



# Epidermal inclusion cyst of the knee

Khaldoon M. Bashaireh<sup>1</sup> · Ziad A. Audat<sup>1</sup> · Rami A. Jahmani<sup>1</sup> · Abdelwahab J. Aleshawi<sup>2</sup> · Ali F. Al Sbihi<sup>1</sup>

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## Abstract

Epidermoid cysts are asymptomatic, slowly enlarging, firm to fluctuant, dome-shaped lesions. Epidermoid cysts frequently appear on the trunk, neck, face, and scrotum, behind the ears and in the palmoplantar region. We review all the cases of epidermoid cyst of the knee and present a case of non-traumatic-induced epidermal cyst in the popliteal fossa of a 66-year-old male with 10-year history of right knee swelling, which appeared firstly as a small mass 2 × 2 cm in the popliteal aspect of the knee. The mass was increasing gradually in size until 2 years ago when it increased suddenly to gain the dimensions of 4 × 6 cm. MRI of the right knee revealed a well-defined cystic lesion in the subcutaneous tissue measuring about 7 × 5 × 5 cm containing internal debris and septations. He underwent complete surgical excision of the mass. The pathological results revealed an epidermal inclusion cyst. To the best of our knowledge, this is the second description for epidermal inclusion cyst involving the popliteal fossa. We were able to retrieve three cases of epidermal cyst of the knee from the literature since its first description in 2004. Including our case, we had a total of four cases of epidermal cyst of the knee. Three males and one female constituted the patients' sample. The mean age for the patients is 55. The epidermal cyst occurred equally in both knees. The popliteal fossa was the location for two epidermal cysts. Similarly, the prepatellar region was the location for another two cysts.

**Keywords** Popliteal fossa · Cystic lesion · MRI · Epidermal

## Introduction

In the orthopedics practice, a diverse type of cystic lesions may be encountered in and around the knee joint [1, 2]. Most of them are benign and consist mainly of bursal fluid collections (bursitis and hematomas), synovial joint herniation or tendons and ligaments ganglia [2]. These cystic lesions can be complicated infectious or inflammatory or neoplastic processes [1]. The Baker's cyst is the most common cyst in the knee, accounts for 40% of magnetic resonance imaging (MRI) findings [3].

Epidermoid cysts are asymptomatic, slowly enlarging, firm to fluctuant, dome-shaped lesions. Epidermoid cysts frequently appear on the trunk, neck, face, and scrotum,

behind the ears, and in the palmoplantar region [4]. Epidermal inclusion cysts are formed of cystic fluid formation mostly secondary to trauma [5]. We review all cases about epidermal cyst of the knee and present a case of non-traumatic-induced epidermal cyst in the popliteal fossa of a 66-year-old male.

## Methods

The systematic literature search was applied via MEDLINE and EMBASE for cases reported in English-language journals. A similar search was made in China Knowledge Resource Integrated (CNKI) database to identify the reported cases in Chinese journals. "Encyclopédie Médico Chirurgicale" (EMC) and uOttawa Library were used to reach reports in French language. The primary keywords used were "epidermal cyst and knee," "epidermoid inclusion cyst and knee," "epidermal cyst and popliteal," "epidermoid inclusion cyst and popliteal," "epidermal cyst and prepatellar" and "epidermoid inclusion cyst and prepatellar." Only cases originated from the knee were included in the study.

✉ Khaldoon M. Bashaireh  
bashaireh@just.edu.jo

<sup>1</sup> Department of Special Surgery, Division of Orthopedics, Faculty of Medicine, Jordan University of Science and Technology, P.O. Box 3030, Irbid 22110, Jordan

<sup>2</sup> Faculty of Medicine, Jordan University of Science and Technology, Irbid 22110, Jordan

**Table 1** The four cases about knee epidermal cyst

References	Location	Sex	Age	Trauma	Clinical presentation	Treatment
Karacal et al. [6]	Left popliteal fossa	Female	60	No	Asymptomatic mass for 3 years	Complete excision
Mayo et al. [7]	Right prepatellar region	Male	42	Yes	Knee pain, swelling and limitation of movement for 5 years	Unsuccessful aspiration followed by complete excision
Rizkallah et al. [8]	Left prepatellar region	Male	58	Yes	Asymptomatic mass for 2 years	Complete excision
Presented case	Right popliteal fossa	Male	60	No	Asymptomatic mass for 10 years and limitation of movement	Complete excision

**Fig. 1** **a** A right soft knee mass which was around 4×6 cm, adherent to the underlying tissue with heterogeneous red–purple skin color. **b** Surgical marking to make a complete excision. **c** Intraoperatively, epidermal inclusion cyst in the right popliteal fossa

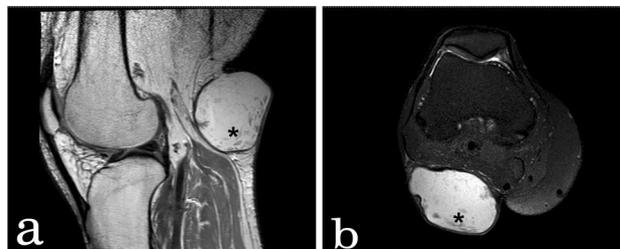


Age, sex and clinical history of these cases were summarized in Table 1. Also, the location and treatment methods of the epidermal cyst are provided in Table 1. In addition, we discuss a case that presented to our center and include it in Table 1. Written informed consent was obtained from the patient for publication of the clinical information and any accompanying images.

### Case presentation

A 66-year-old man, not known to have any medical illness, presented to our center with 10-year history of right knee swelling, which appeared first as a small mass 2×2 cm in the popliteal aspect of the knee. The mass increased gradually in size until 2 years ago when it increased suddenly to gain the dimensions of 4×6 cm. The mass was non-painful, and there was no history of trauma. On physical examination, the patient had a right soft knee mass which was around 4×6 cm, adherent to the underlying tissue with heterogeneous red–purple skin color (Fig. 1a). It was neither hot nor tender to touch. The range of motion was decreased, especially full flexion of his knee. Distal arterial pulses are palpable, and the lower left limb has a normal coloration. The patient walks normally and has stable vitals with no fever.

MRI of the right knee revealed a well-defined cystic lesion in the subcutaneous tissue of the popliteal fossa measuring about 7×5×5 cm containing internal debris and septations indenting the gastrocnemius muscle with no deeper extension. The mass was unrelated to the



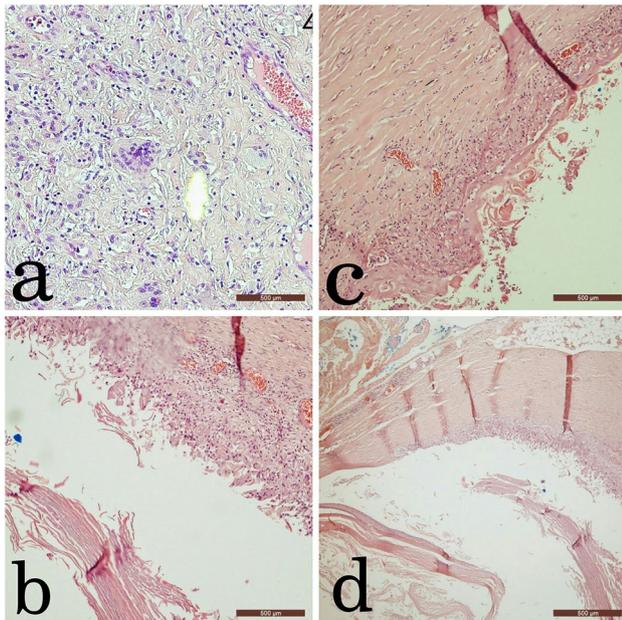
**Fig. 2** **a** T1-MRI sagittal view for the right knee demonstrating a well-defined cystic lesion in the subcutaneous tissue measuring about 7×5×5 cm containing internal debris and septations. **b** T2-MRI axial view; the cystic lesion in the popliteal fossa with internal debris and septations

underlying vasculature. Subchondral edema and mild knee effusion were also detected (Fig. 2).

The decision was to excise the right popliteal fossa mass. Spinal anesthesia was conducted, patient put in prone position, and the plastic surgeon was involved to plan for the surgical incision (Fig. 1b). A ruptured cyst with debris and thick fluids was detected and dissected completely intraoperative, and the mass was excised completely with the skin over it (Figs. 1c, 3). Primary closure was performed. Histopathological examination confirmed the diagnosis of ruptured epidermal inclusion cyst with secondary reactive changes in the form of multinucleated giant cells and angiogenesis (Fig. 4).



**Fig. 3** Completely excised cyst with skin over it



**Fig. 4** **a, b** Histopathological examination indicating the presence of ruptured epidermoid inclusion cyst with keratinous material. **c** Cyst wall composed of squamous epithelium with granular tissue. **d** The cavity contains laminated keratinous material

Postoperatively, the patient had significant improvement in range of motion and regained full flexion of knee 1 month later. During follow-up, the patient did not complain of any symptoms.

## Results

We were able to retrieve three cases of epidermal cyst of the knee from the literature since its first description in 2004. All the cases were retrieved from the English literature. Including our case, we had a total of four cases of epidermal cyst of the knee. Three males and one female constituted the patients' sample. The mean age for the patients is 55. The epidermal cyst occurred equally in both knees. The popliteal

fossa was the location for two epidermal cysts. Similarly, the prepatellar region was the location for another two cysts.

The most common clinical presentation is an asymptomatic mass for long periods of time. All of a sudden, these masses may get swollen and increase in size. Limitation of movement was a predominant feature in the patients. Epidermoid cyst of the knee appeared isointense in T1 MRI and hyperintense in T2 MRI. Complete excision of the mass is the main method of treatment in the four cases. An unsuccessful trial of aspiration was noted in one case.

## Discussion

To the best of our knowledge, this is an updated study about rare pathological entity and the case in this study is the second description for epidermal inclusion cyst involving the popliteal fossa. Karakal et al. reported a non-ruptured left popliteal epidermal cyst in a 60-year-old male [6]. Also, the epidermal inclusion cyst was reported to involve the prepatellar region of the knee in two cases [7, 8]. Mayo et al. reported an epidermal inclusion cyst in a 42-year-old man in the right prepatellar region after traumatic event [7]. In addition, Rizkallah et al. reported a posttraumatic left knee epidermal cyst in the prepatellar region [8]. Nigam et al. did not report the presence of popliteal epidermal cyst in his series review on 103 patients with epidermal cyst [9]. The head and neck region (32%, 33/103) was the most commonly affected region followed by lower limb (26.2%, 27/103), back (19.4%, 20/103) and upper limb (9.7%, 10/103), respectively. In head and neck region, 30.3% (10/33) cases were located on the face followed by scalp (21.21%, 7/33). However, in the lower limb, 40.74% (11/27) cases were seen over left afoot followed by right foot (29.63%, 8/27) [9]. Table 1 summarizes all the reports of knee epidermal cyst.

Epidermoid cysts result from the proliferation of epidermal cells within a circumscribed space of the dermis. The lipid content of the epidermal cyst demonstrates similarities to the epidermis. In addition, epidermal cysts express cytokeratins 1 and 10, which are made in the suprabasilar layers of the epidermis. The source of this epidermis is nearly always the infundibulum of the hair follicle [10]. Epidermal cysts are more common in men as in women with a ratio of 2:1. Epidermoid cysts may occur at any age; however, they most commonly arise in the third and fourth decades of life [11].

There have been several theories regarding the origin of epidermal cysts. First, the traumatic theory suggests that trauma or surgical procedures applied to subcutaneous tissue may result in epithelial migration [12]. Second, the congenital theory suggests pathogenesis resulting from embryonic misplacement of epithelial cells during closure of the neural tube [13]. The third theory is penetration of the existing

mass into the adjacent tissue [14]. The epidermal cyst generally develops in dermis or subcutaneous tissue and is usually diagnosed when the person notices a bump or mass on their skin. Mostly, it is asymptomatic [4].

MRI is necessary to differentiate it from other lesions. Epidermal cysts are isointense or slightly hyperintense on T1 images and hyperintense on T2 images. If it is difficult to rule out a solid mass, enhanced MRI would be necessary. Ruptured epidermal inclusion cyst is a distinct entity that occurs with manipulation or trauma to the cyst. Ruptured epidermal inclusion cyst usually leads to debris and septations seen in the MRI and intraoperatively. The definitive diagnosis is made based on pathologic findings of a cystic lesion lined by stratified squamous epithelium containing lamellated keratin [15].

Epidermoid cysts may be removed via simple excision or incision with removal of the cyst and cyst wall though the surgical defect. If the entire cyst wall is not removed, the lesion may recur. Excision with punch biopsy technique may be used if the size of the lesion permits [16].

We reviewed yet all cases of epidermal inclusion cyst in the knee, in the hope of expanding the knowledge of a rare occurrence and increasing the demand for further research about the etiology, clinical impact and treatment of such conditions existence. This study also highlights the importance of considering the diagnosis of epidermal inclusion cyst in cases of long-standing popliteal fossa masses. The sudden increase in the size often suggests complications as rupture or infection or malignant transformation.

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### Compliance with ethical standards

**Conflict of interest** This article has not been published or presented elsewhere in part or in entirety and is not under consideration by another journal. All authors have approved the manuscript and agreed with submission to your esteemed journal. The authors declare that they have no competing interests.

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