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Hearing Loss Preventions And Safety Of The Spinal Anaesthesia Which Performed At Two Different Levels

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Abstract

The effects on hearing of the spinal anesthesia which was performed at two different levels and safety of the procedures were examined.Forty patients at the ages between 20 and 33 without a previous hearing loss problem were divided into two groups which constituted of 20 individuals each. Spinal anesthesia was performed with 22 gauge Quinckle needles at the L4-L5 interspace in the first group, and at the L5-S1 interspace in the second group. The patients were hydrated with 500 cc saline solution during the intraoperative period, and with 2500 cc saline solution for a period of 24 hours post-operatively. The hearing thresholds were detected with a pure-tone audiometry on the pre and postoperative 1st, 2nd and 3rd days.Thirty-four patients were operated at the general surgery, and six at the urology clinics. The average age of the patients was 21.9. Any differences with respect to the hearing thresholds could not be demonstrated between the two groups.Spinal anesthesia is as a safe anesthetic technique which is currently being performed frequently. Despite the reports in the literature which claim that spinal anesthesia may cause hearing losses, no hearing losses occurred after the spinal anesthesia. In spite of these arguments, spinal anesthesia with a 22 G Quinckle spinal needle can be performed safely without any hearing loss. In our study as well as other studies, it is demonstrated that these hearing losses can be prevented by the pre- and post-operative hydration.

Key Words: Spinal Anaesthesia, Hearing Loss, Hydration, 22 gauge Quinckle needle

INTRODUCTION

Several procedures which impair the integrity of the dura may lead to hearing losses. It has been reported that temporary hearing losses may occur following lumbar punctures, myelograms, spinal anesthesia and other neurosurgical operations.[1-3] The hearing losses which arise in connection with spinal anesthesia usually occur in lower frequencies.

A dural puncture may lead to a temporary hearing loss by changing the balance of the fluid pressure within the neurological system. These losses develop due to the escape of the cerebrospinal fluids (CSF) through the spinal cord membranes during the procedures.[4] Dural puncture reduces the CSF pressure. This situation has an impact on the inner ear via the cochlear aqueduct.[5] As a result, the perilymph production increases, and endolymphatic hydrops develops, and consequently, temporary low-frequency hearing losses may occur.

It is argued that due to the pressure differences, during the spinal anesthesia performed at the lower levels, the amount of the CSF escape may be greater in proportion to the higher levels. In this study, spinal anesthesia was performed at different levels and hearing levels in the patients was examined. We aimed to investigate the safety of two different levels spinal anaesthesia and the role of hydration and 22 gauge (G) Quinckle needles on hearing protection as an preventing therapy.

MATERIALS AND METHODS

Our study was carried out 40 male patients with physical conditions ASA I and II upon the approval of GATA Ankara Ethical Committee and the written/signed consents of the patients were received. The patients were fully examined before the surgical interventions. The tympanic membranes were evaluated. The complete blood counts and biochemical tests were performed on the patients. One day prior to the surgical intervention, the hearing threshold levels of the patients were evaluated by pure-tone audiometry which was performed at frequencies between 250 and 8000 Hz.

The patients who had undergone middle ear and/or mastoid bone surgeries in the past and the patients who had neurological diseases, cranial nerve pathologies and nystagmus were excluded from the study. The patients with anemia, diabetes mellitus, or hypercholesterolemia, and the patients whose liver and/or kidney function tests demonstrated any pathologies were also excluded from the study. The patients with otosclerosis, Menier disease and genetic diseases were also excluded from the study together with the patients who had hearing losses greater than 25 dB and the ones with ototoxic medication intake histories.

The patients were divided into two groups as “prospective”, “randomized” and “single-blind.” Spinal anesthesia with bupivacaine with 10 mgs was administered by 22G needles at the L4-L5 interspace in the first group, and at the L5-S1 interspace in the second group, single blinded. During the course of the procedures, the partial oxygen pressures and pulses of the patients were monitored continuously and their arterial blood pressures were monitored every 5 minutes by non-invasive methods. The patients were hydrated with 500 cc saline solution during the intraoperative period, and with 2500 cc saline solution for a period of 24 hours post-operatively.

On the post-operative 1st, 2nd and 3rd days, the hearing thresholds of the patients were measured by an Interacoustic AC-33 (Denmark) model audiogram at the frequencies between 250 and 8000 Hz. Each ear was evaluated separately.

The data were evaluated by the statistical analysis program SPSS 16.0. During the comparison of the socio-demographic data between the groups, student's t-test was performed for the continuous variables, and chi-square test for the discontinuous variables. The pre-operative and post-operative mean hearing level values between the two groups were evaluated

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Table 1: Demographical Data (MN±SD)

	Age	Height (cm)	Weight (kg)
Group 1 (n=20)	20,8±0,77	175±5,5	77±3,3
Group 2 (n=20)	21,7±2,7	172±4,2	79±2,1

Table 2: Hearing thresholds

		Group I (n=20)				Group II (n=20)			
		Preop	Postop1	Postop2	Postop3	Preop	Postop1	Postop2	Postop3
FREQUENCY	250	17.5±5.9	16.3±5.9	17.3±6	17.5±6.8	18.8±7.2	17.8±5.4	17.8±5.4	17.8±5.4
	500	18.3±4.2	16.2±5	16.5±5	16.2±5.1	19±5.4	17.5±5.1	17.5±5.1	18.2±5
	1000	12.7±4.6	10.5±3.7	11.6±4.7	11.5±4.6	13.1±5	13.2±4.8	13.2±4.8	13.8±4.7
	2000	11.2±4.6	10.3±3.9	10±4.3	10±5	10.6±4.4	10.2±5.1	10.1±5.3	11±4.6
	4000	12.1±4.9	9.7±4	10±4.6	10.8±5.4	10.8±4.2	11.6±4.8	11.6±4.8	11.7±4.8
	6000	12.8±5.8	12.3±4.5	12.6±4.2	13.7±5.8	12.1±5.6	12.8±4.2	12.8±4.2	13.5±5.9
	8000	11.8±4.7	13.6±7.5	11.8±5.9	11.8±6.3	11.3±5	14±5.2	14±5.2	14±5.2

by the student's t-test, and the assessments of the within-group variables were performed by the t-test in the dependent groups. The results were presented as mean ± standard deviation (MN ± SD). And p value below 0.05 was accepted as significant.

RESULTS

All patients were complete study. Thirty four of these patients were operated for reasons regarding the domain of the general surgery, and 6 due to urologic pathology reasons. No difference could be demonstrated between the two groups with respect to the demographical data (p>0.05) (Table 1).

The average pre-operative and post-operative hearing thresholds of both groups which were measured at the frequencies between 250 and 8000 Hz are presented in the Table 2. In both groups, no difference could be demonstrated between the preoperative hearing thresholds and postoperative hearing thresholds (p>0.05); moreover, no difference could be detected between the two groups with respect to the hearing thresholds (p>0.05). In both groups, no differences between the preoperative hearing thresholds and postoperative hearing thresholds were monitored; furthermore, any difference was not also revealed between the two groups regarding the hearing thresholds.

DISCUSSION

Spinal anesthesia is one of the most commonly used regional anesthetic techniques. Although it is accepted as a safe technique, there are publications in the literature which assert that it may cause temporary or permanent hearing losses.[1,2,7]

Since the reduction of the CSF pressure was held responsible for the hearing losses, it was suggested that such losses might be minimized by intraoperative fluid replacement. Schaffartzik et al,[8] demonstrated that there is a significant relationship between the intraoperative fluid replacement and low-frequency hearing losses, and the hearing losses may be prevented by proper intraoperative fluid replacement.

Gultekin et al,[10] carried out another study on two different patient groups, one consisting of 25 patients at ages under 30, and the other consisting of 25 patients at ages over 60, with the intention of demonstrating that the hearing losses could be observed more severely and frequently in the younger patient group. The study results revealed that the hearing losses were observed more frequently in the younger patient group, and it was concluded that the lower incidence of the hearing losses in the older patient group was due to the lower CSF escape risk in this patient group. Ok et al [11] measured the hearing levels of 60 patients ranging from 20 to 40 years of age before and after the spinal anesthesia, and they could not demonstrate any hearing loss in the younger patient population. We also did not detect any hearing losses among our patients whose average age was 21.9.

Several factors which may lead to hearing losses during the spinal anesthesia have been researched. The CSF escape was brought forward as the main cause of the hearing loss. The diameter of the needle used for the spinal anesthesia has also been subject to researches. Kilickan et al have reported that both in the patients who underwent spinal anesthesia performed with 22 G Quinckle needles, and in the group that underwent spinal anesthesia performed with 25 G Quinckle needles, low-frequency hearing losses were demonstrated; however, they did not define these findings as statistically significant. They revealed a positive correlation between the increased epidural pressure and the low-frequency hearing losses, and they have linked this situation with the reduced risk of the CSF escape through dura [6].

Malhotra et al [7] have divided their patients into two groups constituting of 40 individuals per group, and they performed spinal anesthesia with 22 G Quinckle needles in the first group, and with 25 G Quinckle needles in the second group. They suggested that the usage of sharp-point needles instead of the blunt-point ones is important for the prevention of the hearing loss. In our study, the spinal anesthesia was performed with 22 G Quinckle needles, nevertheless no significant differences between pre-operative and post-operative hearing thresholds were detected in the patients (p>0.05).

In their study carried out on two groups of patients which constituted of 22 individuals, following the administration of spinal anesthesia by using 6 mL 2% prilocaine to the 1st group, and 3 mL 0.5% bupivacaine to the 2nd group, Gultekin et al [9] did not observe any significant hearing losses between the groups. In our study, we also used 0.5% bupivacaine as an anesthetic and any hearing loss did not occur in any of our patients.

CONCLUSION

Spinal anesthesia is as a safe anesthetic technique which is currently being performed frequently. Despite the reports in the literature which claim that spinal anesthesia may cause hearing losses, no hearing losses occurred after the spinal anesthesia. In spite of these arguments, spinal anesthesia with a 22 G Quinckle spinal needle can be performed safely without any hearing loss. In our study as well as other studies, it is demonstrated that these hearing losses can be prevented by the pre- and post-operative hydration

REFERENCES

1. Nakaya M, Morita I, Horiuchi M. (2005) Recurrent hearing loss after myelography treated with epidural blood patch. Auris Nasus Larynx. 2005 Dec;32(4):399-401. Sep 23.
2. Kilickan L, Gurkan Y, Ozkarakas H. Permanent sensorineural hearing loss following spinal anesthesia. Acta Anaesthesiol Scand. 2002 Oct;46(9):1155-7.
3. Fog J, Wang LP, Sundberg A, Mucchiano C. Hearing loss after spinal anesthesia is related to needle size. Anesth Analg. 1990 May;70(5):517-22.

4. Gultekin S, Ozcan S.Does hearing loss after spinal anesthesia differ between young and elderly patients? Anesth Analg. 2002 May;94(5):1318-20, table of contents.
5. Cosar A, Yetiser S, Sizlan A, Yanarates O, Yildirim A.Hearing impairment associated with spinal anesthesia. Acta Otolaryngol. 2004 Dec;124(10):1159-64.
6. Kilickan L, Gurkan Y, Aydin O, Etiler N. The effect of combined spinal-epidural (CSE) anaesthesia and size of spinal needle on postoperative hearing loss after elective caesarean section. Clin Otolaryngol Allied Sci. 2003 Jun;28(3):267-72.
7. Malhotra SK, Joshi M, Grover S, Sharma SC, Dutta A.Auditory function following spinal analgesia. Comparison of two spinal needles. Eur J Anaesthesiol. 2002 Jan;19(1):69-72.
8. Schaffartzik W, Hirsch J, Frickmann F, Kuhly P, Ernst A. Hearing loss after spinal and general anesthesia: A comparative study. Anesth Analg. 2000 Dec;91(6):1466-72.
9. Gultekin S, Yilmaz N, Ceyhan A, Karamustafa I, Kilic R, Unal N. The effect of different anaesthetic agents in hearing loss following spinal anaesthesia. Eur J Anaesthesiol. 1998 Jan;15(1):61-3.
10. Gultekin S, Ozcan S.Does hearing loss after spinal anesthesia differ between young and elderly patients? Anesth Analg. 2002 May;94(5):1318-20
11. Ok G, Tok D, Erbuyun K, Aslan A, Tekin I.Hearing loss does not occur in young patients undergoing spinal anesthesia. Reg Anesth Pain Med. 2004 Sep-Oct;29(5):430-3.