

## Effectiveness Of 2% Isobaric In Producing Spinal Anaesthesia In Comparison to 5% Heavy Xylocaine

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**Abstract:** **Background:** The objective of the study was to compare the effect of isobaric 2% Xylocaine with hyperbaric 5% Xylocaine in subarachnoid block in lower abdominal and lower limb surgeries. **Method:** This study was carried out in the department of Anesthesiology, Government Medical College and S.S.G. Hospital, Baroda during the period of 2004 to 2006. The study consisted of 60 patients of either sex of ASA grade I and II between age group 20 to 60 years, undergoing planned lower abdominal and lower limb surgeries. They were randomly assigned into the following two groups: Group X2 (n=30) - Patients receiving Inj. Xylocaine 2% Isobaric 4 ml (80 mg) intrathecally and Group X5 (n=30) - Patients receiving Inj. Xylocaine 5% hyperbaric 1.6 ml (80 mg) intrathecally. They were monitored for sensory block, motor block, vital parameters like pulse rate, blood pressure, oxygen saturation, duration of effective analgesia and peri-operative complications. Results were compared among the groups using unpaired "t" test and difference was considered significant when p value was less than 0.05. **Result:** There was no difference in mean age and weight of patients in both groups. The time for onset of sensory block, time to achieve peak sensory level, and time for sensory regression to L1 level was not found to be statistically significant in both groups. The time for onset time of motor block, maximum Bromage score achieved, mean time to achieve this and the recovery of motor block to grade 0 was also similar in both groups. There was no significant change in mean pulse rate, mean systolic blood pressure, mean diastolic blood pressure and mean oxygen saturation in either of the groups at any point of study. The mean duration of surgery and duration of effective analgesia was also similar in both groups. No significant complications were found other than nausea in either of the group intra and post operatively. **Conclusion:** 2% isobaric Xylocaine can be very well used as an alternative to 5% hyperbaric Xylocaine in spinal anaesthesia for lower abdominal (infra-umbilical) surgeries lasting for less than one hour. [Prajapati H Natl J Integr Res Med, 2019; 10(6):27-32]

**Key Words:** 2% Isobaric, Spinal Anaesthesia, 5% Heavy Xylocaine

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**Introduction:** Use of spinal anaesthesia for surgical procedures is very common in India. This is because of economic reasons as well as lack of sophisticated anaesthetic apparatus and gases in rural and semi urban areas where a majority of population resides. Various local anaesthetics like Xylocaine, Bupivacaine, Tetracaine, Etidocaine & Ropivacaine are being used for providing spinal anaesthesia. However, the commonly used agents in India are only Xylocaine and Bupivacaine - Xylocaine heavy 5% for short duration surgeries and Bupivacaine heavy 0.5% for long duration surgeries. Because of prolonged motor and sensory block with Bupivacaine, the time to walk and micturate postoperatively also gets prolonged, secondly the occurrence of hypotension for long periods intra and postoperatively is another problem with Bupivacaine.<sup>1,2</sup>

For short duration of surgeries or surgeries taken on day care basis, Bupivacaine therefore is not a good choice. Xylocaine 5% heavy is a short lasting, time tested drug and is a good choice in such cases but a drawback might be that the spread of analgesia is dependent on posture,

because of its hyperbaric property and therefore the spread and effect is more on dependent side. As per Wild Smith JA et al and Brown DT et al isobaric solutions are less influenced by posture than are hyperbaric solution and are therefore preferable when effect of gravity is not required.<sup>3,4</sup> However, isobaric solutions of 5% Xylocaine are not available. Furthermore, a good quality of sensory block equivalent to that of 5% Xylocaine can be produced with lesser concentration of isobaric Xylocaine.

Compared to the recommended concentration of Bupivacaine for spinal anaesthesia, the equipotent concentration of Xylocaine is 2%. Various studies have been conducted on use of 2% isobaric Xylocaine for transurethral, lower limb and lower abdominal surgeries.<sup>5-9</sup> They found that 3 to 4 ml of 2% isobaric Xylocaine produced effective analgesia with good cardiovascular stability for at least 1 hour duration of surgery. Another study done by Ajaykumar et al has also mentioned the successful use of isobaric Xylocaine 2% for spinal anaesthesia in patients undergoing caesarean section.<sup>10</sup> So, this study was carried out with

objective to assess the usefulness of 2% preservative free isobaric Xylocaine in spinal anaesthesia for short duration of surgeries and compared it with 5% hyperbaric Xylocaine in producing spinal anesthesia.

**Materials And Methods:** The present study was carried out in the Department of Anaesthesiology, Govt. Medical College, S.S.G. Hospital, Baroda, between the period of 2004-2006. It was randomized prospective clinical study which consisted of sixty patients.

**Inclusion criteria:** In this study, sixty patients of either sex and ASA physical status I or II, between the age of 20-60 years undergoing planned lower abdominal or lower limb surgeries like hernia, hydrocele haemorrhoidectomy, TURP, Cystolithotomy, Debridement & STSG, Amputation and Orthopaedic Surgeries were taken.

**Exclusion Criteria:** Contraindication for spinal anaesthesia like Bleeding disorder, Local infection Anatomical abnormalities of vertebral column. Psychiatric illness, Neurological deficits, history of epilepsy etc. or History of drug allergy or History of alcohol or substance abuse or Patients unable to understand pain assessment test were excluded. All patients were explained in detail about the procedure of spinal anaesthesia, how to quantify the pain post operatively using visual analogue scale (VAS) & about possible side effects. A written informed consent was then taken.

**Process:** Pre-operative assessment was done as detailed in proforma. In nutshell, history was taken regarding present & past complaints, personal history, medication history, history of previous anaesthesia experience, blood transfusion, jaundice etc. General & systemic examination was carried out. Routine & specific investigations were done, the latter when indicated.

**Patients were assigned to one of the following two groups:**

Group X 2 Patients receiving	Inj. Xylocaine 2% isobaric (80 mg)
(n=30)	4 ml intrathecally
Group X 5 Patients receiving	Inj. Xylocaine 5% hyperbaric (80mg)
(n=30)	1.6 ml intrathecally

After taking the patient in operation theatre, monitors like sphygmomanometer and pulse oximeter were attached. Pulse, blood pressure, and oxygen saturation were noted as preblock values. Under all aseptic & antiseptic precautions spinal anaesthesia was given using 23 G spinal needle. Drug was injected as per the group of the patient. Patients were made supine immediately after giving the block.

**The following parameters were monitored:** Onset maximal cephalad, two segment regression time and the regression time of sensory block up to L1 Level. Onset, degree and the duration of motor block Vital parameter like pulse, blood pressure and O<sub>2</sub> saturation. Duration of effective analgesia. Intra and postoperative complications. Data was entered and analysed using Microsoft Excel. Various parameters were compared by unpaired "t" test for statistical significance. A p-value of less than 0.05 was considered to be statistically significant.

**Results:** Majority of patients were in the age group of 20-50 yrs. in both the groups. The mean age in group X2 was 38.03 + 9.98 years and 36.53+ 9.35 years in group X5. The mean weight in Group X 2 was 54.77 + 5.8 kg. & in Group X5 it was 49.53 + 5.41 kg. with no significant different between the two groups in terms of age and weight wise distribution. Max no. of patients was in ASA grade - I in both the groups. Male to female ratio was 26: 4 in group X2 and 27:3 in group X5. (Table 1)

**Table 1: Age, weight and physical status of patients in both study groups (N=60)**

Variables	Group X2		Group X5		P value
	n (30)	%	n (30)	%	
Age (years)					NS
20-30	10	33.3	9	29.7	
31-40	9	29.7	10	33.3	
41-50	8	26.4	9	29.7	
51-60	3	9.9	2	6.6	
Mean Age (mean $\pm$ SD)	38.03 + 9.98		36.53 + 9.35		NS
Weight (kg)					NS
40-50	7	23.1	13	42.9	
51-60	21	69.3	16	52.8	
61-70	2	6.6	1	3.3	
Mean Wt. (mean+SD)	54.77 + 5.8		49.53 + 5.41		NS

Physical Status					NS
ASA Group -I	17	56.1	20	66.6	
ASA Group -II	13	43.2	10	33.3	
Male patients	26	9	27	90	
Female patients	4	86.6	3	10	
		13.4			

NS-Not significant

The mean time for the onset of sensory block was 27.7 + 2.76 sec. in Group X2 & 26.6 + 2.04 sec. in Group X5 which was statistically not significant. Time for sensory regression to LI level from peak sensory level was 95.57 +1.81 min. in Group X2 & was 103.23 + 5.48 min. in Group X5 the

difference being insignificant statistically. Time to achieve maximum motor grade in Group X2 was 177.27 ± 7.46 sec & in Group X5 it was 180.47 ± 5.42 sec., the difference being statistically insignificant. The recovery of motor block to Bromage grade 0 was 112.27 ± 5.32 min in Group X2 & it was 110.0 + 9.16 min in Group X5 and the difference was insignificant. (Table 2).

On intra group comparison in both the group there was no significant difference in mean pulse rate, mean systolic blood pressure, mean diastolic blood pressure and oxygen saturation throughout the study as shown in (Table 3).

**Table 2: Assessment of sensory Block and motor block in both study groups (N=60)**

Parameter	Group X2	Group X5	P value
Onset of Sensory Block (sec.) (mean + SD)	27.7+2.76	26.6±2.04	NS
Highest sensory level achieved (mean + SD & range)	T 8.26±0.85 (T6-T10)	T 9.8±0.6 (T8-T10)	NS
Time to achieve Peak sensory level (sec.) (mean + SD)	98.03+5.56	100.1+6.72	NS
Two segment regression time from Highest sensory level, (min). (mean+SD)	79.6±2.54	75±2.83	NS
Time for sensory regression to LI from highest sensory level (min) mean+SD.	95.57+1.81	103.23+5.48	NS
Onset of Motor Block (mean + SD) (sec.)	39.77+3.86	36.73±1.98	NS
Maximum Bromage score attained	III	III	NS
Time to achieve maximum Bromage score (Sec.) mean+SD	177.27+7.46	180.47±5.42	NS
Recovery of motor block (Bromage grade 0) (min) mean+SD	112.27+5.32	110+9.16	NS

NS-Not significant

**Table 3: Changes in vital parameters Mean Pulse Rate among patients in in both study groups (N=60)**

Time	Group X2		Group X5	
	(mean+SD)	Intra group comparison, p value significance	(mean+SD)	Intra group comparison p value significance
Pulse rate Pre block	83.73 + 6.6	NS	84.6 + 8.3	NS
Pulse rate Post block				
1 min	83.73 + 6.6	NS	84.6 + 8.3	NS
3 min	85.27 + 7.1	NS	88.6 + 8.8	NS
5 min	87.2 + 4.94	NS	90.8 + 8.8	NS
10 min	86.4 + 1.44	NS	90.6 + 6.6	NS
15 min	86.27 + 4.62	NS	91.50 + 9.33	NS
30 min	87.6 ±3.21	NS	91.5 + 8.72	NS
60 min	84.93 + 6.34	NS	91.27 + 7.64	NS
75 min	86.2 + 2.24	NS	90.8 + 6.8	NS
Pulse rate, Post Op.				
Immediate	88.4 + 3.91	NS	89.33+ 1.7 89.97 +	NS
30 mins	89.73 + 3.43	NS	6.46 88.34 + 5.56	NS
1 hour	88.7 + 3.82	NS		NS

Effectiveness Of 2% Isobaric In Producing Spinal Anaesthesia

SBP (mmHg) Pre block	123.87+10.32	NS	120.53+10.66	NS
SBP (mmHg), Post Block				
1 min	123.87+10.32	NS	120.53+10.6	NS
3 min	122.5+11.5	NS	116.73+10.4	NS
5 min	120.13+7.7	NS	114.67+10.6	NS
10 min	120.16 + 5.5	NS	116.8 + 6.8	NS
15 min	118+4.56	NS	112.87+8.85	NS
30 min	118.93+6.6	NS	110.73+8.96	NS
60 min	122+7.32	NS	111.27+9.21	NS
75 min	122+ 1.2	NS	110.7 + 6.68	NS
SBP (mmHg) Post Operative	122.73 + 5.47	NS	112.0+0.76 112+8.76	NS
Immediate	120.0 + 4.63	NS	112 + 5.6	NS
30 mins	120.0 + 5.1	NS		NS
1 hour				
DBP (mmHg) Pre block	77.73 + 4.42	NS	79.3 + 7.02	NS
DBP (mmHg) Post Block				
1 min	77.73 + 4.42	NS	79.3 + 7.02 75.8 +	NS
3 min	77.07 + 4.86	NS	5.74	NS
5 min	76.13 + 6.3	NS	74.67 + 4.91 75.1	NS
10 min	76 + 5.5	NS	+4.1 74 + 4.43	NS
15 min	75.93 + 4.8	NS	73.2 + 5.49	NS
30 min	76.87 + 4.16	NS	75.4 + 5.18 72.1 +4	NS
60 min	76.53 + 4.6	NS		NS
75 min	76.3 + 4.48	NS		NS
DBP (mmHg) Post Operative	79.53 + 2.21	NS	74.2 + 4.31	NS
Immediate	79.87+ 1.66	NS	74.4 + 4.31	NS
30 mins	78.3 + 2.26	NS	74.0 + 3.1	NS
1 hour				
SP02 (%) Pre block	98.83+ 1.78	NS	99.13 + 0.68	NS
SP02 (%) Post Block				
1 min	98.83+ 1.78	NS	99.13 + 0.68	NS
3 min	98.83 ± 0.59	NS	99.13 + 0.65	NS
5 min	98.83 + 0.59	NS	99.13 + 0.68	NS
10 min	98.8+ 1.2	NS	99.1 +0.6	NS
15 min	98.87 + 0.51	NS	99.0+ 1.0	NS
30 min	98.9 + 0.55	NS	99.0+ 1.0	NS
60 min	98.87 + 0.57	NS	99.13 + 0.65	NS
75 min	98.9 + 0.5	NS	99.1 +0.6	NS
SP02 (%) Post Operative	99.03 ± 0.32	NS	99.13 + 0.68 99.0+	NS
Immediate	98.77+ 1.0	NS	1.0 99.1 + 1.8	NS
30 mins	98.7+ 1.0			NS
1 hour				

The difference in mean duration of surgery and duration of effective analgesia was statistically insignificant. Complications like nausea was noted intra-operatively in 2 cases in group X2 (6.66%) & in 1 case in Group X5 (3.33%) No other

complications were seen in either group intra or post operatively. (Table 4)

**Table 4: Duration of surgery, supplementation with anaesthesia & duration of effective analgesia and post operative complications**

	Group X2	Group X5	P-value
Duration of surgery (min)	71.27 + 5.96	67.83 + 8.38	NS
Supplementation with anaesthesia			
Duration of effective analgesia (min) (mean+SD)	107.97 + 4.98	113.77 + 4.20	NS
Nausea / Vomiting	2	1	NS
Rigors, PDPH, Backache, Urinary Problems, Neurological Problems, Bradycardia, Hypotension, Respiratory Depression was not observed in either of the case			

**NS : Not significant**

**Discussion:** Isobaric solutions are less influenced by posture than are hyperbaric solutions.<sup>3,4</sup> The use of an isobaric solution allows the patient to be positioned in a comfortable sitting posture for performing subarachnoid block as required in obese, pregnant and orthopaedic patients. Moreover, isobaric solutions seem to produce a consistent level of analgesia and more potent motor block than hyperbaric solutions.<sup>1,5,11</sup>

Unfortunately, the isobaric solution of 5% xylocaine is not available. Moreover the reason for using 5% xylocaine for spinal anaesthesia is also not clear.<sup>5</sup> The same degree of good quality block as produced by 5% xylocaine can be produced by 2% xylocaine has been concluded by various studies.<sup>1,2,5,6,7</sup> Furthermore, the use of 2% xylocaine has been advocated to reduce the incidence of Transient Neurological Symptoms which have been reported with the use of 5% xylocaine in recent past making its use controversial.<sup>12</sup> Hence, in our study we employed 2% isobaric xylocaine for production of spinal anaesthesia and compared it with 5% hyperbaric xylocaine.

Sixty patients of either sex, between the age of 20-60 years, & ASA grade I & II undergoing various surgical & orthopaedic surgeries with spinal anaesthesia were included in this study. The two groups were identical statistically with reference to age, weight, sex and ASA physical status I & II.

There was no significant difference among both the groups for all the sensory block parameters. This meant that the onset, peak level and the duration of sensory block were statistically identical in two groups or in other words difference in concentration and volume did not affect the various sensory parameters.

Our results in this regard match with the results of Toft P et al and Raina R et al who also did not observe any effect of change in concentration and volume on various indices of sensory and motor block.<sup>1,7</sup>

On the contrary Singh Manjeet et al found that Xylocard 2% patients developed early onset of sensory block compared to hyperbaric 5% xylocaine ( $p < 0.01$ ).<sup>13</sup>

Similar to sensory block all the parameters of motor block were comparable to each other in both groups. Our results in this regard are in resemblance with those of Raina R et al.<sup>7</sup> They also did not find any effect of concentration and volume on parameters of motor block. Results were not so in the study of Toft P et al and Singh Manjeet et al.<sup>1,13</sup> Toft P et al observed motor block was more pronounced and longer in isobaric 2% xylocaine than hyperbaric 5% xylocaine.<sup>1</sup> Singh M. et al reported an early onset of motor block in isobaric 2% xylocaine than that in hyperbaric 5% xylocaine.<sup>13</sup>

Institution of spinal block is usually associated with a fall in blood pressure which is due to sympathetic block occurring along with sensory and motor block. More over the incidence of hypotension is more in old, obese and pregnant patients. Our patients were young, non-obese and not pregnant so hypotension was not observed. Spinal anaesthesia is also associated with either bradycardia (Bainbridge reflex) or tachycardia (Marey's law). But we also did not find any significant change in pulse rate. Whereas, Singh Manjeet et al study mentioned that supplementation was done in six cases in hyperbaric 5% xylocaine group but in none of the cases in isobaric 2% xylocaine group. They clearly mentioned far better superiority of isobaric 2% xylocaine over hyperbaric 5% xylocaine.<sup>13</sup>

The usual complications of spinal anaesthesia are hypotension, bradycardia, nausea and vomiting. Except nausea in 2 cases in group X2 and 1 case in group X5 intraoperatively, no other



complications were noted in either of the groups during intraoperative or postoperative period. Raina R et al and Toft P et al have not mentioned the occurrence of any complications in their study.<sup>1,7</sup> Kristensen et al compared 4ml of 2% isobaric xylocaine with 3 and 2 ml of the same drug and they reported hypotension in 5 cases in 4 ml (80 mg) group, which responded well to 5-10 mg of Inj. Ephedrine IV.<sup>5</sup>

**Conclusion:** Both isobaric Xylocaine 2% and hyperbaric Xylocaine 5%, in the dose of 80 mg, produced effective and reliable sensory and motor block for short duration infra-umbilical surgeries. The onset of sensory and motor block was quick in both the groups. The difference in concentration and volume did not make any impact on various parameters like sensory and motor block and effective duration of analgesia.

Vital parameters like pulse, blood pressure and oxygen saturation remained stable and did not undergo any significant change. The study did not observe any significant complication in either of the group. Hence, 2% isobaric Xylocaine can be very well used as an alternative to 5% hyperbaric Xylocaine in spinal anaesthesia for infra-umbilical surgeries lasting for not more than one hour.

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