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Surgical Treatment of Suppurative Chondritis, Limited *versus* Radical Chondrectomy

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Abstract

Background Suppurative chondritis of auricle due to burn injury is a devastating complication which usually results in deformed shrunken ugly ear in spite of many modalities for treatment.

Objectives To document clinical nature of the injury, the results of various methods of treatment, and to recommend the management protocol of chondritis of burned ear.

Methods From Nov. 1998 to Nov. 2010 a prospective study performed on 100 patients 110 ears in Hilla Teaching General Hospital, Al-Kindy Teaching General Hospital on surgical treatment of suppurative chondritis. All cases were due to flame burn, and all were given prophylactic systemic antibiotics.

Results Forty six of patients were males (46%), 54 females (54%), ages ranged from 1 year 35 years with mean 24years, partial thickness burn 80 patients (80%), full thickness burn 20 patients (20%) .
Patients treated in three groups; the first group 20 ear (18%), treated by only stab wound drainage which resulted in 100% recurrence, the second group 20 ears (18%) treated by limited wound excision which resulted in 85% recurrence, the third group 70 ears (64%) treated by radical wound excision which resulted in 10% recurrence, total loss of auricle occurred in 10%, moderate deformity occurred in 80% of ears, mild deformity resulted in 10% of ears.

Conclusion Surgical treatment of Suppurative chondritis gives superior results by radical excision.

Key words Chondritis, Suppurative chondritis, Burned ears, Radical chondrectomy, Deformed ear.

Introduction

The blood supply of the cartilage of the external ear is poor, should it becomes infected, and it quickly liquefies [(1)]. Some authors mentioned that the cartilage has no intrinsic blood supply and thus has the potential to develop chondritis [(2)].

Burns of the ears could be partial thickness which usually heal with little or no deformity, or full thickness which lead to exposure of the underlying cartilage leading to desiccation and focal necrosis, but the majority of those patients don't develop chondritis.

Early treatment of burn is essential to avoid disablement [(3)].

The key and most important factor in treating ear burns is to prevent the development of suppurative chondritis because it's exceedingly painful and difficult to eradicate and require surgical treatment and the result is shrunken, misshapen ear [(2)].

Prevention is the key, as the treatment of an established infection frequently leads to disastrous consequences [(4)].

1. Avoidance of pressure on the injured ear by avoiding usage of pillows and dressing and the only dressing applied to the pinna should be antibiotic cream [(5)]. If necessary foam can be placed around the pinna to further prevent pressure. Specific head gear can be fashioned to

perform the same role. Local edema may predispose to thrombosis of central vessels, so adjustment of fluid resuscitation and elevation of the head of the patient may be of some value in prevention of suppurative chondritis [2].

2. Topical antibacterial to control bacterial proliferation as Mefanide burn cream which is agent of choice which suppressed chondritis significantly [6]. Systemic antibiotics prophylactically have no influence as shown in many studies [4].

Suppurative chondritis is a devastating complication of auricle burn in which secondary bacterial infection is superadded to thermal damage of the ear cartilage [7]. Chondritis usually seen 3-5 weeks post burn but has occurred as early as 11 days and as late as 9 weeks post burn [8].

The most common bacteria that causes perichondritis is Pseudomonas aeroginosa and it has been found that once chondritis occur the auricle never returns to normal [9]. The majority of the burned auricles heal on conservative treatment. The incidence varies in different studies from less than 3% to 20% or more.

Partial or full thickness burns, and sometimes develop after reepithelialization, has occurred No one can predict which ear will develop chondritis, which may occur in partial or fill thickness burns and sometimes develop after reepithelialization [9].

Suppurative chondritis may present as dull ear pain increasing in intensity within hours, (springing sign), recent onset of pain, redness, warmth, and swelling suggest the presence of chondritis [9].

Early diagnosis and treatment are essential to limit the progression of infection and necrosis and to minimize deformity, by complete removal of all non-viable tissues [10].

Different modalities for treatment tried:

1. Anterior and posterior poly ethylene drains for Antibiotic irrigation (Wanamaker 1972; Basiouny et al [11].
2. Iontophoresis: By using Antibiotic solutions. (LaForest and Cofrancesco) [12]. apparently successful management of Suppurative ear chondritis does suggest a clinical potential for the use of the procedure [12].
3. Excision and drainage leaving the posterior skin intact subsequent wound granulation and epithelialization may occur [13].
4. Extensive incision filleting the ear open with drainage and moist packing immediately up on diagnosis [14].
5. Grant described the use of dermabrasion of the skin and necrotic cartilage followed by skin grafting within 48 hours [15].
6. Treatment at the institute of surgical research (Dowling, Foley, and Moncrief, 1968, Mills, 1988) consisted of either; Formal debridement with incision and bivalving of the ear and excision of all non-viable cartilage, or; as now more common.

Prompt local debridement of infected tissues after early recognition of the process with a single layer of fine mesh gauze soaked in antibacterial solution between the skin flaps and the dressing changed daily until secondary closure [16].

Methods

For the period of November 1998 to November 2010, 100 patients (100 ears with suppurative chondritis) were studied prospectively at Hilla Teaching General Hospital and Al-Kindy Teaching General Hospital. The patient age ranged from 1 to 35 years with a mean of 24 years.

The age, sex, time from burn to detection of chondritis (Table 1), thickness of burn (Figure 1) prophylactic antibiotics, type of bacteria, number and type of operations to treat chondritis (Table 2) and recurrence were studied.

The treated patients were grouped into 3 categories:

a. First group treated by stab wound drainage comprised 20 ears.
b. Second group treated by limited excision comprised 20 ears.
c. Third group treated by radical excision included 70 ears.

Table 1. Duration of clinical detection of chondritis and its percentage

The duration of clinical detection	Percentage
2-3 weeks	70%
3-4 weeks	25%
5-8 weeks	5%

Figure 1. (A)Partial thickness ear burn (B) Full thickness ear burn

Table 2. Type of surgery and percentage of recurrence of chondritis

Type of surgery	Percentage
Stab wound drainage	100%
Limited excision	85%
Radical excision	10%

The patients were evaluated including the burned ear. In case of limited swelling, we incise on it directly with radical cartilage and necrotic tissue excision while if the swelling is wide, bivalving incision (incision along the helical rim) with drainage of pus and radical excision of the infected necrotic cartilage (which is soft while normal cartilage feels granular) and other tissues (Figure 2), with irrigation of the cavity with normal saline and sometimes adding Gentamicin solution, and povidone iodine solution followed by inserting fine mesh gauze soaked with povidone iodine solution 10% then soft dressing with mild pressure and sending the pus for bacteriological study to differentiate the type of microorganism and its sensitivity to antimicrobial drugs.

Figure 2. (A) Bivalving helical incision. (B) Bivalving /Radical excision

Twenty four to forty eight hours later, the dressing and the mesh gauze removed after soaking with normal saline, irrigation with normal saline and mild squeezing and milking of the drained cavity, then insertion of another smaller piece of gauze and redressing for an

additional 24 hours, after that if no pus collection found then cleaning and irrigation, then dressing. This procedure repeated daily until good healing insures which take about 7-10 days; and the ear leaves exposed later on.

After that the patient followed once weekly until complete healing which take 6-8 weeks. Pre and postoperative systemic antibiotic used such as Amikacin (15 mg/Kg/day), Gentamicin (5 mg/Kg/day), Carbenicillin (300 mg/Kg/day), or others according to culture and sensitivity tests.

In all procedures swab from the drained pus sent for bacteriological study and sensitivity test.

Results

The study comprised 46 males (46%) and 54 females (54%) with mean age of 24 years. The anterior surface of the ear involved in 85% and both surfaces in 15%, partial thickness burn in 90%, and full thickness burn in 10%. Unilateral chondritis; 90 patients (90%), bilateral chondritis 10 patients (10%). All cases are due to flame burn.

The results of bacteriological culture showed growth of pseudomonas aeroginosa in 62%, klebsiella in 22%, and E.colli, staphylococcus aureus, and proteus in 16% of the cultures.

Total loss of auricle occurred in 10% of ears, moderate deformity of auricle occurred in 80% of ears and mild deformity of auricle occurred in 10% of ears (Figure 3).

Discussion

The skin of the ear is attached to the perichondrium without any subcutaneous tissue for protection so it is highly vulnerable for injury during facial burns in which ear burn is a common finding [17].

In our study all cases are due to flame burn that is because the majority of cases of facial burns were due to flame burn because of wide usage of direct flame in the vast majority of domestic and industrial activities with carelessness and absence of strict adherence to safety measures and precautions at home or at work place, for that reason we used to receive sever ear burns, some of them came late to us and were badly managed by different types of people like nursing staffs pharmacist other family members, people who use herbals for treatment of burned patients or selling these products and others.

Figure 3. (A) Mild deformity (B) Severe deformity

Prophylactic systemic antibiotics given to all patients from admission and changed according to the results of culture and sensitivity tests.

Daily follow up and close observation of patients for signs of chondritis this was very important in early detection and early treatment.

In spite of systemic antibiotics and local antimicrobial application no one can guarantee its prevention and nobody can predict which ear will develop chondritis, that can follows superficial or deep burns,and which may occur as early as 11 days or after complete reepithelialisation, as late as 9 weeks post burn ; these findings corresponds with the studies accomplished by many authors [8,9].

Three ways of surgical treatment performed and compared with each other. The first group; treated by just stab wound drainage (20 ears), this performed just for pus drainage to relief pain until preparations for excision under general anesthesia were completed the recurrence rate in this group was 100% of the stabbed cases

The second group; treated by limited wound excision (20 ears) under general anesthesia in which the suspicious tissues were left un excised, the recurrence rate was 85% of the excised cases.

The third group; treated by radical wound excision (70 ears), in which no suspicious tissues left behind the recurrence rate was10% of the excised cases.

From this study we have found that the recurrence of chondritis is high in limited excision and low in radical excision; this because of inadequate excision of the abscess cavity leaving behind some infected and necrotic tissues which will result in further multiplication of infecting bacteria, and reaccummulation of pus and further damage to the cartilage and soft tissues, and reappearance of other clinical pictures; this finding corresponds with other studies performed in different countries [8,9,16].

Pseudomonas aeroginosa found to be the most common bacteria that is because in our burn units the most common bacteria is pseudomonas and as a consequence of hospital acquired infection Suppurative chondritis found to be due mostly to this microorganism; this finding corresponds with other studies in different localities in the world [18,11].

Deformity of the auricle is found to be in the majority of cases of moderate to severe deformities that's because of the nature of the disease process which is well known that once it start it is very difficult to stop and usually result in catastrophes'; these findings corresponds to other studies accomplished in different sites worldwide [8,9,18].

In addition to these factors, the compliance and cooperation of our patients and their companions concerning positioning to avoid pressure on the ears and taking medications and timing of surgeries were poor which will be reflected on the severity of the infection and deformity.

Conclusion

Suppurative Chondritis of burned ear is a devastating complication which once occurred is difficult to treat. Prevention of suppurative chondritis is far better than treatment of established infection.

In spite of all precautions and ways of treatment systemically and locally, and in spite of all what has been written and we believe that it is a preventable complication, nobody can predict which ear will develop chondritis and which will not. No evidence for the role of prophylactic antibiotics in prevention of chondritis.

Surgical treatment of chondritis should be of radical excision without leaving any suspiciously non-viable cartilage and other tissues otherwise recurrence rate will be very high. Once chondritis occurred the auricle will never return to normal and result in deformed misshapen shrunken auricles.

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