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A STUDY ON PROPORTION OF PERICHONDRITIS AND ITS MICROBIOLOGICAL PROFILE AMONG PINNA INJURY CASES - A CROSS SECTIONAL STUDY

Dr. Ruksana H.[1], Dr. Darshana Ravindran[2], Dr. Shambhu Dev S.[3], Dr. Santhi T.[4*]

[1]Senior Resident, Department of ENT, Government TD Medical College, Alappuzha, Kerala, India.
[2]Assistant Professor, Department of ENT, Government TD Medical College, Alappuzha, Kerala, India.
[3]Associate Professor, Department of ENT, Government TD Medical College, Alappuzha, Kerala, India.
[4*]Professor & HOD, Department of ENT, Government TD Medical College, Alappuzha, Kerala, India.

***Corresponding Author:** Dr. Santhi T.
*Professor & HOD, Department of ENT, Government TD Medical College, Alappuzha, Kerala, India.

ABSTRACT

Background

The purpose of this study was to determine the prevalence of perichondritis, its clinical microbiological profile, the factors linked to perichondritis, and the complications of perichondritis.

Methods

This was a hospital-based cross-sectional study conducted among patients presenting with pinna injury and symptoms of perichondritis attending the Department of Otorhinolaryngology at Government T.D. Medical College Hospital, Alappuzha, over a period of 18 months after obtaining IRC and IEC clearance.

Results

Out of 216 patients with pinna injury who presented to our department, the proportion of perichondritis was found to be 9.72%. Out of the study population, 86% were males and 14% were females. Regarding the mode of injury to the pinna, 82% resulted from RTA, 7.4% from self-fall, 4.2% from ear piercing, 3.2% from burns, 1.9% from dog bites, 0.5% from electrocution, and 0.5% without any known causes. Amongst the cases for which pus culture and sensitivity were done, 75% were found to be Pseudomonas, 6.2% were E. coli, and 19% were found to have mixed flora. Debridement was done in 29% of patients, and deformity was found in 29% of cases.'

Conclusion

The proportion of perichondritis among pinna injury cases in my study was found to be 9.72%. A statistically significant association was found between mode of injury and pinna perichondritis.

Keywords: Pinna Injury, Perichondritis, Deformity.

INTRODUCTION

Pinna forms an important part of the peripheral auditory system; it functions to conduct sound waves in the form of vibrations to the tympanic membrane.[1] Pinna adds to facial aesthetics. The lesions of

the pinna are not uncommon. Pinna, a delicate, vulnerable structure, is more liable to trauma, and the incidence of pinna injury is more commonly reported due to increasing incidence of road traffic accidents. Delay in diagnosis and improper management, leads to disfigurement and cosmetic deformity of the pinna.[2] Perichondritis is an infection involving cartilage and subcutaneous tissue of the pinna, and it produces swelling, which can be severe, which may lead to focal ear necrosis and hence deformity. The symptoms of perichondritis include pain, erythema, and local warmth. The initial complaint is often a dull ache.[3] Outer ear is painful to the touch and is red and swollen. Perichondritis most commonly affects the upper part of the pinna and rarely affects the earlobe. Perichondritis most commonly occurs as the result of a bacterial infection. The most common bacteria that cause perichondritis is Pseudomonas aeruginosa. Other, less common bacterias include Staphylococcus and Escherichia coli. The main cause of perichondritis is injury or trauma to the ear, which includes road traffic accidents and high piercing of the ear. The other causes include head trauma, especially which involves ear, contact sports, burns, insect bites, dog bites, acupunctures, ear surgeries, minor traumas, shingles infection. Certain individuals are at a higher risk of getting perichondritis. These include, those with inflammatory disorders, those who are immunocompromised and people with diabetes mellitus[3]

Treatment guidelines for perichondritis typically include the usage of antibiotics. The type of antibiotics depends on the severity of the condition and the bacteria causing the infection. The most common antibiotic used for the treatment of perichondritis is fluoroquinolone. Fluoroquinolone usage in children has to be done carefully. Some studies have shown this group of antibiotics causes joint stiffness and tendon tears in children. But the American Academy of Pediatrics considers the antibiotic safe for children. Removal of any foreign bodies from the wound or infected site is an important part of the management of perichondritis. Other medications given are warm compresses, analgesics, and corticosteroids. If there is any pus (abscess) cutting off the blood supply to the cartilage. In such cases incision and drainage of the abscess is needed. Any dead cartilage, if present, has to be removed.

In cases of dog bites, injection ARV (Anti-Rabies Vaccine) and human rabies immunoglobulin was given. Injection ARV (intradermal 0.1 ml) was given on 0, 3, 7, and 28 days of injury; additionally, intralesional (half dose) and intramuscular (half dose) human immunoglobulin was also given according to the 20 IU/kg dosage (or equine rabies immunoglobulin 40 IU/kg). With prompt diagnosis and antibiotic treatment, the symptoms of perichondritis will resolve in days to a week's time. If not managed properly, an abscess can cut off the blood supply to the cartilage. This can destroy the cartilage and cause tissue necrosis. Which will lead to a deformity of the ear called cauliflower ear. Perichondritis, if not treated, can also lead to chondritis. Chondritis can cause severe damage to the ear structure. In such cases, ear reshaping surgery has to be performed to restore the shape of the pinna. Our institution receives lots of road traffic accident cases every day. Most of the cases present with head injury, involving the pinna. Several assault cases with pinna injuries have also been reported. Most of the wounds found are contaminated. Initial management of pinna injury cases in the casualty plays an important role in the prevention of developing perichondritis. Thorough washing of the wound has to be done as an initial management to prevent infection of the wound. The patient as well as the bystander has to be counseled regarding the risk of developing perichondritis, proper management of the wound, signs and symptoms of perichondritis. If needed, admission and intravenous antibiotics have to be started prophylactically to prevent perichondritis. In cases involving massive tissue loss, the patient has to be reassured about various methods of reconstruction of the pinna and medical clinics/centers where these treatments are provided. A hospital-based cross-sectional study is carried out to know about the proportion of perichondritis amongst pinna injury cases, factors associated with perichondritis, and the outcome of perichondritis.

AIMS AND OBJECTIVES

- To study the proportion of perichondritis and its clinico microbiological profile.
- To find the factors associated with perichondritis.
- To find outcome of perichondritis.

MATERIALS & METHODS

This was a hospital-based cross-sectional study conducted among patients presenting with pinna injury and symptoms of perichondritis attending the Department of Otorhinolaryngology at Government T.D. Medical College Hospital, Alappuzha. Over a period of 18 months after obtaining IRC and IEC clearance.

Inclusion Criteria

- The patients attending to department of Otorhinolaryngology with pinna injuries.
- The patients presenting to the department of Otorhinolaryngology with signs/symptoms of perichondritis following trauma/injury.

Exclusion Criteria

- Patients presenting to the department of Otorhinolaryngology with signs and symptoms similar to perichondritis
- Furunculosis, malignant otitis externa, leukemic infiltration, localised initial allergic reaction.

Study Procedure

This study was carried out in the department of Otorhinolaryngology, Govt. T D Medical College Alappuzha. After obtaining informed consent from the patients presenting with pinna injury, signs and symptoms of the patient were assessed through detailed history taking and clinical examination. When pus discharge was present, a swab was taken from the same and sent for culture and sensitivity. If needed, parenteral antibiotics were given and shifted to oral medications when indicated by resolution of acute inflammation and wound healing. Surgical incision and drainage was also performed when indicated, followed by a standard wound care regimen. Follow-up done for assessment of outcome.

Statistical Methods

Data collected were tabulated by using Microsoft Excel. Statistical analysis of all variables and their association was analyzed and studied by the R program of R version 4.2.2 (2022-10-31). For quantitative variables, findings were expressed as mean and standard deviation. For qualitative variables, data was analyzed for frequency and percentage.

RESULTS

Perichondritis				
		Yes	**No**	**Total**
Age Groups	0 - 10 years	1 (12%)	7 (88%)	8 (100%)
	11 - 20 years	2 (6.9%)	27 (93%)	29 (100%)
	21 - 30 years	7 (15%)	39 (85%)	46 (100%)
	31 - 40 years	2 (9.1%)	20 (91%)	22 (100%)
	41 - 50 years	2 (4.3%)	45 (96%)	47 (100%)
	51 - 60 years	3 (14%)	19 (86%)	22 (100%)
	61 - 70 years	4 (10%)	36 (90%)	40 (100%)
	71 - 80 years	0 (0%)	2 (100%)	2 (100%)
Total		21 (9.7%)	195 (90%)	216 (100%)
Perichondritis				

Characteristic		Overall (N = 216)	Yes (N = 21)	No (N = 195)
Sex	Male	186 (100%)	14 (7.5%)	172 (92%)
	Female	30 (100%)	7 (23%)	23 (77%)
Table 1: Demographic Distribution				

Characteristic		Overall (N = 216)	Yes (N = 21)	No (N = 195)	P-Value
Mode of Injury	RTA	177 (82%)	9 (5.1%)	168 (95%)	
	Self-Fall	16 (7.4%)	0 (0%)	16 (100%)	
	Ear Piercing	9 (4.2%)	2 (22%)	7 (78%)	
	Burns	7 (3.2%)	6 (86%)	1 (14%)	
	Dog Bite	4 (1.9%)	2 (50%)	2 (50%)	<0.001
	Electrocution	1 (0.5%)	1 (100%)	0 (0%)	
	Unknown	1 (0.5%)	0 (0%)	1 (100%)	
	Others	1 (0.5%)	1 (100%)	0 (0%)	
	Perichondritic	21 (9.7%)			
Table 2: Modes of Injury as a Risk Factor					
Fisher's exact test					

In total, 21 out of the 216 people in the study developed perichondritis. The p-value associated with Fisher's exact test is less than 0.001, which suggests that there was a statistically significant association between the mode of injury and the development of perichondritis. This means that the likelihood of developing perichondritis depends on the mode of injury. For example, the development of perichondritis seems particularly likely following burns and less likely following a self-fall or a road traffic accident.

Discussing the result of pus culture and sensitivity amongst the 16 cases for which pus culture and sensitivity was done

Characteristic	OR	95% CI	p-value
Redness			
Redness. L	26.6	8.02, 118	<0.001
Swelling			
Swelling. L	15.0	2.36, 149	0.005
Table 3: Risk Factors Association with Perichondritis			
OR = Odds Ratio, CI = Confidence Interval			

The association of risk factors for perichondritis was analyzed using backward stepwise regression. The 6 risk factors used in the logistic regression model were age, sex, mode of injury, and the symptoms of pain and redness and swelling in pinna injury cases. Inspite of these risk factors, the regression results conveyed that redness and swelling symptoms of pinna injury are significantly related to perichondritis upon removing other factors. It means that the other factors were either confounding and not associated with perichondritis.

The odds of perichondritis are 26.6 times greater when redness is present than when it is not. The 95% confidence interval for this odds ratio ranges from 8.02 to 118, which means we are 95% confident that the true odds ratio lies within this interval. Since the p-value is less than 0.001, we reject the null hypothesis that redness has no effect on perichondritis. This suggests that redness is a significant predictor of perichondritis.

The odds of perichondritis are 15 times greater when swelling is present than when it is not. The 95% confidence interval for this odds ratio ranges from 2.36 to 149, which means we are 95% confident that the true odds ratio lies within this interval. Since the p-value is 0.005, we reject the null hypothesis that swelling has no effect on perichondritis. This suggests that swelling is also a significant predictor

of perichondritis.
Since there is a wide range for the odds ratio of both factors, it may indicate its high uncertainity at the same time. It conveys there is a strong association, provided there could be other sources of bias or confounding.

DISCUSSION

An ENT surgeon has an important role in the proper recognition and treatment of pinna injuries to avoid resulting complications and to give excellent cosmetic outcomes.[4] Pinna injuries are painful because the skin on the lateral part of the pinna is tightly adherent to the underlying cartilage, and pain-sensitive nerve endings are more superficial at the lateral side. The external ear can easily get necrosed because of its complicated structure, which is due to its irregular plate of elastic cartilage with 0.5–2 mm thickness.[5] Thickened or cauliflower pinna is the end result of the perichondritis of pinna.[6]
Perichondritis of the pinna is relatively common, but serious complications occur if cartilage loss is there and if the patient presents to the healthcare system very late. The goal of treatment lies in the restoration of the normal contour of the pinna and preventing infection, especially perichondritis. The perichondrium is responsible for the provision of blood supply to the underlying cartilage, and it is tightly adherent on the lateral surface and loose on the medial surface of the pinna. Thus, disruption of the perichondrium can result in necrosis, and destruction of the cartilage will result in irreversible cosmetic deformity. A partially avulsed pinna can be reattached after thorough washing and debridement, after which survival of the pinna depends on the establishment of capillary circulation, and if perichondritis develops, it will result in disfigurement. Initial symptoms are red, hot, and painful pinna; later on, an abscess may form between the perichondrium and the cartilage, which requires the prompt removal of pus and necrotic cartilage. The most frightful complications of auricular lacerations include chondrites and poor cosmetic results such as cauliflower ear.

Facial injuries are a common complaint in the emergency or primary care setting, and amongst that, the ear presents a unique challenge due to its structure. The ear is susceptible to lacerations, avulsions, and blunt trauma because of its prominent position overlying a bony surface. Additionally, the unique composition and relatively tenuous blood supply to the structures of the pinna make ear prone for perichondritis.[7] Ideally, pinna injuries should be repaired at the time of presentation if the patient is presenting within 24 hours after the injury occurred. If the auricular cartilage is exposed, the ear must be repaired to reduce the risk of complications such as infection, chondritis, necrosis, or deformities such as "cauliflower ear." Delayed closure or a staged repair can be considered in patients who present to the clinic after 24 hours, patients with evidence of infection, patients with relatively devascularized portions of the pinna, and patients at increased risk for infection, like uncontrolled diabetes mellitus. An infected wound is the primary contraindication to the primary repair of an ear laceration.[7] Proper care should be taken to clean the area of ear laceration prior to initiating the repair.

In the present study, the proportion of perichondritis among pinna injury cases was found to be 9.72%. Patients of age groups ranging from 2 years to 76 years were present in my study. They are being grouped in order to get a better statistical comparison. The highest number of cases was found in the 41 to 50 years of age group. Considering the mode of pinna injury, a larger number of cases were resulting from road traffic accidents. Amongst a total of 216 cases, there were 186 males (86%) and 30 females (14%). Males were most commonly affected in this study. Out of 186 male patients with pinna injury, 14 resulted in perichondritis (7.5%). Amongst the 30 females, 7 patients presented with perichondritis (23%). A similar study conducted by A. H. M. Delwar found a prevalence of perichondritis to be 0.86%. In his study sample, 52% were males and 48% were females; post-traumatic pinna injury constituted the major number of cases.[8]

Considering the modes of injuries, out of the total cases, 177 cases (82%) resulted from RTA, 16 cases (7.4%) resulted from self-fall, and 9 cases (4.2%) of pinna injury were reported from ear piercing. 7 patients (3.2%) resulted from burns, 4 cases (1.9%) with dog bites to the pinna, one case of pinna injury from electrocution (0.5%), and one patient (0.5%) presented without any known history of trauma. In a similar study of case series published by R. B. Ramasiva Navin, 63% of cases were from road traffic accidents, 22% resulted from assault, and 14% were self fall.[9] Considering the modes of injury, the p-value associated with Fisher's exact test is less than 0.001, which suggests that there is a statistically significant association between the mode of injury and the development of perichondritis. This means that the likelihood of developing perichondritis depends on the mode of injury. For example, the development of perichondritis seems particularly likely following burns and less likely following a self-fall or a road traffic accident.

Before suturing of the wound, sterile saline should be used to irrigate the wound with 50 to 100 mL of solution per centimeter of the wound. Anesthetizing the ear with a regional auricular block will provide the patient with greater comfort before the irrigation. After the wound has been cleaned, a sterile drape can be applied to isolate the field. If necessary, debridement or excision of macerated or devitalized tissue to make the wound margins clean, which will hold a suture before attempting the repair. The regional auricular block can be performed by injecting an anesthetic agent in the shape of a "V," one inferior to the ear, and an inverted "V" superior to the ear. Done by inserting the needle inferior to the ear near the lobule, aiming toward the mastoid process. Withdraw the needle while instilling 1 mL of anesthetic per inch of tissue in a subcutaneous plane to avoid anesthetizing the facial nerve. Using the same technique, insert the needle from the same starting point toward the skin anterior to the tragus and instill the anesthetic agent while withdrawing the needle. Injection of an anesthetic in an inverted "V," starting from the skin superior to the ear, again aiming towards the mastoid, followed by the installation of a line of anesthetic from the starting point above the ear towards the skin anterior to the tragus. Allow 5 to 10 minutes for complete anesthesia to occur, and be certain to test the patient's sensation prior to initiating the repair.[7]

Once the patient's wound has been properly cleaned and the area anesthetized, the repair of the wound can be done. Devascularized tissues are minimally resected prior to repair.[7]
In our study, out of the 21 patients with perichondritis, 16 patients had pain associated with perichondritis, 15 patients had swelling of the site, and 16 patients had pus discharge.
Pus culture and sensitivity was not done in all cases with perichondritis. As most of the patients improve with prophylactic intravenous antibiotics and wound management. Amongst the perichondritis cases for which pus culture and sensitivity was done, 12 (75%) yielded Pseudomonas aeruginosa, one case (6.2%) E.coli, 3 cases (19%) with mixed flora. In an article published by Klug, T. E., N. Greve, 2019, out of 112 patients with perichondritis, Pseudomonas aeruginosa was found in 58%.[10]

All the patients with signs and symptoms of perichondritis were admitted and started on antibiotics. All of them were given an injection of ciprofloxacin. Some patients were given combinations of antibiotics. Daily dressing of the wound was done. Local application of antibiotics, including framycetin and mupirocin, was done. The progress of wound healing was assessed daily. Depending upon the need, debridement of the wound was done. Removal of necrosed tissues was done as needed; most of the patients responded well with the parenteral antibiotics. In some cases with persistent infection and pus discharge, pus culture and sensitivity were done. Antibiotics were changed accordingly. Since we were prophylactically giving antibiotics, also combinations of antibiotics were given; we could not statistically study the outcome with respect to each antibiotic.
In our study, 6 patients needed debridement (29%). When there is destruction of the cartilage, as well as dead tissue, it can result in the development of a deformity of the ear known as cauliflower ear.

This may require cosmetic surgery to repair. Out of the total patients with perichondritis, after effective management, 6 patients had a deformity in the pinna (29%).

Traumatic pinna injuries are very common due to the increased incidence of road traffic accidents. Timely intervention is very important for healing and prevention of complications. Normal anatomical contour and good cosmetic results are achieved by adequate wound debridement, maximum tissue restoration, meticulous suturing, and wide antibiotic coverage. Regular follow-up will help in the early identification of complications and prompt treatment to prevent the incidence of cauliflower ear.

CONCLUSION

There were 86% males and 14% females. RTA was the common mode of pinna injury. The proportion of perichondritis among pinna injury cases presented during the study period was found to be 9.72%. A statistically significant association was found between mode of injury and pinna perichondritis. Effective management of the pinna injury cases at the time of presentation helps in preventing the complication of perichondritis and cosmetic disfigurement to the pinna. Those patients who need intravenous antibiotics have to be admitted, and antibiotics need to be started prophylactically. Patients need to be well explained regarding the risk of perichondritis in cases of pinna injury for early identification of the infection and timely management to prevent complications. Awareness needs to be made regarding the increased risk of perichondritis in high ear piercing for seeking health advice if they develop perichondritis.

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