Clinical Differences in Types of Otalgia

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Background and Objectives: Although otalgia is usually associated with ear problems, it may also originate outside the ear. We therefore assessed the clinical characteristics of patients with otalgia. Subjects and Methods: We analyzed 294 patients who presented with otalgia. We assessed differences in otalgia between adults and children, differences in otogenic vs. referred otalgia between adults and children, differences between men and women. Results: Of the 294 patients, 208 (70.7%) had otogenic otalgia and 86 (29.3%) had referred otalgia. Hearing disturbance and otorhea were significantly more common in otogenic otalgia, whereas rhinorrhea, sore throat, and postnasal drip were significantly more common in referred otalgia. Children were more likely to have otogenic otalgia than adults. The proportion of patients with referred otalgia was significantly higher in adults than in children (p<0.05). Otogenic otalgia was more common in men, whereas referred otalgia was more common in women. Among patients with referred otalgia, neuralgia was significantly more frequent in women than in men (p<0.05). Conclusions: Otogenic otalgia was more frequent in men than in women and in children than in adults, whereas referred otalgia was more frequent in women and adults, indicating that types of otalgia were dependent on age and gender.

KEY WORDS: Otalgia · Primary · Referred · Adult · Child.

Introduction

Various diseases can cause otalgia because the ear has rich sensory innervation through many cranial (V, VII, IX, and X) and cervical (2 and 3) nerves. Otalgia can be classified as primary or referred. Primary otalgia is ear pain that originates inside the ear, whereas referred otalgia is ear pain that originates from outside the ear [1,2]. Thus, a detailed patient history and through exam are is required to accurately determine whether otalgia is primary or referred.

Each part of the ear is affected by several sensory nerves. The auricle is affected by cranial nerves V, VII, X, C2, and C3; the external auditory meatus by cranial nerves V, VII, and X; the tympanic membrane by cranial nerves VII, IX, and X; and the middle ear by cranial nerves V, VII, and IX. These 4 cranial nerves, as well as cervical nerves 2 and 3 are also distributed in other regions of the body as well as the ears. Therefore physical exam in adjacent structures should be performed [3-5]. We therefore investigated the clinical characteristics of patients with otalgia, including accompanying diseases, the difference between children and adults, and the difference between men and women.

Subjects and Methods

Between 2010 and 2013, 294 patients visited the Department of Otolaryngology at Kyung Hee University Medical Center with complaints of otalgia. Patients were subdivided into those with otogenic or referred otalgia and their clinical characteristics were compared. In addition, we assessed differences in characteristics of otalgia between adults and children, differences in characteristics of otogenic vs. referred otalgia between adults and children, differences between men and women, and differences according to the side of pain. Patients who had difficulties communicating and those with an inaccurate medical history were excluded.

The 294 patients consisted of 108 males and 186 females. There were 52 children, of mean age 5.5±2.7 years (range, 1
to 13 years) and 231 adults, of mean age 49.8 ± 15.8 years (range, 20 to 81 years). The patients underwent thorough examinations covered the ear, the teeth, the temporomandibular joint, the nose, the sinuses, and head and neck areas, and when necessary, examinations included direct and indirect laryngoscopy and biopsy. Patients without an ear, nose, and throat disease were referred to other departments for a definitive diagnosis.

All statistical analyses were performed using SPSS version 18.0 (SPSS Inc., Chicago, IL, USA). Groups were compared using the chi-square test, Fisher’s exact test, and other statistical analyses, as indicated. Differences were considered statistically significant at p<0.05.

Results

Of the 294 patients, 208 (70.7%) were diagnosed with otogenic otalgia and 86 (29.3%) with referred otalgia. Children were significantly more likely to have otogenic otalgia than adults (p<0.05). Most children with otogenic otalgia were diagnosed with acute otitis media (AOM). The frequency of referred otalgia was significantly higher in adults than in children. Otogenic otalgia tended to be more frequent in males than in females, whereas referred otalgia was more frequent in females (p<0.05). Neuralgia was diagnosed significantly more often in females (Table 1).

Ear fullness (33%) and rhinorrhea (14.6%) were the most common symptoms accompanying otogenic and referred otalgia, respectively. Hearing disturbance and ototrauma were significantly more frequent in patients with otogenic otalgia, whereas rhinorrhea, sore throat, and postnasal drip were significantly more frequent in patients with referred otalgia (p<0.05 each; Table 2 and 3). There was no different in frequency in unilateral and bilateral otalgia in otogenic and referred otalgia (Table 4).

Discussion

Otalgia can be classified into 2 types. Otogenic otalgia originates from diseases of the external, middle and inner ear, whereas referred otalgia arises from pathologies outside the ear [4,5]. The frequency and ratio of these two types of symp-

| Table 1. Diagnosis of otalgia patients |
|--------------------------------------|
|                                      |
| **Otalgie otalgia (diagnosis)**      |
|--------------------------------------|
| COM 73 (35.1%)                       |
| AOM 55 (26.4%)                       |
| External auditory canal 33 (15.9%)   |
| Ear trauma 13 (6.2%)                 |
| E-tube dysfunction 9 (4.3%)          |
| Ramsay hunt syndrome/Bell’s palsy 8 (3.8%) |
| Auricular infection 7 (3.4%)         |
| Myringitis 2 (1.0%)                  |
| Impacted cerumen 1 (0.5%)            |
| Others 7 (3.4%)                      |
| Total 43 (82.7%)                     |

| **Referred otalgia (diagnosis)** |
|----------------------------------|
| Tonsillitis, pharyngitis 19 (22.1%) |
| Nasal lesion 17 (20.0%)           |
| Neuralgia (CN V, CN IX) 12 (14.0%) |
| Headache 10 (11.6%)               |
| TMJ disorder 7 (8.1%)             |
| Oral lesion 2 (2.3%)              |
| LPR 2 (2.3%)                      |
| Salivary gland disorder 2 (2.3%)  |
| Cervical lymphadenopathy 1 (1.2%)  |
| Nasopharyngeal cancer 1 (1.2%)     |
| Others 13 (15.1%)                 |
| Total 9 (17.3%)                   |

*p < 0.05, Fisher’s exact test, COM: chronic otitis media, AOM: acute otitis media, TMJ: temporomandibular joint, LPR: laryngopharyngeal reflux
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Symptoms are dependent on whether patients are seen by otolaryngologists or other physicians. In this study, otogenic otalgia was more frequent than referred otalgia, perhaps because these patients were initially examined and treated by otologists.

Otogenic otalgia may be due to inflammation, mechanical causes, neoplasm, or Eustachian tube dysfunction [6]. Infectious causes include furunculosis, infected sebaceous cysts, cellulitis, otitis externa, necrotizing otitis externa, AOM, mastoiditis, petrous apicitis, bullous otitis externa, and bullous myringitis. Inflammatory causes include chondrodermatitis and relapsing polychondritis. Mechanical causes include traumatic laceration, pinna hematoma, and tympanic membrane perforation. Neoplastic causes include squamous cell carcinoma and adenocarcinoma; and Eustachian tube dysfunctions include those due to otitis media with effusion and chronic otitis media.

Acute infectious ear disease is the most common cause of primary otalgia. Patients with chronic otologic infections, except for chronic myringitis, rarely complain of severe otalgia. Thus, another cause, such as acute infection, is likely if chronic otologic infections are accompanied by otalgia [7].

The causes of otalgia varied among our patients. For example, 78% of patients with primary otalgia were diagnosed with acute infectious ear disease, similar to previous results [4].

Referred otalgia may be caused by various mechanisms. Complex sensory innervation of the auricle and external ear originates during the generation of the ear. Otic cysts are located between pairs of branchial arches, with cyst location resulting in the domination of various cranial nerves. Other organs are also under the control of these sensory nerves, resulting in referred otalgia [8,9]. Referred otalgia may arise from the inability of the brain to distinguish the origin of pain because neurons starting from visceral and somatic sensation territories ascend to the brain via the same pathway [10]. Alternatively, miscommunication may occur at the ventral posterior nucleus between the lateral and medial levels of the thalamus. Finally, referred otalgia may be a high-level phenomenon oc-

| Table 2. Symptoms accompanying otalgia | Accompanying symptoms | n (%) |
|---------------------------------------|-----------------------|-------|
| Otologic symptoms                     |                       |       |
| Ear fullness                          | 97 (33.0)             |       |
| Hearing disturbance                   | 90 (30.6)             |       |
| Otorrhea                              | 79 (26.9)             |       |
| Tinnitus                              | 65 (22.1)             |       |
| Dizziness                             | 38 (12.9)             |       |
| Rhinorrhea                            | 43 (14.6)             |       |
| Nasal obstruction                     | 40 (13.6)             |       |
| Sore throat                           | 29 (9.9)              |       |
| Fever                                 | 23 (7.8)              |       |
| Postnasal drip                        | 20 (6.8)              |       |
| Voice change                          | 3 (1.6)               |       |
| Reflux symptom                        | 3 (1.6)               |       |
| Non-otologic symptoms                 |                       |       |
|                                      |                       |       |

Table 3. Main symptoms accompanying otogenic and referred otalgia

| Accompanying symptoms | Otogenic otalgia (%) | Referred otalgia (%) | p value |
|-----------------------|---------------------|----------------------|---------|
| Ear fullness          | 73 (35.1)           | 24 (27.9)            | 0.233   |
| Hearing disturbance   | 73 (35.1)           | 17 (19.8)            | 0.009*  |
| Otorrhea              | 72 (34.6)           | 7 (8.1)              | 0.000*  |
| Tinnitus              | 47 (22.6)           | 18 (20.9)            | 0.754   |
| Dizziness             | 29 (13.9)           | 9 (10.5)             | 0.419   |
| Rhinorrhea            | 25 (12.0)           | 18 (20.9)            | 0.049*  |
| Nasal obstruction     | 25 (12.0)           | 15 (17.4)            | 0.217   |
| Sore throat           | 14 (6.7)            | 15 (17.4)            | 0.005*  |
| Fever                 | 18 (8.7)            | 5 (5.8)              | 0.409   |
| Postnasal drip        | 10 (4.8)            | 10 (11.6)            | 0.035*  |
| Voice change          | 1 (0.5)             | 2 (2.3)              | 0.206   |
| Reflux symptom        | 1 (0.5)             | 2 (2.3)              | 0.206   |

*p<0.05, Fisher’s exact test

Table 4. Difference in laterality between otogenic and referred otalgia

| Laterality     | Otogenic otalgia (%) | Referred otalgia (%) | p value |
|----------------|----------------------|----------------------|---------|
| Unilateral     | 174 (83.7%)          | 64 (74.4%)           |         |
| Right          | 96 (46.2%)           | 32 (37.2%)           |         |
| Left           | 78 (37.5%)           | 32 (37.2%)           |         |
| Bilateral      | 34 (16.3%)           | 22 (25.6%)           | 0.155   |

Chi-square test

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curring at the cerebral cortex itself [8].

Referred otalgia is associated with the nerve affected. For example, the auriculotemporal nerve (cranial nerve V) is affected by temporomandibular joint dysfunction, dental diseases, trigeminal neuralgia, and mandibular osteomyelitis/tumor. The posterior auricular nerve (cranial nerve VII) is affected by acoustic neuroma and herpes zoster infection. Jacobson’s nerve (cranial nerve IX) is affected by tonsillitis/pharyngitis, sinusitis, pharyngeal tumor, and glossopharyngeal neuroma. Arnold’s nerve (cranial nerve X) is affected by laryngopharyngeal reflux, criopharyngeal spasm, and vagal stimulators. The greater auricular (C2) and lesser occipital (C3) nerves are affected by cricopharyngeal spasm, and vagal stimulators. The greater auricular nerve is affected by temporomandibular joint dysfunction, dental diseases, trigeminal neuralgia, and mandibular osteomyelitis/tumor.

In this study, otologic symptoms, such as ear fullness, hearing disturbance, otorrhea, tinnitus, and dizziness, accompanied otogenic otalgia; whereas rhinorrhea, nasal obstruction, post-nasal drip, sore throat, fever, voice change, and reflux symptoms accompanied referred otalgia. This result is consistent with those of previous reports [16,17].

In children, otalgia, cough, rhinitis, fever, diarrhea or vomiting are symptoms of AOM, the most commonly diagnosed cause of primary otalgia [18]. The rates of referred otalgia were similar in men and women. Previous studies found that unilateral otalgia was more common than bilateral otalgia, although the frequencies of right and left sided unilateral otalgia were similar [19]. We found that 83.7% of patients with otogenic otalgia and 74.4% of those with referred otalgia had unilateral otalgia, but there was no difference between the right and left sides.

**Conclusion**

Otogenic otalgia was more commonly diagnosed than referred otalgia, with the latter usually arising from rhinologic or head and neck diseases. The proportion of otogenic and referred otalgia differed by age and gender, with otogenic otalgia being more frequent in men and in children and referred otalgia more frequent in women and in adults. Adults who complain of otalgia should be suspected of having referred otalgia and undergo detailed physical examination for other diseases that can cause referred otalgia.

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