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# Clinical Records

# Luc's abscess - a rare complication of middle-ear infection

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**Abstract**
A case of subperiosteal temporal abscess of otitic origin is presented. This is an unusual complication of otitis media. The pathogenesis of Luc's abscess is different from other extracranial complications of middle-ear infections in that it is not associated with mastoid infection which results in subperiosteal pus formation. Based on our experience and the reports from the turn of the century, we present the presumptive pathogenesis and clinical features. We contend that these patients run an unexpectedly benign course, and require concomitantly more conservative treatment than other otitic abscesses.

**Key words: Abscess, complicationl; Otitis media**

## Introduction

Otitis media is a common disease which is usually amenable to medical treatment and in the vast majority of cases does not progress towards significant complications. Both the acute and chronic forms of middle-ear infection however have the potential to cause severe morbidity and even mortality (Table I). The spectrum of complications has essentially remained the same as encountered in the pre-antibiotic era, but two important problems have arisen since the introduction of antimicrobial drugs. Firstly, the dramatic decrease of complications has resulted in a diminished experience by many otolaryngologists and has possibly led to decreased awareness of the conditions (Kangsanarak *et al.*, 1993). Certain rare complications are almost never seen, even in larger referral centres. This has led to a steady loss of valuable knowledge acquired by previous generations of otolaryngologists and might result in inappropriate therapeutic steps being taken. Secondly, the injudicious use of antibiotics; i.e. the selection of an inappropriate drug or inadequate dose or period of administration can alter the cause of the disease and mask its progression. In addition, immunocompromised patients are treated more frequently in daily practice, their decreased resistance even to common pathogens affecting and often dramatically changing the clinical findings in otitis media.

The routes along which infections disease can spread from the middle ear causing complications are numerous and easily recognized. There are, however, less commonly encountered pathways which can pose diagnostic challenges and will require different therapeutic intervention. In this report a case of Luc's abscess is presented and its pathophysiology discussed. Review of the literature has revealed a historical background as well as further insight into this rare complication of otitis media.

## Case report

A 15-year-old girl presented with a one-week history of right-sided swelling over her temple and cheek. This had increased steadily and stretched to involve the periorbital soft tissues on the same side. For the previous three days she had experienced progressive trismus. There was a history of chronic otorrhoea from the right ear for the past year. This had worsened initially during her acute illness and then decreased again. There was no contributory medical or surgical history. She had not been attended to by an otorhinolaryngologist before.

TABLE I
COMPLICATIONS OF OTITIS MEDIA

| Intracranial | | Extracranial | |
|---|---|---|---|
| *Intracerebral* | *Extracerebral* | *Intratemporal* | *Extratemporal* |
| Focal encephalitis | Epidural abscess | Ossicular lesions | Bezold's abscess |
| Cerebral abscess | Subdural abscess | TM – perforation | Citelli's abscess |
| Otitic hydrocephalus | Lateral sinus thrombosis | VII – paralysis | Postauricular abscess |
| | Meningitis | Mastoiditis | Zygomatic abscess |
| | | Petrositis | Temporal abscess (Luc's abscess) |
| | | ↓ Pneumatization | |
| | | Labyrinthitis | |
| | | Sensorineural hearing loss | |

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FIG. 1

Computed tomography with intravenous contrast. Extensive soft tissue swelling and subperiosteal pus collection are demonstrated in the temporal fossa.

The patient was not acutely ill. Her temperature was 38.7°C, her pulse was 90 per minute. A prominent swelling reached from the pinna to the eye filling the temporal fossa and stretching inferiorly beyond the zygomatic arch into the soft tissue of the cheek. The overlying skin was warm, red and showed a few small blisters. Palpation produced pain and maximum fluctuation two to three cm anterosuperior to the pinna. Examination of the right ear revealed an offensive, purulent discharge emanating from the external meatus which was narrowed by marked swelling, predominantly of the superior canal skin. This made visualization of the tympanic membrane and middle ear impossible. The patient had severe trismus and weakness of the mandibular and buccal branches of the right facial nerve. Gingival tenderness and hyperaesthesia were present on the right without any evidence of dental disease. The function of the other cranial nerves was normal. There were no clinical signs of intracranial extension of disease.

The white cell count was 16 000. A CT scan showed a subperiosteal fluid collection in the temporal fossa, sclerosis of the mastoid, an opacified middle ear and severely narrowed external meatus (Figures 1, 2 and 3). The diagnosis of chronic otitis media with subperiosteal abscess and possible mastoiditis was made. At operation a temporal abscess was drained through an incision in the canal wall, facilitated by pressure exerted on the temporal swelling. Inspection of the middle ear revealed severe inflammatory changes in the meso- and epitympanum as well as squamous epithelium stretching into the attic. An antrostomy was performed, exposing a cholesteatoma filling out the antrum. It was noteworthy that the cholesteatoma sack as well as the surrounding antrum were dry, the few mastoid air cells found in the sclerosed bone were lined with normal healthy mucosa. No intraosseous suppuration or osteitis could be detected in any part of the temporal bone. There were no zygomatic air cells to be found. A modified radical mastoidectomy was performed, removing the cholesteatoma and a small drain left in the abscess cavity through the intrameatal

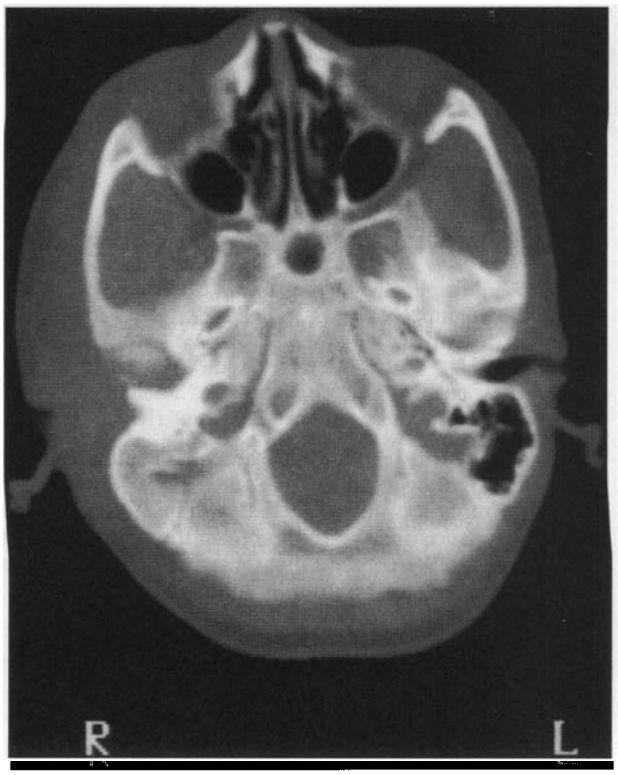


FIG. 2

The soft tissue swelling comprises the external acoustic meatus, which is almost completely obliterated and reaches anteriorly as far as the ipsilateral orbit.

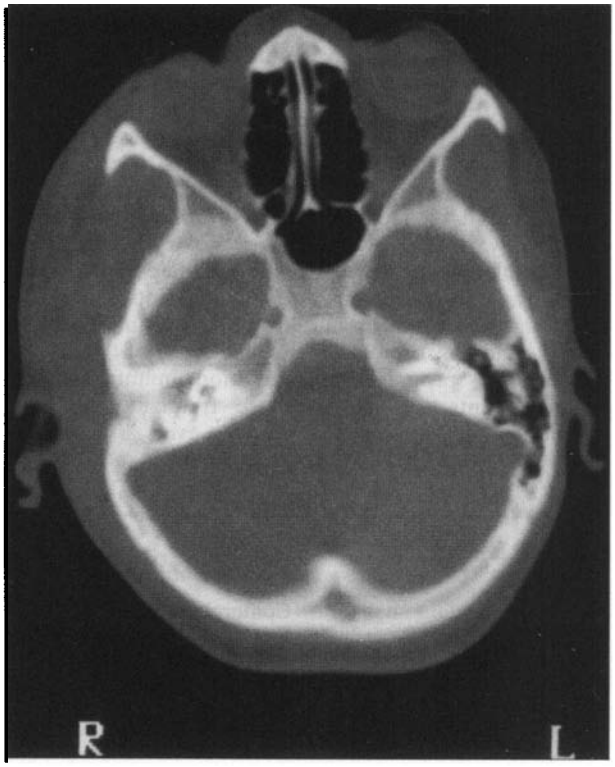


FIG. 3

Unilateral sclerosis in the mastoid segment of the temporal bone raised the suspicion of an underlying cholesteatoma. The most pronounced soft tissue expansion is superior to the zygomatic arch.

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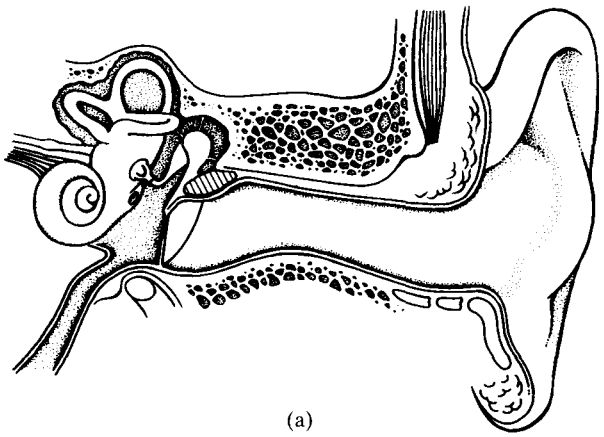
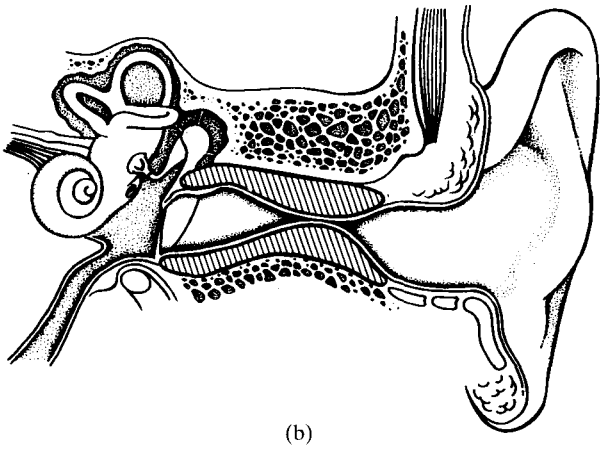


(a)

a. The development of the subperiosteal abscess starts in the epitympanum, where infection spreads along the notch of Rivinus into the superior part of the external auditory canal, undermining the canal skin. Prominent "juxtatympanic" swelling and pus collections can be mistakenly viewed as a bulging tympanic membrane and myringotomy may inadvertently be performed into the wrong space.



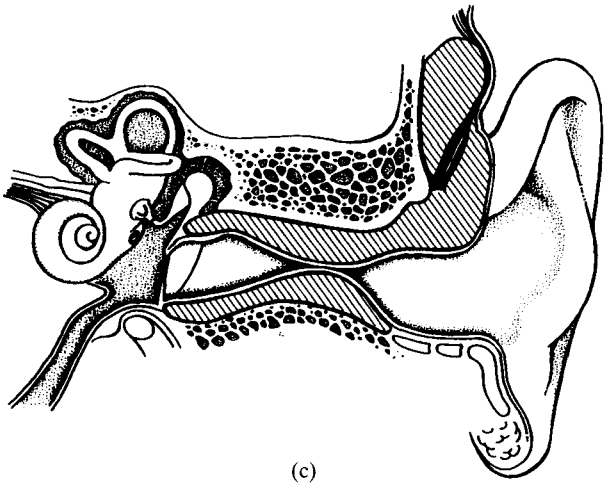
(b)

b. Spread of infection occurs along the meatus leading to oedema of canal skin and its separation from the bony wall through subperiosteal suppuration.

incision (it was removed after 24 hours). Tissue specimens cultured a β-haemolytic *Streptococcus* sp. Immediately post-operatively, the temperature returned to normal, the patient made a quick, uneventful recovery. Intravenous antibiotics were administered for a total of five days. Seven days post-operatively the trismus had resolved and the facial nerve function returned to normal.

## Discussion

Complications of middle-ear infection are commonly classified into intra- and extracranial, the latter further subdivided into intratemporal and extratemporal (Table I). The group which consists of extracranial, extratemporal spread of disease comprise subperiosteal abscess formations in different areas of the temporal bone. Generally, it is believed that this pus collection is a result of intraosseous suppuration causing osteitis, most commonly in the mastoid and leading finally to destruction of the cortex overlying the affected air cells. Pus then spreads between cortical bone and periosteum leading to the formation of a subperiosteal abscess. The periosteum functions, at least temporarily, as a solid barrier against further progression of infection. An abscess formed in this manner is a complication of mastoiditis which itself is a complication of otitis media.



(c)

c. The pathology progresses towards an abscess formation, which can manifest itself anterior, superior or posterior of the auricle and lies between intact cortical bone and periosteum and is therefore deep to the temporalis muscle.

FIG. 4

Development of a temporal subperiosteal abscess after the rationale of LeMarc 'Hardour and Chauveau (1910)

Clearly our case does not fit the description of this disease process, as the infection was entirely limited to the middle ear and despite the presence of cholesteatoma in the antrum, no involvement of neighbouring air cells in the acute infection was noted. Furthermore zygomatic air cells were absent and no osteitis was demonstrable in the zygoma. The route by which the infection apparently progressed, was directly from the middle ear to the outside of the temporal bone via a subperiosteal route along the external meatus.

In 1900, Henri Luc was the first to describe this complication of otitis media. After the encounter of several similar cases he presented his experience before the International Otological Congress in 1912. (Luc, 1913) The 'subperiosteal temporal abscess of otitic origin without intraosseous suppuration' was later to become Luc's abscess. It was proposed by him that microorganisms penetrate the mucosa in the middle ear and spread submucosally reaching the subperiosteal space in the ear canal via anatomical pathways, especially in the superior meatus, the incisure of Rivinus and along branches of the deep auricular artery.

Support for this theory is found in an article by LeMarc'Hadour and Chauveau in 1910. Based on information collected from several patients they proposed three stages of periosteal involvement in middle-ear infection. They stressed the fact that their observations were made in patients *without* intraosseous extension of infection. Although only retroauricular abscesses were described by these authors, it is evident that anterosuperior spread is equally possible and will result in the formation of a temporal abscess. We have tried to demonstrate these stages in Figure 4 showing the formation of a temporal abscess.

(1) In the juxtatympanic stage (Figure 4a) the middle ear infection has just escaped from the tympanic cavity and formed a subperiosteal pus collection in the external ear canal immediately adjacent to the tympanic membrane, usually the posterosuperior quadrant.

(2) Further progression leads to the second stage which is characterized by swelling of the canal skin usually in its entire circumference (Figure 4b). Examination of the tympanic membrane is difficult or impossible;

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the clinical picture can easily be confused with otitis externa at this stage.

(3) In the third stage the disease has spread onto the lateral aspect of the temporal bone resulting in a palpable subperiosteal collection (Figure 4c).

Clinical findings in patients with Luc's abscess are distinct from cases of suppurative mastoiditis. The similarity between our patient, those of Luc and of LeMarc'Hadour and Chauveau can be distilled into the following description of the clinical picture: The general appearance of the patient shows few or no signs of an acute systemic illness. Otorrhoea may or may not be present or may be very mild or of a transient nature. Significant swelling of the external canal skin occurs, suggesting otitis externa. The pus formed in the middle ear tracks subperiosteally to reach the temporal fossa as shown in Figure 4. The pus therefore passes deep to temporalis muscle (Figure 4c). The maximum swelling and palpable fluctuation is located anterosuperior to the auricle but the disease can frequently involve the ipsilateral eye and cheek. Luc (1913) emphasized the 'particularly benign' nature of this complication of otitis media. Conservatism in treatment has therefore been advocated for this condition by the early authors. Simple drainage of the abscess through an incision in the superior part of the meatus was thought to be sufficient surgical therapy.

One has to bear in mind that in those early days incision and drainage was usually done under cocaine infiltration, whereas 'opening the bone' (Luc, 1913) required chloroform anaesthesia with its associated high risk. None of the early cases of Luc in which an antrostomy was performed showed any disease in the mastoid. Today, the underlying middle-ear infection, and probably, early subperiosteal spread is amenable to antibiotic treatment. Incision and drainage of an established abscess would be indicated, and whilst this would be done usually under general anaesthetic, and opening of the mastoid would not represent any greater morbidity, it would be unnecessary as the disease is usually limited to the middle ear. This realization by Luc represented a significant advance in diagnosis which could spare the patient further unnecessary surgery and risk.

Computed tomography (CT) scan findings in our case however made a mastoid exploration obligatory (Figures 2 and 3). The discovered cholesteatoma was certainly the cause of the chronic otitis in this patient but did not lead to mastoid disease with osteitis. Thus a case could be made for staged intervention, treating the acute complication with abscess drainage and intravenous antibiotics and performing an elective mastoidectomy later. The presence of a cholesteatoma in a case of subperiosteal temporal abscess of otic origin has not been previously reported. Most complications of acute or chronic otitis have been described in the pre-antibiotic era and can today still be found in the very young child or more rarely in the untreated- or incorrectly treated patient. In our experience however the majority of complicated cases in today's practice has a cholesteatoma underlying the acute exacerbation. A high degree of suspicion must hence be maintained in the management of these patients.

Of particular interest in our patient was the marked trismus and the partial palsy of facial nerve branches. No mention is made in the reviewed literature of either of these complications. The trismus can be explained by direct local effects of the pus collection and the surrounding inflammation on the temporalis muscle. Inferior spread of the infection into the infratemporal fossa further aggravates this effect on the musculature involved in jaw movements. Involvement of the mandibular and buccal branches of the facial nerve is however rather unexpected. In the absence of local swelling over the mandible and lower cheek, inflammatory and mechanical factors causing interruption in nerve conduction in the lower trunk of Cranial Nerve VII seem to be the cause although this does not account for the sparing of the upper trunk. The quick recovery of the nerve function demonstrates that only mild neuropraxia was present in this case.

A literature review of the last 30 years (Kafka, 1935; Hawkins *et al.*, 1983; Hawkins and Dru, 1983; Rosen *et al.*, 1986; Moisa *et al.*, 1987) did not reveal the report of a single case of subperiosteal temporal abscess of otitic origin as it was described by Luc. Rosen *et al.* (1986) report on one case of zygomatic subperiosteal abscess, which suffered from underlying mastoiditis. Unfortunately, exact details of this patient are not provided. The pathogenesis of zygomatic abscess complicating mastoiditis is described by Moisa *et al.* (1987). No information could be found pertaining to the significant difference in origin between zygomatic and temporal abscess. Despite their rarity, correct early diagnosis and differentiation between the underlying pathogenesis are important, particularly with regard to treatment.

## Conclusion

Subperiosteal abscesses of otitic origin can form without underlying osteitis. The spread of infection in Luc's abscess is through the submucoperiosteal layer in the middle ear via the subperiosteal space in the ear canal towards a subperiosteal collection in the temporal area. This condition is associated with relatively little morbidity and requires more limited surgical intervention. It can be drained via the external canal, and does not require mastoidectomy.

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