Results

During the period from (1982-1985) 100 cases fulfilling the above criteria were selected for this study.

Age Distibution:

The age of our patients ranged between 23 and 44 years with a mean at the group of 30-40 years. The distribution of the motorial recording to the age is shown in table 2

Age (years)	Number of cases
20-30	12
31-40	70
41-50	18

Table 2: Age Distibution of patients

Sex Distribution:

We performed stapedectomy operation for 64 females and 36 males.

Symptoms:

All the patients presented with bilateral progressive diminution of hearing. the average duration of hearing loss before the operation ranged between 3 and 12 years with an average of 5 years (Fig. 7). No symptom of

vestibular dysfunction was experienced by any patient.

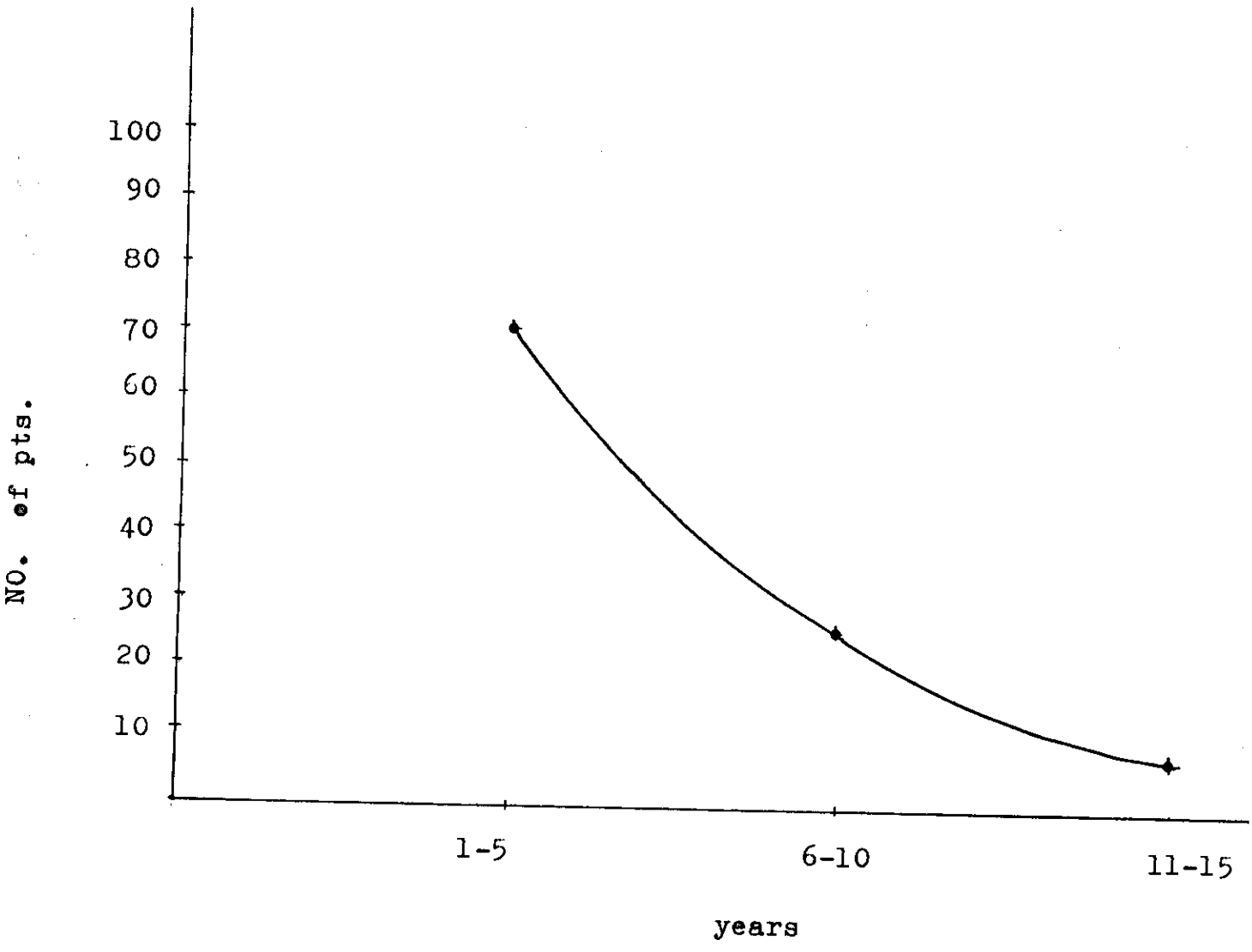


Fig. 7: Duration of Hearing Loss.

Pre-operative audiological results

The audiometric results in our study were "age corrected" in order to eliminate the effects of presbyacusis on the hearing threshold level. This is to prevent contamination of our results by the hearing loss from presbyacusis. This loss, as determined by Nauton and Valvassori (1969) was substracted from the total sensorineural hearing level of the patient e.g. 5 dB was substracted from the total hearing loss at 4000 HZ for patients between 30-39 years and 15 dB was substracted for patients between 40-49 years (table 1).

The preoperative hearing results of the operated ears are shown in table 3 and Fig. 8. The mean hearing levels by bone conduction at frequencies 500, 1000, 2000, 4000 Hz are given in table 3 while Fig. 8 represent, the hearing results as an audiogram.

The mean of the average hearing threshold levels at the 4 frequencies was 17.6 dB. Similarly, the preoperative audiological reuslts of the non-operated ears are presented in table 4 and Fig. 9. The mean of the average hearing threshold level by bone conduction at the four frequencies 500, 1000, 2000, 4000 Hz was 13.8 dB. The mean hearing levels at these frequencies are shown in

table 4 and are plotted as an audiogram in Fig. 9.

Table 5 shows the difference at each frequency and at the average of the 4 frequencies between the mean preoperative hearing threshold levels by bone conduction of the operated and non operated ears.

Fig. 10 presents the corresponding audiogram. The difference is statistically insignificant at all frequencies. Likewise, the difference between the mean of the average hearing threshold level at the 4 frequencies is statistically insignificant ($P < 0.001$).

Hz	B.C. Threshold
500	13.2
1000	14.6
2000	30.1
4000	21.0

Table (3)
The mean preoperative B.C. hearing.
Threshold (in dB) in the operated ear.

Hz	B.C. Threshold
500	10.8
1000	12.9
2000	25.7
4000	17.2

Table (4)
The mean preoperative B.C. hearing.
Threshold (in dB) in the non operated ears.

	Operated ears	Non operated ears
500	13.2	10.8
1000	14.6	12.9
2000	30.1	25.7
4000	21.0	17.2
average	17.6	13.8

Table (5)
The mean Preoperative B.C. hearing
threshold (in dB) of the operated and non operated ears

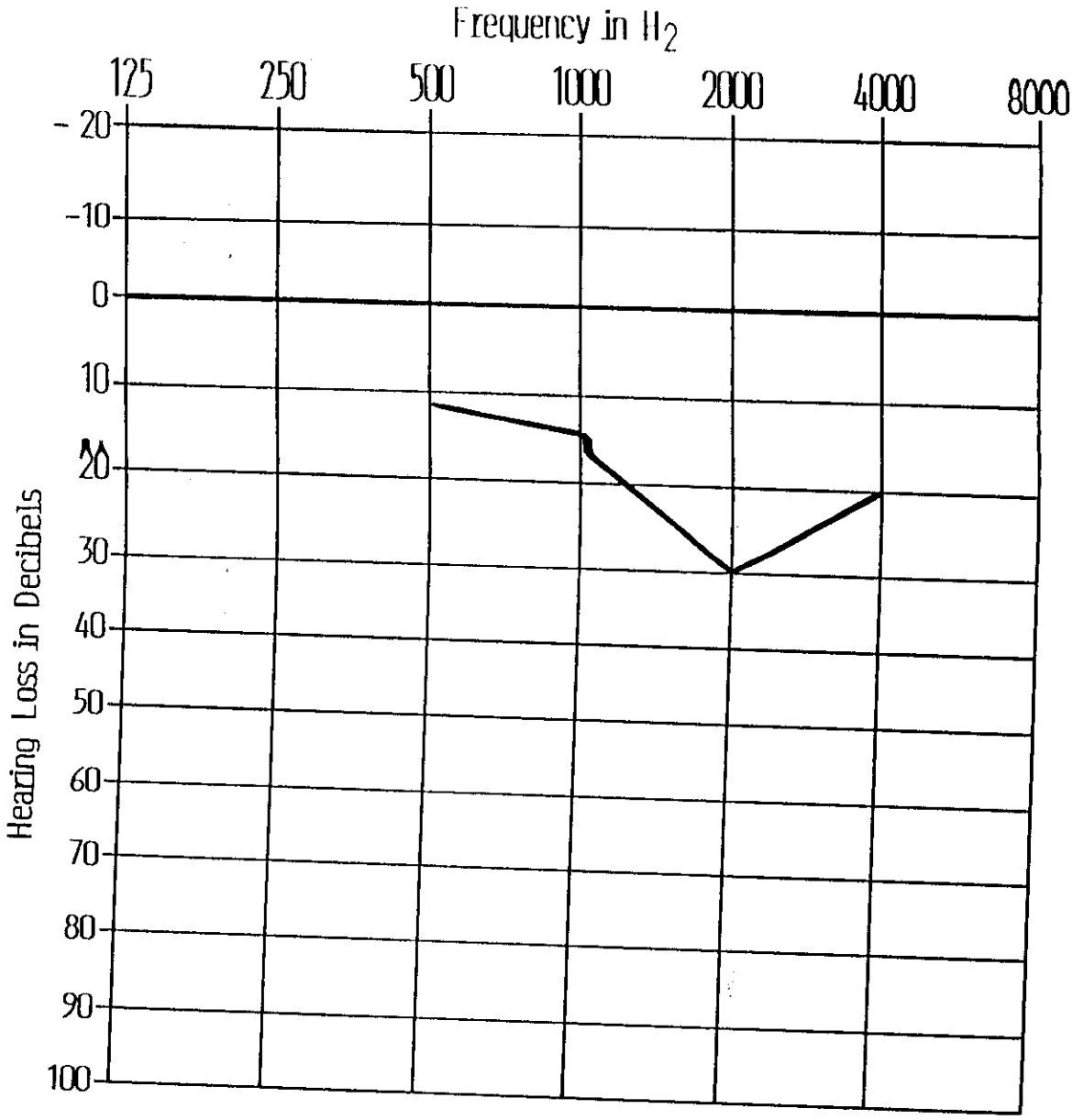


Fig. 8: The mean preoperative B.C. audiogram of the operated ears.

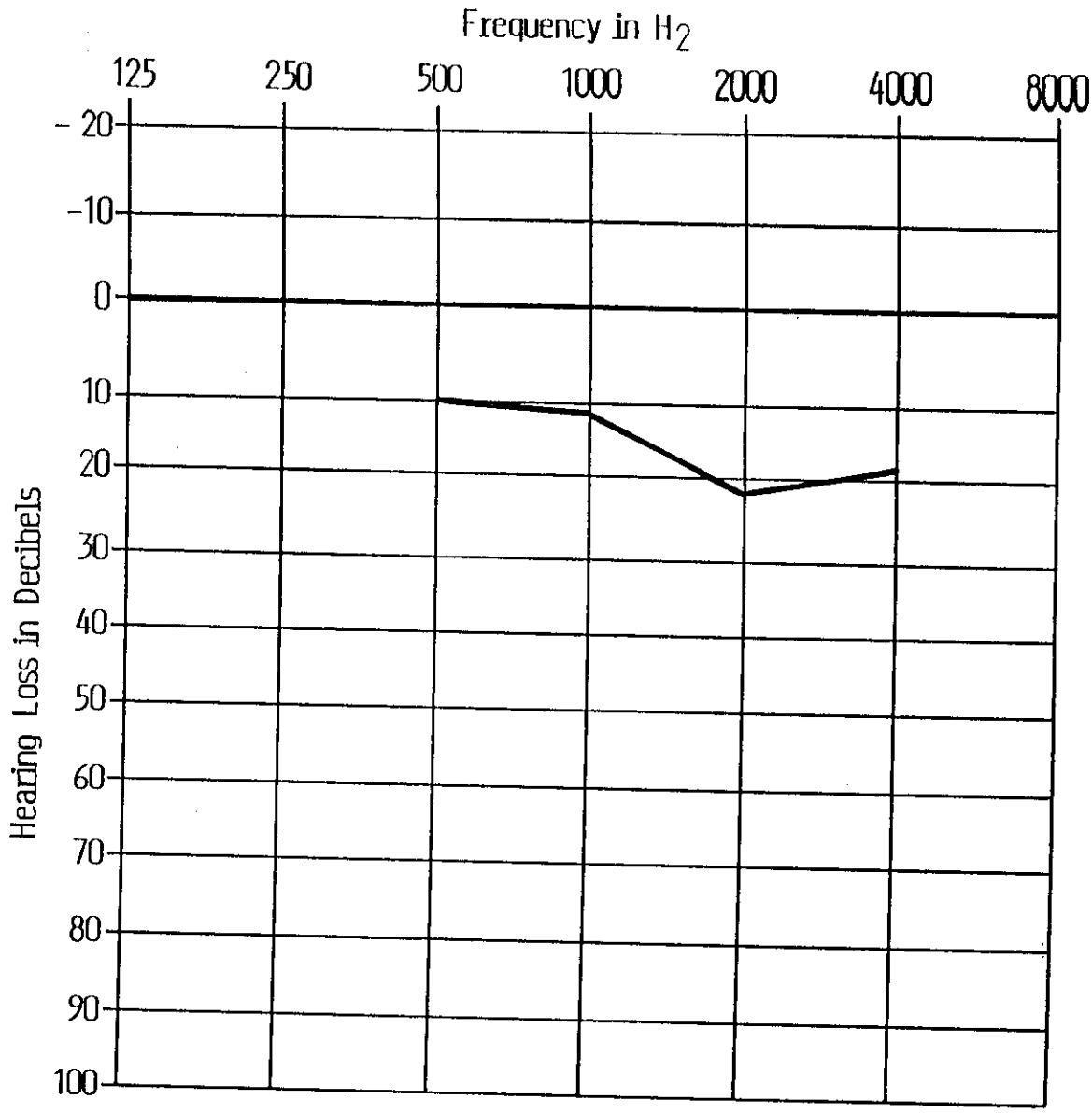


Fig. 9: The mean preoperative B.C. audiogram of the non-operated ears.

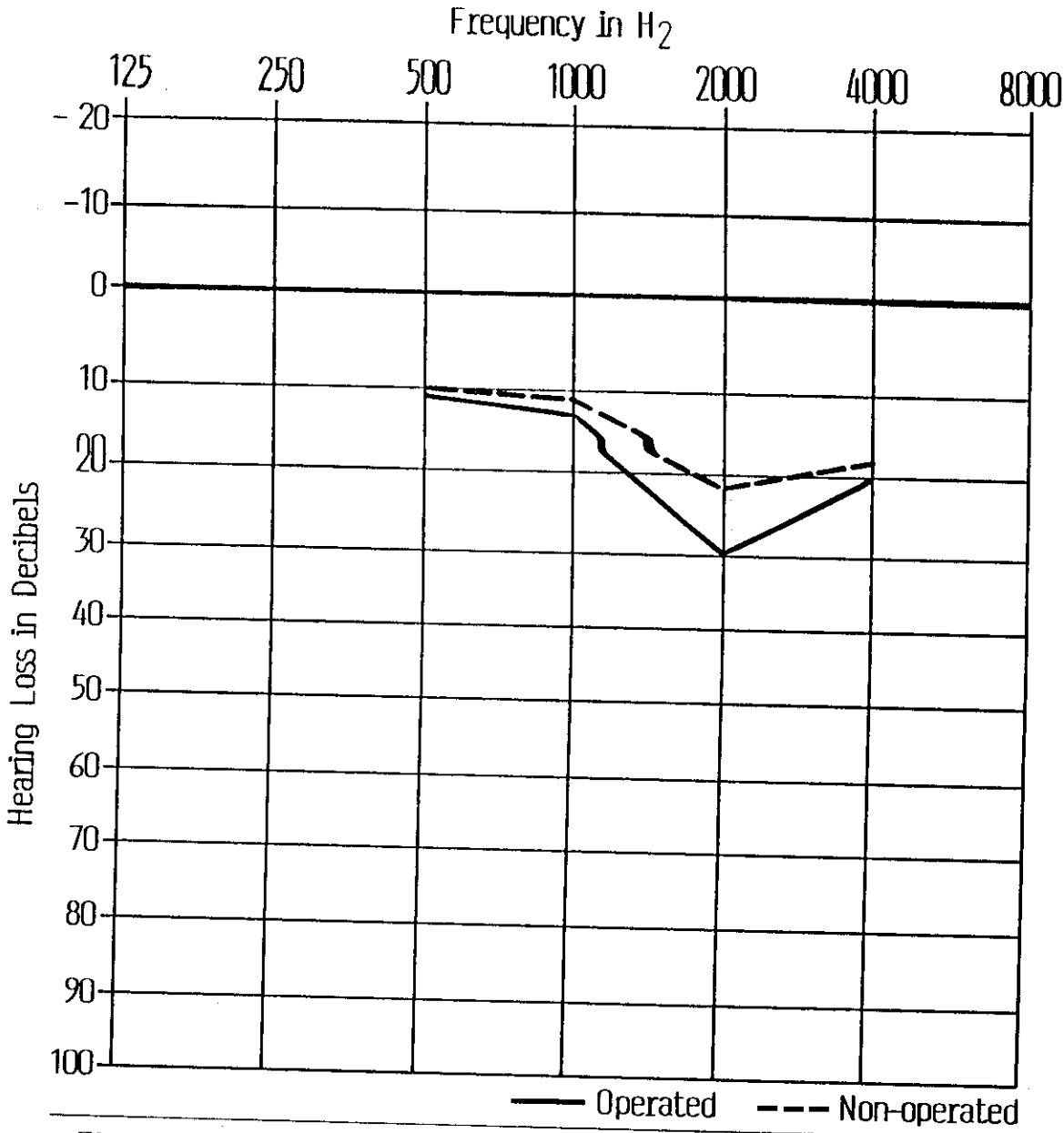


Fig.10: The mean preoperative B.C. audiogram of the operated and non-operated ears.

Postoperative Vertigo

Vertigo was the main postoperative complaint in all patients. Accordingly, we have classified the patients into 4 groups.

(1) Vertigo lasting for only 72 hours.
(2) Vertigo lasting for 4-7 days.
(3) Vertigo lasting for 2-4 weeks.
(4) Vertigo lasting for 1-3 months.

Thirty seven of our patient (i.e. 37%), had postoperative vertigo for more than 72 hours. But, it persisted till the end of the first week in only 7 patients.

Three months after the operation, two patients complained of attacks of vertigo lasting for seconds on rapid head movement. However, it was not disabling (Table 6).

vertigo lasting for 72 hours	vertigo lasting for 4-7 days	vertigo lasting for 2-4 weeks	vertigo lasting for 1-3 months
63 cases	30 cases	3 cases	4 cases

Table (6)

Duration of postoperative vertigo

In the first post-operative day, vertigo was associated with nausea in 91 cases and Vomiting in 17 cases. Nausea persisted to the third day only in 6 cases. While only one patient complained of persistent vomiting.

Vomiting disappeared thereafter, while nausea was annoying till the end of the first week in one patient who had C.S.F. leakage during the operation.

Postoperative Audiological Results

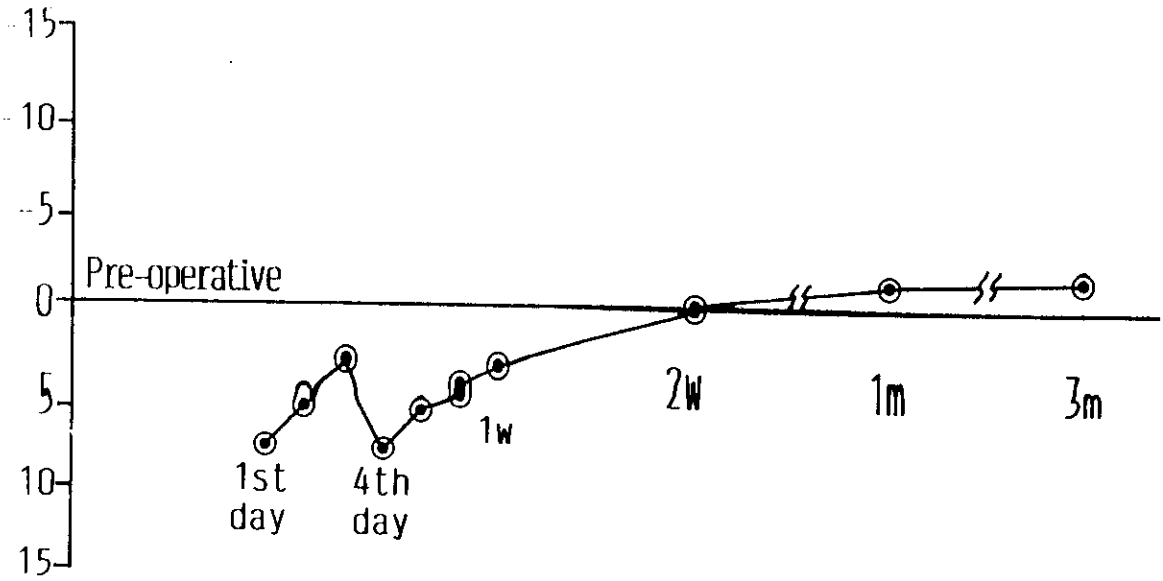
Figure 11 (a/b/c/d), shows the mean values of postoperative bone conduction hearing threshold in the operated ears of all subjects through the 4 speech frequencies (500, 1000, 2000, 4000 Hz) after 1,2,3,4,5,6,7 days, 2 wks, 1 months and 3 months.

For Purpose of comparison, the preoperative and 3 months postoperative mean B.C. hearing threshold for the operated ears of all subjects are plotted in Fig. 12 and Table 7.

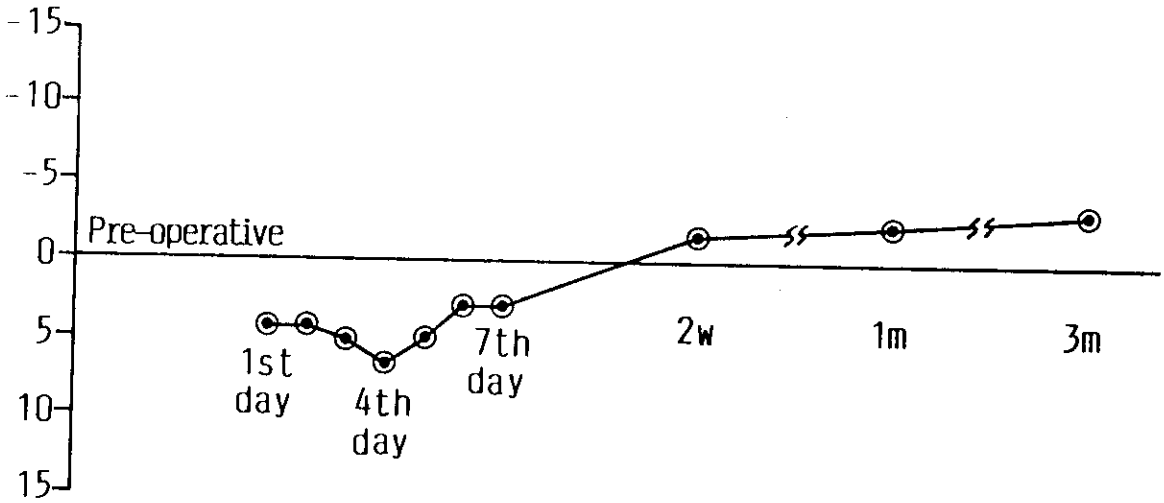
	Pre-operative	3 months Post-operative
500	13.2	11.3
1000	14.6	10.8
2000	30.1	21.6
4000	21.0	23.1

Table (7)
The mean preoperative and 3 months postoperative B.C. hearing threshold. in dB.

Ⓐ 500Hz



Ⓑ 1000Hz



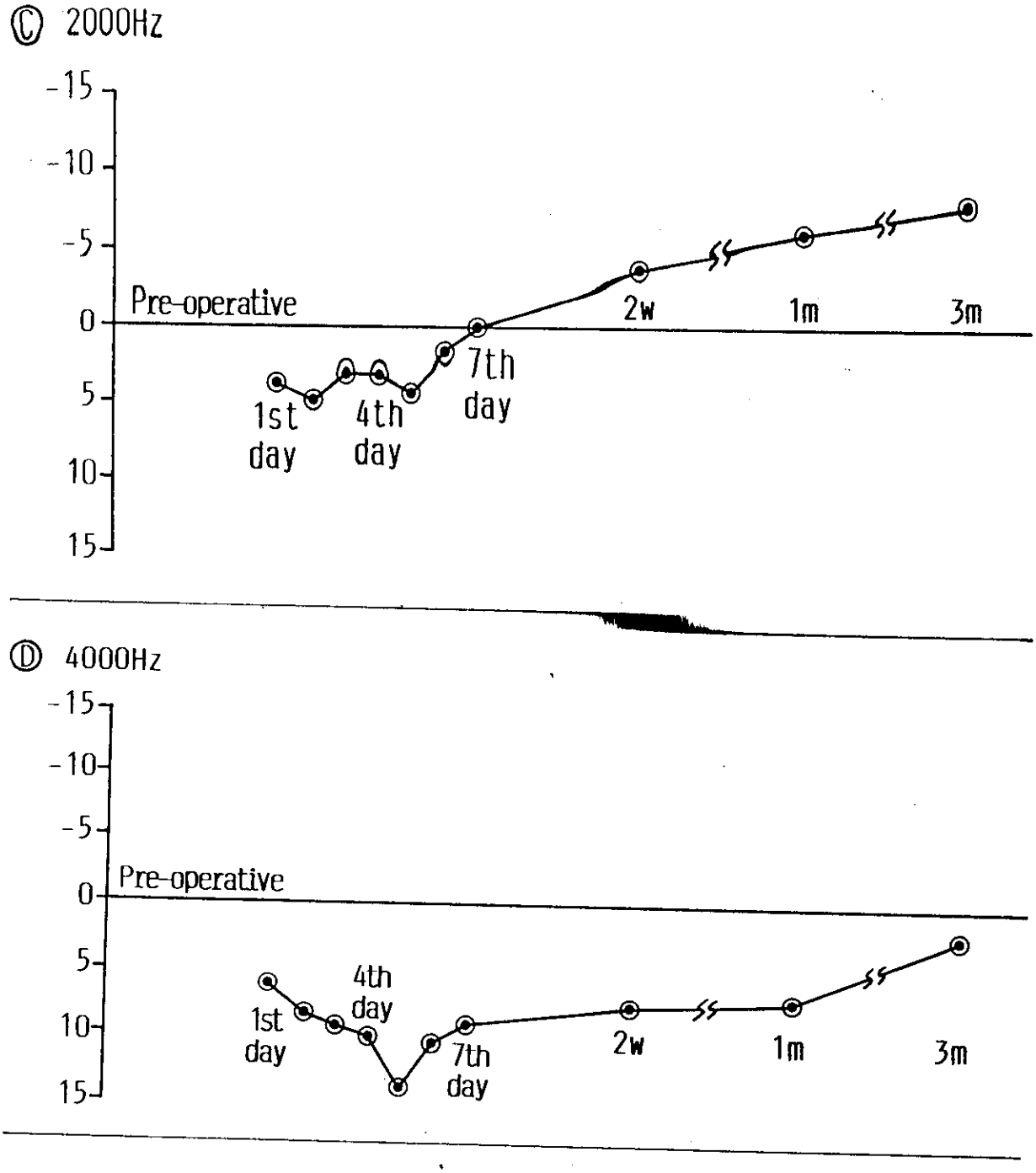


Fig. (11): Mean post-operative decibel changes in B.C. threshold at (500, 1000, 2000, 4000 Hz).

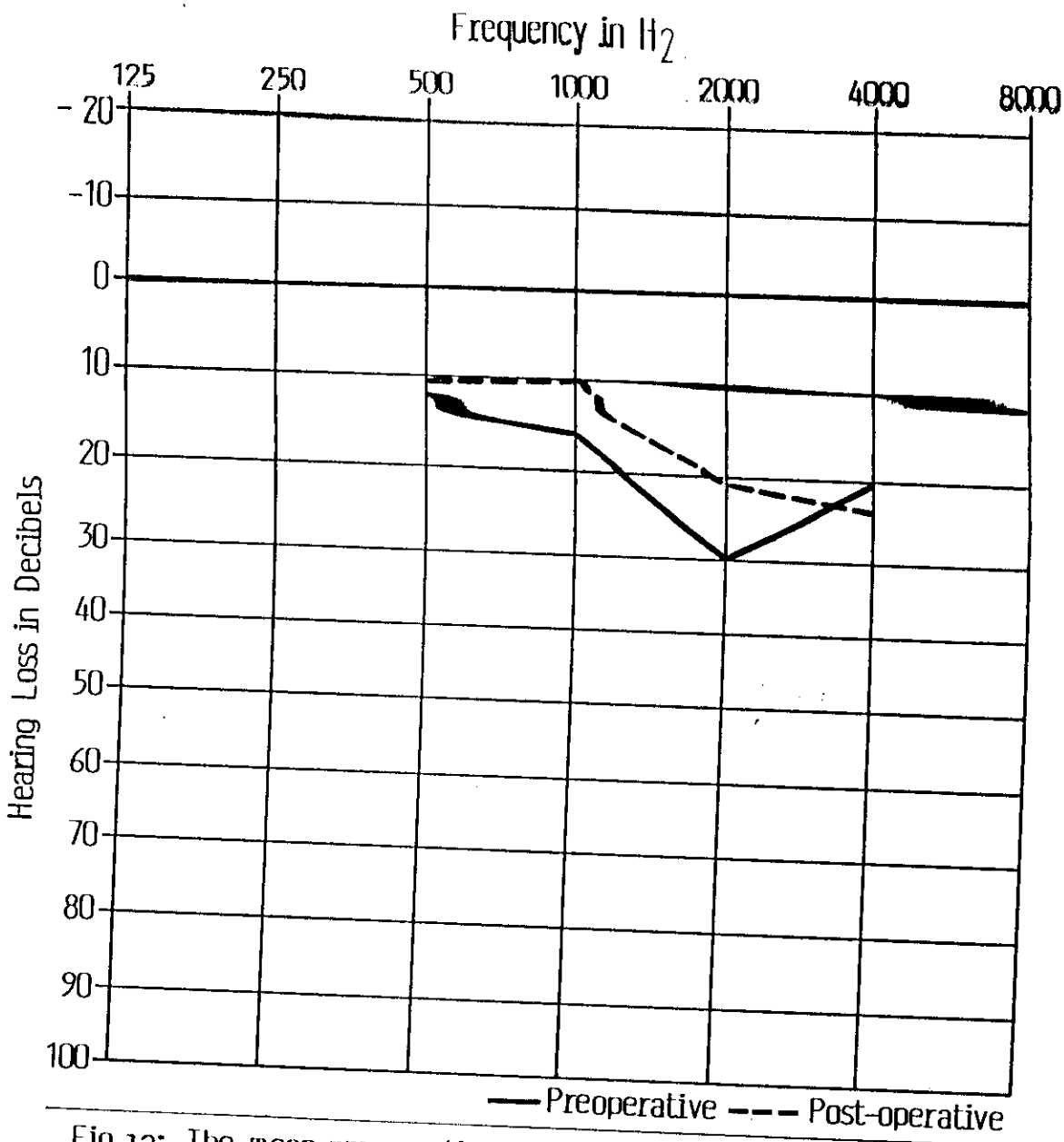


Fig.12: The mean preoperative and 3 months post operative B.C. audiogram of all patients.

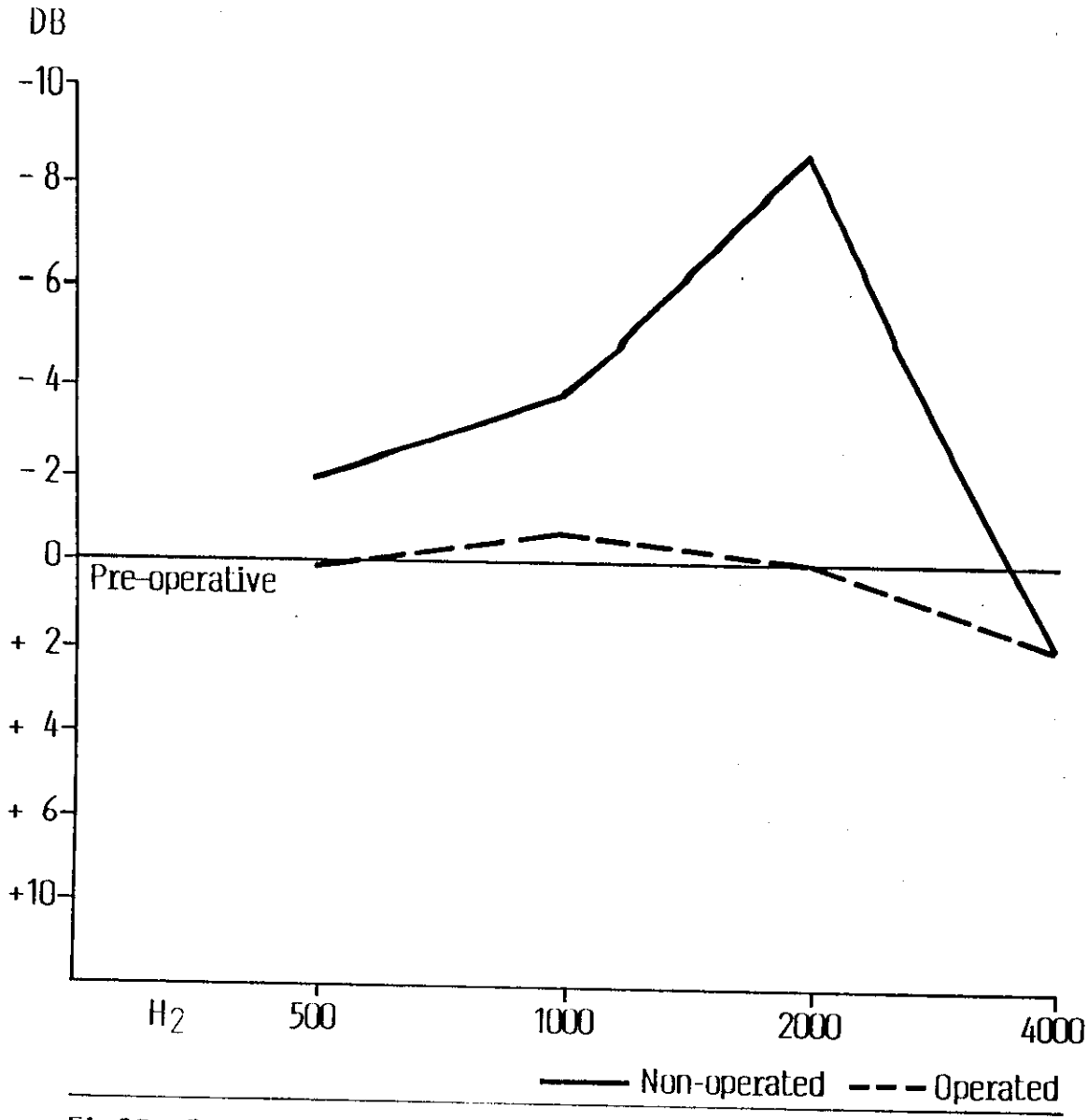


Fig.13: Compares the changes in B.C. threshold for all subjects in the non-operated and operated ears 3 months after the operation in the 4 speech frequencies (500, 1000, 2000, 4000 H_2).

Post Operative Vestibular Function Tests Results

(1) Spontaneous Nystagmus:

Sixteen patients had spontaneous nystagmus after the operation Table 8 shows the direction of spontaneous nystagmus in relation to the operated ear, 12 had nystagmus towards the operated ear and 4 had nystagmus toward the unoperated ear.

Nystagmus toward the operated ear	12
Nystagmus toward the non-operated ear	4
Total	16

Table (8)
Postoperative spontaneous nystagmus

(Table 9) shows the relationship between the duration of vertigo and spontaneous nystagmus.

	Vertigo lasting for 72 hours	Vertigo lasting for 4-7 days	Vertigo lasting for 2-4 wks	Vertigo lasting for 1-3 months	Total
Spontaneous nystagmus present	5	8	1	2	16
Spontaneous nystagmus absent	58	22	2	2	84

Table (9)

Relationship between Vertigo and spontaneous nystagmus

(2) Positional Nystagmus:

The results of the positional tests are shown in Fig. 14. On the first postoperative day, 13 patients showed positive tests, whereas on the second day 60 patients, and on the third day 56 patients subsequently, the number decreased rapidly and on the 7 th day only 8 patients had positive tests. The positional nystagmus of these 8 cases persisted till the end of the second week, 3 patients till the end of 4 weeks and 3 patients remained with positive tests till the end of the third month.

Therefore, 70 patients had positive positional nystagmus at some time.

In 22 cases, nystagmus persisted for more than 5 days after its onset, while in 48 it disappeared within 5 days. In all the 70 cases with positive positional tests, exept 6, nystagmus was directed towards the operated ear. The exception were 5 cases with nystagmus directed toward the non operated ear and one case with direction changing nystagmus.

(3) Caloric test:

The Hallpike caloric test performed 3 months after the operation revealed that 4 patients had complete canal paresis. Six patients had partial canal paresis. Direction preponderance was not calculated because it has recently proved to be of unclear diagnostic value. i.e. 10 patients had caloric abnormalities.

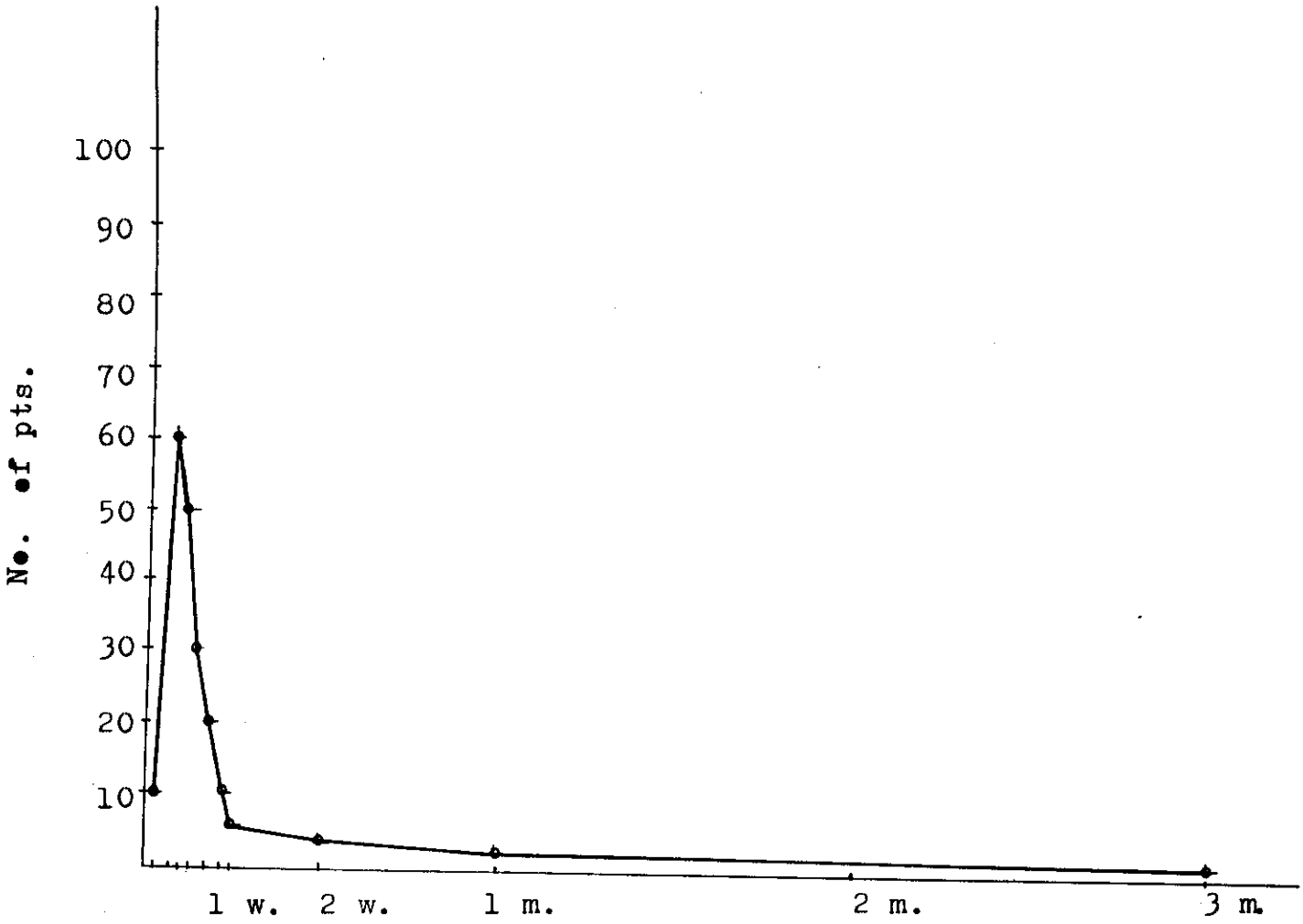


Fig. 14: Results of Positional Tests.

Correlation of Postoperative Cochlear and Vestibular Functions

(1) Relationship between Vertigo and Cochlear Function: Postoperative vertigo of our cases was divided into 4 groups:

(1) Vertigo lasting for 3 days.

(2) Vertigo lasting for 4-7 days.

(3) Vertigo lasting for 2-4 weeks.

(4) Vertigo lasting for 1-3 months.

(Fig. 15) gives the mean change in postoperative B.C. Threshold in the 4 groups after 3 months.

(2) Relationship Between Spontaneous Nystagmus and Cochlear Function:

The mean changes in B.C. threshold 3 months after operation for patients with Spontaneous nystagmus at sometimes during the observation period (16 cases) and the other 84 patients are plotted in (Fig. 16).

Fig. 17 presents the changes in postoperative B.C. threshold at 3 months of cases with early spontaneous nystagmus towards the operated ear and towards the non-operated ear.

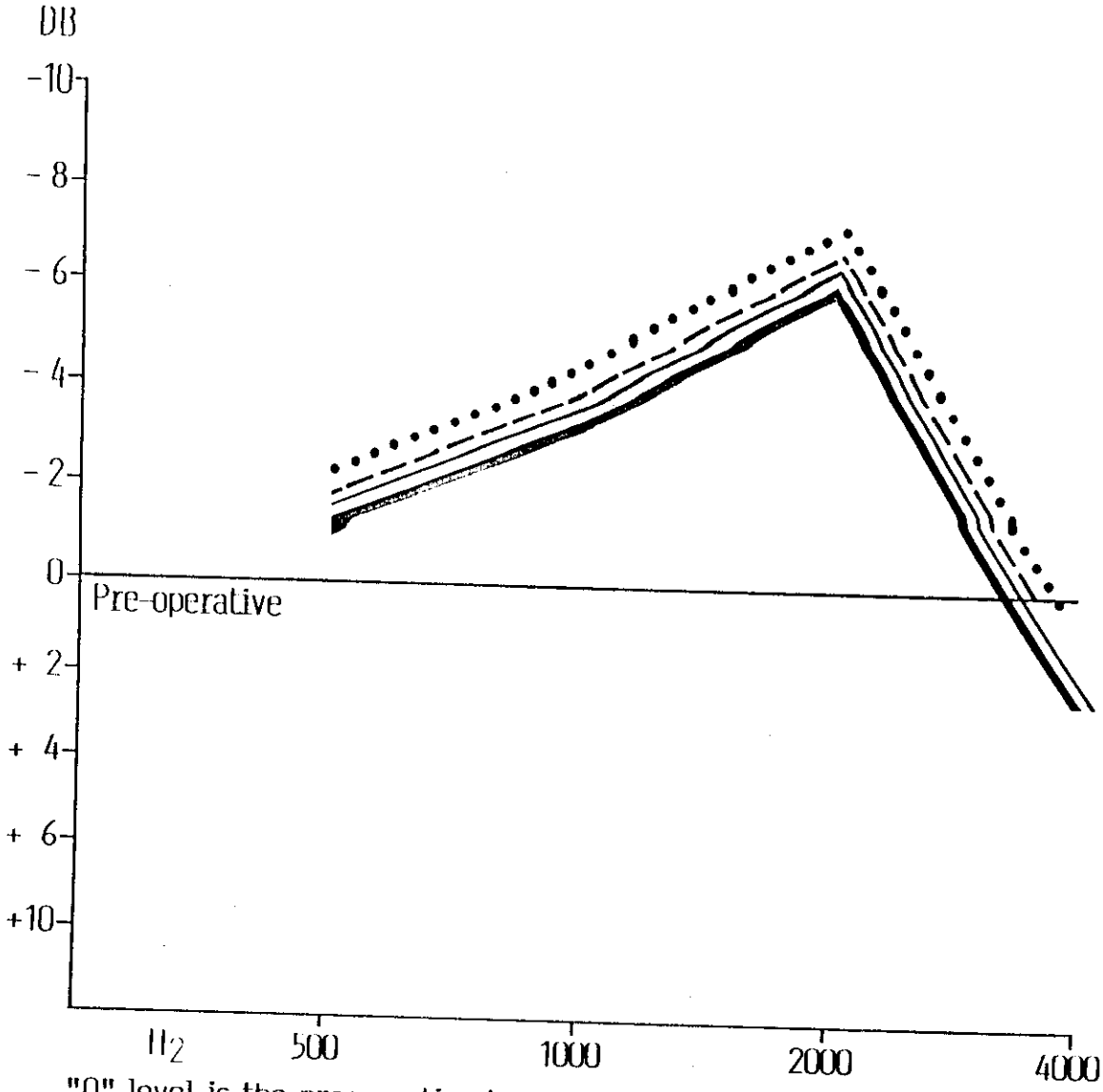


Fig.15: The mean decibel changes in B.C. threshold 3 months after the operation for the 4 groups of vertigo.

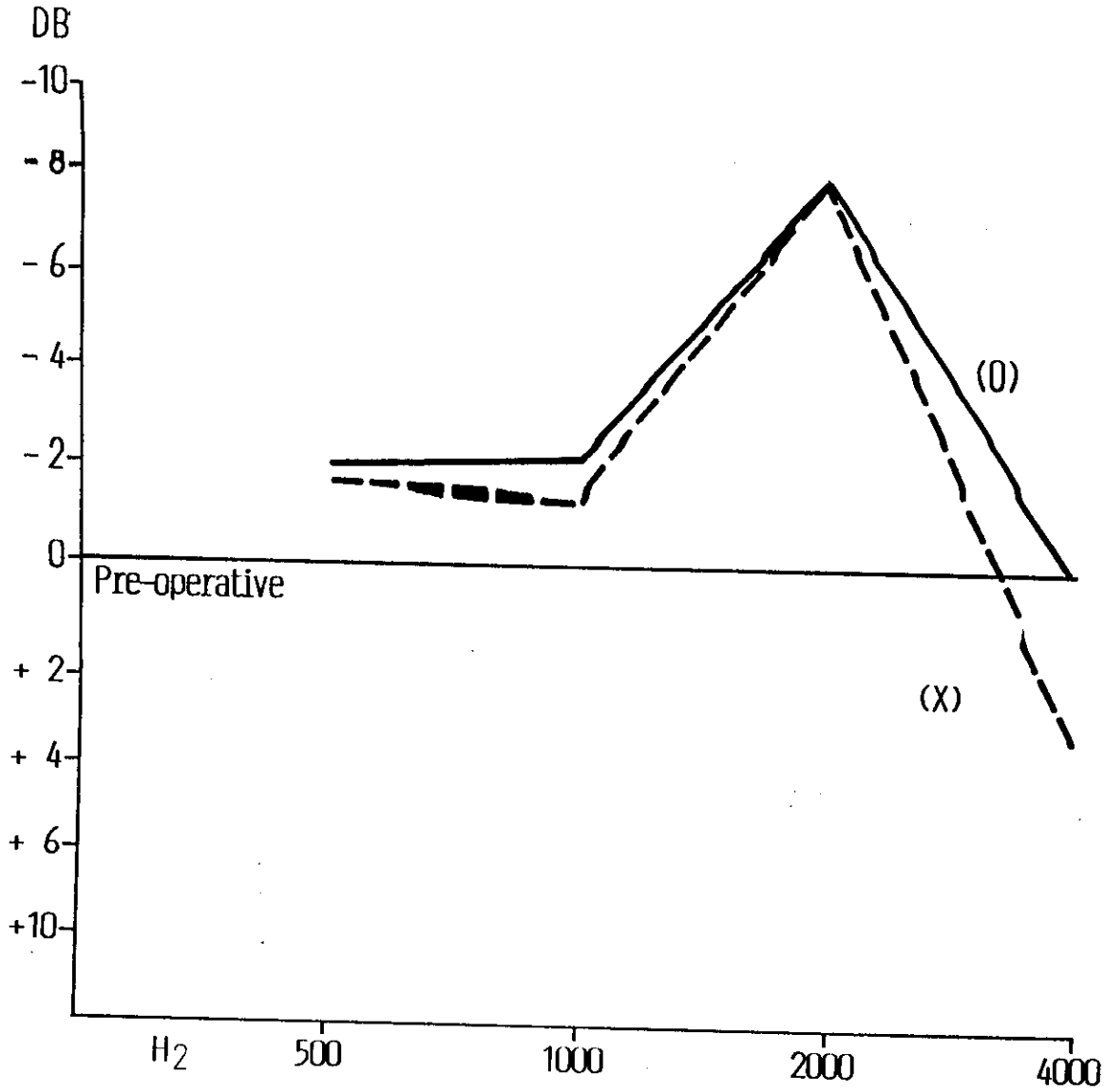


Fig.16: Mean decibel changes in B.C. threshold in patients with (O) and without (X) spontaneous nystagmus after 3 months.

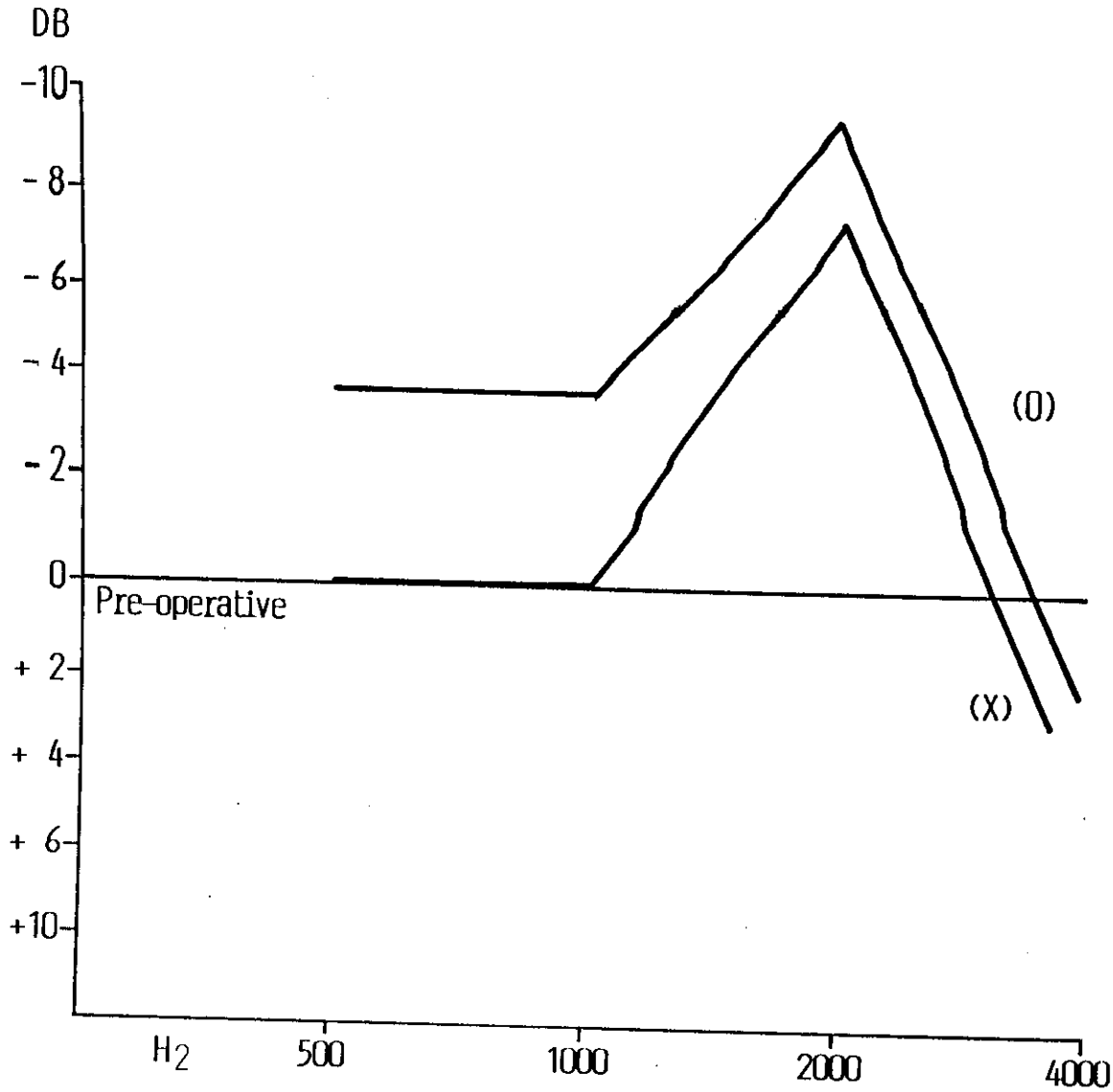


Fig. 17: Decibel changes in B.C. threshold in patients with spontaneous nystagmus toward (O) and away (X) from the operated ear after 3 months.

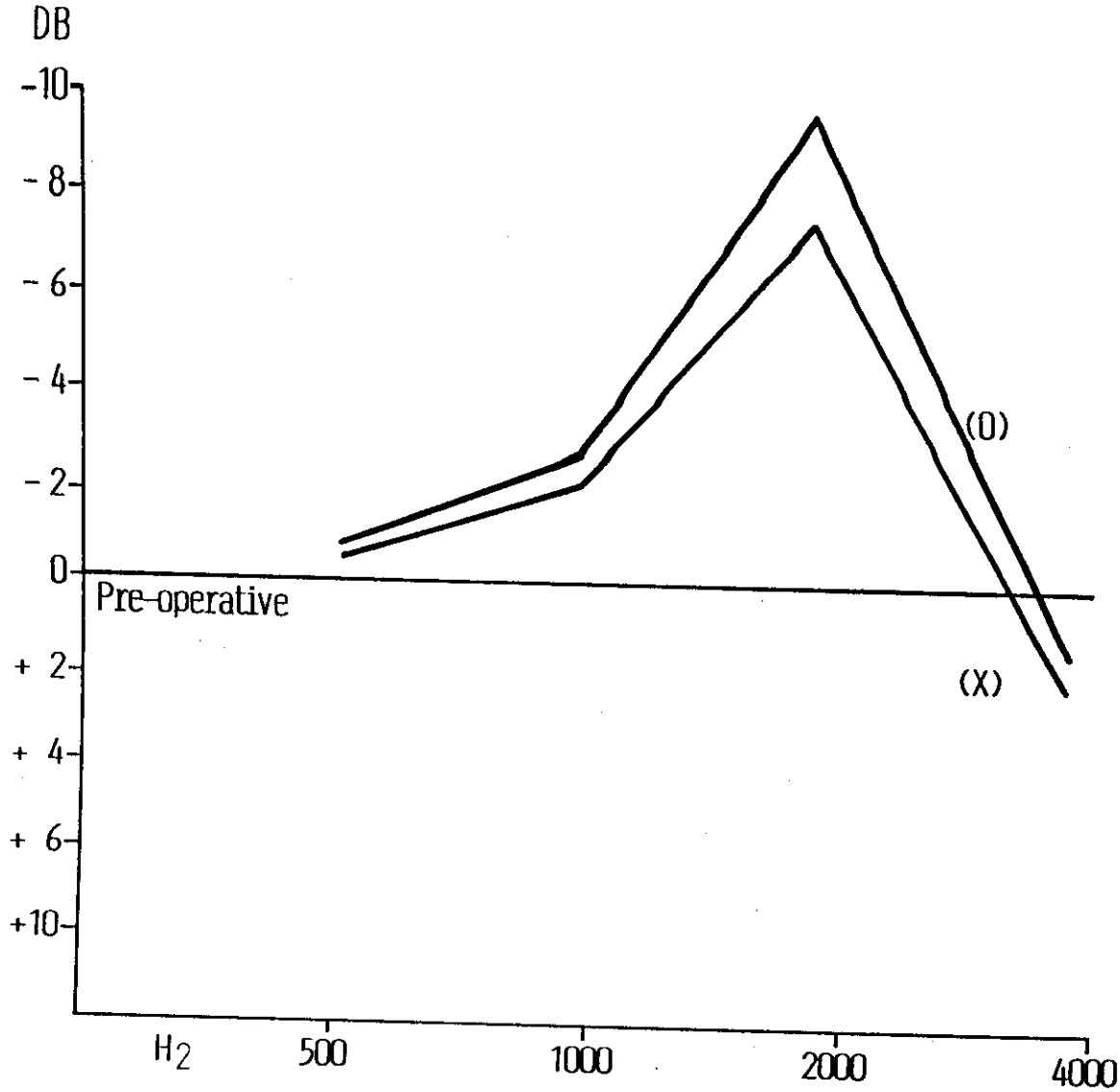


Fig. 18: Mean decibel changes in B.C. threshold in patients with (O) and without (X) positional nystagmus 3 months after the opreation.

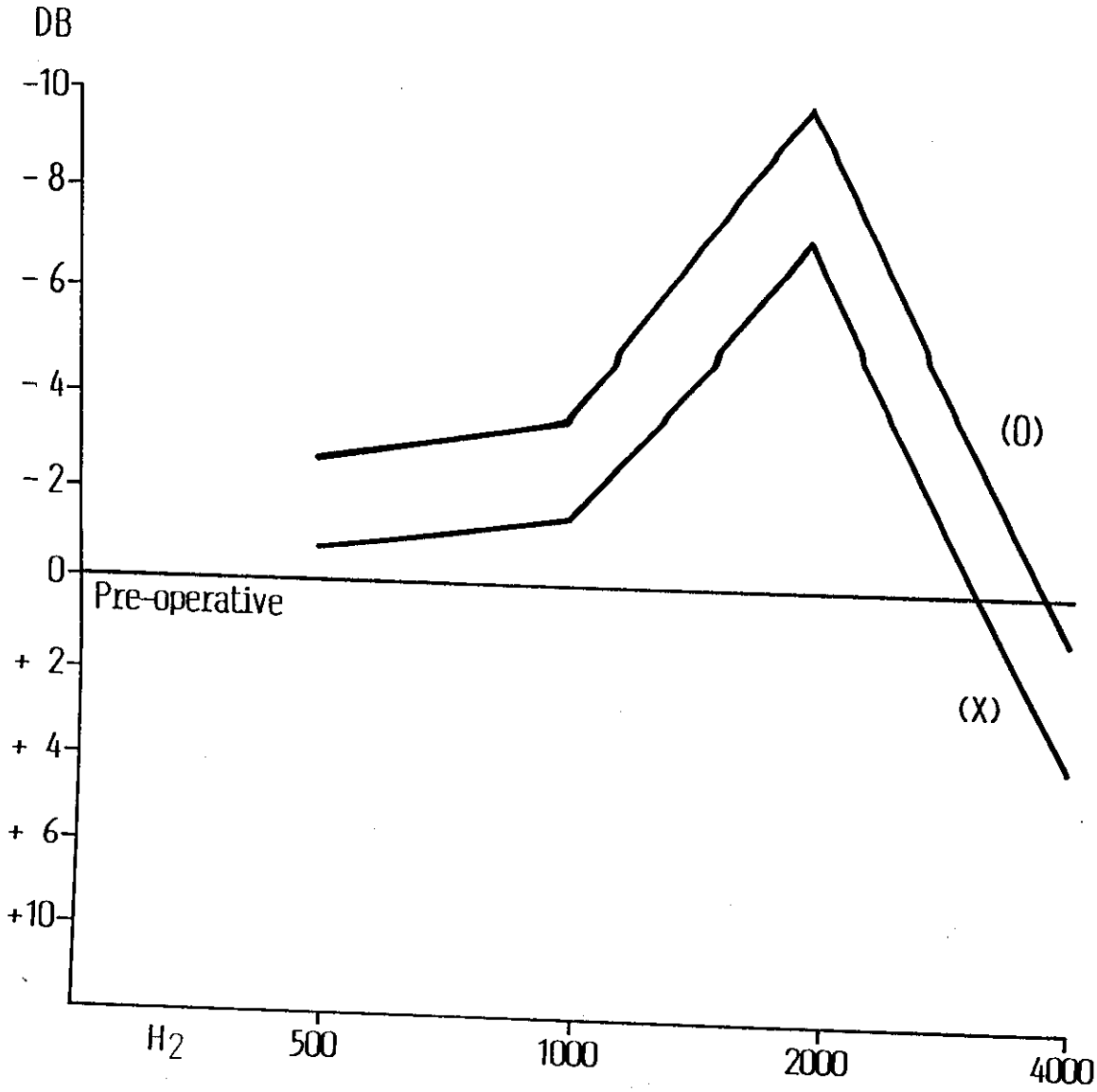


Fig.19: Decibel changes in B.C. threshold 3 months after the operation in patients with normal (O) and abnormal (X) caloric response.

(3) Relationship Between Positional Nystagmus and Cochlear Function:

Seventy of our patients developed positional nystagmus at sometime during the postoperative period. The changes in B.C. threshold for frequencies 500, 1000, 2000, 4000 Hz in cases with and cases without positional nystagmus are plotted in (Fig. 18).

(4)Relationship Between Results of Caloric Test and Cochlear Function:

After 3 months, severe S.N.H.L was found in 3 of our cases. Of these, one had complete canal paresis, one had partial canal paresis and one had normal caloric response. On the other hand, 10 casess had abnormal caloric response Fig. 19 presents the mean postoperative change in B.C. threshold after a month in patients with normal and abnormal caloric response.