

Case Report

Epidermoid Cyst of Sole

Kista Epidermoid pada Plantar Pedis

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ABSTRACT

An epidermoid cyst is benign cystic tumor coated with squamous epithelium and contains keratin. It generally appear on the body parts which have pilosebaceous follicles, such as head, neck, and body. The manifestation of the disease is a skin-colored, mobile, painless nodule with a punctum in the center. Epidermoid cyst of sole is often similar to clavus, callus, and verruca plantaris. However, epidermoid cyst of sole is rare because the area is without pilosebaceous follicles. The etiopathology is believed due to trauma that causes implantation of epidermal cells into the dermis layer, thus triggering the formation of epidermoid cysts. This case report a girl with an epidermoid cyst of sole that was initially thought as a verruca plantaris and clavus. A 14-year-old girl complained about a bump on her right foot that got bigger during nine months. The lesions surface was slippery, and the patient felt pain when walking. The patient denied any trauma or changing footwear with friends or relatives. Examination in the right lateral plantar pedis region, a nodule was found skin-colored, round, measuring 2x2 cm, and solitary. The patient was planned to undergo excochleation, but since a white cystic mass was found during the operation, it was continued with extirpation surgery. The histopathological examination results showed a stroma with keratin, which was concluded as an epidermoid cyst. In the case of epidermoid cysts with atypical clinical symptoms and unusual lesion locations, histopathological examination is required for a definite diagnosis.

Keywords: Epidermoid cyst, extirpation surgery, sole

ABSTRAK

Kista epidermoid merupakan salah satu tumor kista jinak yang dilapisi epitel skuamosa seperti lapisan epidermis dan berisi keratin, umumnya timbul pada bagian tubuh yang memiliki folikel pilosebacea seperti kepala, leher dan badan. Gambaran khas berupa nodul berwarna kulit, mobile, tidak nyeri, dengan puntum dibagian sentral nodul. Kista epidermoid pada plantar pedis sering kali serupa dengan verruca plantaris, clavus dan callus. Kista epidermoid pada plantar pedis jarang dijumpai, karena area tersebut tidak memiliki folikel pilosebacea. Etiopatologinya diduga akibat trauma yang menyebabkan implantasi sel epidermis ke dalam lapisan dermis sehingga memicu terbentuknya kista epidermis. Dilaporkan satu kasus anak perempuan dengan kista epidermoid pada telapak kaki yang awalnya diduga sebagai verruca plantaris dan clavus. Seorang anak perempuan berusia 14 tahun, datang dengan keluhan benjolan di telapak kaki kanan yang bertambah besar sejak 9 bulan lalu. Permukaan lesi licin dan nyeri bila digunakan berjalan. Riwayat trauma dan berganti alas kaki dengan teman atau saudara disangkal. Pada pemeriksaan di regio plantar pedis lateral dekstra ditemukan nodul berwarna kulit, bulat, soliter, 2x2 cm. Pasien direncanakan tindakan excochleasi, tetapi karena pada saat operasi ditemukan massa kistik berwarna putih maka dilanjutkan dengan bedah ekstirpasi. Hasil pemeriksaan histopatologi menunjukkan gambaran stroma dengan keratin yang disimpulkan sebagai kista epidermoid. Pada kasus kista epidermis dengan gejala klinis tidak khas dan lokasi lesi yang tidak umum, dibutuhkan pemeriksaan histopatologi untuk menegakkan diagnosis pasti.

Kata Kunci: Bedah ekstirpasi, kista epidermoid, plantar pedis

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INTRODUCTION

An epidermoid cyst is a nodule bounded by a wall or capsule in the epidermis and contains keratin, a product of the epidermis. Epidermoid cysts are also known as epidermal cysts, epidermal inclusion cysts, epithelial cysts, keratin cysts, implantation cysts, atheroma cysts, or infundibular cysts (1,2). This cyst is intradermal or subcutaneous, and clinically this cyst is round, soft, elevated or protrude, moveable from the surrounding tissue, and grow slowly (1,3). Epidermoid cysts can occur at any age but are more common in adulthood and occur over a wide age range, from birth until 72 years of age. However, epidermoid cysts are more common in the third and fourth decades of life (4). Men and women can be affected with the same incidence, but a study found that male sufferers were twice higher than women (3).

Epidermoid cyst is generally found in areas that have hair follicles; thus, the most frequent locations are on the scalp, face, neck, body, and scrotum. These cysts can arise on the extremities, but the incidence in the lower extremities is less than 10% (1,5). The etiology of Epidermoid cysts is from the progressive cystic ectasia of the infundibular portion of the hair follicles (5). Therefore, cysts that arise on the palms of the hands and feet (palmoplantar), which do not have hair follicles, are very rare. The pathogenesis of palmoplantar epidermoid cysts is thought to be different from cysts in general; it might be due to Human Papilloma Virus (HPV) infection or implantation of the epidermis into the dermis during trauma (1,5,6). Clinically, epidermoid cyst lesions on the sole of the feet can resemble lesions on the feet, such as callus, clavus, or verruca plantaris (warts) (7).

This case report presented a case of an epidermal cyst found on the sole of the foot in a 14-year-old girl, which was previously suspected as verruca plantaris. This patient underwent extirpation surgery and showed a good result. This case is reported because epidermoid cyst on the plantar pedis are rare. This case report aims to increase the clinician's knowledge about the diagnosis and differential diagnosis of epidermoid cysts, so it can add a discussion that epidermoid cyst can be found in unusual locations.

CASE REPORT

A 14-year-old girl came to the Dermatology and Venereology Outpatient Clinic of Saiful Anwar Hospital Malang, complaining about a lump on the sole of her right foot during the past nine months. Initially, the patient complained of a small soft lump that did not itch or hurt. Since the last three months the patient found that the lump grew bigger and harder; the patient also felt pain in the lump on the sole when walking. The patient denied any drip of blood or fluid from this lump. There were no complaints of lumps on other body parts or any injury before the appearance of lumps on the soles of the feet.

The patient admitted that she had never experienced this before. The patient went to a dermatologist one week earlier and was diagnosed with verruca plantaris, so she was referred to RSSA for electrosurgery. The patient has never given any medicine and never put any ointment on the lump. The patient's father claimed that he has lumps similar to his daughter's on his body and arms, in a higher number but smaller and softer than hers. He has felt these since approximately two years ago. The patient is a junior

high school student and often goes to school by walking or riding a bicycle on shoes. The patient admitted that she swam several times, and the last swimming was about a year ago. The patient never exchanges socks with friends or family.

The general examinations showed compos mentis, 110/70 mmHg blood pressure, 78 times per minute pulse, 20 times per minute respiratory rate, 36.7°C axillary temperature, and 30kg body weight. Examination of the lymph nodes revealed no enlargement. Dermatological status in the right plantar pedis region (Figure 1.) showed the presence of a skin-colored, solitary, palpable nodule approximately 2x2 cm in size and without a punctum.

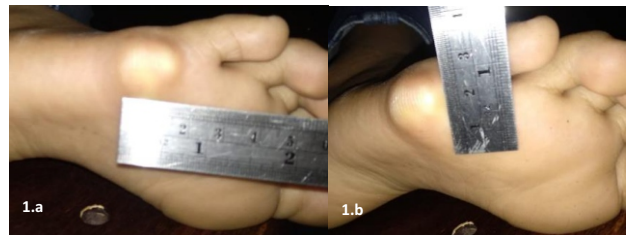


Figure 1. (a and b). Lesion on the right lateral plantar pedis, a nodule that is solitary, skin-colored, mobile, solid, size \pm 2x2 cm, punctum (-)

Then the patient examined by dermoscopy. The examination results showed brownish macules, no punctum or black dot in the lesion, clear skin lines with a translucent central core (+).



Figure 2. Dermoscopy of the lesion

Note: punctum (-), black dot (-), translucent central core (+), clearly visible skin lines

Based on anamnesis, physical examination, and dermoscopy, the patient was diagnosed with verruca plantaris with differential diagnoses of clavus and epidermoid cyst. The patient was given 5-Fluorouracil (5-FU) therapy which was applied twice a day on the surface of the lump. The patient was informed that the therapy would be evaluated after two weeks, and if there were no improvement, electrodesiccation would be carried out to remove the lump. At a follow-up after two weeks, no improvement was found in the nodule, so further electrocoagulation and electrodesiccation were planned.

Prior to the procedure, pre-procedural preparations were carried out, which included explaining the purpose of the

procedure and the types of procedure (electrocoagulation and electrodesiccation). The procedure could be changed to surgical extirpation if other tissues, such as lipomas or cysts, were found. The other education provided was about extracting a history of allergy to anesthetic drugs, bleeding disorders, and the risk of possible post-operative scars, risks, and complications of the procedure performed.

The procedure began by positioning the patient lying on her left side on the operating table, so the lump on the sole was clearly visible as the operating field. Aseptic procedures were performed in the operating field using 10% povidone-iodine solution, and local anesthesia was performed using the ring block anesthetic method using lidocaine compositum. Subsequently, an incision was made at the edge of the liner lesion using a scalpel; a shiny white cystic mass appeared under the skin and was assumed to be an epidermal cyst. The surgical wound was then widened using scissors to refine the defect under the skin, the procedure originally planned for electrocoagulation and electrodesiccation turned into extirpation surgery. The mass was freed from the surrounding tissue by blunt and sharp dissection using scissors. One ruptured cyst released thick white fluid, while the other cyst was successfully extracted entirely in the form of a cyst capsule measuring 1.5 x 1.5 cm. The ruptured cyst capsule was then freed from the surrounding tissue by sharp dissection using scissors. A surgical wound exploration was performed to assess any remaining cyst capsule and evaluate the bleeding (Figure 3).

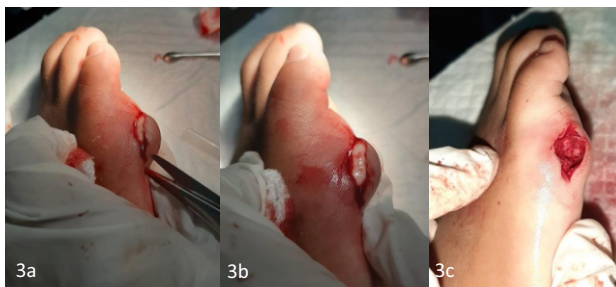


Figure 3. Surgical extirpation of the cyst

Note: (3.a). A linear incision was made on the lateral nodule. (3.b). The mass appeared white and shiny like a cyst, and then extirpation was done. (3.c). Post extirpation wound.



Figure 4. Macroscopic preparation of the lesion

Note: The cyst successfully extirpated was approximately 1.5 x 1.5 cm in size

Bleeding was stopped with pressure using sterile gauze,

and the surgical wound was cleaned with 0.9% sodium chloride. Undermine was performed on the edge of the lesion; the edges of the lesion were then closed and sutured with five simple interrupted sutures using monofilament Prolene 4-0. The wound was given gentamicin cream 0.1% and covered with sterile gauze and *Hypafix*. The patient was given mefenamic acid 3x250 mg and cefadroxil 2x100 mg and asked to do a follow-up examination for suture evaluation on the following week.

The histopathological examination results showed that the tissue sections consisted of keratin, tissue stroma with sebaceous glands, and mature fatty tissue. It was concluded that the morphological features matched to Epidermoid cysts (Figure 5).

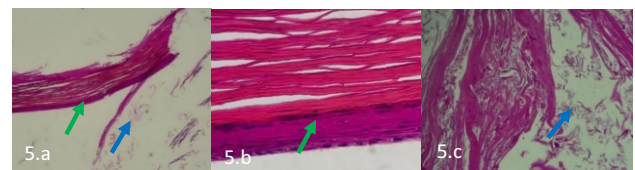


Figure 5. Histopathological examination

Note: (a) 400x magnification. (b, c) 100x magnification. Tissue stroma (↗). Layers of the stratum corneum undergoing parakeratosis and orthokeratosis (↘). The tissue consists of keratin layers and mature fat tissue.

Evaluation of the wound at three weeks after the procedure showed that the wound was dry with no signs of edema and infection, but only desquamation of the outer skin was visible. Eight weeks after the procedure, the wound evaluation shows the scar looks faint and only slightly visible hyperpigmented patch with indistinct borders.

DISCUSSION

An epidermoid cyst is benign tumors in the skin and are commonly known as epidermal inclusion cysts, epidermal cysts, and infundibular cysts (6). Epidermoid cyst developed from progressive cystic ectasia of the hair follicle infundibular as retention associated with the sebaceous gland and produce a cyst cavity filled with lipids and keratin (1,7). Blockage of the follicular opening can cause epidermoid, where these cysts can connect to the skin surface through a hole filled with keratin called the punctum. Epidermoid cysts can also occur due to follicular orifice obstruction, as seen in patients with acne vulgaris. Follicular disorders are essential in pathogenesis because patients with acne vulgaris may have multiple epidermoid cysts originated from comedo. The cyst wall is coated with stratified squamous epithelium. Therefore, a layer of sloughed keratin will accumulate within the cyst (4). The cyst enlarges through keratin debris and epithelial accumulation, producing a subcutaneous mass (6).

The most common locations for epidermal cysts are the head, neck, trunk, and extremities with an incidence of less than 10% case in the lower extremities (6). Therefore, it is very rare to see epidermal cysts on the palms and soles, which do not have hair follicles (4,6). This study reported a case of an epidermoid cyst found on the sole of a 14-year-

old. This case is rare and unique because epidermoid cyst rarely occur on the palms and soles that do not have hair follicle.

The etiology of epidermal cysts of sole is different from the body parts that have hair follicles (1,7). Traumatic implantation of epidermal elements into the dermis at the time of trauma has been suggested as pathogenesis of epidermal cysts on the palms and soles (palmoplantar). Microtrauma, such as irritation, can act as a precipitating factor (5). Plantar epidermoid cysts are thought to occur after the sole is subjected to continuous mechanical stress during standing, walking, and running, causing the implantation of traumatic epidermal cells into the dermis (1). Palmoplantar cysts can be found in farmers, factory workers, carpenters, and tailors who frequently experience trauma to the feet or hands (8). Cysts grow very slowly due to the desquamation of normal cells into the cystic cavity, and therefore, they present an asymptomatic pattern (2). This patient often walks to school and rides a bike while going to school, while a history of trauma was denied, so it was suspected that the epidermoid cyst was caused by trauma to the foot.

Another theory is palmoplantar epidermoid cysts may develop from the eccrine tract as a result of Human Papilloma Virus (HPV) infection, which may have a high affinity for the eccrine duct epithelium, HPV detected in palmoplantar epidermal cysts are HPV 57 and HPV 60. Currently, there are two main alternatives for the association between palmoplantar epidermoid cysts and HPV infection. The first alternative is the superinfection by blunt penetrating wounds (penetrating warts located on the skin surface), while the second theory is metaplasia of the eccrine duct epithelium in response to infection. It is theorized that HPV infects the upper part of the eccrine duct, where warts develop, then migrates to the dermal part of the eccrine duct, and eventually leading to epidermoid cyst formation (3,5). In addition, the relationship between HPV 6, 8, 11, and 60 with non-palmoplantar epidermoid cysts has also been suggested (3). Epidermoid cysts have also been found in surgical incision scars after several surgical procedures, and obstruction of the eccrine ducts is also thought as the other factors that lead to the development of palmoplantar epidermoid cysts (8).

These cysts are rare in the extremities, but they are more common in the upper extremities than in the lower extremities (2). Epidermoid cysts of soles are reported to have an incidence of 7.2% of plantar lesions, becoming the third most common type of lesion in this location. Report by Nigam et al., from a total 103 epidermal cyst sites, only 19 case on their feet, and the heel was the most common site followed by the lateral border of the sole (3).

In this patient, there was a nodule on the lateral side of the sole that was skin-colored, solitary, measuring 2x2 cm with solid consistency, and no visible punctum in the central part of the nodule. This lump enlarges and presses the surface of the sole, creates pain when the patient walks. Clinically, epidermal cysts appear as dome-shaped nodules protruding above the skin surface and are located intradermally or subcutaneously that are completely encapsulated and may enlarge (6,9). It ranges in size from 0.2 to 5 cm, and the number can be solitary or multiple (4,7). On the nodule surface, there is usually a central punctum (a dilated pore covered with black comedo). On palpation, epidermal cysts are easily moved from the

underlying structures (mobile), but the movement can be limited if there are fibrosis and scar tissue. The consistency of the cyst ranges from spongy to firm (4,9). Although usually asymptomatic, epidermoid cysts may become inflamed as a result of ruptured cyst lining. The cyst content is a smelly yellowish cheese-like substance secreted from the clot. Complaints of erythema, swelling, tenderness, palpation, pain, and fluctuations can occur suddenly. The acute inflammation that can cause purulence requires cyst incision and drainage (4,7,9). Chronic inflammation and irritation can lead to perilesional fibrosis (9).

Macroscopic examination of this case revealed a white smooth shiny mass. The results of microscopic examination found stroma with keratin in the lumen, leading to a conclusion of an epidermal cyst. On microscopic examination, the epidermoid cysts are coated by stratified squamous epithelium cell walls that resemble the epidermis and include a granular layer and keratin lamellae in the lumen (4,10). This keratin can also be produced by an organism called *Demodex folliculorum* found in the cyst wall (5). If the epidermal cyst layer ruptures and the keratin scales contained within the cyst leak into the surrounding soft tissue, then an acute foreign body granulomatous reaction will develop in response to the keratin scale (4).

The patient in this case was diagnosed early as verruca plantaris. The most common lesions on the sole are the clavus (corns), callus, and verruca plantaris (8). Verruca plantaris is generally a hyperkeratotic lump caused by HPV and is often seen at pressure points or areas that often receive pressures (1,3,4,11). Verruca plantaris is often found in children and adults, clinically in the form of papules or skin-colored nodules that are dome-shaped with a rough or hyperkeratotic surface (12). On dermoscopy examination, Verruca is depicted as black or red dots to a homogeneous globus with papiliform surfaces or blurred or broken skin lines (13). A clavus is a well-demarcated thickened area of the epidermis and has a central core. This skin lesion is most commonly found on the feet and is often painful due to the central nucleus of the clavus pressing on the underlying nerve structures. Clavus results from repeated friction, pressure, or trauma to certain areas of the foot. Repeated mechanical stress to this particular area of the epidermis causes hyperkeratosis, defined as hypertrophy or hyperplasia of cells within the stratum corneum. Callus is another hyperkeratotic skin lesion similar to clavus, a thickened localized lesion of the epidermis with poor demarcation, painless borders, and hyperkeratosis, arising in the plantar area as a result of repeated mechanical stress or foot deformity (11). Surgical management can be accomplished by excoriation, curettage followed by cauterization, or complete excision (12).

In this patient, lumps appear on the feet so that they are similar to the verruca plantaris and clavus commonly found on the soles. Dermoscopy can help in differentiating hyperkeratotic lesions. On the verruca plantaris, black/red dots and bleeding points will appear. A translucent central core is a characteristic feature of the clavus accompanied by clear skin lines with hyperkeratosis (11). On physical examination, there was no punctum, which is the characteristic of an epidermoid cyst and was palpable solid. Therefore, it was suspected as a verruca plantaris with differential diagnosis of a clavus at the beginning of the examination. Dermoscopy examination revealed a dubious

brownish macula with globus on the verruca plantaris, whereas a similar central core was found on the clavus.

Additional examination to confirm the diagnosis are radiographs and magnetic resonance imaging (MRI) which obtained before surgery (6). Another examination is foot sonography which can show oval heterogeneous hypoechoic mass in the subcutaneous layer (1). In this patient no additional examination was performed before surgery but the pathological findings confirmed the epidermoid cyst.

Small uncomplicated cysts do not require treatment, but removal can be accomplished by simple complete surgical excision of the cyst with intact cyst wall with little or no leakage of sebum to avoid recurrence. The treatment consists of surgical excision of the entire lesion, including the cyst capsule (4,5). The recommended excision technique is the elliptical excision technique, which results in a better cosmetic result. The excision should be done with a small diameter with a punctum in the middle of the ellipse. It is vital to avoid any destruction of the cyst during excision to avoid the formation of a keratotic granuloma of giant cells (5). Excision should be delayed if there is an active infection because the dissection area will

be more complex and has a higher infection risk, wound dehiscence, and cyst recurrence. If there is inflammation, intralesional triamcinolone can also be used to help reduce inflammation (4).

A relapse rate of 17% in epidermoid cysts is associated with incomplete excision. Beymour et al. found a significantly higher recurrence rate in patients with intraoperative rupture because the surrounding tissue was contaminated by pathological cell implantation via intralesional excision (2). Although epidermoid cysts are benign lesions, malignant transformation into basal cell carcinoma and squamous cell carcinoma has been reported in several cases (5). Malignant transformation from epidermoid cyst to squamous cancer is between 0.11% and 0.045% (2).

Epidermoid cyst of sole is rare because this area does not have hair follicles, so it is assumed to have a different etiopathophysiology. Epidermoid cysts of the plantar pedis are often similar to clavus, callus, and verruca plantaris. In the case of epidermoid cysts with atypical clinical symptoms and unusual lesion locations, histopathological examination is required to establish a definite diagnosis. Surgical extirpation has shown good results for the management of epidermoid cysts in the plantar pedis.

REFERENCES

1. Lee KM, Park JH, Min KH, and Kim EK. *Epidermal Cyst on the Sole*. Archives of Plastic Surgery. 2013; 40(4): 475-476.
2. Beytemür O and Yüksel S. *Epidermoid Cysts Localized on Extremities*. Joint Diseases and Related Surgery. 2018; 29(1): 27-33.
3. Arandes-Marcocci J, Melé-Ninot G, Quintana-Codina M, Iglesias-Sancho M, and Redonnet MS. *Palmoplantar Epidermoid Cysts: Two Cases and Brief Review of the Literature*. Dermatology Online Journal. 2019; 25(10): 1-5.
4. Hoang VT, Trinh CT, Nguyen CH, Chansomphou V, Chansomphou V, and Tran TTT. *Overview of Epidermoid Cyst*. European Journal of Radiology Open. 2019; 6: 291-301.
5. Ramakrishnaiah SB, Rajput SS, and Gopinathan NS. *Epidermoid Cyst of the Sole-A Case Report*. Journal of Clinical and Diagnostic Research. 2016; 10(11): 1-2.
6. Parks CB, Nguyen S, Vu A, and Tran Y. *Epidermal Cyst of the Plantar Foot: A Case Study*. Archives of Clinical Case Studies. 2019; 1(2): 1-3.
7. Yamanaka H, Tamai H, Suzuki M, Kobayashi T, and Eguchi Y. *Plantar Epidermoid Cyst in a Patient with Rheumatoid Arthritis*. Ortopedics and Rheumatology. 2018; 10(2): 1-4.
8. Rahar S, Gupta P, and Bhardwaj M. *Epidermoid Cyst at Plantar Aspect of Foot-Report of a Case with Brief Review of Literature*. International Journal of Science and Research. 2018; 8(4): 768-769.
9. Robinson JK, Hanke CW, Siegel DM, Fratila A, Bhatia AC, and Rohrer TE. *Surgery of the Skin E-Book: Procedural Dermatology*. Amsterdam: Elsevier Health Sciences; 2014.
10. Rapini RP. *Practical dermatopathology*. Amsterdam: Elsevier Health Sciences; 2012.
11. Pennycook KM and McCready TA. *Clavus*. (Online) 2019 Sep 13. <https://www.ncbi.nlm.nih.gov/books/NBK546598/>
12. Vlahovic TC and Khan MT. *The Human Papillomavirus and Its Role in Plantar Warts: A Comprehensive Review of Diagnosis and Management*. Clinics in Podiatric Medicine and Surgery. 2016; 33(3): 337-353.
13. Bae JM, Kang H, Kim HO, and Park YM. *Differential Diagnosis of Plantar Wart from Corn, Callus and Healed Wart with the Aid of Dermoscopy*. British Journal of Dermatology. 2009; 160(1): 220-222.