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Calcinosis circumscripta associated with surgical site of the right femur in a Belgian sheepdog: imaging diagnosis and surgical treatment

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Abstract

A nine-month, intact male, Belgian Sheepdog was presented to the hospital due to a history of rapidly progressive growth of a solitary calcified mass at the right hip area. The dog has a history of an internal implant fixation for the right femoral fracture at 5 months ago. Physical examination revealed a dome shape, hard consistency, non-movable, painless, subcutaneous mass with size 5x6 cm. Radiography and ultrasonography showed a well-circumscribed, calcified soft tissue mass at craniolateral aspect of the right proximal femur without cortical bone reaction. Computed tomography (CT) scan was not performed in this case because metal fixation was implanted at the right femur. Cytology was obtained by the fine needle aspiration which revealed numerous unstained granular crystals material with few neutrophils and macrophage. Whereas blood profile revealed normal ranges of serum calcium, phosphorus and parathyroid hormone levels. Surgical excision was subsequently done to remove the calcified mass. On the gross, cross section of the calcified mass revealed variable sizes of chalky-like appearance that accumulated in the dermis and epidermis. In addition, the calcified lesion also extended into the underlying skeletal muscle. The mass was finally diagnosed to be calcinosis circumscripta with the positive staining with Von Koss. After 4 months post-operative monitoring, no evidence of recurrence calcinosis circumscripta at the corrected surgical site.

Keywords: Belgian Sheepdog, calcinosis circumscripta, internal implant fixation, radiographic, ultrasonographic

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Introduction

Calcinosis circumscripta is an uncommon condition, described as a formation of calcium crystal salt in soft tissue structure that usually presented in dermis and subcutaneous layer. It has been reported not only in dog and cat, but also in various kinds of animals such as monkey (Radi and Sato, 2010), horse (Dodd and Raker, 1970), eagle (Sabater *et al.*, 2016) and captive animals (Bauer *et al.*, 2017; Mumba *et al.*, 2014). In dog, this abnormality is frequently occurred in young and large breed dog without sex influence (Tafti *et al.*, 2005) however, calcinosis circumscripta can be found in young small breed dog (Ginel *et al.*, 1995). The calcified lesions are frequently found in soft tissue at distal extremities and tongue (Tafti *et al.*, 2005). Besides, it can present at salivary glands (Movassaghi, 1999), vertebral spine (Engel *et al.*, 2013; McEwan *et al.*, 1992), intestinal wall (Tafti *et al.*, 2005), and urinary tract (Muller *et al.*, 2011). The pathogenesis is remained incompletely understood despite that heredity, inflammation, trauma and secondary systemic disease were reported to be predisposed factors (Bauer *et al.*, 2017; Tafti *et al.*, 2005). The ectopic calcified soft tissue mass can be classified into 4 types: e.g. dystrophic, metastasis, iatrogenic and idiopathic calcinosis circumscripta. Dystrophic calcification occurs following the soft tissue trauma, especially at the pressure point or prominent bone while the consequence of calcium and phosphorus disturbance is a major cause of metastasis calcification (Spotswood *et al.*, 2003). On the other hand, the idiopathic calcification is not related with soft tissue trauma or metabolic disorders. Iatrogenic calcification was reported to be induced by injection of progesterone derivatives (Ginel *et al.*, 1995; O'Brien and Wilkie, 2001). Since this abnormality is a rare condition and it has not been reported in Thailand. The aim of this study was to demonstrate a rare presentation of dystrophic calcinosis circumscripta after surgical implant fixation at the right proximal femur with the physical appearance, imaging features, serological, and gross examination in a Belgian sheepdog.

Case Report

A nine-month, 25-kilogram, intact male, Belgian Sheepdog was presented to the Small Animal Hospital, Faculty of Veterinary Science, Chulalongkorn University during January 2021 with a history of rapidly progressive growth with painless of a large, solitary calcified lump at the right hip area. Five months earlier, an internal plate and rod fixation of the right femur had been performed from private clinic to correct a traumatic fracture of the right femoral diaphysis. The radiographs of right femur after surgery at 1 week revealed the displacement of an intramedullary pin with right hindlimb lameness. Failed intramedullary pin was removed immediately, and bone healing then occurred properly. The dog was able to bear weight on the affected limb. Serial radiographic evaluations were performed at every 2 weeks after surgery, and it showed normal finding. After the dog was discharged for 2 months, a locally rapid growing mass at the right hip area was observed by owner. On current presentation, general

physical examination revealed normal body condition score, normal heart sound and lung sound, normal hydration status, strong femoral pulse without pulse deficit. The right hip area revealed a 5x6 cm, solitary, dome shape, hard consistency, non-movable, painless, subcutaneous mass (Fig. 1A-B). No evidence of an enlargement of the right popliteal lymph node. Subsequently, standard lateral and ventrodorsal radiographs of the right femur were obtained using a digital x-ray (ETL®, GE healthcare, Beijing, China). The radiographs showed a well-circumscribed, calcified callus formation at the cranialateral to the aspect of right greater trochanter (Fig. 2A-B). The dog was proceeded for further diagnosis by ultrasound scanned using a 7 MHz, linear transducer (Logiq P6®, GE healthcare, Seoul, Korea) on lateral recumbency position. Ultrasonographic examination of the right femur revealed an encapsulated, hyperechoic calcified soft tissue mass with inhomogenous acoustic shadowing, adjacent to the right proximal femur without bone involvement (Fig. 3A-B). The metallic implant fixation at the right femur results in X-ray attenuation which caused striking artifact surrounding that area. This artifact can completely obscure the adjacent structure. Therefore, CT scan was not performed in this case. Subsequently, cytology with Diff-Quick® staining method was obtained from the fine needle aspiration to evaluate the calcified mass. The cytologic feature showed numerous unstained granular crystals with few neutrophils and macrophage. Moreover, hematology, biochemistry panel and parathyroid hormone were evaluated in order to exclude other metabolic disorders such as chronic kidney disease and hyperparathyroidism. Complete blood count showed no remarkable change. Biochemistry showed mild elevation of alkaline phosphatase, but serum calcium, phosphorus and parathyroid hormone were in normal ranges (Table 1 and 2). The dog was then scheduled for surgical excision the calcified mass. Prior to anesthesia, the dog was fasted for 8 hours. Premedication was done using 5 mg/kg of dexmedetomidine (Dextomitor®, Zoetis, USA) combine with 0.3 mg/kg morphine sulfate pentahydrate (Morphine sulfate, Thai FDA, Thailand) intramuscularly following by induction of anesthesia using 4 mg/kg propofol (Propofol-Lipuro 1%®, B. Braun Melsungen AG, Germany) slow intravenous injection. After the endotracheal intubation, the dog was maintained the generalized anesthesia with 1% isoflurane (AERRANE®, Baxter healthcare corporation, USA) in 100% oxygen. The cefazolin sodium (Cefamezin®, Pharmacia, Thailand) at 25 mg/kg intravenously was given as surgical antibiotic prophylaxis. In addition, epidural nerve block was performed with 1 mg/kg bupivacaine (Marcain®, Aspen Pharmacare, Australia) combined with 0.1 mg/kg morphine sulfate pentahydrate. The excisional biopsy mass and plate removal were done. After surgery, anti-inflammatory drug, using 4 mg/kg carprofen (Rimadyl®, Zoetis, Brazil) was given for 4 consecutive days while post-operative antibiotic was continued for 14 days. Unfortunately, wound dehiscence was found at day seventh because owner could not restrict the exercise and keep a collar on the dog. Therefore, open wound management was

continued until wound close and heal as the secondary intention wound healing. However, normal gait pattern after surgery was observed. After surgical excision, cross section of mass revealed a diffuse, variable size of chalky-like appearance accumulation in the dermis and epidermis. Moreover, the calcified lesion also extended into the underlying skeletal muscle (Fig. 4). The biopsy sample was immediately sent to the Department of Veterinary Pathology,

Chulalongkorn University for further histopathological investigation. The result indicated calcinosis circumscripta with positive stain of Von kossa. In addition, bacterial isolation was done, however, it showed no detection of any bacteria from surgical site. After surgical removal for 4 months, no evidence of recurrent calcinosis circumscripta was found.

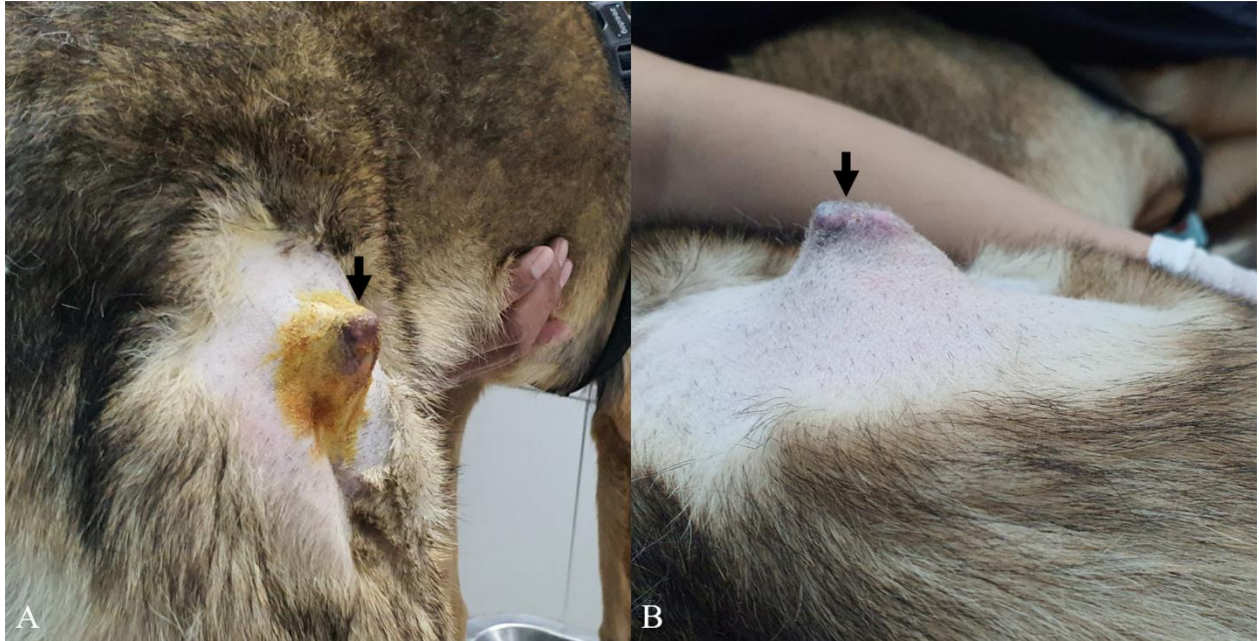


Figure 1 Physical appearance of a 9-months old intact male, Belgian sheepdog with a lump at right hip area in standing position (A) and left lateral recumbency position (B). The arrow indicated calcified lump at right hip area.

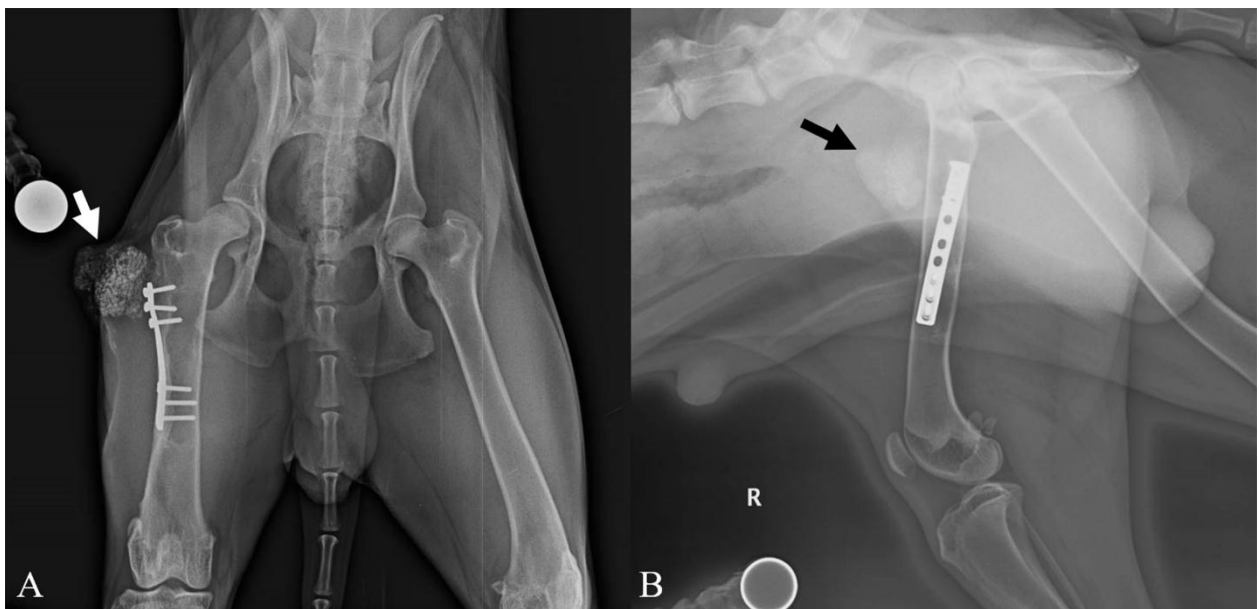


Figure 2 Radiographic examination on right lateral (A) and ventrodorsal (B) radiograph of the pelvis revealed a well-circumscribed, calcified callus formation at the craniolateral to the aspect of the right greater trochanter. The arrow indicated the location of calcified mass.

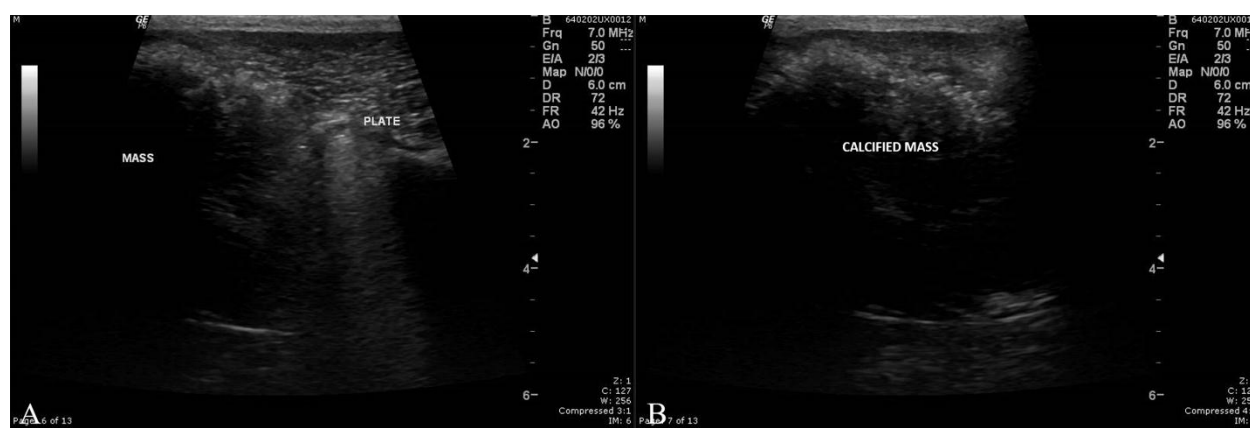


Figure 3 Ultrasound examination of right proximal area showed hyperechoic calcified mass with inhomogenous acoustic shadowing (B), adjacent to right proximal femur without bone involvement (A).

Table 1 Hematological profile of a calcinosis circumscripta affected the dog.

Parameters	Results	Reference interval
Hematocrit (%)	34.4	29.8 - 57.5
Hemoglobin (g/dL)	12.1	12.4 - 19.1
Red blood cell (x10/mm ³)	6.79	5.2 - 8.06
White blood cell (x10/mm ³)	13.25	5.4 - 15.3
Neutrophil (%)	59.3	51 - 84
Lymphocyte (%)	23.8	8 - 38
Monocyte (%)	4.5	1 - 10
Eosinophil (%)	12.3	0 - 9
Platelet (x10/mm ³)	340	200 - 500

Table 2 Serum biochemistry and hormone profiles of a calcinosis circumscripta affected the dog.

Parameters	Results	Reference interval
Blood urea nitrogen (mg/dL)	20.3	7 - 26
Creatinine (mg/dL)	1.4	0.6 - 1.4
SGPT (U/L)	43	4 - 91
ALP (U/L)	101	3 - 60
Total protein (g/dL)	6.4	5.8 - 7.9
Albumin (g/dL)	2.5	2.5 - 4
Calcium (mg/dL)	10.7	9.6 - 11.6
Phosphorus (mg/dL)	5.7	2.5 - 6.2
Parathyroid hormone (pmol/L)	< 0.12	2-13

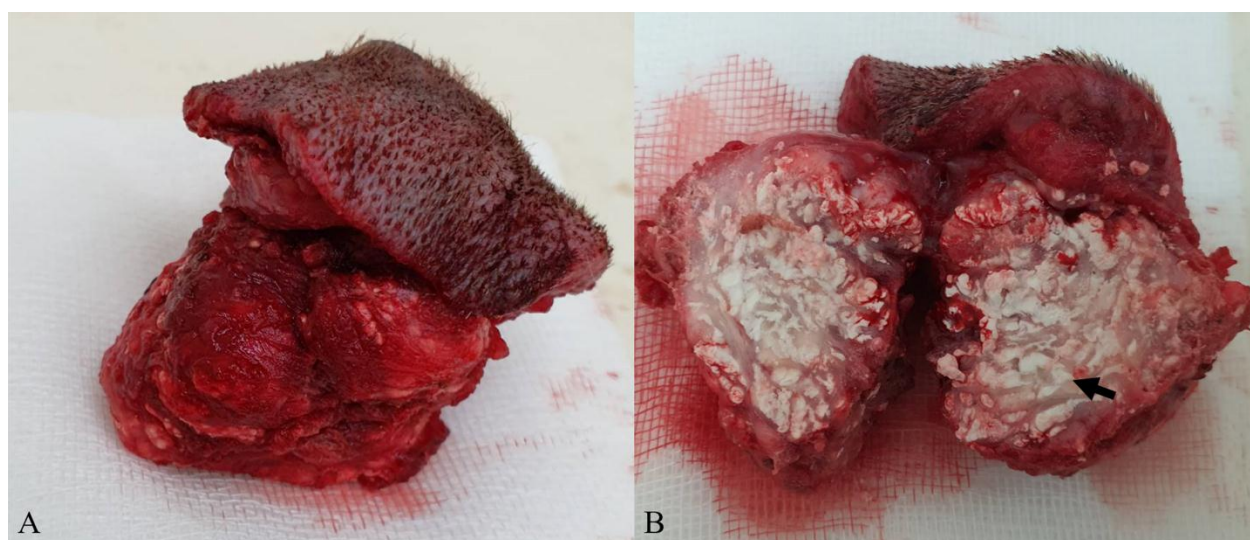


Figure 4 Macroscopic view of the calcinosis circumscripta on gross appearance (A) and the cross section demonstrated various size of chalky like appearance deposition in the dermis and epidermis (B). The arrow indicated accumulated chalky lesion in mass.

Discussion

In this article, we described a rare case of dystrophic calcosinosis circumscripta at surgical site following by an internal implantation for the right femoral fracture in a Belgian sheepdog. This condition is calcium cluster deposition in susceptible soft tissue due to an injury or inflammation without changing of blood profile. The lesion usually involves with prominent bone or periarticular structures. German shepherd, Rottweiler and Labrador were reported to be the susceptible breeds (Tafti *et al.*, 2005). From four types of calcosinosis circumscripta, dystrophic calcosinosis circumscripta is the most common lesion occurred in dog while metastatic type is more frequently found in human (Tafti *et al.*, 2005; Muller *et al.*, 2011). An initial diagnosis of dystrophic calcosinosis circumscripta is based on signalment, history, location and physical appearance of calcified mass. Moreover, the radiographic and ultrasonographic diagnosis are essential tools for evaluation of the position and size of calcified tumor. In addition, CT scan or magnetic resonance imaging (MRI) can be aided and provided additional information for calcified mass associated with vertebral spine and spinal cord (Engel *et al.*, 2013). The evaluation of hematology, serum biochemistry and parathyroid hormone can additionally assist veterinary practitioners to differentiate the type of calcosinosis circumscripta. However, the histopathology is the principle method to confirm this abnormality. Special staining such as Von Kossa and Alizarin red S dyes is commonly used to determine calcium deposition in soft tissue as the final diagnosis of calcosinosis circumscripta (Marcos *et al.*, 2006). Although several treatments for calcosinosis circumscripta have been reported; for example, carbondioxide laser (Mouzakitis *et al.*, 2015) and an oral charcoal absorbent (Komori and Washizu, 2001), a complete surgical excision is the treatment of choice with good prognosis. The recurrence after surgical excision is rare. One study recently reported that the recurrent lesion has detected after 4 months of surgical removal (Genccelep *et al.*, 2018). In contrast, a regression of the calcified mass by itself without surgery has been described in an African lion (Bauer *et al.*, 2017). In this report, authors have followed the patient up to 4 months post-operatively, no evidence of recurrence was noted. In conclusion, this report provided a crucial information of the physical, radiographic and ultrasonographic appearances, hematology including the serum biochemistry and, gross finding of calcosinosis circumscripta in Belgian Sheepdog, that would be elucidated further information as a differential diagnosis if a post-operative lump was found at the previous surgical site.

Conflict of interests: The authors declare there are no conflicts of interest.

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