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Prevalence of eardrum pathology in a cohort born in 1955

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Abstract

The aim of this study was to compare the prevalence of the different types of eardrum pathology in a cohort of adults not previously treated by grommet insertion with corresponding findings obtained in a cohort previously treated with grommet insertion.

A cohort born in 1955 were invited to a screening examination including otomicroscopy. In the untreated cohort, retraction of Shrapnell's membrane was found in four per cent of the ears compared to 20 per cent in the cohort treated with grommets. Tensa pathology, including atrophy and myringosclerosis, was found in six per cent of the ears in the untreated cohort and in 17 per cent in the treated cohort. Normal eardrums were found in 91 per cent of the ears. Despite the increased awareness of secretory otitis, as well as the increased rate of surgical treatment, the prevalence of eardrum pathology seems to be increasing. The reasons for this are discussed.

Key words: Otitis media with effusion; Cohort studies; Ventilation tubes; Tympanic membrane

Introduction

During recent years the prevalence of eardrum pathology in different groups of patients has been the subject of many studies. Some of these have focused on the long-term sequelae following secretory otitis media (SOM) (Tos and Poulsen, 1980; Stevens, 1985; Tos *et al.*, 1987; Cohen and Tamir, 1989; Møller *et al.*, 1989), while others have focused on the long-term sequelae following surgical treatment of the disease, primarily grommet insertion (Lildholt, 1983; Bonding and Tos, 1985; Sederberg-Olsen *et al.*, 1989; Maw, 1991). The prevalence of SOM has apparently increased over the years (Falbe-Hansen, 1954; Fishman *et al.*, 1960; Everberg *et al.*, 1968). During the last 15 years the cumulative incidence for secretory otitis has been estimated to be 80 per cent during the preschool age (Fiellau-Nikolajsen, 1980; Tos, 1984; Tos *et al.*, 1984). Because of the great variability of the spontaneous course of SOM, the indications for when, and how, to treat the condition have varied similarly. The variability in the observation period and the type of treatment is one of the reasons why it is difficult to establish to what extent eardrum pathology is attributable to SOM or to the treatment of the condition. Most authors agree that chronic middle ear diseases later in life occur predominantly in patients who have suffered from long-lasting SOM during childhood (Tos, 1981). One of the main objectives of the treatment of SOM, apart from improving the hearing, is the prevention of recurrent episodes of acute otitis media, which may promote the development of irreversible changes to the eardrum. Before the introduction of ventilation tubes (Armstrong, 1954), the treatment of SOM was primarily by adenoidectomy (Black, 1962).

In order to contribute to the debate on whether or not grommet insertion can prevent sequelae following SOM, we calculated the prevalence of eardrum pathology in a group of patients treated at a time when adenoidectomy was the standard treatment and compared it with that obtained in a group of patients treated when insertion of ventilation tubes was the treatment of choice.

Materials and methods

To identify a group of patients who had not been treated with grommet insertion during childhood but still were comparable with respect to the treatment of acute otitis, we focused on patients born in 1955, because, in Denmark, grommet insertion was not a routine treatment of SOM before 1965. All inhabitants of Hillerød county (total population of 35 000 inhabitants), born in 1955 were invited to attend a screening examination in the ENT Department of the Hillerød Central Hospital. A detailed otological and epidemiological history was recorded and otomicroscopy, audiometry and tympanometry were performed. People who did not attend the screening examination were asked to return a

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TABLE I
PREVALENCE OF EARDRUM PATHOLOGY AT THE AGE OF 35 YEARS

Type of pathology	No. of ears	Percentage
Attic only	19	3.5
Tensa only	27	5.0
Attic and tensa	5	0.9
Total pathology	51	9.4
Normal eardrum	491	90.6

questionnaire focusing on previous middle ear diseases, previous treatment, and nursing care during childhood. Of the 460 people fulfilling the inclusion criteria, 271 people (59 per cent) attended the screening examination, and 43 people returned the questionnaire. A medical history was obtained from 314 (68 per cent). There was no significant difference (χ^2; $p > 0.05$) between the medical history of those who attended and those who did not but returned the questionnaire.

Results

Medical history

Twenty-four per cent of the cohort had received nursing care and 54 per cent had had at least one episode of acute otitis media before school age. Of these, six per cent had received no treatment, 59 per cent had been treated with penicillin, 35 per cent with myringotomy, and 28 per cent had undergone adenoidectomy before school age. Middle ear surgery had been performed in only one case before examination at the age of 35 years. At the screening examination 88 per cent claimed to have normal hearing.

Prevalence of eardrum abnormality

The pathological changes of the eardrum have been assessed and defined according to their localization in either Shrapnell's membrane, in the pars tensa, or in both regions. At the age of 35 years nine per cent of the ears showed some signs of pathology, involving the pars tensa, Shrapnell's membrane or both (Table I).

Attic retractions

As defined by Tos and Poulsen (1980) the otomicroscopic appearance of Shrapnell's membrane was graded into five types, ranging from Type 0 indicating normal conditions to Type IV indicating a deep retraction with the membrane adherent to the neck of the malleus and resorption of the bony annulus (Figure 1). Type I retractions appear to be quite harmless and without importance; Type II may also be harmless, but if the membrane is adherent to the neck of the malleus, the retraction may be irreversible. Type III and IV retractions are

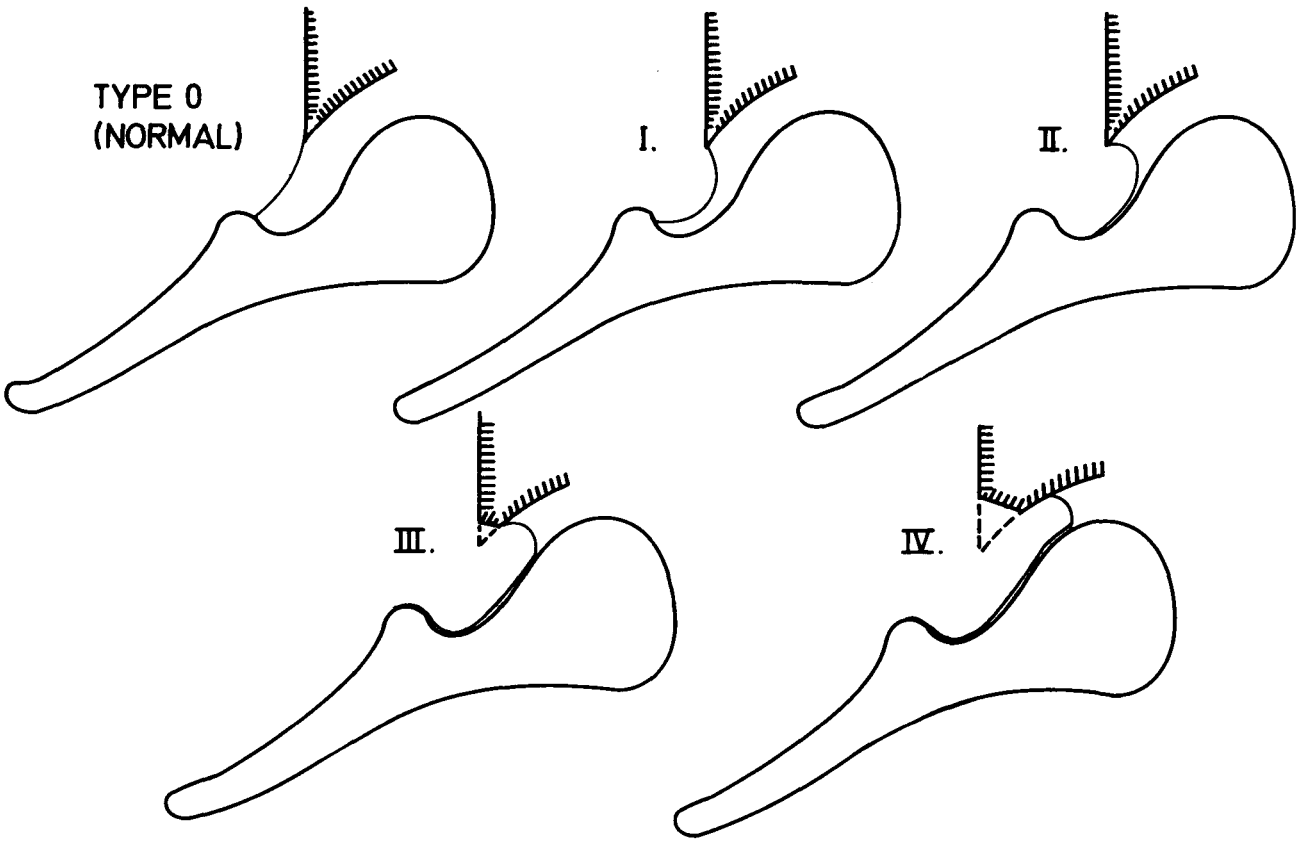

FIG. 1
Schematic illustration of the four types of attic retractions.

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TABLE II
PREVALENCE OF ATTIC RETRACTIONS AT THE AGE OF 35 YEARS

Type of retraction	No. of ears	Percentage
Type I	16	3.0
Type II	5	0.9
Type III	3	0.6
Type IV	-	-
Total	24	4.4
Normal attic	518	95.6

permanently at risk of further development into attic cholesteatoma. Attic retractions occurred in four per cent, the majority being Type I retractions (Table II). In this study, Type IV retraction and attic cholesteatoma were not found.

Tensa pathology

Atrophy. This is indicated by a thin, pellucid area of the eardrum where the lamina propria has lost some of its elastic fibres. Atrophy may not be of functional importance but constitutes a weak point which may develop into a permanent perforation following an episode of acute otitis. Atrophy was found in four per cent of the ears, whereas atelectasis, adhesive otitis, eardrum perforation or cholesteatoma were not observed (Table III).

Atrophy with pexy. Adherence of an atrophic drum onto the incudostapedial joint is called myringoincudopexy and was observed in one per cent of the ears. Total resorption of the long process of the incus was not observed (Table III).

Tympanosclerosis. This occurs in the form of plaques in the pars tensa and are usually of minor functional importance. Tympanosclerosis was found in only two per cent of the ears (Table III).

Other eardrum pathology. The most abnormal eardrum was found in a guest worker from Pakistan, who had been operated on in childhood and had a radical cavity in one ear.

Eardrum pathology related to previous acute otitis and adenoidectomy

It is not possible on the basis of the medical history to identify those in the cohort who had suffered from secretory otitis during the preschool age, but we know that there is a strong correlation between the prevalence of acute otitis media and the prevalence of secretory otitis (Tos, 1981; Stangerup and Tos, 1985) and that the cumulative incidence of secretory otitis and acute otitis in early childhood is almost the same (Stangerup and Tos, 1986). There was a significant correlation between a history of acute otitis media in childhood and eardrum pathology. The prevalence of eardrum pathology was 15 per cent in people with previous acute otitis compared to four per cent in people with no history of acute otitis. Pathological features were primarily found in the pars tensa and occurred in one per cent of the group with no episodes of otitis compared to 10 per cent in the group with secretory otitis (Table IV). Another indicator of previous secretory otitis may be a history of adenoidectomy in childhood, since this was the standard treatment of SOM in the period 1955 to 1965 (Black, 1962). Amongst those with a history of adenoidectomy, the prevalence of eardrum pathology was 13 per cent compared to eight per cent in people with no history of adenoidectomy (Table IV). By selecting people with a history of acute otitis and adenoidectomy, there is a strong possibility that these have suffered from SOM during childhood. Similarly, the group with no history of acute otitis or adenoidectomy may be assumed not to have had SOM. Table V shows that the prevalence of eardrum pathology is 17 per cent in the group with SOM compared to three per cent in the group with no SOM.

Comparison with other study groups

In Table III the prevalence of pars tensa pathology in our cohort born in 1955 is compared with that

TABLE III
PREVALENCE OF TENSA PATHOLOGY IN A COHORT BORN IN 1955 AND IN 1975

Type of pathology	(cohort 1955) No. of ears	Percentage	(cohort 1975) No. of ears	Percentage
Tympanosclerosis	9	1.7	32	7.2
Atrophy	16	3.0	28	6.3
Tympanosclerosis and atrophy	2	0.4	6	1.4
Myringoincudopexy	4	0.7	9	2.0
Perforation	1*	0.2	1	0.2
Total pathology	31	5.9	76	17.1
Nomal tensa	510	94.1	368	82.9

*Radical cavity.

TABLE IV
EARDRUM PATHOLOGY RELATED TO PREVIOUS ACUTE OTITIS BEFORE SCHOOL AGE IN 271 ADULTS AT THE AGE OF 35 YEARS

Type of pathology	No acute otitis (252 ears: %)	Acute otitis (290 ears: %)	No adenoidectomy (392 ears: %)	Adenoidectomy (150 ears: %)
Attic only	2.4	4.5	2.6	6.0
Tensa only	1.2	7.9	4.6	5.3
Attic and tensa	-	2.1	1.0	1.3
Total pathology	3.6	14.5	8.2	12.7
Normal eardrum	96.4	85.5	91.8	87.3

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TABLE V
EARDRUM PATHOLOGY RELATED TO PREVIOUS SECRETORY OTITIS, AND THE TREATMENT IN THE COHORTS BORN IN 1955 AND 1975

	Non-secretory otitis group born in:		Secretory otitis group born in:			
	1955	1975	1955		1975	
	Percentage	Percentage	Adenoidectomy and otitis Percentage	No treatment Percentage	Adenoidectomy and otitis Percentage	Grommet insertion Percentage
Flaccida	1.6	13.0	5.3	38.1	21.6	21.1
Tensa	1.0	4.0	9.2	10.6	5.9	29.8
Flaccida and Tensa	–	1.8	2.6	5.3	7.8	35.1
Total pathology	2.6	20.2	17.1	54.0	35.3	86.0
No. of ears	187	223	76	113	51	57

observed in a cohort born in 1975 (Tos *et al.*, 1984). These children attended annual screening examinations from the age of four years to the age of 16 years in 1991. At the age of seven years, 50 per cent of the children had suffered from SOM for at least three months.

Of the children with long-lasting SOM, 49 per cent had been treated surgically. Of these 47 per cent had adenoidectomy, 42 per cent adenoidectomy and grommet insertion, and 11 per cent grommet insertion alone. Table V shows that even in the group with no SOM, the prevalence of eardrum pathology is 20 per cent in the cohort born in 1975 compared to three per cent in the cohort born in 1955. This difference derives mainly from the higher prevalence of attic retractions in the cohort born in 1975. Comparing the otomicroscopic findings of the children in the two cohorts treated with adenoidectomy shows that eardrum pathology was found in 35 per cent of the ears in the cohort born in 1975 compared to 17 per cent in the cohort born in 1955. Rudin *et al.* (1985) have estimated the prevalence of eardrum pathology in four different age groups; men aged 70 years (born in 1913), 60 years (born in 1923), 50 years (born in 1943) and less than 30 years (born in 1954–1957). Eardrum pathology was found in 42, 45, 33 and 28 per cent respectively (Table VI). Also in these cohorts the prevalence of eardrum pathology was two to four times higher in the group with previous acute otitis than in the group with no history of acute otitis. None of these cohorts had been treated with grommet insertion.

Discussion

The prevalence of eardrum pathology in our cohort born in 1955 is very low compared to that described in other cohort studies. One reason for this may be differences in nursing patterns. In the period 1955–1962 most children were nursed in this homes until aged three to five years, because most women were working in the home. In the period 1975–1982 most children were nursed in a public day-care centre because many women were now employed outside the home. In the nurseries, many children are gathered inside a limited area and upper respiratory infections are very common, presumably because of the high infection risk. Sørensen *et al.* (1982) have shown that there is a statistically significant correlation between the prevalence of upper respiratory tract infections and secretory otitis media. Another possible explanation of the low prevalence of eardrum pathology in the cohort born in 1955 compared to those born in 1975 may be that the prevalence of SOM was higher in the latter period.

Falbe-Hansen (1954) found impaired hearing in 12 per cent of the children in four public schools in Copenhagen. Fishman *et al.* (1960) found a significant increase in the prevalence of secretory otitis during the period 1954 to 1959. In our cohort born in 1955, the estimated cumulative incidence of secretory otitis was 40 per cent compared to 80 per cent during the period 1975 to 1982. Another reason for the large difference in the prevalence of eardrum pathology might be that the course of SOM is more severe today than 30 years ago, especially since the prevalence of eardrum pathology is also higher in the patients treated with adenoidectomy only. This, however, ought to be counterbalanced by the increased attention to the disease and the surgical treatment of this condition, which has reached almost epidemic proportions.

Conclusion

Secretory otitis (SOM) seems to be more frequent today than 35 years ago which might, at least, in part explain the higher prevalence of eardrum pathology

TABLE VI
EARDRUM PATHOLOGY RELATED TO PREVIOUS ACUTE OTITIS IN DIFFERENT COHORTS

	Total		No history of otitis		History of otitis	
Age group	No. of ears	Percentage	No. of ears	Percentage	No. of ears	Percentage
1913	260	41.5	115	16.4	145	61.7
1923	76	44.7	28	22.4	48	58.5
1943	30	33.3	9	12.3	21	42.0
1954–57	58	27.6	22	16.4	36	33.0
1955	271	9.4	9	3.6	42	14.5

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found today. It seems that the increased surgical treatment of SOM may decrease the prevalence of acute otitis media, but there are no indications that the increased rate of the surgical treatment of secretory otitis media has reduced the prevalence of eardrum pathology.

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