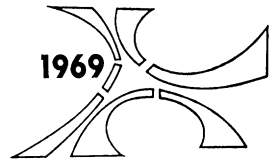
# Better Hearing Results in Cleft Palate Repaired by the Bone Flap Technique

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The presence of a conductive type of hearing loss in repaired and unrepaired cleft palate cases is well established in the literature (*3, 4, 5*). Reduced hearing sensitivity is usually brought about by certain specific medical conditions that primarily affect the middle ear area. These medical conditions range from a fluid build-up in the middle ear (otitis media) to various degrees of retraction of the eardrum or bulging of the eardrum. The conditions are usually bilateral and equal in severity. An associated hearing loss can also be bilateral and equal in the degree of impairment. The various medical conditions and associated hearing losses can frequently be found in noncleft palate cases as well.

One of the most common reasons for the presence of the various medical conditions and a frequent decrease in hearing sensitivity may be that deficient structure and function of the tensor and levator muscles of the palate lead to abnormal occlusions of the eustachian tubes. The poor muscular control that often occurs with repaired and unrepaired cleft palate can have a long standing history in many cases. Many of the surgical techniques presently employed in the repair of cleft palates effect a desirable closure but do not maintain an effective muscle control for the proper function of the eustachian tubes. Proper closing of the eustachian tube is difficult and the consequent result can be the various medical problems and decreased hearing sensitivity that is so often associated with cleft palate cases.

In our opinion, the bone flap technique of surgical repair of cleft palates permits a greater control of eustachian tube closure (*1, 2, 6*). The technique permits important musculature to remain fairly intact, and better control and function of the tensor and levator muscles is assured. The ideal operative procedure for correcting cleft of the palate should be one that enables the surgeon to place the parts whose development has been arrested into their normally intended positions, without disturbing the attachments of the muscles of the palate, and with as few steps as pos-

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sible. We had a clinical impression that, in the cases that had undergone surgical treatment by the bone flap technique, hearing sensitivity is better than has been reported in the recent literature. A comparison of bone flap repaired cases with other cases reported in the literature and other noncleft palate cases seemed to be in order.

The major criterion for determining hearing sensitivity was based upon the relationship between bone conduction and air conduction sensitivity. In a pure conductive loss, bone conduction sensitivity is always better than air conduction. The air-bone gap is therefore of primary importance. Any air conduction threshold poorer than a bone conduction threshold was considered abnormal and technically a loss even though the air conduction was within normal limits.

## Subjects

There were four major groups of subjects. Group I consisted of children two-and-one-half years to three years of age. There were nine children in this group. Group II represented four- to five-year-olds; there were fifteen in this group. Group III consisted of 14 six- to eight-year-olds. Group IV consisted of 8 nine- to thirteen-year-olds.

The children were selected on the basis of ability to perform adequately on a pure tone audiometric assessment as well as having had their cleft palates repaired by the bone flap technique. Otological findings consisted of the detection of fluid in the middle ear, retraction, scarring

TABLE 1. Types and incidence of abnormal ear, nose, and throat findings among 46 cleft and 46 noncleft subjects.

| *abnormal ear, nose, and throat findings* | *incidence per grouping* | |
|---|---|---|
| | *cleft* | *noncleft* |
| I. ear canals | | |
| 1. debris and wax | Grp II (1) | |
| | Grp IV (1) | |
| 2. narrow canals | Grp IV (1) | |
| 3. drainage | Grp IV (1) | |
| II. middle ear | | |
| 1. otitis media | Grp I (2) | Grp I (2) |
| | Grp II (3) | Grp II (3) |
| | Grp IV (1) | Grp III (3) |
| III. tympanic membranes | | |
| 1. dulled and scarred | Grp I (2) | |
| 2. dulled and retracted | Grp II (1) | Grp II (1) |
| | Grp III (4) | Grp III (1) |
| 3. adhesions | Grp III (1) | |
| 4. perforations | Grp I (1) | Grp IV (1) |
| IV. enlarged tonsils and adenoids | | Grp III (2) |
| total | 19 | 13 |

TABLE 2. Mean pure tone air conduction thresholds 500, 1000, and 2000 Hz (speech frequencies) for cleft and noncleft palate groups. Thresholds represent poorer ear. Thresholds in dB re ISO-1964. Single asterisks indicate significance at .01; double asterisks indicate significance at .05.

| *cleft groups* (*N* = 46) | *noncleft groups* (*N* = 46) | *difference* |
|---|---|---|
| Group I (N = 9) 20.7 dB | Group I (N = 9) 28.8 dB | 8.1 dB** |
| Group II (N = 15) 24.6 dB | Group II (N = 15) 30.2 dB | 5.6 dB** |
| Group III (N = 14) 16.0 dB | Group III (N = 14) 28.4 dB | 12.4 dB* |
| Group IV (N = 8) 18.2 dB | Group IV (N = 8) 28.6 dB | 10.4 dB* |

and bulging of eardrums, and the presence of small but healing perforations. The noncleft palate groups were similar in age, number, and the presence of similar otological findings. Table 1 indicates the incidence of the various otological findings as well as the breakdown into various groupings.

## Equipment and Procedure

Audiometric testing was conducted in a Series 800 Industrial Acoustics Corporation (IAC) sound treated booth. A portable 10-C Beltone pure tone audiometer was used for the pure tone assessments. The audiometer was equipped with TDH-39 earphones and a standard bone conduction receiver. A routine pure tone assessment procedure was used for each subject. Play or conditioning audiometry had to be used for the very young subjects.

## Results

Table 2 indicates the average thresholds for 500, 1000, and 2000 Hz (speech frequencies) for each age grouping in the cleft and noncleft groups. The thresholds represent the worse ear in each subject although, in general, both ears were relatively similar in thresholds. For all four age groups, the noncleft children had higher thresholds than the cleft subjects.

Table 3 indicates the average thresholds for 500, 1000, and 2000 Hz in

TABLE 3. Mean pure tone air conduction thresholds at 500, 1000, and 2000 Hz (speech frequencies) for cleft palates repaired by the bone flap technique (N = 46) and cleft palates repaired by other techniques (N = 140). Age range three to 13 years. Thresholds in dB re ISO-1964.

| *cleft palate* (*bone flap repair technique*) | *cleft palate* (*other repair techniques*)* | *difference* |
|---|---|---|
| 20.0 dB<br>range: 16.0–24.6 dB | 27.7 dB<br>range: 23.7–33.2 dB | 7.7 dB |

* Data obtained from Spriestersbach and associates (*4*). DB values corrected from ASA-1951 to ISO-1964 equivalent.

the cleft palate groups as compared to cleft palates repaired by techniques other than the bone flap method. These findings are based upon extensive studies made by Spriestersbach and others (*4*). The average thresholds are for Group I, 33.2 dB; for Group II, 23.7 dB; for Group III, 26.2 dB; and for Group IV, 25.5 dB.

## Discussion

It is interesting to note that although the otological findings were similar in the cleft palate cases and in the noncleft palate cases, the audiological findings were clearly different. There is an appreciable sensitivity gap for each group. The bone flap repaired cleft palate cases are obviously better in hearing sensitivity for air conduction pure tones. A comparison of the cleft palate cases with the findings in the literature also indicates better hearing sensitivity. Again it should be pointed out that the cleft palate cases in our study were repaired by the bone flap technique, whereas those cleft palate cases reported in most of the literature were repaired predominantly by various other techniques. The hearing sensitivity of the cases reported in the literature more nearly resembles the sensitivity of our noncleft palate category.

## Summary

Hearing sensitivity levels of 46 cleft palate patients who had bone flap palatal surgery were compared with the levels obtained from a group of normal children with similar otolaryngological findings and with levels reported in the literature for cleft palate children who had other types of palate surgery. The children with bone flap surgery had better hearing than either of the other two groups. We feel that the better control of musculature essential for good eustachian tube closure is maintained and enhanced by the bone flap technique. This, we believe, reduces the severity of the medical conditions that may cause a decrease in the hearing sensitivity.

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