

Historical Article

Clinical otosclerosis and auditory exostoses in ancient Europeans (investigation of Lithuanian paleosteological samples)

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Abstract

The purpose of this investigation was to establish the incidence of clinical otosclerosis and auditory exostoses in Lithuanian paleopopulations. The total sample consists of 4080 skulls, dating from the Neolithic to the C17th–C18th A.D., investigated visually, under magnification and radiologically. Eight cases of clinical otosclerosis and 22 of auditory exostoses were identified. The general epidemiology of otosclerosis (0.19 ± 0.08 per cent) was established to be similar to contemporary populations. This suggests that there are no new aetiological factors attributable to our modern society. Clear diminution of the incidence of auditory exostoses from the 1st to the 2nd millennium A.D. (3.46 ± 0.76 per cent, against 0.06 ± 0.04 per cent, $p < 0.001$) and definite sexual differences (males: 1.21 ± 0.28 per cent; females: 0.17 ± 0.10 per cent, $p < 0.001$) were also noted. In general, auditory exostoses were found much more frequently than in recent populations.

Key words: Otosclerosis; Exostoses; Ear, external; Paleopathology; Epidemiology

Introduction

Otosclerosis is seen most frequently in the Caucasian race and is a common cause of deafness in Europe, the Middle East, the subcontinent of India and in Caucasoid people of the world. Friedmann (1974) has estimated that up to 2 per cent of all Caucasians suffer from deafness caused by clinical otosclerosis. It is rarely found in Mongoloid or Negroid man; in the latter group the disease is about 10 times less frequent (Morrison, 1979). The epidemiology of otosclerosis seems to be of interest from an historical point of view, as this may help us to elucidate some aetiological factors. However, we were unable to find data on the incidence of clinical otosclerosis in ancient European populations, other than some data from our previous investigations (Sakalinskas and Jankauskas, 1990, 1991).

We have also found little material for comparison on auditory exostoses. In paleopopulations, the shellfish divers of California had especially high frequencies (14.2–72.2 per cent) when compared with the Plains Indians (2.3–8.8 per cent) (Kennedy, 1986). In the Vlasac fishing population, the prevalence of auditory exostoses was as high as 34.2 per cent (Frayer, 1988).

Various factors, including external influences, some diseases (otitis externa, eczema, traumatic lesions, mechanical and chemical irritation of long duration, syphilis, gout and rheumatism) (Paparella and Meyerhoff, 1980) and genetic predisposition (Berry and Berry, 1967; Maw-

son and Lundman, 1979) may cause auditory exostoses. Cold water can stimulate their emergence (Mawson and Lundman, 1979; Kennedy, 1986; Hammond, 1987), an opinion that has experimental support since patients who swim frequently have an increased incidence of exostoses (Mann, 1986). A local increase in osteogenic activity therefore may result from cold water irritation, and the highest frequencies of auditory exostoses are observed in populations where the average water temperature is below 19°C (between latitudes 30° and 45° north and south of the equator) (Kennedy, 1986).

The purpose of this investigation was to establish the incidence of clinical otosclerosis and auditory exostoses in a European—Lithuanian—paleopopulation, and to discuss their epidemiology and aetiology.

Materials and methods

The skull collection of the Department of Anatomy, Histology and Anthropology (Faculty of Medicine) at the University of Vilnius was investigated visually, under magnification and radiologically. The total sample consists of 4080 skulls, dating from the Neolithic to C17th–C18th A.D., of which 578 skulls were from the first millennium and 3502 skulls were from the second. Age and sex distribution was as follows: infants I (0–7 years): 298; infants II (7–14 years): 301; juveniles (14–20 years): 379;

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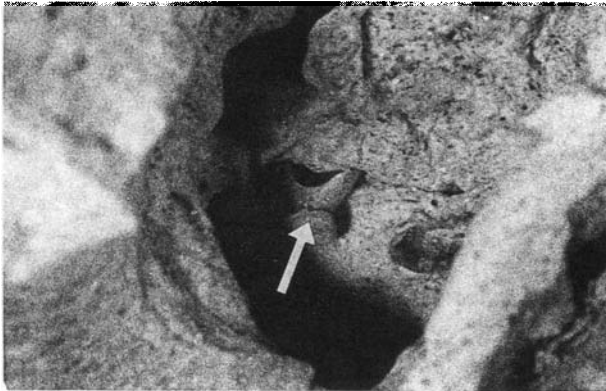


FIG. 1

The right ear of a 40–45-year-old male (15th–16th century A.D.). Stapes is fixed and compressed by expanded otosclerosis foci (arrow).

adults (20–40 years): 912 females and 501 males; mature adults (40–55 years): 459 females and 659 males; aged (over 55 years): 245 females and 326 males.

When clinical otosclerosis (stapes footplate fixation) was suspected during visual examination, radiology and tomography of temporal bone was performed (Valvassori *et al.*, 1984). To evaluate the detected changes, we compared the results with a control group of 20 skulls.

External auditory exostoses were determined visually during routine inspection of the external auditory meatus.

Results

Eight cases (0.19 per cent) of clinical otosclerosis, found visually with stapes footplate fixation and confirmed radiologically, were identified (Figs. 1 and 2). Three cases (0.51 per cent) were from the first millennium A.D.: a 35–45-year-old female and a male of the same age (5th–6th century) and a 25–30-year-old male (8th–9th century). The remaining five (0.14 per cent) are from the second millennium: three females 30–50-years old and two males of the same age, all dated 14th–16th century. In all cases the pathological process was bilateral. On temporal radiographs, otosclerotic changes were found on vestibular fenestra, the cochlea and even in semicircular canals.

In the sample, 22 cases (0.53 per cent) of auditory exos-

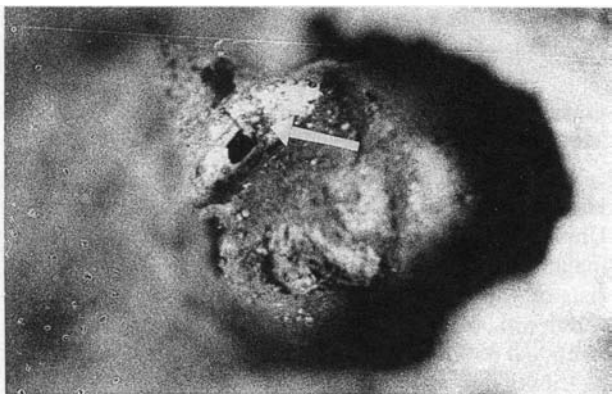


FIG. 2

Large part of stapes footplate is fixed by otosclerotic foci (arrow) in the fenestra ovalis of the right ear (40–45 year-old male, 5th–6th century A.D.).

toses were found. In the first millennium sample there were 20 cases (3.46 per cent): three females, 20–40-years old (1.25 per cent); 16 males, age range from 40 to 50 years (6.25 per cent) and one juvenile of 12–14 years. The two cases from the second millennium (0.057 per cent) were both males (0.16 per cent) falling into the mature adult (20–55 years) age groups. Only one case of auditory exostoses was unilateral, the remaining being bilateral and symmetrical. They were variable in form, from small and single to multiple (one case had five exostoses on each side almost completely blocking the external auditory meatus—see Fig. 3).

Discussion

Our investigation reveals that, at least in the first millennium A.D., ancient Europeans suffered from clinical otosclerosis and would suffer deafness as a result. The earliest case detected comes from the 5th–6th century. However, it is difficult for us to discuss the general incidence of otosclerosis over a thousand years ago as the general sample (239 females and 256 males) is insufficient. Nevertheless, we can consider this disease not to be a consequence of contemporary civilization. The incidence of otosclerosis in the second millennium A.D. was 0.19 ± 0.08 per cent among adults (1377 females and 1230 males). This corresponds to the epidemiology of clinical otosclerosis among recent Caucasians.

Investigation of auditory exostoses revealed definite secular differences: in the first millennium A.D. their incidence was 3.46 ± 0.76 per cent, and in the second only 0.06 ± 0.04 per cent ($p < 0.001$). One very rare case of exostoses in a subadult, 12–14 years old, from the first millennium, is worth a mention. Clear sexual differences were also evident: in the pooled sample, the frequency of exostoses in males was 1.21 ± 0.28 per cent, in females, 0.17 ± 0.10 per cent ($p < 0.001$). As Lithuania lies in the middle latitudes, with a climate transitional from maritime to continental (average January temperature -4.9°C /July $+17.0^\circ\text{C}$; Kausyla, 1986), the incidence of auditory exostoses should not be considered as high. It seems that ecological factors and differences in the way of life could be the cause of such differences. Nevertheless, genetic factors and/or some of the above mentioned pathological processes cannot be totally rejected.

Conclusion

Our goal was to establish the incidence and frequency



FIG. 3

Five large exostoses partly blocking the external auditory meatus of the right ear (40–45-year-old male, 4th–5th century A.D.).

of clinical otosclerosis and auditory exostoses diachronically (in duration of centuries) and to compare it with synchronous (contemporary) populations. It can be concluded that no differences in clinical otosclerosis incidence were established. Approximately the same percentage of ancient Europeans suffered from otosclerosis as in more recent populations.

Auditory exostoses are a different matter. In the second millennium their frequency was substantially lower than in the first.

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