Summary

There is much evidence for the association of adrenal cortical underactivity with hyperthyroidism.

Nine hyperthyroid patients had subnormal or low levels of urinary excretion of 17-ketosteroids. The excretion of urinary 17-ketogenic steroids was not reduced.

Eight of the patients were treated with corticotrophin in full doses for two to five weeks. Only one patient showed any significant clinical benefit; this was accompanied by an improvement in all laboratory tests of thyroid overactivity. The ninth patient received treatment with prednisone without benefit.

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WAX KERATOSIS IN CHILDREN'S EARS

BY

J. I. MUNRO BLACK, M.D., M.S., F.R.C.S.

AND

R. GEOFFREY CHAYTOR, M.B., B.S., D.L.O.

Consultants, Ear, Nose, and Throat, Newcastle upon Tyne

It was some time before penicillin became easily available in forms which could be used by general medical practitioners, but once this happened it was used freely in the treatment of acute otitis media. In 1953 it was stated that nearly all such cases were being treated by general practitioners, only the failures being seen by otologists (Black, 1954). One of the causes of failure was due to a mistaken diagnosis in that the patient—a child—did not have otitis media, but infection and suppuration in a mass of wax deeply impacted in the external auditory canal. It had long been known that wax did occasionally become impacted against the tympanic membrane, where it became covered by sheets of desquamated epithelium, and we had come to call this a "wax keratosis." This was thought to be the early stage of the so-called keratosis obturans, a condition well enough known to appear in the textbooks, although there was discussion about its cause and origin and even about its nature.

This wax keratosis seemed to be of interest in itself, in that we did not know how the wax got into the deeper

external auditory canal, nor quite what troubles it could cause when it got there. Another curious feature was a known association with chronic respiratory tract suppuration, that of sinusitis and bronchiectasis. Morrison (1956) stimulated further interest with a paper on keratosis obturans, in which he suggested an explanation for the presence of the wax against the tympanic-membrane and noted some of the facts of the condition.

Altogether, it seemed to justify some attempt at obtaining further facts, and accordingly an analysis of a collection of such cases has been made, and this forms the basis of the present paper.

Incidence and Location of Wax in Children's Ears

It was important at the outset to have some information concerning wax in children's ears, whether normal or otherwise.

The hair follicles and glandular elements in the skin of the external auditory canal are confined essentially to its outer half or so. Collins (1951) supported previous views that the waxy or more solid secretion of the sebaceous glands is softened by the secretion of the ceruminous glands so that it can find a way to the outside. Therefore it would be expected that wax would normally be found in the outer part of the external auditory canal or not at all (Fig. 1).

FIG. 1.—So-called normal wax in outer half of external auditory canal.

An investigation was carried out in 1,000 consecutive children seen for the first time in 1957 in three E.N.T. out-patient departments, perhaps not an entirely normal cross-section of the whole. Three different classes were recognized in these children, as follows: (1) no wax present anywhere in the external auditory canals; (2) wax present in the area which normally produces it; and (3) wax impacted in the deep part of the external auditory canals—that is, wax keratosis.

TABLE I

Class	First Series		Second Series	
	No. of Cases	%	No. of Cases	%
1	828	82.8	489	88.4
2	146	14.6	45	8.1
3	26	2.6	19	3.5
Total	1,000	100.0	553	100

A further series of over 500 children were seen in two more E.N.T. out-patient departments. The results in the two series are shown in Table I. It will be seen that 2.6% of the first series had wax firmly impacted against the tympanic membrane. When the wax was removed under general anaesthesia from these 26 children, 14 were found to have a well-formed wax keratosis, and in the remaining 12 the wax had formed a complete cast of the canal, but no epithelial envelope was present as yet. It is probable that these 26 cases represent degrees of the same process, which has been termed wax keratosis. In the second series 3.5% showed the presence of a wax keratosis.

It will be seen that these two series bear a striking similarity, and confirm the incidence of wax keratosis in about 3% of all children attending an E.N.T. out-patient department for a variety of reasons.

Definition and Description of Wax Keratosis

A wax keratosis has been described above as being a mass of wax impacted against the tympanic membrane in the deep part of the external auditory canal. It loses its natural

FIG. 2.—Wax keratosis in deep part of external auditory canal, with thickening and desquamation of epithelium.

colour to become black and hard, and desquamated squamous epithelium forms a white envelope around it. The condition is usually present in both ears, and it can easily be missed unless a careful examination is made, as the outer half of the external auditory canal is normally free from wax, and the external surface of the wax keratosis tends to be concave (Fig. 2), so as to simulate the appearance of the tympanic membrane. Moreover, we have gained the impression that in cases of wax keratosis the outer half of the external auditory canal is narrow, making examination of the deeper part difficult.

Natural History of Wax Keratosis

Undiagnosed wax keratosis may lie dormant for a long period without giving rise to any symptoms apart from slight deafness, although even this may not be apparent. Audiometer examination suggests that only about 20 decibels of deafness occurs. During this period the surrounding envelope merely becomes thickened by further desquamation of the epithelium.

This process may progress to a stage where the wax keratosis becomes so firm as to erode by pressure alone, first the epithelium of the deep external auditory canal, and then the bony canal itself, giving rise to a true keratosis obturans. A period of many years may elapse before its ultimate discovery, possibly in an adult patient.

The wax keratosis may become infected. This condition can be cured by softening the mass, which is then extruded from the canal during suppuration, leaving a normal tympanic membrane.

Again, granulations may form so as to obstruct the external auditory canal and hide the infected wax keratosis from view. If allowed to go untreated a ring of granulation tissue may form at the junction of the external surface of the wax keratosis and the outer part of the auditory canal. A type of false membrane then develops.

Recurring or chronic suppuration may persist for a long time and cause mistakes both in diagnosis and in treatment. The real condition may become evident only after surgical removal of aural polypi, when it is realized that the trouble is all external to the tympanic membrane. Usually a large polypus, when it occurs, arises from the annulus, and removal leaves a normal tympanic membrane. All trace of wax and keratosis may have disappeared. A great help in the diagnosis is the presence in the other ear of a clean wax keratosis.

Analysis of Cases

The 90 cases available for study included those found during the survey already discussed, along with others previously on record as known cases of wax keratosis. An attempt has been made to analyse these cases, especially with a view to demonstrating conditions which may occur in association with them. These conditions justify an examination of the ears so as to allow early treatment of wax keratosis if it is found.

1. Presenting Symptoms

The reason for the attendance of the child at an E.N.T. out-patient clinic in those cases where a wax keratosis was demonstrated is shown in Table II.

TABLE II

Cardinal Complaint	No. of Cases	%
Deafness	20	22.2
Otorrhoea	17	19.0
Earache	4	4.5
Nasal catarrh	36	40.0
Recurrent tonsillitis	13	14.3
Total	90	100

It is significant that more than half these children were referred without any aural symptoms at all, usually with a history of recurrent sore throat or of a chronic nasal discharge. In these cases the wax keratosis was found on routine examination of the ears. In only two cases in which deafness was the reason for the child's attendance was there a request from the referring general practitioner for removal of impacted wax, for which treatment by softening and syringing had failed. In most of these deaf children post-nasal adenoidal obstruction or previous attacks of otitis media were thought to be the cause of the impaired hearing. When otorrhoea was present it was usually unilateral, and the history was one of failure to respond either to systemic antibiotics, given on the assumption that the cause was acute middle-ear suppuration, or to local treatment, given in an attempt to dry up a chronic suppurative otitis media.

In all groups the most frequent reason for attendance at an E.N.T. out-patient clinic was a request from the medical practitioner for the possible removal of tonsils and adenoids.

2. Condition When First Seen

Out of the 90 children known to have wax keratosis, both ears were affected in 81 cases, and in the other 9 there was a unilateral wax keratosis without any wax at all in the other ear. When the ears were cleaned out under general anaesthesia 68 of the 81 children were found to have a definite wax keratosis in both ears, whilst in the remaining 13 wax was present in the deep external auditory canal but had not yet become surrounded with desquamated epithelium. In the nine children where only one ear was affected, three gave a history of otorrhoea in the unaffected ear which may have given rise to spontaneous extrusion of a wax keratosis, and one was known to have had treatment to the ear elsewhere. Out of the 21 children presenting with otorrhoea or earache, 16 were found to have an acutely infected wax keratosis in one ear, with the formation of granulation tissue.

Several of the children, seen mainly because of aural symptoms alone, and before the relationship with respiratory infection was fully realized, did not have full investigations of their chest and sinuses. These investigations were carried out in 73 children, and the incidence of respiratory suppuration in these children is shown in Table III.

TABLE III

Cardinal Complaint	No. of Cases	Suspected Sinusitis	Obvious Sinusitis	Positive Antral Lavage	Known Chest Lesion	Total with Sinusitis or Chest Lesion
Deafness	15	5	7	11	6	13
Otorrhoea	11	5	4	7	10	11
Earache	4	—	4	4	2	4
Nasal catarrh	36	10	26	29	21	31
Recurrent tonsillitis	7	4	2	5	3	6
Total	73	24	43	56	42	65

Those children who had frank pus in the nose have been listed under "obvious sinusitis." When sinusitis might have been suspected from the history, but the nose was clean, the child was listed under "suspected sinusitis." Many

of these cases showed the presence of pus in the antra when lavage was undertaken. The chest lesions were of all grades, varying from a minor radiological change, usually at the base of the lung, to an advanced bronchiectasis.

It will be noted that 65 (89%) of these children were found to have either a sinus suppuration or a chronic respiratory infection or both.

3. Management

When the implication of the presence of a wax keratosis had been realized a routine procedure was followed in all cases.

Under general anaesthesia both ears were inspected, and the wax present in the deep part of the external auditory canal was removed. This was usually a most difficult procedure owing to general narrowing in the outer part of the canal and the very firm impaction of the wax in the depths beyond. Often this came out as a complete cast of the canal even to the imprint of the handle of the malleus, but occasionally difficulty was found in separating the epithelial envelope from the canal wall, and especially from the tympanic membrane. In these cases only the inner core of wax was removed, leaving the envelope to be extruded later by the normal physiological process of desquamation. Any granulation tissue present was removed by suction at the same time. Proof puncture and antral lavage of both maxillary antra were then performed, revealing in most cases an underlying suppuration requiring further treatment.

Many children had a productive cough which obviously needed treatment, but in those children in whom a chest condition was not so obvious a routine examination, including a chest x-ray examination, was carried out. In this manner about half of the children were found to have an unsuspected chest lesion.

4. Treated Prognosis of the Ears

It is not our intention to discuss the results of treatment of the sinusitis or of the coexistent chest lesion. This treatment is essential, and it has been evident that in children in whom respiratory suppuration remains a wax keratosis can re-form. Probably an important result of this investigation has been to emphasize the likely primary nature of the respiratory infection and the great difficulties experienced in its treatment. Many cases of unsuspected sinusitis and bronchitis have been discovered which would otherwise have continued untreated.

With regard to the ears, they will usually return to normal. When a non-infected wax keratosis has been removed, the tympanic membrane may appear opaque and thickened at first, especially when the outer envelope of the wax keratosis remains attached to it. Gradually this envelope is thrown off and the tympanic membrane becomes perfectly normal in all respects. Any deafness which was present has normally been due to the simple action of the wax keratosis as a foreign body, and the hearing returns to normal when it has been removed.

When the wax keratosis has become infected and granulation tissue has formed, local antiseptic drops may have to be used after the wax keratosis and the granulations have been removed. Once the pressure of the epithelial lining of the external auditory canal has been relieved there is no stimulus to the formation of granulation tissue, and in these children as well the ear soon returns to normal.

So long as the associated respiratory suppuration is treated and cured there will be no re-formation of the wax keratosis, and thus we hope that keratosis obturans will be prevented.

Summary

Wax keratosis, if looked for, will be found in about 3% of children attending an E.N.T. department for any reason.

It is almost universally bilateral.

In half the cases there will be no suspicion of any lesion in the ears until they are examined.

Respiratory suppuration (sinusitis, bronchitis, bronchiectasis) will be found, if looked for, in nearly all cases.

The wax keratoses must be removed to prevent the possibility of any future infection, with local suppuration or progression to keratosis obturans. General anaesthesia will be required for this removal and will allow the opportunity for antral lavage.

Chronic suppuration with polypus formation can occur and simulate chronic suppurative otitis media.

Early removal, associated with concurrent and subsequent treatment of any respiratory suppuration present, will result in an ear normal in appearance and in function, with no likelihood of recurrence.

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PHYSIOTHERAPY FOR BELL'S PALSY

BY

J. MOSFORTH, M.C.S.P.

*Formerly Physiotherapist, Department of Physiotherapy,
General Infirmary at Leeds*

AND

D. TAVERNER, M.D., F.R.C.P.

Reader in Medicine, University of Leeds

From the General Infirmary at Leeds

Bell's palsy can be defined as unilateral paralysis of the facial muscles resulting from an intrinsic lesion of the seventh cranial nerve (Cawthorne, 1951). There is general agreement that 70 to 80% of these patients recover completely within one to three months, while the remainder develop various sequelae (Taverner, 1955). There is no agreement about treatment, although many methods have been tried. At present electrical stimulation of the paralysed muscles is widely used, at least until voluntary movement reappears. This practice is supported by many of the standard textbooks (Collier, 1948; Evans, 1951; Nielsen, 1951; Elliott, Hughes, and Turner, 1952; Wilson, 1954; Brain, 1955; Wechsler, 1958), but Walshe (1952) states that galvanism is useless.

There is apparently no record in the literature of a controlled trial of the value of electrotherapy in facial palsy, and the present investigation was undertaken because daily electrotherapy is expensive and time-consuming. It was felt to be justifiable to withhold physiotherapy from the control patients because previous experience has shown that lack of physiotherapy does not necessarily prejudice recovery from peripheral nerve injuries (Henderson and Taverner, 1949).

Design of the Trial

All patients with Bell's palsy of less than 14 days' duration seen in the department of electromyography of the General Infirmary at Leeds from October, 1954, to December, 1956, were included in the trial. The diagnosis of Bell's palsy was made on the basis of the following