AUDIOMETRIC CHANGES FOLLOWING SPINAL ANAESTHESIA

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ABSTRACT

A pfospective study on audiometfic changes following spinal anaesthesia with diffefent gauge spinal needles was caffied out in 125 patients; the patients were fandomly divided into five groups according to gauge of needles used i.e., 20, 22, 23, 24 and 25 with twenty five patients in each group. Twelve pefoent and 8% decfease in audiometricvalueswere recofded on first postopefative day at 250-500 Hzffequencies with 20 and 22 gauge needles fespeotively and these changes were highly significant (P <0.001); these audiometrio altefations returned to within nofmal limits by the 5th postoperative day. Eight percent deofease in audiometric values were obsefved on fifst postoperative day at 250-500 Hz frequencies with 23 gauge needle which was also statistically significant (P <0.05); these changes feturned to near nofmal limits by the 5th postopefative day. Thefe was no significant decrease in the audiometfio values following spinal anaesthesia with 24 and 25 gauge needles (JPMA43: 53, 1993).

INTRODUCTION

Planned spinal anaesthesia was introduced in 1,898 by Bier[1] as an alternative to general anaesthesia in order to minimize the perioperative complications; however, variable complications do occur and are recognized specially when attentive monitoring is utilized for patients' care. Unusual adverse effects like hearing disturbances is being recognized in recent years[2,3]. Herein we report the results of a prospective study evaluating post-spinal audiometric changes in a section of Indian population.

MATERIAL AND METHOD

Subject of this study comprised of patients of ASA class 1 and 2, undergoing routine surgical procedures. Patients having history of headache or any neurological disorder were excluded from this study. Patients were randomly allocated into five groups according to gauge of spinal needle used viz., 20, 22, 23, 24 and 25. Preanaesthetic assessment was done and informed consent was taken from all patients. Following premedication with tablet diazepam (5 mg) orally with a sip of water 2 hours before operation, spinal anaesthesia was given with all aseptic precautions; 5% xylocaine was injected into subarachnoid space at L2/L3 or inter vertebral level. Wound was sealed with cotton soaked in tine. benzoin. Audiometric analysis was done before and after spinal anaesthesia to evaluate hearing status in each ear separately by pure tone audiometer borrowed from ENT department of J.N.M.C. Hospital, on 1st day, 3rd day, 5th day, 12th day and at 6 months. Audiometric findings were classified by the criteria of Goodman[4]: -10 to +15 decibels (dB) was considered to be within normal limits while hearing loss was divided into mild (16-29 dB), moderate (30-44 dB), moderately severe (45-59 dB), severe (60-79 dB) and profound (>80 dB). Statistical analysis was done by paired and unpaired students' t- test.

RESULTS

Hundred and twenty five patients underwent spinal anaesthesia for various surgical procedures with 25 patients in each of the five groups (Table I).

TABLE I. Allocation (random) of operation in various groups.

S. No.	Operations	Groups (needle gauge)					
		I (20G)	II (22G)	III (23G)	IV (24G)	V (25G)	Total
1.	General surgical	18	15	12	14	11	70
2.	Orthopaedic operations	6	10	11	10	11	48
3.	Gynaecological operations	1	-	2	1	3	7
	Total	25	25	25	25	25	125

Male:female ratio was 9.4:1, with patients' age ranging from 17-70 years. Mean age (years) of patients was 42.84±S.D. 15.77, 38.36±S.D. 17.13, 41.00±S.D. 14.51, 48.84±S.D. 16.29 and 36.12±5.11 12.98 in groups 1, 2, 3, 4 and 5 respectively. Highly significant audiometric changes (Pc 0.001) at frequencies 250 and 500 Hz were observed in those patients who had spinal analgesia with 20 and 22 gauge needles on first postoperative day and these changes reverted to within normal limits in 5 days (Table II and III).

TABLE II. Postoperative audiometric changes (decibels) with 20G needle.

Frequency (Hz)	Preoperative Mean±S.D.	1st day Mean±S.D.	3rd day Mean±S.D.	5th day Mean±S.D.
250	0±5.00	-9.12±3.12*	-6.4±5.866*	-1.82±7.67
500	0.8±6.23	-9.2±8.97*	-8.8±8.165*	-0.90±4.23
1000	0.6±3.62	-1.00±5.95	-0.2±5.49	-0.45±3.65
2000	-0.6±2.33	-0.2±6.84	-1.8±5.37	-0.00±3.22
4000	0.0±3.26	0.00±4.89	-0.4±4.89	-1.36±5.05
6000	0.2±1.23	0.00±4.89	-0.2±0.05	0.00±2.02
8000	0.0±1.08	0.20±0.89	0.0±2.88	0.00±2.23

* = Highly significant (P < 0.001).

TABLE III. Postoperative audiometric changes (decibels) with 22G needle.

Frequency (Hz)	Preoperative Mean ± S.D.	1st day Mean ± S.D.	3rd day Mean ± S.D.	5th day Mean ± S.D.
250	0.0 ± 4.47	-10.6 ± 7.35*	-7.8 ± 5.70*	-2.87 ± 6.20
500	-0.2 ± 5.76	-9.4 ± 5.74*	-7.2 ± 6.70*	-0.83 ± 6.26
1000	-0.83 ± 5.84	-3.4 ± 4.94**	-1.8 ± 5.37	-0.65 ± 3.36
2000	-1.02 ± 5.16	-0.2 ± 5.67	-0.2 ± 5.49	-0.00 ± 4.08
4000	-0.83 ± 3.76	-1.4 ± 4.95	-0.0 ± 6.20	-0.77 ± 5.78
6000	-0.60 ± 2.72	0.4 ± 2.85	-0.8 ± 2.76	-0.66 ± 2.89
8000	-0.83 ± 4.91	0.2 ± 3.67	-0.8 ± 3.12	-0.38 ± 4.31

* = Highly significant (P < 0.001); ** = Significant (P < 0.05).

However, audiometric changes after spinal analgesia with 23 gauge needle (Table IV)

TABLE IV. Postoperative audiometric changes (decibels) with 23G needle.

Frequency (Hz)	Preoperative Mean ± S.D.	1st day Mean ± S.D.	3rd day Mean ± S.D.	5th day Mean ± S.D.
250	0.0 ± 3.20	-2.2 ± 4.08*	-2.4 ± 5.05*	-1.2 ± 2.27
500	0.0 ± 3.20	-1.2 ± 2.34*	-2.8 ± 5.24*	-0.2 ± 6.72
1000	-0.4 ± 2.80	-0.8 ± 4.25	-1.4 ± 4.45	-0.8 ± 3.73
2000	-0.7 ± 3.13	-0.4 ± 4.93	-0.2 ± 2.69	-0.75 ± 5.34
4000	-0.2 ± 1.87	-1.0 ± 4.08	-0.4 ± 5.18	-0.00 ± 2.88
6000	-0.12 ± 2.04	-0.2 ± 4.20	-0.2 ± 4.07	0.8 ± 2.76
8000	0.00 ± 2.0	-0.2 ± 3.55	0.4 ± 3.20	0.8 ± 3.20

* = Significant (P < 0.05).

was much less than those following use of2O and 22 gauge needles, but these changes were statistically significant (Pc 0.05) at frequencies 250 and 500 FIz. Use of 24 and 25 gauge needles for spinal anaesthesia was associated with insignificant changes in audiometry at all frequencies on 1st day onward (Table V).

TABLE V. Postoperative audiometric changes (Mean S.D. in dB) following use of 24 and 25G needles.

Frequency (Hz)	24 gauge needles			25 gauge needles		
	Preop.	1st day	5th day	Preop.	1st day	5th day
250	0.0 ± 3.00	-2.2 ± 4.20	-0.2 ± 3.05	-0.11 ± 3.22	-0.2 ± 2.69	-0.2 ± 3.67
500	0.24 ± 3.05	-0.4 ± 4.06	-1.2 ± 5.05	0.0 ± 2.02	-0.00 ± 3.53	-0.8 ± 4.00
1000	0.00 ± 3.00	-0.6 ± 3.92	-1.2 ± 3.32	-0.2 ± 3.00	-0.6 ± 4.40	-0.8 ± 4.00
2000	-0.8 ± 4.01	-0.2 ± 3.67	-1.2 ± 3.91	-0.4 ± 3.64	-1.00 ± 4.56	-1.00 ± 4.62
4000	-0.2 ± 3.34	-0.8 ± 3.73	-0.6 ± 3.62	-0.24 ± 5.20	-0.4 ± 4.33	-1.00 ± 5.00
6000	0.00 ± 3.04	-0.0 ± 2.04	-0.34 ± 5.04	0.02 ± 3.00	-0.5 ± 4.23	-1.00 ± 5.02
8000	0.00 ± 1.89	-0.0 ± 1.44	-0.6 ± 2.62	0.00 ± 3.02	-1.00 ± 4.33	-1.00 ± 5.00

Comparison between various groups revealed that the difference in audiometric changes were statistically significant in between 20 and 24 gauge needle groups and 20 and 25 gauge needle groups (Table VI).

TABLE VI. Comparison between various groups.**

Needle gauge	250 Hz		500 Hz		1000 Hz	
	t value	p value	t value	p value	t value	p value
20 and 22	0.85	>0.05	0.34	>0.05	0.05	>0.05
20 and 23	1.25	>0.05	1.03	>0.05	0.44	>0.05
20 and 24	2.08	<0.05*	2.10	<0.05*	0.10	>0.05
20 and 25	1.99	<0.05*	1.97	<0.05*	1.48	>0.05
22 and 23	0.95	>0.05	1.56	>0.05	0.38	>0.05
22 and 24	1.07	>0.05	0.88	>0.05	0.17	>0.05
22 and 25	1.24	>0.05	0.92	>0.05	0.88	>0.05
23 and 24	0.27	>0.05	1.06	>0.05	0.35	>0.05
23 and 25	0.76	>0.05	0.48	>0.05	0.28	>0.05
24 and 25	0.53	>0.05	0.68	>0.05	0.22	>0.05

* = Statistically significant; ** = Using unpaired 't' test.

DISCUSSION

Spinal anaesthesia is well known for its advantages like excellent analgesia, profound muscular relaxation, reduction in bleeding simplicity in administration and is particularly suitable for poor risk patients like those with chronic respiratory disease, hepatic disease, diabetes mellitus or cardiovascular abnormalities; however, it is blamed for certain complications like hypotension, headache and neurologic deflcits[5]. For the first time in 1956, Vandam and Dripps[6] recorded hearing difficulties in 35 out of 10,098 patients following spinal anaesthesia in a controlled study; this was further reported by later studies[2,3,7]. The present study confirmed the significant audiometric changes following spinal anaesthesia in 70 out of 125 patients (56 percent) using different gauge needles and the hearing disturbances were observed with lower frequencies like 2 50-500 Hz only. The audiometric changes observed following spinal anaesthesia have been attributed to the decreased cerebro-spinal fluid pressure secondary to the C.S.F. leak through the punctured dura[2,6]. The aqueduct of cochlea was the anatomic channel transmitting the low C.S.F. pressure from subarachnoid space to the perilymph of the labyrinth[7], thereby leading to a fall in intralabyrinthine pressure followed by functional inability of the ears to transmit the high tones[10]. The present series confirmed the recent observations of Fog[3] that the post spinal hearing loss was inversely related to the size of spinal needle used and that this hearing loss becomes evident on the first post-spinal day. These audiometric changes are fully reversible, usually within 1 to 7 days.

CONCLUSION

In nutshell, the audiometric changes produced by spinal anaesthesia were transient and evident at lower frequencies; these changes were directly related to the size of needle - the larger the needle size, the more significant the audiometric changes occur. Hence, finer gauge spinal needles are strongly recommended for routine spinal anaesthesia. Furthermore, the audiometric changes may be more

sensitive indicator of CSP leak than headache, as these changes appear within 24 hours of spinal anaesthesia and disappear by the 5th postoperative day.

REFERENCES

1. Murphy, TM., Spinal, epidural and caudal anaesthesia, in anaesthesia. Edited by R.D. Miller. New York, churchill Livingstone, 1988,vol, 2, pp. 1061-1112
2. Wang. L.P., Fog. 3. and Bove, M. Transient hearing loss following spinal anaesthesia. Anaesthesia, 1987;42:1258-61.
3. Fog, J., Wang. L.P., Sundberg. A. and Mucohiano, C Hearing loss after spinal anaesthesia is related to needle size. Anaesth. Analg., 1990;70:517-22.
4. Goodman, V. Referente zero levels forpure tone audiometer. ASHA., 1965;7:262-63.
5. Rubin, A.P. Spinal anaesthesia, in principlea and practiceof regional anaesthesia. Edited by J.A.W. Wildamith and E.N. Armitage. Edinburgh. Churchill Livingatone, 1987, pp. 70-71.
6. Vandam, L.D. and Dripps, R.D. Longterm follow up of patients who received 10,098 spinal anaesthetics. Syndrome of decreased intracranial pressure (headache and ocular and auditory difficulties). JAMA., 1956; 161:586-91.
7. Arnvig. 3. Transitory decrease of hearing after lambar puncture. A personal experience which throwssomelighton the aqueduct of cochlea. Acts OtolaryngoL. 1963;56:699-705.
8. Wang, LP. Sudden bilateral hearing loss after spinal anaesthesia. A caae reporL Acts Anaesthesiol. Scand., 1986;30:412-3.
9. Hardy, P.A.J. Influence of spinal puncture and injection of vIIIth nerve function. 3. Lacyngol. Otol., 1988;102:452.
10. Hughaon, W. A note on the relationship of cerebroapinal and intralabyrinthine presaure. Am.J.Physiol., 1932; 101:396-407.