concentration was changed frequently to maintain blood pressure of approximately 90 mmHg. Systolic pressure (SP) and diastolic pressure (DP) were measured by

**Table 1.** Characteristics of patients participating in the study

| | Group A | Group B |
|---|---|---|
| Number | 8 Patients | 14 Patients |
| Position | Prone | Modified knee–chest |
| Age (years) | | |
| Mean | 36.3 | 32.6 |
| SD[a] | 11.7 | 14.3 |
| Sex | | |
| Male | 6 | 10 |
| Female | 2 | 4 |
| Weight (kg) | | |
| Mean | 62.3 | 66.1 |
| SD[a] | 10.8 | 9.1 |

[a] SD = standard deviation.

**Fig. 1.** The modified knee–chest position.

sphyngomanometer. Mean arterial pressure (MAP) was taken as equal to DP + 1/3 (SP − DP). Electrocardiogram (ECG) lead II was recorded. Heart rate was measured from the ECG. The surgeon was then allowed to proceed with his surgery. Blood loss was monitored during surgery in the suction machine and the weight difference of the soaked gauze.

At the conclusion of surgery, the position was changed to supine and reversal of the residual effect of the neuromuscular blocker was achieved with 2.5 mg prostigmine mixed with 1.2 mg atropine sulfate.

The Mann-Whitney U-test was used to test the difference in MAP and heart rate between the groups. The standard normal deviate test (Z-test) was used to test the difference in the amount of blood loss in both groups.

## Results

There were no significant differences between the two groups in age, body weight, and sex distribution, as shown in Table 1. Eight patients were put in the prone position, fourteen patients were put in the modified knee–chest position.

The commonest preoperative diagnosis was pro-

**Table 2.** Clinical data of patients included in the study

| Preoperative diagnosis | Disc prolapse | Cord compression | Abscess | Tumour |
|---|---|---|---|---|
| Group A | | | | |
| No. of cases | 5 | 2 | 1 | – |
| Duration of surgery (min) | 80–100 | 100–120 | 100 | – |
| Group B | | | | |
| No. of cases | 7 | 5 | 1 | 1 |
| Duration of surgery (min) | 60–80 | 90–100 | 80 | 90 |
| Region of surgery | Lumbar and lumbosacral | Lumbar and lumbosacral | Dorsal | Lumbar |
| Type of surgery | Laminectomy with discectomy | Laminectomy with decompression | Laminectomy and drainage | Laminectomy and exision |

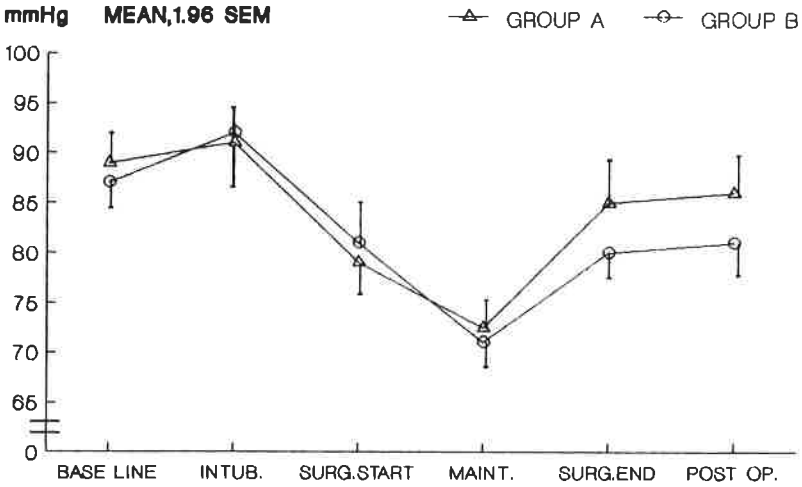


**Fig. 2.** Mean arterial pressure changes in both groups.

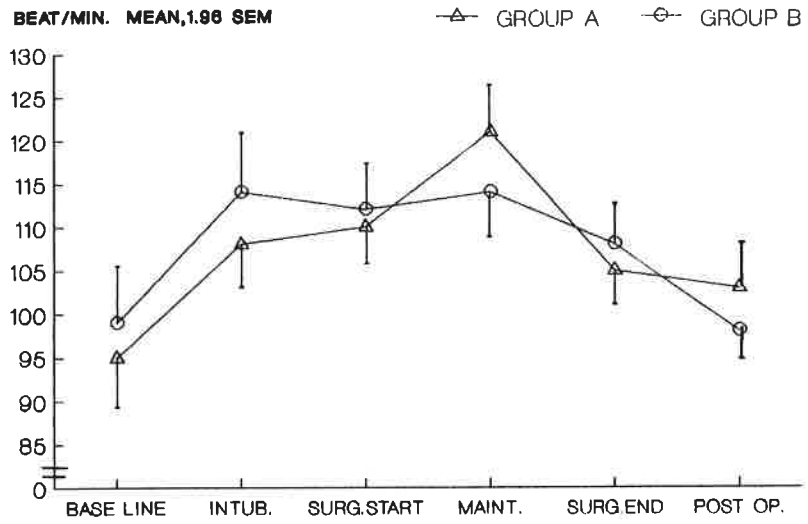


**Fig. 3.** Heart rate changes in both groups.

**Table 3.** The amount of blood loss in both groups

| Blood loss | Prone position | Percent | Modified knee–chest position | Percent |
|---|---|---|---|---|
| 0–250 ml | – | – | 9 cases | 64.3% |
| 250–500 ml | 2 cases | 25% | 4 cases | 28.6% |
| 500–750 ml | 2 cases | 25% | 1 case | 7.1% |
| 750–1000 ml | 4 cases | 50% | – | – |
| Totals | 8 cases | 100% | 14 cases | 100% |

lapsed intervertebral disc and the common sites for surgery were the lumbar and lumbosacral regions. Duration of surgery was significantly lower in group B (Table 2). No significant changes were noticed between the two groups in blood pressure and heart rate during surgery (Figs. 2, 3). The amount of blood loss during surgery was significantly higher in the prone position: four cases (50%) lost about 1 liter of blood and were in need of blood transfusion, while in the modified knee–chest position the bleeding was much less and none of the patients required transfusion (Table 3).

## Discussion

The basic aims of anesthetic management of spinal surgery are to secure a clear airway and to put the patient in a position which is convenient to the anesthesiologist and the surgeon as well. Laminectomy procedures have been reported to cause a significant amount of blood loss during incision and stripping of the muscles from the vertebrae and greater losses have occurred during decortication of laminae [1–3]. Most types of laminectomy need 1–3 units of blood to replace blood loss [4].

Various postures have been used for laminectomy, each has its advantages and disadvantages. The prone position provides good ventilation and reduces the pressure on the vena cava to some degree, but the inadequate surgical exposure caused by lumbar lordosis and the continuous oozing from the wound are inconvenient for the surgeon. The anesthesiologist also faces the problems of substantial blood loss and difficult access to the patient's arms for monitoring and fluid and blood therapy [3].

In this study, the modified knee–chest position reversed lumbar lordosis by placing the lumbar spine in a horizontal position and opening the interlaminer spaces, providing complete exposure for the procedure with minimal traction on spinal roots and minimal pressure on blood vessels and peripheral nerves.

Concerning the hemodynamic changes, blood pressure and heart rate were fairly stable in both groups (Figs. 2, 3). The stability of MAP was well established to be around 70 mmHg (Fig. 2) with the use of lidocaine prior to intubation [5] and the change in halothane concentration. No ECG changes or respiratory complications were noted in either group. Although both groups had the same blood pressure range during surgery, blood loss was significantly higher for patients in the prone position. This can be explained by the fact that the modified knee–chest position relieves venous congestion in the spinal region by pooling blood in the periphery and lessening pressure on the inferior vena cava. Half of the patients in the prone

position needed blood transfusion, while none of the patients in the modified knee–chest position required blood. With this position there is no need to set aside blood; a sample typing and screening is sufficient.

The modified knee–chest position provided the advantages of minimal blood loss, easy access to the patient's arms, and a completely free abdomen, all of which was appreciated by the anesthesiologist. In addition, the surgeon worked easily in a nearly bloodless field with excellent exposure.

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# Supracondylar Osteotomy of the Humerus: New Technique

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**Abstract.** Supracondylar humeral osteotomy for cubitus varus deformity of the humerus has been carried out in numerous series; however, in most of the reported cases internal fixation was considered necessary using K-wire fixation and cast fixation. K-wire fixation has been technically difficult and has had associated problems of pin tract infection and occasional impringement of the neurovascular structures in the vicinity of the K-wires, particularly on the medial side near the ulnar nerve. Therefore, a new technique of supracondylar osteotomy was considered which could be inherently stable and require only cast fixation.

**Key Words:** Humeral osteotomy—Cubitus varus.

## Introduction

Internal fixation of the supracondylar humeral osteotomy has been done by the author in many cases for correction of the cubitus varus deformity; however, pin tract infection and difficulty with internal fixation using medial and lateral pins have been observed. The fixation of the osteotomy has also been less than rigid. Therefore, a new technique for supracondylar osteotomy was considered.

## Materials and Methods

Since this technique has been carried out in only 2 patients, this is a preliminary report.

The supracondylar osteotomy was done in a V-shape fashion with the long limb of the V on the lateral side and the short limb of the V on the medial side, thus giving good correction of the varus deformity after removal of the valgus wedge from the lateral supracondylar region (Fig. 1). The small limb of the V on the medial side was carefully fashioned to function as a buttress to avoid me-

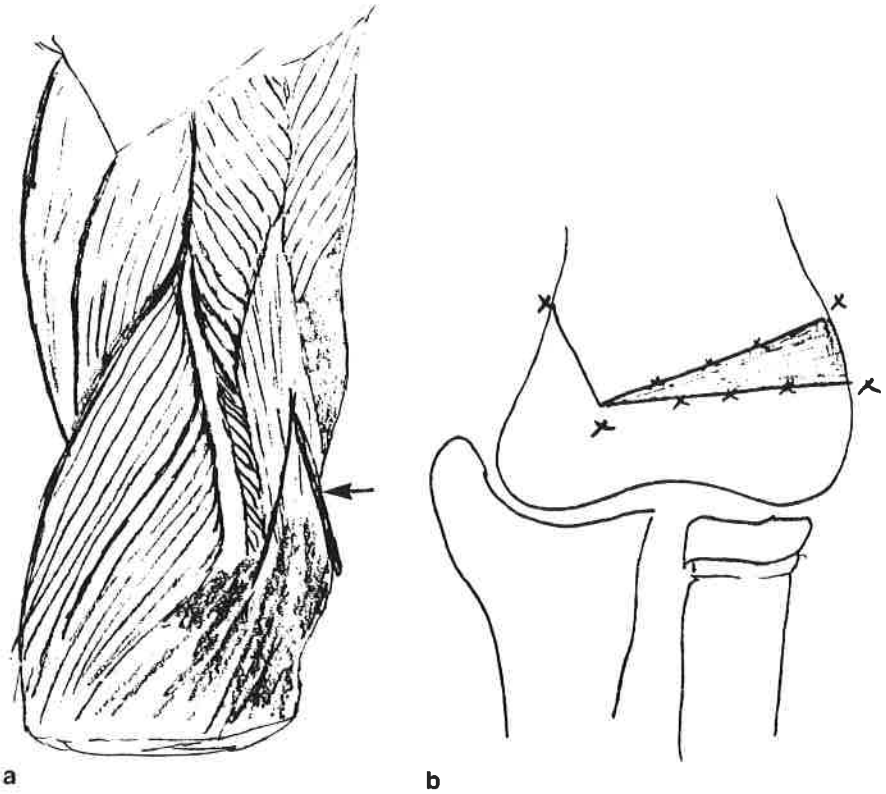


**Fig. 1.** (a) V-shaped triceps incision (arrow) for the elbow. (b) V-shaped supracondylar osteotomy humerus and lateral wedge excision outline.

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