CAN SPINAL ANAESTHESIA BE A ROUTINE FOR SINGLE LEVEL LUMBAR DISCECTOMY?

Zahid Hussain, Abdul Ghaffar, Muhammad Junaid Mushtaq, Shahzad Ahmed Qasmi
Combined Military Hospital Rawalpindi

ABSTRACT

Objective: To compare the efficacy of spinal anaesthesia with general anaesthesia for lumbar discectomy in terms of theatre time and post-operative effects.

Study Design: Randomized controlled trial.

Place and Duration of Study: Neurosurgery department Combined Military Hospital Rawalpindi, from November 2013 to April 2014.

Material and Methods: A total 60 consecutive patients with herniated lumbar discs were enrolled in this study to undergo randomly into assigned spinal anaesthesia group SA (n=30, group A) or General anaesthesia GA (n=30, group B). Variables included age, gender, level of lumbar disc prolapse, type of anaesthesia, operative time, and combined total theatre time, post-operative pain using visual analogue scale (VAS) and hospital stay in days.

Results: Mean theatre time in group A was 62.70 and for group B it was 90.73 (p<0.001). The mean hospital stay after surgery in group A was 2.0 days and in group B was 2.27 days (p 0.002). Peak post-operative pain scores according to visual analogue scale and resultant analgesic requirements in group A was 5.10 while for group B it was 6.87 p <0.001.

Conclusion: Spinal anaesthesia is safe and can be routine anaesthesia for most of the patients undergoing lumbar discectomy.

Keywords: General anaesthesia, Lumbar discectomy, Spinal anaesthesia.

INTRODUCTION

Lumbar disc herniation is a very common problem and is the main work load of neurosurgical centres in the country. Herniated lumbar disc causes narrowing at three different anatomical spaces like central canal, lateral recess or the neural foramen and clinical picture mostly correlates well with the intruded space. Lumbar discectomy is the universally accepted standard procedure for lumbar disc prolapse. Busy neurosurgical centres struggle with the amount of work load of lumbar disc prolapse. We tried to find a safe and an effective alternative to general anaesthesia (GA) in the form of spinal anaesthesia (SA), which can offer reduced time in theatre, shorter hospital stay, and better pain control and potentially substitute GA for young, fit and willing patients with lumbar disc herniation.

The anaesthetic options available for lumbar disc surgery include general, regional and local anaesthesia. Despite a history of safety and efficacy of SA, the preference for GA does not appear to be based on any clinical superiority but, rather, more on surgeon satisfaction and preference. Both GA and SA have been shown to be suitable for patients undergoing lumbar disc surgery. Reasons for favouring GA may be due to the accepted practice, anaesthesiologist/surgeon’s confidence, greater patient acceptance and coping with un-expected longer duration operations or prone position.

SA may reduce blood loss and hemodynamic instability, lower the incidence of pulmonary complications compared to GA and gives patients ability to reposition their extremities and chest as needed to avoid nerve injury or pressure sores.

This study was conducted to assess the safety and efficacy of SA over GA for lumbar discectomy.

MATERIAL AND METHODS

These randomised controlled trials were conducted from January 2014 to May 2014 at Department of Neurosurgery Combined Military Hospital Rawalpindi. Study population included patients with symptoms of...
radiculopathy, having radiological confirmed diagnosis of single level lumbar disc herniation, failure of conservative treatment, ASA I-II, age 20 to 50 years and either gender, willing and fit for the prescribed surgery. Excluded the patients more than 50 years old, an infection, spinal instability, hepatic or renal disease, severe cardiac disease, or bleeding abnormalities and those undergoing revision surgery, more than 2 levels or requiring stabilisation or fusion.

A total of 60 patients with lumbar herniated discs were randomly assigned to undergo micro discectomy either under SA (n=30, group A), or under GA (n=30, group B) using random numbers tables. The anaesthetic protocols were established by the Department of Anaesthesiology.

In group A, patients were pre-loaded with 7 ml/kg lactated ringer's solution over 10-15 minutes, placed in left lateral decubitus position, prepared/draped and local infiltration of 2-3 ml of 2% lidocaine. SA was performed using a 25-gauge spinal needle one to two levels above the herniated disc level using 2 ml 0.75% bupivacaine administered into intrathecal space and repositioned to supine. After 5-10 minutes of establishment of spinal level of block (usually between T-6 and T-10), the patients were placed into proper position. Oxygen at 2L/min via nasal cannula was administered and the patients were monitored. Patients were sedated by midazolam (0.05 mg/kg) and at the end the patient was turned supine and transferred to the recovery area.

In group B, patients were given GA with propofol (2 mg/kg iV), endotracheal intubation was facilitated with atracurium (0.6 mg/kg IV) and maintained with 1.4% sevoflurane. Nalbuphine (10 mg) was administered for analgesia and the patients were properly positioned and monitored throughout using ECG, non-invasive blood pressure monitoring and pulse oximetry. After completion of operation, the anaesthetic drugs were discontinued and patients received 100% oxygen. Neuromuscular blockade was reversed by using neostigmine 0.04 mg/kg and atropine 0.02mg/kg and extubated. The patients were transferred to the recovery area when patients had spontaneous respiration, pulse oximetry oxygen saturation more than 95%, respiratory rate less than 30 per minutes, and tidal volume more than 5 ml per kilogram.

A study proforma was designed including variables of age, gender, level of lumbar disc prolapse, type of anaesthesia, operative time, and combined total time, post-operative pain using visual analogue scale (VAS) of 10 (0=minimum effect, 10= maximum effect) and hospital stay in days.

Pre-operatively patients had MRI lumbosacral spine, pre-anaesthesia assessment and informed, written consent. Surgical prophylaxis with antibiotics at induction of anaesthesia and maintained for 24 hours post-operatively. Following anaesthesia (SA/GA) the patient was placed in lateral position, midline incision made over required level. Using operative loops, laminar fenestration/laminectomy performed and offending disc fragment/s removed and decompression of the target anatomical space was achieved. Postoperative variables and complication if any and the analgesic requirements were recorded.

Data was analysed by descriptive statistics in terms of frequencies, percentages and mean ± standard deviation using SPSS 17. Frequency data were compared using a univariate analysis of variance. Parametric data was analysed by T-test equality of means and statistical significance was defined as p<0.05.

RESULTS

There were 40 % (n=12) females and 60% (n=18) males in group A and 46.7 % (n=14) females and 53.3 % (n=16) males in group B. Age ranged from 27-50 years in group A, and 23-50 years in group B (table-1). All patients underwent single level discectomy as mentioned in inclusion criteria. The overall incidence of level of disc prolapse was 51.7% L4/5, 38.3% L5/ S1 and 10 % L3/4 levels. The mean operating time in group A was 40.36 minutes (SD 4.88), while for group B it was 43.56 minutes (SD 9.86). However mean total
theatre time in group A was 62.70 and for group B it was 90.73 minutes, \( p < 0.001 \) (table-2).

The mean hospital stay after surgery in group A was 2.0 days (SD 0.00) and in group B was 2.27 (SD 0.45) \( p = 0.002 \). Peak Post-operative pain scores on VAS and resultant analgesic requirements in Group A was 5.10 while for group B it was 6.87 \( p < 0.001 \) (table-3).

Regarding recovery area stay and ambulation on day of surgery, no significant difference was observed between two groups. The patients were re-evaluated 24 hours after the operation. The day after surgery, the incidence of nausea and vomiting was visibly higher in group B, i.e. 6 patients (20.0%), but not significant \( ( p = 0.062 ) \). There was also no significant difference in the incidence of urinary retention and headache during the post-operative stay (table-3).

**DISCUSSION**

Traditionally, GA is used in lumbar disc surgery; nevertheless, regional anaesthesia, either spinal or epidural, has been a successful alternative. SA has previously been used for discectomy, it is however unclear exactly how widely the technique is being practiced\(^2\)-\(^5\). In general, SA has been shown to carry a very low risk of serious complications\(^1\).

SA advantages include patients self-positioning, so as to regulate the respiratory functions and decreasing intraoperative bleeding by decreasing peripheral venous pressure\(^5\). The reduced reported bleeding may also be due to relatively fewer episodes of intraoperative hypertension because SA inhibits surgically induced stress levels to a greater degree than GA\(^6\). The reduced blood loss was due to a combination of sympathetic blockade and lowered intra-thoracic pressure experienced with patients breathing spontaneously\(^6,7\). Reduced intraoperative hypertensive episodes, decreased blood loss and less postoperative pain and nausea are

<table>
<thead>
<tr>
<th>Table- 1: Demographic data.</th>
<th>SA group</th>
<th>GA group</th>
<th>p value</th>
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</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12 (40%)</td>
<td>14 (46.7%)</td>
<td>0.61</td>
</tr>
<tr>
<td>Male</td>
<td>18 (60%)</td>
<td>16 (53.3%)</td>
<td></td>
</tr>
<tr>
<td>Age in yrs</td>
<td>37.70 ± 6.577</td>
<td>37.53 ± 6.715</td>
<td>0.923</td>
</tr>
<tr>
<td>Level of disc prolapse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L3/4</td>
<td>3 (10%)</td>
<td>3 (10%)</td>
<td>0.842</td>
</tr>
<tr>
<td>L4/5</td>
<td>15 (50%)</td>
<td>16 (53.3%)</td>
<td></td>
</tr>
<tr>
<td>L5/ S1</td>
<td>12 (40%)</td>
<td>11 (36.7%)</td>
<td></td>
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</tbody>
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<thead>
<tr>
<th>Table- 2: Surgical characteristics of patients.</th>
<th>SA Group</th>
<th>GA Group</th>
<th>p-value</th>
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</thead>
<tbody>
<tr>
<td>Mean theatre time (mins)</td>
<td>62.70 ± 6.92</td>
<td>90.73 ± 14.80</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean operative time (mins)</td>
<td>40.36 ± 4.88</td>
<td>43.56 ± 9.86</td>
<td>0.117</td>
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</table>

<table>
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<tr>
<th>Table- 3: Post-operative outcomes.</th>
<th>SA Group</th>
<th>GA Group</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean duration of hospital stay (days)</td>
<td>2.00 ± 0.00</td>
<td>2.27 ± 0.45</td>
<td>0.002</td>
</tr>
<tr>
<td>Mean post-operative peak pain score</td>
<td>5.10 ± 0.60</td>
<td>6.87 ± 0.57</td>
<td>0.000</td>
</tr>
<tr>
<td>Nausea/ Vomiting</td>
<td>4 (13.34%)</td>
<td>6 (20.0%)</td>
<td>0.062</td>
</tr>
<tr>
<td>Recovery area time (mins)</td>
<td>95.8 ± 9.7</td>
<td>92.3 ± 5.7</td>
<td>0.92</td>
</tr>
<tr>
<td>Ambulation on operation day</td>
<td>11 (36.67%)</td>
<td>14 (46.66%)</td>
<td>0.28</td>
</tr>
<tr>
<td>Headache</td>
<td>3 (10.0%)</td>
<td>2 (6.67%)</td>
<td>0.078</td>
</tr>
<tr>
<td>Urinary retention</td>
<td>3 (10.0%)</td>
<td>5 (16.67%)</td>
<td>0.064</td>
</tr>
</tbody>
</table>
among the many reported advantages of SA compared with GA in patients undergoing lumbar laminectomy\textsuperscript{8}. But found no significant difference in terms of operative bleeding between the patients operated under SA and GA in study by Indi et al\textsuperscript{9}. Techniques of regional anaesthesia alone, may reduce the amount of blood loss, which is an effect of decreased peripheral venous pressure after regional anaesthesia and may also lower the incidence of pulmonary complications\textsuperscript{10}. However our study did not find any difference in operative bleeding in any group.

Mclain et al found that the absolute reduction in anaesthesia time likely resulted from the decreased time needed to assess responsiveness and respiratory function prior to extubation and transfer to recovery area\textsuperscript{6}. We found significant correlation of total theatre time advantage in SA group (p 0.002). Combined epidural and GA has shown positive effect on level of sedation and reduced usage of maintenance inhalational agents\textsuperscript{11}.

The analgesic advantage of SA has been well documented by Attari et al, in which the post-operative analgesic use was significantly less in SA group compared to GA group (p< 0.05)\textsuperscript{12}. Our study found subtle but significant advantage in SA group in terms of pain scores and analgesic boluses. Sadrolsadat et al found the same regarding pain but their overall confidence tilted towards GA in broader overall outcome\textsuperscript{13}. Khajavi et al noted that time to first rescue analgesia was significantly longer in combined regional and GA group than GA group p <0.0514.

The timings for surgery did not differ much with the type of anaesthesia rather it was more relevant to surgical field technical difficulties in individual anatomy and variations and local pathology 15 and so in our series it was not significant (p 0.117). McLain et al found that length of hospital stay was significantly reduced in SA group and so were the overall complication rates including dural tear\textsuperscript{6}, although mean age range was much different than our study. Dagher et al found that post-operative recovery, time to drinking and walking were more rapid after SA when compared to GA and postoperative nausea and vomiting was significantly higher in the GA group\textsuperscript{16}.

The limitation of the study are the small number, ASA 1-2 and younger age of cases and therefore further research with larger series and maximal inclusion of patients would be testifying for the standard of practice.

**CONCLUSION**

Our results support the existing literature that spinal anaesthesia is safer than general anaesthesia in patients undergoing lumbar discectomy and that it reduces postoperative discomfort, nausea, vomiting, analgesic requirements, and operative time compared with general anaesthesia.

**CONFLICT OF INTEREST**

This study has no conflict of interest to declare by any author.

**REFERENCES**

