

Retrospective Analysis

e Comparison of the Effects of Epidural Anesthesia and Local Anesthesia in Lumbar Transforaminal Endoscopic Surgery

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Background: Percutaneous endoscopic lumbar discectomy (PELD) is a standard technique for the treatment of lumbar disc hernia. Thus far, most surgeons have recommended local anesthesia. However, in clinical practice, some patients experience pain and are unable to cooperate with the surgery during intervertebral foramen hemi expansion. The use of general anesthesia may create a greater risk of complications because of nerve root anomalies; thus, intraoperative neurophysiological monitoring should be utilized. Reports regarding the use of epidural anesthesia are few in comparison.

Objective: To investigate the risks and contingency plans of epidural anesthesia in lumbar transforaminal endoscopic surgery.

Study Design: A retrospective analysis of all lumbar transforaminal endoscopic surgeries performed from 2010 to 2014.

Setting: Kanghua hospital.

Methods: Patients treated with local and epidural anesthesia were divided into 2 groups. In local anesthesia group (A) and local anesthesia group (B), 0.5% lidocaine and 0.25% ropivacaine was administered, respectively. The incidences of complications, including urological complications, in each surgical group as well as Oswestry disability index (ODI) improvement rates, postoperative patient satisfaction rates, and x-ray exposure times were assessed.

Results: From 2010 to 2014, there were 286 cases of lumbar transforaminal endoscopic surgeries, 121 cases utilizing local anesthesia and 165 cases utilizing epidural anesthesia. In cases in which neurological complications occurred after surgery, 15 cases involved nerve root numbness, including one case of foot drop and 2 cases of cerebrospinal leakage in the local anesthesia group, which accounted for 12.4% of group A. However, in the epidural anesthesia group, which accounted for 9.70% of group B, there were 16 cases of nerve root numbness, including 2 cases of foot drop and 2 cases of cerebrospinal leakage. No significant difference was detected in the incidence of neurological complications between the 2 groups ($P > 0.05$). The ODI improvement rates were 86.0% in the local anesthesia group and 85.4% in the epidural anesthesia group ($P > 0.05$). The average x-ray exposure times were 14.7 seconds and 16 seconds in the local anesthesia group and epidural anesthesia group, respectively ($P > 0.05$). The postoperative patient satisfaction rates were 73.6% and 91% in the local anesthesia group and epidural anesthesia group, respectively ($P < 0.001$).

Limitations: This was a single-blind study, and the complications observed were related to the learning curve; all these factors may lead to biases.

Conclusions: Epidural anesthesia in transforaminal lumbar surgery is feasible and safe, and no significant difference in neurological complications was observed between the epidural anesthesia and the local anesthesia groups. However, for the patients concerned, the postoperative patient satisfaction rate was significantly greater in the epidural anesthesia group. It is noteworthy that the x-ray exposure times of the groups were not significantly different.

Key words: Epidural anesthesia, transforaminal lumbar surgery, neurological complications, cerebrospinal leak

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Since the first attempt at a percutaneous posterolateral extracanal approach by Kambin and Gellman in 1983 (1), minimally invasive procedures, including percutaneous therapies under local anesthesia, have gained increasing attention. Percutaneous endoscopic lumbar discectomy (PELD) has continuously evolved from a state-of-the-art procedure into a more standard technique for the treatment of extruded and/or migrated lumbar disc herniation (1-4). Thus far, most surgeons have recommended local anesthesia (1-5). Nevertheless, in clinical practice, some patients experience pain and are unable to cooperate with the surgery during intervertebral foramen hemip expansion. The use of general anesthesia may create a greater risk of neurological complications because of nerve root anomalies; thus, intraoperative neurophysiological monitoring should be employed. The use of epidural anesthesia is comparatively infrequent. All PELD cases admitted to the Kanghua hospital from 2010 to 2014 were recalled, and of the 286 cases examined, 121 cases and 165 cases were treated with local anesthesia and epidural anesthesia, respectively. Thus, we found that epidural anesthesia is both feasible and safe for use in transformational lumbar surgery, and we recommend this procedure.

METHODS

Patients

From January 2010 to December 2014, we performed PELD on 286 patients. The patients included in this study underwent PELD for lumbar disc herniation. The population consisted entirely of patients who

underwent PELD, which was performed by the same surgeon over 4 years. Furthermore, 0.5% lidocaine in 10 mL and 0.25% ropivacaine in 1.3 mg/kg were administered to prevent related pain in the local anesthesia group and the epidural anesthesia group, respectively. PELD was performed under either local anesthesia or epidural anesthesia, and the 2 groups were divided randomly. The surgeon blindly treated the patients with the following 2 options: group A corresponds to the group upon which local anesthesia was used, and group B indicates the group upon which epidurals were performed. After selection, the surgeon informed the patients of the type of anesthesia they would receive, and all of the patients consented to the anesthesia methodologies selected (Table 1).

Surgical Methods

The procedures were performed according to the standard PELD technique under local anesthesia (2-11) or epidural anesthesia. Furthermore, 0.5% lidocaine in 10 mL and 0.25% ropivacaine in 1.3 mg/kg were administered in the local anesthesia group and epidural anesthesia group, respectively.

Follow-up Evaluations

Patients were followed up regularly by the operating surgeon for 24 months after their operations. An assessment of the incidence of complications of surgery groups, including the incidence of neurological complications, Oswestry disability index (ODI) improvement rates, postoperative patient satisfaction rates, and x-ray exposure times were assessed.

RESULTS

A total of 286 patients were admitted to Kanghua Hospital for lumbar disc herniation between January 1, 2010, and December 31, 2014. Of these, 121 cases were treated with local anesthesia (group A) and 165 cases were treated with epidural anesthesia (group B). Patients in group A ranged in age from 18 to 68 years, with a mean age of 40.5 years. Patients in group B ranged in age from 20 to 63 years, with a mean age of 40.0 years. All of the patients presented symptoms and confirmatory signs of lumbar radiculopathy that were consistent with the symptomatic disc level and findings of imaging studies. There were 286 cases of lumbar transforaminal endoscopic surgery in Kanghua Hospital from 2010 to 2014. Of these, 121 cases and 165 cases utilized local

Table 1. Patient demographic characteristics.

	Group A (n = 121)	Group B (n = 165)
Age	40.5 ± 9.6	40.0 ± 10.6
Gender (male:female)	83:38	119:46
Segment		
L3/4	12	15
L4/5	82	120
L5S1	27	30
Herniation (%)		
Central	56	38
Paracentral	116	118
Foraminal	13	7

anesthesia and epidural anesthesia, respectively. With regard to the incidence of neurological complications in the local anesthesia group, there were 15 cases of lower limb numbness during surgery, accounting for 12.4% of group A and including one case of foot drop and 2 cases of cerebrospinal leakage. These patients recovered 6 – 12 months after surgery. With regard to the incidence of neurological complications in the epidural anesthesia group, there were 16 cases of lower limb numbness during surgery, accounting for 9.70% of group B and including 2 cases of foot drop and 2 cases of cerebrospinal leakage. These patients recovered 6 – 12 months after surgery. No significant difference was observed with regard to the incidences of neurological complications between the 2 groups ($P > 0.05$).

In both groups A and B, the mean ODI values decreased significantly after surgery (from 69.3 ± 8.1 to 13.5 ± 7.0 , $P < 0.001$, and from 71.0 ± 7.9 to 15.1 ± 7.9 , $P < 0.001$, respectively).

The postoperative patient satisfaction rate in group B was significantly greater than that of group A. There were 32 cases of dissatisfied patients in group A, which accounted for 24.6%. There were 15 cases of dissatisfied patients in group B, which accounted for 9.0%. Most patients in group A complained about pain during their surgeries, particularly during the period of epidurally foramina enlargement. None of the patients in group B complained about pain during their surgeries.

Mean x-ray exposure times were 14.7 seconds in group A (between 2 seconds and 60 seconds) and 16 seconds in group B (between 2 seconds and 50 seconds).

Discussion

PELD has become a standard procedure in recent years as a result of several advantages (2,4-6). The long learning curve associated with this surgical technique may be a disadvantage. Thus far, all surgeons have recommended local anesthesia (2-11). However, in our study, we found that local anesthesia could not meet the needs of the PELD procedure in some cases, particularly during foramina expansion. We found that some

patients cannot endure the pain experienced under local anesthesia and require general anesthesia. All of the patients who expressed dissatisfaction with their results had experienced discomfort during their surgeries. Thus, we performed epidural anesthesia from 2010 onward. We divided the patients into 2 groups according to patient consent. As shown in Table 2, the patient satisfaction rate in the epidural group was higher than that in the local group. The 2 groups exhibited no significant difference with regard to incidences of neurological complications, ODI improvement rates, or x-ray exposure times.

General anesthesia was not recommended because the patients might have had lumbar nerve root anomalies, rendering them unable to cooperate with the surgery; thus, this procedure may increase the incidence of neurological complications. If general anesthesia is used, intraoperative neurophysiological monitoring should be considered, and general anesthesia may raise medical costs.

However, 0.25% ropivacaine epidural anesthesia can preserve motor function and only blocks sensation during surgery. The patients do not feel any pain and can move their toes freely during surgery. In the local group, some patients felt sharp pain during the foramina expansion because sensation was incompletely blocked with lidocaine. Intraoperative pain was the main complaint. Thus, epidural anesthesia was the best choice. Although the patients may not have been able to provide accurate verbal responses due to the epidural anesthesia, they could move their lower limbs when the surgeons required, a good means of identifying nerve injury.

Low concentrations and doses of ropivacaine in epidural anesthesia can effectively block sensation and preserve lower limb motor function. Thus, the patient does not feel any pain during the surgery, and lower limb motor function can be preserved such that the patient can cooperate with the surgery. In addition, because motor function is preserved, the incidence of neurological complications is reduced or avoided early

Table 2. Comparison of clinical results between the local group and the epidural group.

	Neurological complications	ODI improvement rate	Satisfaction rate	X-ray exposure time
Local group	12.4%	80.9%	73.6%	14.7s
Epidural group	9.70%	79.0%	91.0%	16.0s
Statistical parameter	$X^2 = 0.422$	$Z = 1.126$	$X^2 = 15.311$	$T = 1.011$
P-value	> 0.05	> 0.05	< 0.001	> 0.05

with intraoperative observation. Thus, treatment with 0.25% ropivacaine in 1.3 mg/kg is suggested prior to surgery.

Post-operative dysesthesia (POD) due to existing dorsal root ganglion (DRG) injury is a unique complication of PELD. In the epidural group, there were no POD cases caused by DRG injury. The floating retraction technique is a good method for preventing the development of postoperative dysesthesia in PELD.

Notably, during the early learning curve, the epidural anesthesia groups experienced long x-ray exposure times compared to those of the local anesthesia group. However, after the learning period, the x-ray exposure times became shorter. As shown in Table 2, when considered in their entirety, the x-ray exposure

times between the 2 groups exhibited no obvious difference. Thus, x-ray exposure time is related to the learning curve (2).

CONCLUSIONS

This study is a retrospective study. We divided the patients into 2 groups according to patient choice and consent. This was a single-blind study, and the complications observed were related to the learning curve; all these factors may lead to biases. However, the goal of this study was to investigate the risks of using epidural anesthesia only in lumbar transforaminal endoscopic surgery, and, in this regard, we found that epidural anesthesia was feasible and safe and did not increase surgical risks.

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