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Original Research Article

Epidermal Inclusion Cyst- Usual and Unusual Sites

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Abstract:

Background: Epidermal inclusion cysts (EIC) are the most common cutaneous cysts and can occur anywhere on the body. These cysts can occur anywhere on the body, typically present as nodules directly underneath the patient's skin, and often have a visible central punctum. It commonly results from the trauma to the pilosebaceous unit in the hair bearing area. In areas without hair, these cysts are considered implantation and proliferation of squamous epithelium into the dermis due to injury.

Objective: It is to evaluate the clinicopathologic details of the usual and unusual sites of the Epidermoid cyst.

Material & Method: Patients of epidermal inclusion cyst encountered over a period of 1 year from January 2023 to December 2023 were evaluated. A total of 70 cases were studied retrospectively. The clinical details including age, gender, sites and dimensions were noted. The histopathological findings were evaluated and correlated with the clinical findings.

Result: The highest incidence was observed in the age group of 21–30 years (21.4%, 15/70) and the most common affected region was the head and neck region (60%, 42/70). The size of cysts ranged from 0.3 to 9 cm in diameter with a mean of 2.1 cm. The unusual sites observed in this study were one at the plantar aspect of foot and one at dorsal aspect of foot. Three cases were reported from the upper eyelid, one from the breast, one from the chest, two from the gluteal region, and one from the finger. Histopathological findings included rupture of epidermoid cysts with giant cell reaction.

Conclusion: Epidermoid cysts are common benign intradermal or subcutaneous tumors, but they can have unusual presentations and histopathological findings. Epidermoid cysts need early diagnosis and treatment as they can cause cosmetic and functional impairment.

Keywords: Epidermal Inclusion Cyst, Implantation, Pilosebaceous Unit, Squamous Epithelium.

Introduction

Epidermal inclusion cysts, frequently referred to as epidermoid cysts or keratin cysts, are the most prevalent type of cutaneous cysts. These cysts can be found anywhere on the body and frequently appear as nodules just below the skin's surface, with a visible central opening. They are generally movable and vary in size from a few millimeters to several centimeters in diameter. The cysts may remain stable or grow progressively larger over time, with no reliable predictors for when they will become inflamed or remain quiescent. Infected and/or fluctuant cysts tend to be larger, more noticeable, and accompanied by an erythematous appearance. Due to inflammation, these cysts can become painful and present as a fluctuant nodule beneath the skin. Unlike sebaceous glands, epidermal inclusion cysts' center contains keratin and not sebum, which often appears "cheesy" in appearance. It is important to note that epidermal inclusion cysts are not sebaceous cysts, and the terms should not be used interchangeably, despite their frequent use in practice.[1]

It is a common occurrence on the scalp, face, neck, trunk, and extremities. Reports of cases on male and female external genitalia, palm, sole, fingers, and breast are also documented. These cysts arise from trauma to the pilosebaceous unit in hair-bearing regions. In regions without hair, such as the palm and sole, these cysts are believed to be epidermal inclusions resulting from trauma, including injuries caused by sewing needles, crush injuries, or human papillomavirus (HPV) infections, which lead to the implantation and proliferation of squamous epithelium in the dermis.[2]

Method

Study design: A retrospective study

Availability of Data and material: The data for this study were obtained from the Department of Pathology, Patna Medical College and Hospital (PMCH), Patna, India where retrospective study for one year (Jan 2023- Dec 2023) was done and 70 cases including both usual and unusual sites of EIC obtained.

Materials and Method

The present study includes the 70 cases reported by histopathology section of the Department of Pathology from January 1, 2023 to December 31, 2023.

The clinicopathological details were taken from the record office for the given period and evaluated with emphasis on unusual finding related to epidermoid cysts. The histopathological examination in these 70 cases was done on formalin-fixed, paraffin-embedded blocks sections stained by Hematoxylin and Eosin stain.

Inclusion Criteria

1) Patients of all ages and both sexes.
2) Patients with confirmed diagnoses through clinical examination and histopathological analysis.

Exclusion Criteria

1) Patients with incomplete medical records.
2) Patients unwilling to be part of the study.

Data collection: A total of 70 cases with the epidermal inclusion cyst were selected for the study. A thorough examination of the patient's age, gender, site, swelling period and associated condition were all noted.

Procedure: Histopathological examination of the sample sent post-surgery was done. The tissue was fixed in 10% neutral buffered formalin, then cut sectionally, embedded in paraffin and stained with hematoxylin and eosin. Finally, these sections were seen under a microscope and allowed for histopathological investigation.

Ethical approval and consent to participate: The study was approved by the Institutional Ethics Committee.

Competing interests: The authors declare that they have no competing interests in this section.

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Author's contribution

TS has done the histopathological examination of the patient sample and written the manuscript.

BC has seen the patients in the outpatient department and assisted in surgical procedure. She has also helped in manuscript writing.

PV reported the cases, analysed the data and reviewed the manuscript.

DK reported the cases, analysed the data and reviewed the manuscript.

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Results

A total of 70 cases of epidermal inclusion cyst were included in the present study**.** The age of the patients ranged from 5 years to 75 years with the mean age of 37.67 years and the median age of 36 years. The highest incidence was observed in the age group of 21–30 years (23%, 16/70) and 41–50 (23%, 16/70) followed by age group of 31–40 (17%, 12/70) years, respectively [Figure 1]. The head and neck region (60%, 42/70) was the most common affected region followed by back (11.4%, 8/70), lower limb (10%, 7/70), and upper limb (10%, 7/70), respectively. The unusual sites observed in this study were breast (1/70), palm (2/70), plantar aspect of foot (1/70), dorsal aspect of foot (1/70), finger (1/70), axilla (2/70), pinna (3/70), scrotum (2/70), chest (1/70), upper eyelid (3/70), gluteal region (2/70), and angle of mandible (2/70) cases. [Table 1] [Figure 2]. The males were more affected than females with an overall male:female ratio of 1.5:1. The size of cysts ranged from 0.5 to 8 cm in diameter with a mean of 2.9 cm.

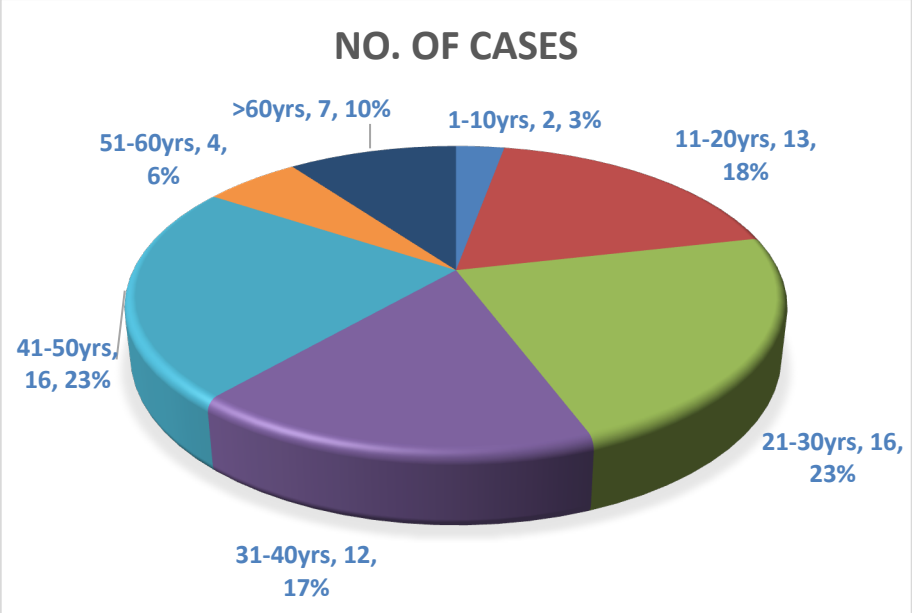


Figure 1: Age wise distribution of epidermoid cyst

Table 1: Region- and site-wise distribution of epidermoid cysts

Region	Site	No. of cases (%)
Head and Neck	Scalp	17(24.2)
	Forehead	5(7.1)
	Upper eyelid	3(4.2)
	Pinna(ear)	3(4.2)
	Preauricular	3(4.2)
	Supraclavicular	1(1.4)
	Postauricular	4(5.7)
	Neck left side	4(5.7)
	Neck right side	2(2.8)
	Mandibular	2(2.8)
	Total	42(60)
Back	Back	8(11.4)
Upper Limb	Forehand	2(2.8)
	Palm	2(2.8)
	Finger	1(1.4)
	Axilla	2(2.8)
	Total	7(10)
Lower Limb	Foot	2(2.8)
	Thigh	3(4.2)
	Gluteal region	2(2.8)
	Total	7(10)
Male genital tract	Scrotum	2(2.8)
Breast	Breast	1(1.4)
Chest	Chest	1(1.4)

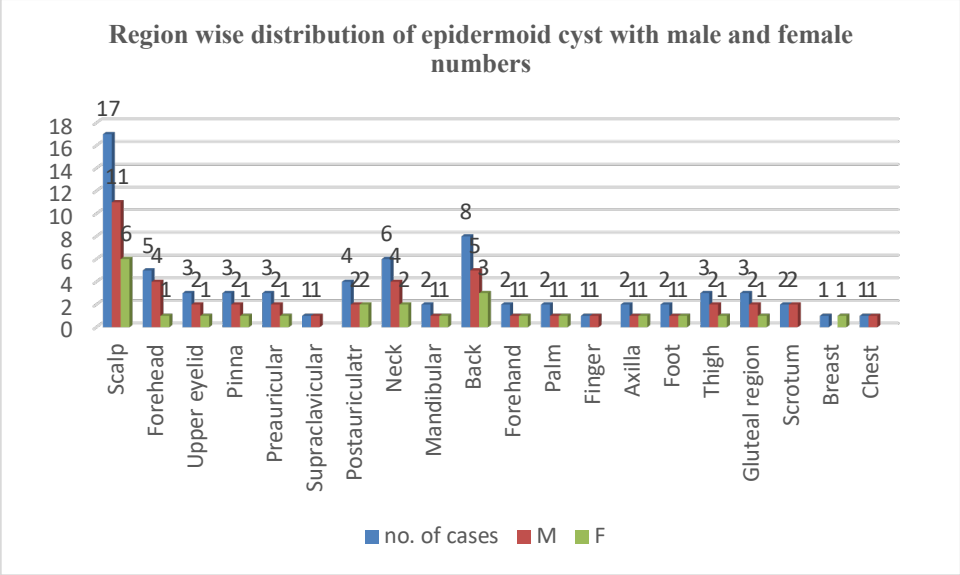
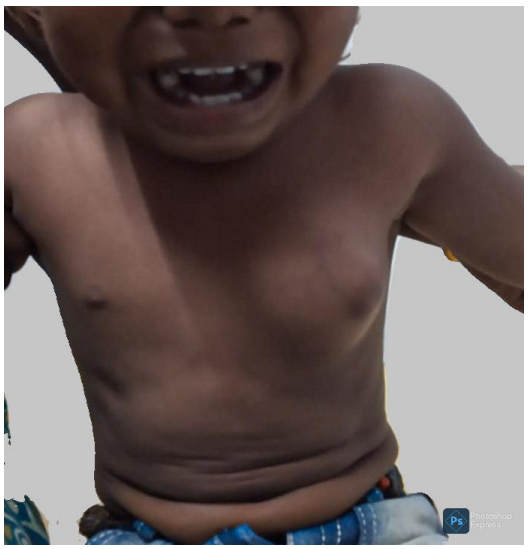


Figure 2: Region wise distribution of epidermoid cyst with male and female numbers.



3a- breast

3b- knee joint **3c- left index finger**

Figure 3: a, b, c – Clinical photograph showing unusual sites involved by EIC

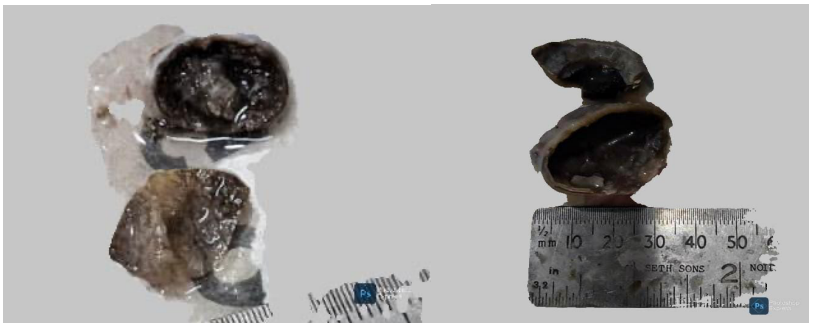


Figure 4: EIC gross specimen shows a grey white unilocular cyst containing pultaceous material.

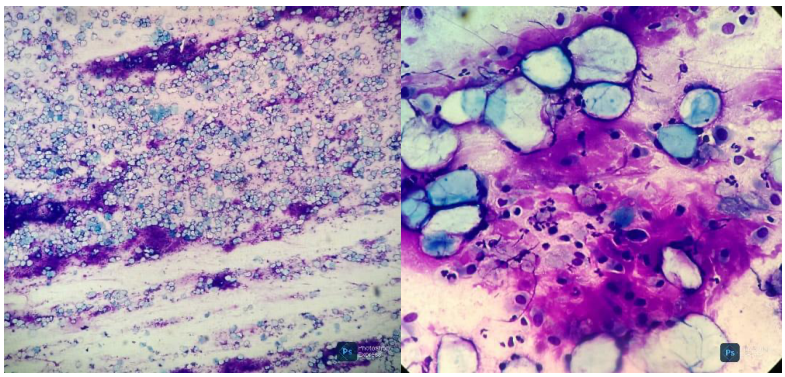


Figure 5: Photomicrograph of the FNAC of epidermal inclusion cyst showing many anucleate squames and few benign nucleated squamous cells in a background containing inflammatory infiltrate.

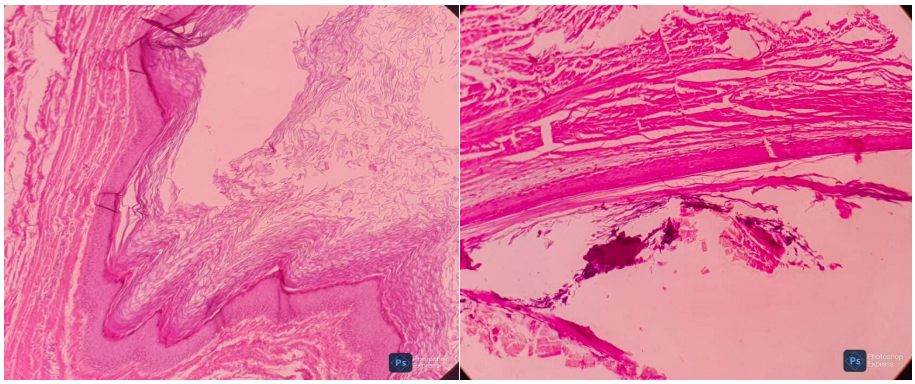


Figure 6: Photomicrograph showing H & E section of keratinous cyst shows a cyst cavity lined by keratinized squamous epithelium and contents of cyst comprises of lamellated keratin.

Histological examination shows cysts lined by stratified squamous epithelium with granular layer and filled with laminated keratin materials. Seven cases showed ruptured cyst wall with dense chronic inflammatory cells and giant cell reaction.

Discussion

The epidermoid tumor was first described by Duverney in 1683, and later, Cruveilleir reported the first case in 1829. Although the etiology of epidermal inclusion cysts remains unknown, some authors have explained their etiopathogenesis as the result of an epidermoid cyst forming when the embryonic neural tube is closed with the ectoderm, eventually growing into a tumor. This occurs as residues of the skin epidermal layer accumulate in the site and form a cyst. The gradual shedding and renewal of keratinized cells within the cyst can lead to tumor formation. Alternatively, others believe that epidermal cells are implanted in tissues or organs during trauma and grow into epidermal inclusion cysts.

The epidermal inclusion cyst can be classified as either primary or secondary. Primary epidermal cysts arise directly from the infundibulum of the hair follicle, and the plugging of the follicular orifice allows for cyst formation. These cysts often communicate with the surface of the skin through a small orifice or visible central punctum. Secondary epidermoid cysts can arise after the implantation of the follicular epithelium in the dermis due to trauma or come done formation.[1]

Epidermal inclusion cysts have a few associations, including those with Human papillomavirus virus (HPV), Ultraviolet radiation, Gardner syndrome,

and Familial adenomatous polyposis. Verrucous cysts, which are plantar and non-plantar epidermoid cysts with histologic features of HPV infection, have been reported and are commonly referred to as verrucous cysts. These cysts are usually solitary and can sometimes co-occur with non-infected cysts. HPV-60 is the most common type found in plantar cysts, while HPV-57 and HPV-59 are other types reported to infect cysts.[13] The characteristic histopathological findings for these cysts include vacuolated cells and keratohyalin granules. However, in this study, the histological examination did not reveal these findings, so tests for the HPV virus were not performed.

Ultraviolet radiation exposure has been shown to cause local immunosuppression, which may activate certain HPV types' promoters.[14]

Gardner syndrome or familial adenomatous polyposis (FAP) is a disease process in which epidermal cysts often appear before the onset of puberty and may even occur before colonic polyposis.[1]

Usual areas of the epidermal inclusion cyst occurrence are the scalp, face, neck, trunk, and extremities whereas the unusual areas include male and female external genitalia, palm, sole, fingers, and breast. [3-7] This study had the head and neck region (60%, 42/70) as the most commonly affected region, followed by the back (11.4%, 8/70), lower limb (10%, 7/70), and upper limb (10%, 7/70).

The head is the most commonly affected region where the size of the cyst ranges from a few millimeters to centimeters in diameter. Lesions can either stay the same in size or grow larger with time. There are no known definite factors that can predict whether an epidermal inclusion cyst will increase in size, become inflamed, or remain dormant. Cysts that are clinically infected or fluctuant are typically bigger, more red, and easily noticed by the patient. These cysts can develop at any age, showing no preference between genders, with the majority affecting young and middle-aged adults.[1] In the investigation, the most common age ranges affected were 21-30 (23%, 16/70) and 41-50 (23%, 16/70). However, in this study, males were more commonly impacted than females, with a male to female ratio of 1.5:1.

The unusual locations on the upper and lower limbs were the palm, finger, and sole due to their lack of hair. [5,7] Within our study, we encountered two instances on the palm, one on the finger, and two on the sole. Epidermoid inclusion cysts found on the hands typically grow slowly, and are painless, superficial, and localized swellings on the palm, sometimes originating from deeper structures such as tendons and phalangeal bones.[9] In the case of the finger, epidermoid cysts frequently develop in the terminal phalanx, presenting with pain, swelling, and nail deformities.[9] Both cases involving the palm and finger in our research involved male individuals, with the middle phalanx being affected on the finger. The swellings were small, painless, and did not result in any deformities.

The present study showed a lateral border of sole involvement for plantar epidermoid cysts. These cysts are believed to develop when epidermal cells are accidentally inserted into the dermis due to the mechanical pressure experienced by the sole during activities like standing, walking, and running. There were no signs of virus-induced changes in the skin.[10]

The occurrence of epidermoid cysts in breast tissue is typically rare, often appearing in adults due to various forms of trauma or injuries. There have been minimal documented cases in English literature, with these cysts forming in either the skin layer or the breast parenchyma. The development of these cysts may stem from various factors like epidermal damage implanting deep within the breast, cystic ectasia, or metaplasia of normal columnar cells due to fibrocystic changes.[11] In one instance discussed in this study, a young girl had a small epidermoid cyst in the subareolar skin layer of her left breast, with no other breast abnormalities noted during a clinical examination.

An epidermal inclusion cyst located in the superotemporal region of the eyelid typically does not cause symptoms until complications arise. Within this study, three cases of this cyst type were identified in the upper eyelid, all present in the superotemporal region. One case involved an 8-year-old boy with the other two cases occurring in adults. The epidermal inclusion cyst in these areas had no breach in tissue at the time of trauma and no punctum over the mass at the time of clinical presentation. Consequently, it is crucial to include epidermal inclusion cysts in the differential diagnoses of abnormal eyelid masses in children.[3]

Epidermal inclusion cysts typically progress without major issues; however, complications like inflammation, secondary infection, and abscess development are not rare. In some cases, these cysts may become large, leading to spontaneous rupture, ulceration, and sinus formation. While extremely uncommon, there have been reports of squamous cell carcinoma in longer-standing EICs.[5] The preferred treatment involves surgical removal, ensuring the complete excision of the cyst wall to prevent recurrence. Recently, erbium-doped yttrium aluminum garnet (Er:YAG) laser fenestration has been successfully experimented with as a non-surgical alternative for treating EICs.[12]

Conclusion

Epidermoid cysts are relatively common benign intradermal or subcutaneous tumors involving any

site on the body including hair free sites. In this study, male predominance was seen may be because of women being very tolerant to this mostly painless simple lesion. The head and neck, lower limb and back were the leading affected sites. The unusual site such as breast, palm, finger

and upper eyelid have confusing clinical presentation which may enhance the chance of diagnostic dilemma for many reasons. Considering that these cysts have a relatively high risk of recurrence, the thorough histopathological examination is required. Epidermoid cysts need early diagnosis and treatment as they can cause cosmetic and functional impairment. The variations in sites, clinical presentations and histopathological findings in the present study have added both to the diagnostic and clinical knowledge known so far.

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