Vasodilator and Vitamins in Therapy of Sensorineural Hearing Loss Following War-related Blast Injury: Retrospective Study

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Aim. To establish whether a better recovery of the sensorineural hearing loss can be achieved by systemic administration of a vasodilator and vitamins in a saline infusion immediately after a blast injury.

Methods. Retrospective analysis included 134 patients with pure sensorineural hearing loss after blast injury (a total of 192 injuries), who were treated between 1991 and 1995. A group of 82 patients (119 injuries) was treated with 250 mL infusion of saline containing vitamins and pentoxifylin, whereas the other group (52 patients or 73 injuries) did not receive any therapy.

Results. The patients who received infusion therapy with vitamins and pentoxifylin showed no better hearing recovery than the patients who did not receive any therapy. There was no statistically significant difference between the groups in the average values of the sensorineural hearing recovery (p=0.315).

Conclusion. Therapy with vitamins and pentoxifylin does not improve recovery of sensorineural hearing loss caused by blast injuries of the internal ear.

Key words: blast injuries; hearing loss, sensorineural; hearing loss, noise-induced; pentoxifylline; vitamins
phic examinations. The remaining 134 patients (192 injuries) with pure sensorineural hearing loss were included in the analysis.

Treatment

There were 82 patients (119 injuries) in the group that received treatment, which consisted of 250 mL saline infusion with a vasodilator pentoxifylline 100 mg, (Pentilin, Krka, Novo Mesto, Slovenia), and the following vitamins: thiamin (B1 vitamin) 250 mg (Pliva, Zagreb), pyridoxine-chloride (B6 vitamin) 250 mg (Pliva, Zagreb), and ascorbic acid (C vitamin) 1,000 mg (Pliva, Zagreb). The therapy was started within the first two days from the blast injury and continued for 10 days. Patients who were to be hospitalized at our Department for less than 10 days (i.e., transferred to other departments for the treatment of other injuries) were not administered the therapy because it would have been interrupted. There were 52 patients (73 injuries of the internal ear) who did not receive any therapy and they formed the control group.

Statistics

Values of the sensorineural hearing loss recovery were tested for normal distribution with one-sample Kolmogorov-Smirnov test and were found to be non-Gaussian (p<0.001, p=0.004). All statistical analyses (descriptive statistic, Kolmogorov-Smirnov test, Mann Whitney test) were made using SPSS for Windows Version 8.0 computer program (11). P-values of <0.05 were considered statistically significant.

Results

The frequencies of 3,000 Hz, 4,000 Hz, 6,000 Hz, and 8,000 Hz were most often affected by the blast injury of the internal ear (Fig. 2) and also more severely damaged than lower frequencies (Fig. 3).

In patients with internal ear injuries who did not undergo any therapy (control group), the average value of the sensorineural hearing loss on all 9 frequencies (between 250 Hz and 8 kHz) measured within the first 2 days from the blast injury was very similar to the average value found in the group of treated patients (24.9±12.4 vs 27.3±9.5, respectively). Six months and more after the therapy, when the final effects of the blast injury to the internal ear develop, the average value of the sensorineural hearing loss in the group of patients who received the therapy improved by $7.0 \pm 9.7$ dB compared with the value before the therapy (Fig. 4). The average value of sensorineural hearing loss six months and more from the blast injury in the group of patients who received no therapy was $6.8 \pm 6.2$ dB better than immediately after blast injury (Fig. 5). However, the difference between the groups was not statistically significant ($T = -1.004$, $p = 0.315$, Mann Whitney test).

Discussion

Sensorineural hearing loss after a blast injury is caused by internal ear damage (2,3). In the process of recovery of sensorineural hearing loss, circulation and oxygen availability could play a role (7-10,12). Lamm et al (12) showed that oxygen partial pressure in scala tympani was lower after blast injury. Experi-
Mental data on the pharmacology of the inner ear showed that better circulation could induce better recovery of sensorineural hearing loss after sudden deafness due to an acoustic trauma (7). Also, some other authors claimed that better recovery of sensorineural hearing loss could be achieved if infusion therapy with vitamins and vasodilators or hyperbaric oxygenation therapy was administered immediately after the blast injury (7-10).

In our study, we did not find evidence that the hearing loss recovery in patients who received the infusion therapy with vasodilator and vitamins was any better than in the patients who did not receive any therapy, notwithstanding the fact that the therapy began within the first two days from the blast injury, or immediately after the initial audiological testing. Our finding that saline therapy with vasodilator and vitamins was not efficient in cases of sensorineural hearing loss caused by the blast injury of the internal ear is in concordance with findings in some previous studies performed on a smaller number of patients (13). Our study had all limitations of a retrospective study. More convincing results could have been produced by a prospective randomized placebo-controlled study on the same number of patients. However, this was not possible because of the emergency of a whole situation and high number of the wounded during the war. Thus we could not achieve proper randomization or placebo-control. Nevertheless, patient allocation to either control or treatment group was biased rather to the beneficial effect of treatment with vasodilators and vitamins than to no effect. Control, no-treatment group was composed of patients that were in a more serious medical condition and had other injuries that needed further and urgent treatment, whereas the treatment group stayed at our Department.

We diagnosed more pure sensorineural and less conduction hearing losses that some other authors (14,15). This can be explained by the timing of audiometry in our patients. Spontaneous healing of sensorineural blast injury is very intensive during first few days after injury infliction, as opposed to spontaneous healing of conductive blast injury (eardrum rupture), which usually takes a few weeks. If audiometry is not performed within the first two days after injury, some sensorineural injuries may not be detected. More than half of our patients had audiometry within the first two days after injury, which may account for a higher rate of sensorineural loss.

In conclusion, our study on a large number of patients, despite its limitations, showed that war-related blast injury to the internal ear follows its natural course of healing regardless of the adjuvant therapy with vasodilators and vitamins.

References

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