

Perichondritis of the auricle and its management

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Abstract

Objective: To conduct a study of patients presenting with perichondritis of the auricle and to analyse the possible aetiological factors responsible, the bacteriological agents involved, the treatment modalities and the complications of such infections.

Setting: Academic department of otolaryngology.

Design: A retrospective clinical study of patients treated over a five-year period.

Participants: Sixty-one patients with clinically proven perichondritis of the auricle, with or without diabetes mellitus (i.e. malignant otitis externa).

Results: Based on the severity of the disease, otherwise uncomplicated patients were assigned to group A and divided into three cohorts. Patients with perichondritis secondary to malignant otitis externa were analysed separately as group B. Men formed the majority of the patients and most were young (16–35 years). Trauma was the main cause (46 per cent) and *Pseudomonas aeruginosa* the most common micro-organism isolated. The condition was managed conservatively with antibiotics alone in 19 patients (31 per cent) and these cases had no residual deformity at follow up (group A, stage one). Incision and drainage was performed in a further 19 patients (31 per cent), resulting in minor residual deformity in one half (group A, stage two). Debridement was performed in 17 patients, and these patients had either gross (29 per cent) or minor residual deformity (71 per cent; group A, stage three). Six patients with perichondritis secondary to malignant otitis externa were managed by wound debridement via a post-auricular approach; all had minor residual deformities.

Conclusions: Perichondritis can be divided into two groups, depending on cartilage loss and on the presence or absence of malignant otitis externa. The treatment used and the residual deformity that will ensue are entirely dependent on the stage of disease.

Key words: Perichondritis, Ear, External; Bacterial Infections; Anti-Bacterial Agents; Surgical Procedures, Operative; Treatment Outcomes

Introduction

Perichondritis of the auricle is a complication of the traumatised ear and can lead to residual deformity.^{1,2} The term ‘perichondritis’ is itself a misnomer, as the cartilage is almost always involved, with abscess formation and cavitation.

Blunt injury with subsequent haematoma and secondary infection is the commonest cause of perichondritis,³ although penetrating injuries such as ear-piercing⁴ and acupuncture⁵ may also introduce infection directly. Suppurative perichondritis has also been described following mastoid surgery⁶ and as a complication of a burns injury. In uncomplicated cases, only a limited portion of the cartilage is usually involved, whereas in burns the cartilage damage is more generalised.¹

The infection usually presents as a dull pain accompanied by redness, warmth and swelling. It usually starts in the helix and anti-helix but may

involve the whole cartilage if treatment is withheld.¹ As with otitis externa, the most common microbiological agent implicated is thought to be *Pseudomonas aeruginosa*,¹ which seems to have a special affinity for the damaged cartilage.^{7,8} The other organisms commonly found include proteus species,⁶ *Staphylococcus aureus*¹ and *Escherichia coli*.⁹

Although suppurating perichondritis resembles any surgical abscess, the structure and texture of the pinna makes it difficult to treat.⁶ Many different surgical modalities have been described but, if the disease is severe, considerable disfigurement should be anticipated. One of the first surgical methods of treatment was multiple skin incisions over the abscess.¹⁰ However, in more advanced cases, wide excision, with a composite resection of the overlying skin, necrotic cartilage and diseased perichondrium but preserving the skin of the contralateral surface, may be necessary.⁶ Dowling *et al.* advocated

modifying the procedure by excising the necrotic material through a helical incision and by splitting the ear in a bivalved fashion.¹¹ These procedures require repeated debridement and prolonged treatment, and there is frequently loss of cartilage and a severe residual deformity.⁹

Perhaps because of this, other authors have described the insertion of polyethylene tubes inside Penrose drains placed anterior and posterior to the infected cartilage,⁷ with antibiotic solution irrigated into the infected area daily.^{7,12} A review comparing the effectiveness of excision versus tubal drainage concluded that the aesthetic results of the tubal method were superior to those of methods that excise damaged cartilage.⁹

A literature search revealed only a handful of articles dealing with this subject. The aim of this present paper was to analyse the aetiological factors responsible and to attempt to classify and stage this disease, as well as to formulate a treatment protocol that should be advocated for the different disease stages.

Materials and methods

A retrospective study was conducted of all patients presenting with perichondritis to the department of otolaryngology – head and neck surgery at Kasturba Medical College over a five-year period.

From the case records, the clinical history details were extracted, with special emphasis on the apparent aetiology and any predisposing conditions. The results of microbiological examination and culture sensitivity of the pus obtained were recorded from the case sheets.

Selection criteria for different treatment modalities

In retrospect, the severity of the disease appeared to fall into the following groups. We would propose these groups as a staging system for this disease, as the prognosis seemed directly related to these stages.

Group A comprised patients with perichondritis of the auricle secondary to causes other than malignant otitis externa. Within this group, the following stages were evident: stage one, early perichondritis without fluctuant abscess; stage two, perichondritis with fluctuant abscess but no cartilage destruction; and stage three, perichondritis with fluctuant abscess and cartilage destruction.

Group B comprised patients with perichondritis secondary to malignant otitis externa, with or without osteomyelitis of the temporal bone.

Of the 61 patients included (see below), 19 had early disease (i.e. group A, stage one, tenderness and erythema only) and all were treated with intravenous antibiotics alone. In patients with a fluctuant abscess, surgical intervention was undertaken in the form of incision and drainage. The cartilage was then inspected for necrosis; any diseased cartilage was excised. Patients with perichondritis secondary to malignant otitis externa, with or without osteomyelitis of the temporal bone, were treated by wound debridement.

Medical treatment

The following antibiotics were given in differing combinations: crystalline penicillin 1 million units 6 hourly intravenously (iv); gentamicin 3–5 mg/kg body weight 8 hourly iv; ciprofloxacin 200 mg 12 hourly iv; or amikacin 15 mg/kg body weight 12 hourly iv. Combinations of crystalline penicillin and gentamicin were given initially in all cases; antibiotics were subsequently changed depending on the bacterial culture and sensitivity reports obtained.

Surgical treatment

Incision and drainage was performed in all cases with a clinical suggestion of abscess formation. In all cases, this was performed under local anaesthesia and with aseptic precautions. The initial incision was made horizontally at the lower limit of the swelling (Figure 1) and a swab was taken for culture and sensitivity. The cartilage was then inspected and, if found to be normal, a pressure bandage was applied. In cases of persistent fluctuance in the same area, or appearance of fluctuance in any other area, the procedure was repeated.

In cases of cartilage necrosis, additional limbs were added to the incisions to convert the wound into a 'window panel' (Figure 2). The skin flap was reflected and the perichondrium was excised, together with any necrosed or dead cartilage. The margins of the remaining cartilage were then freshened and the skin flap repositioned. A firm pressure bandage was applied in all cases.

Patients with perichondritis secondary to malignant otitis externa, with or without osteomyelitis, were treated by wound debridement via a post-auricular approach. A mastoidectomy was performed in patients in whom temporal bone osteomyelitis was suspected, followed by fashioning of a wide meatoplasty.

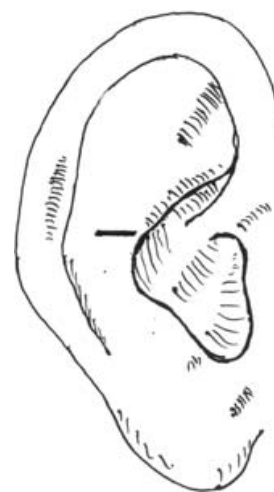


FIG. 1

The horizontal incision made at the lower limit of the swelling.

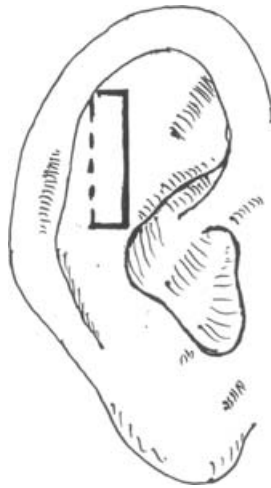


FIG. 2

Additional limbs are added to convert the horizontal incision into a window panel.

Results

Sixty-one patients were diagnosed with perichondritis over the five-year study period. Of these, 46 were male (75 per cent) and 15 female (25 per cent). The patients' ages ranged from two to 72 years, but the majority (57 per cent) were aged between 16 and 30 years.

The most common aetiological factor was trauma, which was present in 28 cases (46 per cent). Six cases (10 per cent) were secondary to chronic ear discharge and one to furunculosis. Four cases (7 per cent) followed mastoid surgery. Six cases (10 per cent) were due to malignant otitis externa with coexisting diabetes mellitus. One case each was due to a burn, to leukaemic infiltration and to an insect bite. One patient who was a painter developed perichondritis secondary to an allergic reaction to paint. In eleven of our cases (18 per cent), no significant cause could be determined. The results are shown in Table I.

The results of bacteriological culture were only available in 42 patients. *Pseudomonas aeruginosa* was the predominant causative organism, being found either alone (in 16 patients, 38 per cent) or in combination with other organisms (*Escherichia*

TABLE II

MICRO-ORGANISMS ISOLATED FROM CASES OF PERICHONDritis		
Micro-organism	Cases (n)	%
<i>Pseudomonas & E coli</i>	21	50
<i>Pseudomonas aeruginosa</i>	16	38
<i>Pseudomonas & Staphylococcus aureus</i>	3	7
<i>Staphylococcus aureus</i>	2	5

coli in 21 cases and *Staphylococcus aureus* in three patients). *Staphylococcus aureus* alone was cultured in two patients. These results are shown in Table II. The causative organism was sensitive to ciprofloxacin in 18 cases (43 per cent) and to gentamicin in 16 cases (38 per cent). In other cases, the organisms were sensitive either to amikacin (12 per cent), lincomycin (5 per cent) or co-trimoxazole (2 per cent).

Of the cases surveyed, 55 (comprising group A) had no evidence of malignant otitis externa. In this group, 19 patients (31 per cent) with early perichondritis and no fluctuant abscess were managed conservatively with antibiotics only. At the end of treatment, there was no deformity of the auricle noted in any of these patients. This group was classified as stage one.

A further 19 patients presented with a fluctuant abscess but no cartilage involvement (stage two). All of these patients underwent incision and drainage together with antibiotic therapy. Following treatment, only 10 patients (53 per cent) had minor residual deformity. In four cases, which had initially been classified as stage two, there was progression of disease with cartilage involvement (stage three), and debridement was eventually necessary.

Seventeen patients (28 per cent) had cartilage necrosis (stage three) and underwent cartilage debridement (including the four cases which progressed from stage two to stage three). In this group, five patients (30 per cent) developed a grossly deformed auricle following treatment and 12 (70 per cent) developed a minor deformity of the auricle.

All six patients (10 per cent) with malignant otitis externa (i.e. group B) were treated with wound debridement, which included cartilage debridement of the auricle and external auditory canal via a post-auricular incision. In four cases of coexisting temporal bone osteomyelitis, a mastoidectomy was also performed (Table III).

TABLE I

APPARENT AETIOLOGY OF PERICHONDritis*

Aetiology	Cases (n)	%
Post-traumatic	28	46
Post-infective	6	10
Post-operative	4	7
Malignant otitis externa	6	10
Burns	1	1.5
Leukaemia	1	1.5
Furunculosis	1	1.5
Herpes zoster	1	1.5
Insect bite	1	2.5
Allergy	1	1.5
Unknown	11	18

*n = 61

Discussion

Perichondritis of the auricle can lead to varying degrees of external deformity, and it is a challenging condition to treat.

Previous studies have reported the main aetiological causes for this disease to be iatrogenic (post-operative),^{6,7,12} burns^{1,11} and ear-piercing.⁴ In our study, we found a considerably broader aetiology; in addition to the above, we also found cases resulting from burns, malignant (leukaemic) infiltration, allergy and insect bite. In eight cases, infection developed on a background of middle-ear and external ear infections, the latter varying from furunculosis to

TABLE III
SURGICAL METHODS EMPLOYED

Method	Cases (<i>n</i>)	%
Conservative	19	31
Incision & drainage	19	31
Cartilage debridement	17	28
Wound debridement	2	3
Mastoidectomy	4	7

diffuse lesions following herpes zoster and infection in diabetic patients (i.e. malignant otitis externa). This indicates that damage to the cartilage is not a necessary prerequisite for perichondritis; the cartilage can clearly become infected if the overlying infected meatal skin is subjected to only minimal trauma, such as follows instrumentation or scratching with an infected fingernail. In a significant percentage of cases, no significant cause could be determined.

We divided our patients into two groups depending on whether the patient had malignant otitis externa or not. This division was essentially because of the different management of the two groups. Patients in the first group can be treated either entirely conservatively or with minimal surgery, whereas patients with diabetes need aggressive management of their disease followed by surgical intervention. We further divided the first group into different stages, depending on the presence or absence of a fluctuant abscess and on whether the underlying cartilage was damaged. Progression appears to depend on the virulence of the responsible organism, the aetiology of the infection and, perhaps, the immunocompetence of the host.

Although many surgical modalities have been described in the past, all authors have agreed that parenteral antibiotics are of paramount importance in the treatment of this condition. We analysed the pus in 42 patients with perichondritis and, in agreement with other studies, found that *Pseudomonas aeruginosa* was present in the majority of cases (95 per cent). However, the antibiotic sensitivity of this organism did vary, and this highlights the need to obtain a swab in all cases.

In early cases with erythema and tenderness but no fluctuant abscess (group A, stage one), conservative management with antibiotics alone led to complete resolution of disease, with no residual deformity. In the literature, we found only a few references to conservative management, offered in most cases for perichondritis developing after mastoid surgery.^{13,14} However, we would contend, on the basis of our study, that there is an early stage in perichondritis at which there is no abscess formation and at which parenteral antibiotics alone can resolve the condition.

Treatment of perichondritis using the composite excision method has previously been reported⁶ and has appeared useful in patients with infection following burns.¹ Any loss of the underlying structure of the ear is liable to lead to gross deformity. However, if the disease is early and is localised to the antihelix

then, even following a burns injury, there may be minimal subsequent deformity.¹¹ Splitting of the auricle in a bivalve fashion in advanced cases and removal of necrotic cartilage¹¹ will obviously lead to a gross deformity of the pinna. Tubal drainage methods and irrigation with antibiotics to treat localised perichondritis have been advocated.^{7,12,15} Such methods, which produce a high local concentration of antibiotic, may produce better aesthetic results compared with methods using composite resection.⁹ Indeed, as the framework of the pinna is preserved, and because irrigation may help in the regeneration of new cartilage,^{9,16,17} these methods are to be preferred. We could not use tubal methods, both because of the prolonged duration of treatment involved and because of poor patient compliance.

Our surgical management was also based on the belief that an intact cartilaginous framework leads to a better cosmetic result, and our results support this conclusion. Only in the case of diseased cartilage did we extend the incision to a window procedure, as has been previously reported,¹⁸ with excision of diseased tissues and cartilage. However, this approach has its drawbacks, since in four cases of relatively early disease there was progression, with eventual cartilage involvement and requirement for debridement.

- **This was a retrospective study of 61 patients with perichondritis of the auricle. There were no control data**
- **The putative aetiologies of the disease are reported. As in other series, the commonest infective organism was *Pseudomonas aeruginosa***
- **All patients received antibiotics. Incision and drainage was performed in cases in which an abscess had resulted. A separate sub-group of patients with diabetes and malignant otitis externa was also included, and a staging system for the disease is proposed**
- **Cosmetic outcome depended on the disease stage and, in particular, on the damage to the underlying cartilage. In uncomplicated cases, the authors advocate antibiotics alone**

Our series also included cases of perichondritis following malignant otitis externa. It is widely known that perichondritis of the auricle can be secondary to this disease,² and woody induration of the pinna is one of the many warning signs of temporal bone osteomyelitis.¹⁹ In our series, we had six cases of malignant otitis externa with or without osteomyelitis of the temporal bone and with involvement either of the external auditory canal cartilage or of the part of the conchal cartilage adjacent to the opening of the external auditory canal. This we treated by wound debridement via a post-auricular approach and, where necessary, with a wide

meatoplasty and mastoidectomy. Only minor deformity of the auricle resulted, perhaps due to the fact that only the part of the conchal cartilage adjacent to the opening of the external auditory canal was involved. However, we have separated these cases from the rest, since they required more radical management.

Conclusion

We present a large series of perichondritis of the auricle, with diverse apparent aetiologies, some of which have not been reported before. As in other series, *Pseudomonas aeruginosa* was the predominant causative organism, although other organisms were also incriminated. The prognosis of the condition varies depending upon the disease stage and on whether there is any underlying pathology. No surgical intervention is necessary in the earliest stages, and intravenous antibiotics alone will suffice in these cases. However, abscess formation requires drainage and, as might be anticipated, perichondritis secondary to malignant otitis externa requires very aggressive surgery and therapy if it is to be brought under control. In all cases, an attempt must be made to preserve cartilage, since the final cosmetic outcome depends on the amount of cartilage damaged or removed.

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Dr H K Chandra Prasad takes responsibility for the integrity of the content of the paper.
Competing interests: None declared
