

Lactate dehydrogenase isoenzyme patterns in auricular pseudocyst fluid

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Abstract

Objective: We investigated lactate dehydrogenase isoenzyme patterns in the cyst fluid of auricular pseudocysts and autogenous blood, to assist the diagnosis of auricular pseudocyst.

Methods: Twenty patients with auricular pseudocysts participated in this study conducted in Kaohsiung Medical University Hospital between February 2007 and June 2010. Patterns of lactate dehydrogenase in cyst fluid and autogenous blood were analysed.

Results: Levels of lactate dehydrogenase 1 and 2 were lower in auricular pseudocysts than in autogenous blood, whereas levels of lactate dehydrogenase 4 and 5 were higher; this difference was statistically significant ($p < 0.001$).

Conclusion: Lactate dehydrogenase isoenzyme patterns in auricular pseudocyst fluid indicated higher percentage distributions of lactate dehydrogenase 4 and 5 and lower percentage distributions of lactate dehydrogenase 1 and 2. An effective laboratory method of evaluating the different lactate dehydrogenase isoenzyme components was developed; this method may improve the accuracy of auricular pseudocyst diagnosis.

Key words: Ear, External; L-Lactate Dehydrogenase; Pathology

Introduction

An auricular pseudocyst is a fluid-filled cavity present within the cartilage of the ear, which is not lined by epithelium.^{1–4} Clinically, it is an uncommon, benign, idiopathic disease which typically presents as a painless, spontaneously arising swelling on the upper anterior surface of the auricle, and which contains sterile, straw-coloured fluid on aspiration.^{5,6}

In 1966, Engel reported 17 cases in young, healthy, Chinese men and gave the first description of the histological changes seen in auricular pseudocysts.⁴ Although these lesions can occur in both genders, all races and at any age, they occur predominantly among males, especially young, Asian males.^{4,7–10} A hormonal influence modulating the inflammatory process has been suggested to explain the marked male predominance of this condition.¹⁰ Most auricular pseudocysts are unilateral, but bilateral cases have been described.^{4,11–13} They are most commonly located in the concha fossa.¹⁰

Various aetiological theories have been suggested, including chronic minor trauma, congenital embryonic dysplasia, autoimmune defect and circulatory disturbances in the auricle; however, the exact cause remains unclear.^{3,6,14–20}

In 1985, Okuma described successful treatment of an auricular pseudocyst with needle aspiration followed by local steroid injection.²¹ Since then, many different treatments have been employed, with varying success.^{5,7,9,14,21–28}

The auricle can be the site of a variety of cystic lesions, many of which involve potential spaces between the auricular cartilage and the perichondrium or within the skin and the subcutaneous tissues.²² Therefore, it is important to properly diagnose and treat auricular pseudocysts. If misdiagnosed and treated inappropriately, or left untreated, permanent deformity of the auricle may result.

In several cases of auricular pseudocysts, high levels of lactate dehydrogenase (LDH) have been reported in the cyst fluid.^{10,14} The LDH isoenzyme patterns within cyst fluid have been examined, and LDH-4 and LDH-5 have been found to predominate in a small group of patients.^{6,7,14}

In this study, we assessed and compared the distribution of LDH isoenzymes in the cyst fluid and autogenous sera of a group of patients with auricular pseudocysts. Such an investigation has not previously been reported. We also attempted to determine an

accurate method with which to diagnose auricular pseudocyst in clinically suspicious cases, in addition to the usual clinical features.

Materials and methods

Between February 2007 and June 2010, 20 consecutive patients diagnosed with auricular pseudocysts participated in this prospective study conducted at the otolaryngology department of Kaohsiung Medical University Hospital, Taiwan. None of the patients had received any previous treatment for their auricular pseudocyst. All patients were initially treated with needle aspiration of cyst fluid, followed by injection of steroid solution (triamcinolone, 1 ml ampoule of 10 mg/ml suspension) into the pseudocyst cavity (using a separate syringe) until it regained its original size. Autogenous blood was drawn at the same time.

The volume of aspirated cyst fluid and blood was measured, and the presence and percentage distribution of LDH isoenzymes 1, 2, 3, 4 and 5 were analysed.

The study protocol was approved by the hospital institutional review board. Statistical evaluations were performed using the paired *t*-test. A *p* value of less than 0.05 was considered statistically significant.

Results

The cohort consisted of 15 males (75 per cent) and 5 females (25 per cent) with a mean age \pm standard deviation (SD) of 42.05 ± 13.43 years. Ten patients had left-sided lesions and 10 had right-sided lesions. No case of bilateral pseudocysts was seen. The pseudocyst was located in the concha fossa in 12 patients (60 per cent), in the scaphoid fossa in 1 patient (5 per cent) and in the triangular fossa in 5 patients (25 per cent). The final two patients (10 per cent) had large pseudocysts, one extending over three sites (the concha fossa, triangular fossa and scaphoid fossa) and one extending over the triangular fossa and scaphoid fossa.

The mean \pm SD and range of the percentage distribution of LDH isoenzymes in cyst fluid and sera in the 20 patients are presented in Table I. In our hospital laboratory, the normal reference percentage distributions of LDH isoenzymes in sera were: LDH-1, 25–30 per cent; LDH-2, 32–35 per cent; LDH-3, 20–25 per cent; LDH-4, 7–10 per cent; and LDH-5, 7–10 per cent.

All patients had fairly normal percentage distributions of LDH isoenzymes in their serum. However, very different LDH isoenzyme distributions were seen in the cyst fluid (Table I), and this difference was statistically significant (paired *t*-test, *p* < 0.001). The mean \pm SD percentage distributions of LDH-4 and LDH-5 in auricular pseudocyst fluid were 30.33 ± 8.12 per cent and 42.01 ± 7.84 per cent, respectively; these values were substantially higher than corresponding serum values (Table I). In contrast, serum LDH-1 and LDH-2 had mean \pm SD percentage distributions of 21.05 ± 5.05 per cent and 32.78 ± 2.70 per cent, respectively; these were substantially higher than cyst fluid values (Table I). Plotted graphically, the overall gradient of

TABLE I
LDH ISOENZYME PATTERNS IN CYST FLUID AND SERUM

| Source | Pts (n) | LDH-1 | | LDH-2 | | LDH-3 | | LDH-4 | | LDH-5 | |
|------------|---------|------------------|-----------|------------------|-----------|------------------|-----------|------------------|-----------|------------------|-----------|
| | | Mean \pm SD | Range | Mean \pm SD | Range | Mean \pm SD | Range | Mean \pm SD | Range | Mean \pm SD | Range |
| Cyst fluid | 20 | 5.57 ± 4.72 | 0–15.9 | 8.89 ± 5.81 | 0.8–21.8 | 13.20 ± 3.13 | 5–19.7 | 30.33 ± 8.12 | 16.9–50.0 | 42.01 ± 7.84 | 24.1–58.1 |
| Serum | 20 | 21.05 ± 5.05 | 14.9–37.5 | 32.78 ± 2.70 | 28.3–38.5 | 20.29 ± 1.96 | 16.2–23.3 | 11.98 ± 2.21 | 8.7–16.7 | 13.91 ± 5.74 | 4.9–27.1 |

Pts = patients; LDH = lactate dehydrogenase; SD = standard deviation

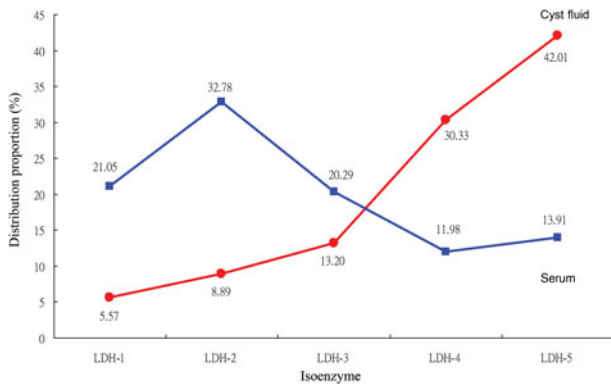


FIG. 1

Percentage distribution of analysed lactate dehydrogenase (LDH) isoenzymes in cyst fluid and autogenous serum, in 20 patients with auricular pseudocyst.

LDH isoenzyme percentage distribution was positive in cyst fluid but negative in serum (Figure 1).

This pattern was also seen on an individual level, following analysis of initially clear, yellowish cyst fluid from a 35-year-old, female patient with a clinical diagnosis of left auricular pseudocyst in the concha fossa (Figure 2), and after analysis of dark brownish cyst fluid from a 30-year-old, female patient with a suspected auricular pseudocyst in the left scaphoid fossa (Figure 3): the percentage distributions of LDH-4 and LDH-5 were higher in cyst fluid than in serum, those of LDH-1 and LDH-2 were higher in serum than in cyst fluid (Fig 2 and 3). This confirmed the accuracy of auricular pseudocyst diagnosis in both these cases.

Discussion

An auricular pseudocyst is a benign, asymptomatic, fluctuant outpouching with no epithelial lining, which is usually located on the anterior surface of the auricle.¹⁻⁴ Some believe that these lesions arise as a consequence of repeated minor trauma of the auricular cartilage, for example due to sleeping on a hard pillow or wearing stereo headphones or a motorcycle helmet; cases have also been reported in children.^{3,6,14,21,25}

Several authors have described the histology of these lesions.¹⁻⁴ Perivascular, lymphocytic infiltrates are consistently evident in the connective tissue layer just superficial to the anterior segment of the cartilage. In

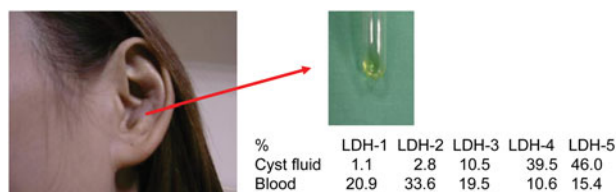


FIG. 2

Clinical photographs showing an auricular pseudocyst in the left concha fossa of a 35-year-old woman, and aspirated clear, yellowish cyst fluid, together with the percentage distribution of analysed lactate dehydrogenase (LDH) isoenzymes in this patient's cyst fluid and serum.

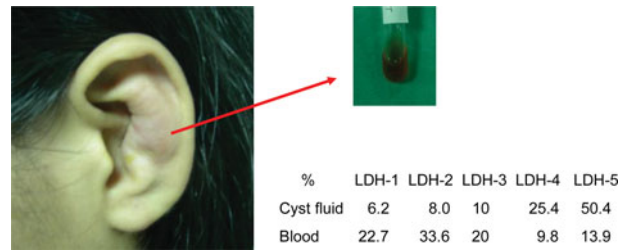


FIG. 3

Clinical photographs showing an auricular pseudocyst in the left scaphoid fossa of a 30-year-old woman, and aspirated dark brownish cyst fluid, together with the percentage distribution of analysed lactate dehydrogenase (LDH) isoenzymes in this patient's cyst fluid and serum.

the present study, an inflammatory response was seen in all specimens.

Minor trauma may trigger the release of LDH in cyst fluid; however, there is conflicting evidence on an association with trauma.^{21,29} Others have suggested aetiological mechanisms such as lysosomal abnormalities, enzyme leakage with subsequent cartilage degeneration, and ischaemic necrosis secondary to repeated low-grade trauma.^{10,28} A more likely pathogenetic mechanism is that individuals are predisposed to endochondral pseudocysts during embryological development of the ears. The complex fusion and folding of the first and second brachial arches results in formation of the auricle cartilage, but may also leave residual tissue planes within the mesenchyme. These planes may later reopen to cause a pseudocyst.^{4,7,10,28}

Studies on LDH isoenzyme patterns in auricular pseudocyst fluid have shown that LDH-4 and LDH-5 predominate quantitatively, despite a normal serum LDH isoenzyme pattern.¹⁰ Lactate dehydrogenase 4 and 5 have been reported to predominate in the auricular cartilage of rabbits, cows and humans.²¹ Iekioka *et al.* theorised that, as the LDH isoenzyme pattern of auricular pseudocyst fluid was consistent with that of cartilage, and as histological examination of pseudocyst walls revealed cartilage degeneration, LDH may be released from disrupted auricular cartilage during pseudocyst formation.⁶

- This study assessed lactate dehydrogenase (LDH) isoenzyme patterns in auricular pseudocyst fluid and serum
- Cyst fluid had higher proportions of LDH-4 and LDH-5 and lower proportions of LDH-1 and LDH-2, compared with serum
- A characteristic LDH isoenzyme pattern was identified which could assist auricular pseudocyst diagnosis

Many treatment modalities have been reported for auricular pseudocyst, but the problems of recurrence and cosmetic appearance persist. Treatments include conservative management and surgical intervention, and usually address cosmetic considerations. One

successful approach is local aspiration followed by local injection of a topical steroid or sclerosing agent, followed by application of a compression dressing to ensure a better cosmetic appearance of the pinna. A more aggressive treatment comprises deroofing the anterior leaflet of the cyst and curetting the posterior leaflet to remove granulation tissue and debris. Such deroofing surgery is a safe, easy and reliable procedure for auricular pseudocyst treatment, if conservative measures fail or are declined by the patient.^{5,10,26}

In the present study, cyst fluid was found to have high percentage distributions of LDH-4 and LDH-5 and low percentage distributions of LDH-1 and LDH-2, despite fairly normal serum LDH isoenzyme patterns. Plotted graphically, the percentage distribution of LDH isoenzymes had a positive gradient in cyst fluid but a negative gradient in serum (Figure 1).

This analytical result can be applied clinically to help improve the accuracy of auricular pseudocyst diagnosis in clinically suspicious cases. This is illustrated by the patient shown in Figure 3. This patient had previously undergone needle aspiration of her cyst twice in a local clinic before being seen at our hospital. The percentage values of LDH-4 and LDH-5 were higher in the cyst fluid than the serum. The percentage distribution plot of the various LDH isoenzymes had a positive gradient for cyst fluid but a negative gradient for serum. Therefore, this patient was diagnosed with auricular pseudocyst and successfully treated, with no recurrence at the time of writing.

Conclusion

In this study of patients with auricular pseudocysts, the percentage distributions of various LDH isoenzymes differed in cyst fluid compared with autogenous serum: percentage distributions of LDH-4 and LDH-5 were higher in cyst fluid than in serum, while those of LDH-1 and LDH-2 were higher in serum than in cyst fluid. This result could provide a useful, laboratory-generated marker assisting accurate diagnosis of auricular pseudocyst in clinically suspicious cases, in addition to observation of the usual clinical features. This would facilitate successful treatment of the lesion.

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