

## Case Report



# Management of Spinal Osteochondroma in Young Golden Retriever Dog

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**Abstract** | Osteochondroma is the most common type of benign bone tumor. We report here a rare case of osteochondroma in a 4-month-old male golden retriever dog presented to Kasetsart Veterinary Teaching Hospital, Kamphaeng Saen, with progressive paresis over two weeks. The dog was ultimately diagnosed with a spinal tumor by radiography and MRI. In this study, the dog was successfully treated by dorsal laminectomy of T8-T9 to excise an abnormal spinal mass, and a modified pedicle screw-rod was fixed to T7-T10 for stabilization. The biopsy result was cartilaginous exostosis (osteochondroma). The dog completely recovered within two months, and no recurrence was observed. Osteochondroma can be considered a rare cause of spinal cord compression. Complete excision of the tumor will result in decompression and reduce the risk of recurrence. This case report provides essential information on the clinical symptoms, diagnosis, and treatment of osteochondroma in a young dog.

**Keywords** | Cartilaginous exostosis, Dog, MRI, Osteochondroma, Total resection

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## INTRODUCTION

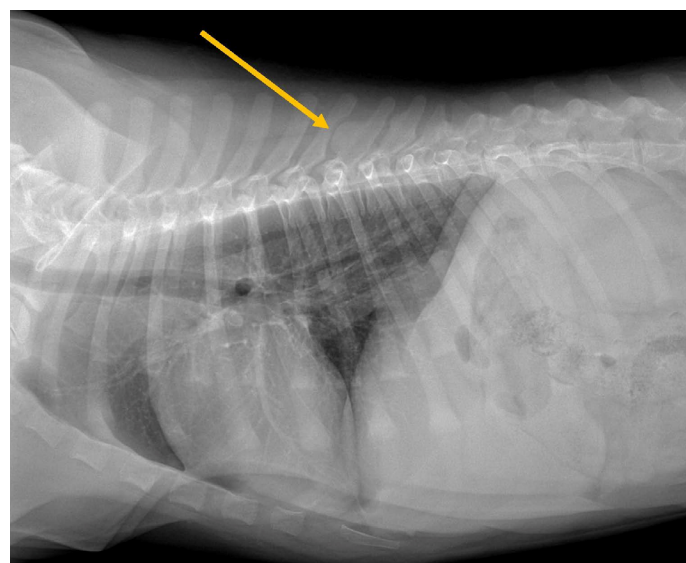
Osteochondroma, also known as cartilaginous exostoses or diaphyseal aclasia, is the most common benign tumor of the bone. Osteochondroma is usually located on the extremities and is rarely found in the spine (Kitsoulis et al., 2008; Gunay et al., 2010; Czerwik et al., 2019). Osteochondroma is a rare benign nodule of cartilage, with or without bone, that proliferates in a growth plate area of various bones, and osteochondroma has been described in humans, horses, dogs, and cats (Jacobson and Kirbinger, 1996; Silver et al., 2001; Mozos et al., 2002). This disease typically occurs in young dogs and adult cats. Although the etiology is unclear, this disease is associated with the abnormal migration of chondrocytes from the epiphyseal growth plates towards the bony cortex. Ossification of

heterotopic cartilage cells causes subsequent irregular bone formation on bone surfaces (Niemand and Sutter, 2013; Houlton et al., 2006; Doige, 1987). The vertebrae (especially spinous processes, vertebral bodies, and arches), ribs, and long bones of the limbs are most frequently affected (Niemand and Sutter, 2013; Houlton et al., 2006; Vite, 2006). Osteochondroma of the spine is commonly asymptomatic (Kitsoulis et al., 2008; Gunay et al., 2010). However, the symptoms associated with neural compression may be used as a further diagnosis of spinal osteochondroma. The present case is reported for its rarity, uncommon presentation, and successful treatment by laminectomy.

## CASE SUMMARY

A 4-month-old male golden retriever, weighing 16 kg,

was referred to Kasetsart Veterinary Teaching Hospital Kamphaeng Saen, Thailand, with a history of subacute progressive paresis within 2 weeks before admission to a hospital. The referring veterinarian had prescribed nonsteroidal anti-inflammatory drugs (NSAIDs), but no improvement was observed after 1 week. The dog's owner was provided a consent form to approve the therapeutic procedure. On the physical examination, the dog presented grade III paresis with hindlimb hyperreflexia, and proprioceptive responses were absent and painful at the area of the T10-L1 spine. The dog was able to urinate normally. The results of cranial nerve and forelimbs examinations were normal. Other vital signs such as body temperature, heart rate, respiratory rate, and blood pressure were normal. The neurological examination indicated T3-L3 myelopathy.



**Figure 1:** Radiograph of thoracic (lateral view) with exostoses at T8-T9 dorsal spinous processes (yellow arrow).

### THORACIC RADIOGRAPHY

The patient was subjected to thoracic image evaluation as shown in Figure 1. Plain thoracic radiography was used to diagnose the location of the tumor. The radiographic images showed the tumor involving the T7-T9 dorsal spinous processes.

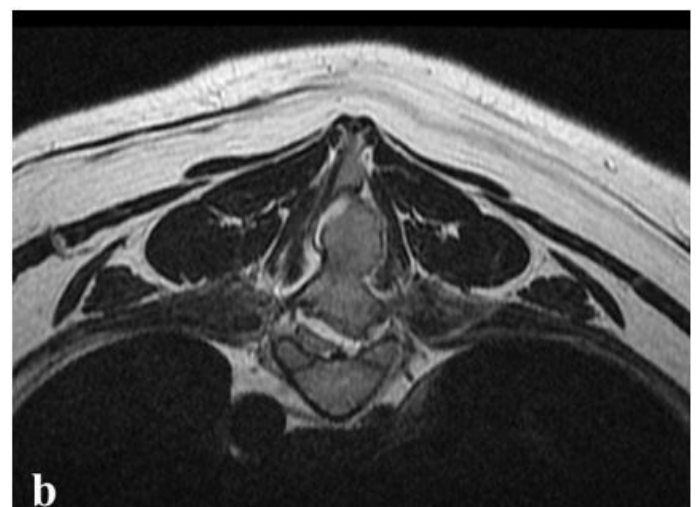
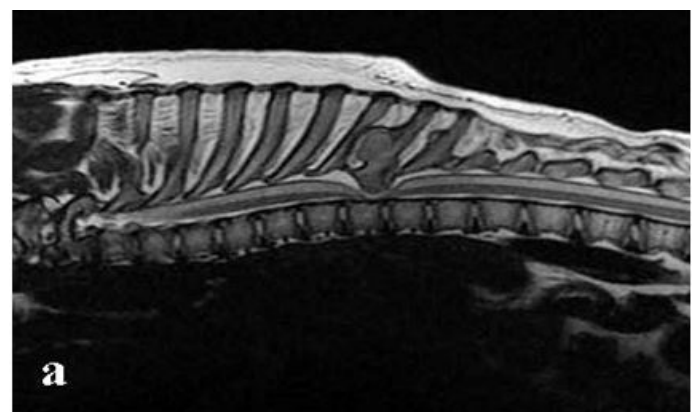
### CLINICAL EVALUATION AND MANAGEMENT

Routine laboratory evaluations, including hematology and serum biochemistry, were performed as shown in Table 1. The laboratory results from the complete blood count (CBC) and rapid tests were all within the normal range. The MRI scan with 1.5 tesla and contrast media injection was performed at the T3-L3 spine to further diagnose the lesion. The MRI revealed an extramedullary mass at T8 with a severely compressed spinal cord (Figure 2). With the tentative diagnosis of osteochondroma, total resection of the tumor was recommended. Thereafter, the dog was

**Table 1:** Blood profiles.

	Reference range	Result
HCT (%)	30-35	36
RBC( $\times 10^6/\mu\text{l}$ )	5-9	5.04
Hb(gm%)	12-18	12.1
MCV (fl)	60-70	70
MCHC (gm%)	32-36	33.3
WBC ( $\times 10^3 \mu\text{l}$ )	6-17	10.63
Band neutrophil ( $\times 10^3 \mu\text{l}$ )	0-0.3	0
Segmented neutrophil ( $\times 10^3 \mu\text{l}$ )	3-11.5	8.40
Lymphocyte ( $\times 10^3 \mu\text{l}$ )	1-4.8	1.8
Monocyte ( $\times 10^3 \mu\text{l}$ )	0.15-1.35	0.43
Eosinophil ( $\times 10^3 \mu\text{l}$ )	0.1-1.25	0
Platelet ( $\times 10^3 \mu\text{l}$ )	200-900	206
Protein (refract) (gm%)	5-7.5	6.6
Creatinine (mg%)	<1.8	0.43
Total protein (gm%)	5.3-7.8	5.2
Albumin (gm%)	2.3-3.2	3.0

HCT: hematocrit; RBC: Red blood cell; HGB: hemoglobin; MCV: Mean corpuscular volume; MCHC: Mean corpuscular hemoglobin concentration; WBC: White blood cell.

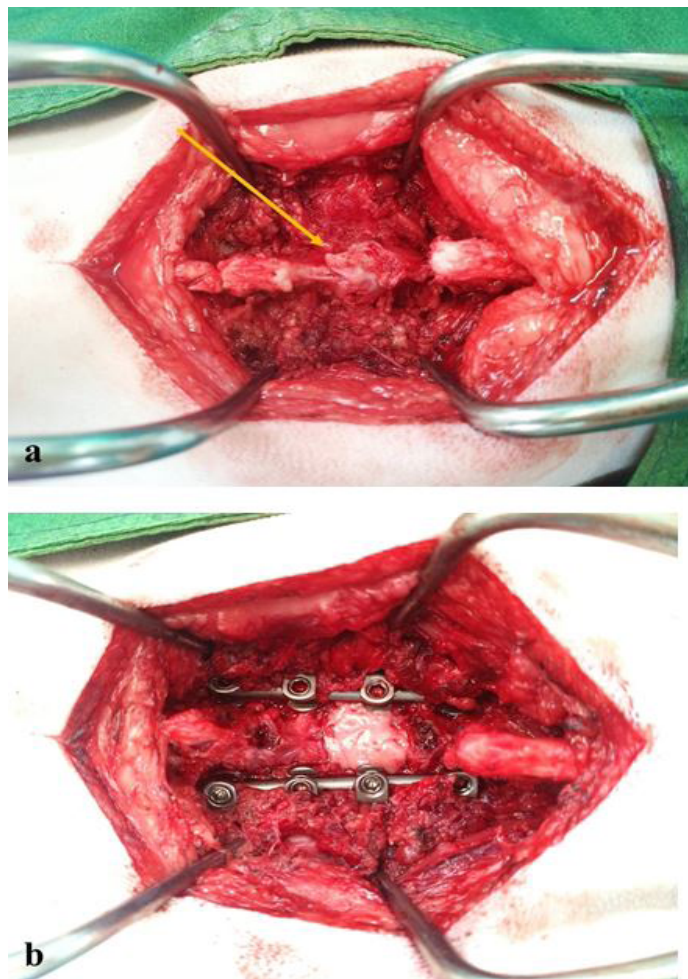


**Figure 2:** T2-weighted sagittal (a) and transverse (b, c) MRI showing bony mass at T8 with severely compressed the spinal cord.



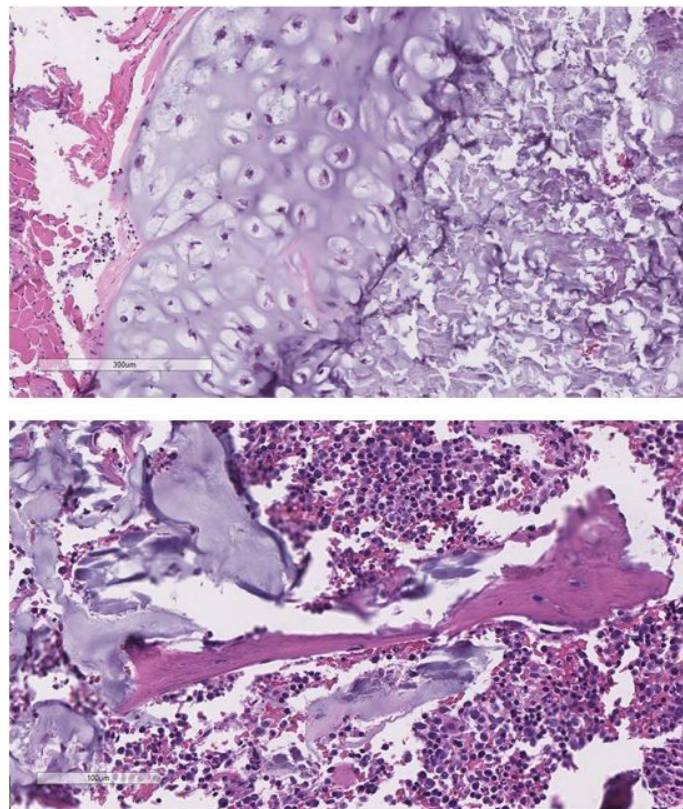
stabilized and premedicated with diazepam (0.25 mg/kg), the dog was induced for anesthesia with propofol (4 mg/kg), intubated, and maintained for anesthesia with isoflurane in oxygen (1L/min) passing through a circle breathing system. During the anesthesia, an electrocardiogram, capnography, blood pressure, oxygen saturation, and body core temperature were monitored.

monofilament non-absorbable suture was used with a cross-mattress pattern. The resected tumor was approximately 2x2.5 cm in diameter, and its surface was covered with cartilaginous tissue. The excised biopsies are then sent for a histopathological diagnosis of the tumor type and the biopsy result was cartilaginous exostosis (osteochondroma) as shown in Figure 4.



**Figure 3:** Intraoperative view of pathological exostoses located at T8 dorsal spinous process (a, yellow arrow). The modified pedicle screw-rod fixation was placed to T7-T10 for stabilization after exostoses were excised and the defect was covered with an autologous fat graft (b).

Intra-operative and post-operative pictures are presented in Figure 3a and b, respectively. A dorsal laminectomy of T8-T9 was performed, including the laminar and bilateral facet joints to excise abnormal bony mass with small rongeurs, and bone samples were collected for histological examination. A durotomy was performed to reduce intrathecal pressure and improve spinal cord perfusion. After flushing with sterile saline, the defect was covered with an autologous fat graft. Four 3.5 mm modified monoaxial pedicle screw-rod fixation were placed on each side of T7-T10 for stabilization. The muscle sheath and subcutaneous layers were sutured with 2-0 polyglycolide monofilament absorbable suture using a simple continuous pattern. To close the skin layer, 2-0 nylon



**Figure 4:** The microscopic finding presented a nodule of the cartilaginous cap with well-differentiated chondrocytes interspersed with bone spicules surrounded by marrow cells.

Post-operative care was provided by administering fentanyl (0.002 mg/kg) every 4 hours together with carprofen (2.2 mg/kg) every 12 hours to control inflammation and pain. Antioxidant supplements such as N-acetylcysteine (50 mg/kg) were also prescribed.

On postoperative day 7, the dog presented bilateral hindlimbs partial weight-bearing, ambulatory paraparesis, and positive proprioceptive response. No complication in the operated area. Prednisolone (0.5 mg/kg/sid) and Gabapentin (5 mg/kg/bid) were orally administered for 1 week. The clinical signs were almost complete recovery on day 55 after surgery.

## RESULTS AND DISCUSSION

Osteochondroma is a common benign bone tumor causing an osteocartilaginous proliferation that usually originates on the long bone. Although the etiology has not been fully

clarified, the affected dogs should not be breeders because there is some evidence that this is a heritable condition in dogs and horses (Doige, 1987; Shupe et al., 1981).

According to a previous study, spinal osteochondroma is commonly found in young patients, and symptoms are usually related to bone development. Decreased phosphorus and calcium levels have been reported during maturation and in immature animals (Anderson et al., 1940). However, in the present case, the calcium and phosphorus levels were not evaluated but should have been normal in relation to the patient's growth.

Osteochondroma may be found as a solitary or multiple lesions. The clinical signs vary depending on the location and severity of the masses. The bone masses are usually detectable on plain radiography which should be used to evaluate the whole body to detect all abnormal masses and rule out other causes of the disease. It is difficult to diagnose spinal osteochondroma by plain radiography, and computed tomography (CT) and magnetic resonance imaging (MRI) can provide more detail about the involved vertebral canal. MRI is the method of choice for central nervous system imaging, as it allows the determination of lesion location and the severity of the lesion which are useful for surgical planning. The definitive diagnosis is based on microscopic examination to differentiate the condition from vertebral neoplasia.

Total resection of the tumor and dorsal spinous process fixation were performed for this patient. A vertical midline incision was made from the T6 to the T11 spinous process, and the laminar and bilateral facet joints exposed to the tumor were removed (Heblinski and SchmÖkel, 2017).

A modified monoaxial pedicle screw-rod was fixed to T7-T10 of this patient for stabilization. Thoracic vertebral radiography should be performed regularly to evaluate the formation of the immature bone. If malformation occurs, which might lead to neurological signs, the implant removal should be performed at approximately 12 weeks postoperation according to the bone healing time and the age of the dog.

The pathological examination indicated a nodule of the cartilaginous cap with well-differentiated chondrocytes interspersed with bone spicules surrounded by marrow cells, leading to a diagnosis of benign osteochondroma. The disease is a benign proliferation of cartilage and bone that affects the bones formed by endochondral ossification. A small percentage of cartilaginous exostoses may undergo malignant transformation into chondrosarcoma or osteosarcoma. While the growth of most exostoses discontinues as the animal matures, some lesions may undergo a neoplastic transformation as was observed

in a group of adult dogs over 7 years old, and the spinal malignant transformation of osteochondroma can cause neurological symptoms and pain (Vite, 2006). In cats, the disease was reported to be associated with a feline leukemia virus infection (Dewey and Costa, 2016; Lorenz et al., 2011; Platt and Olby, 2014). The radiological examination associated with CT or MRI can reveal the area of spinal cord impingement as presented in this study.

## CONCLUSIONS AND RECOMMENDATIONS

Osteochondroma is the most common benign bone tumor of the spine. Surgery is necessary in patient with neurological symptoms and pain. In this case, successful management of osteochondroma was achieved through surgery and ongoing physical therapy. The dog was free of clinical signs and no recurrent mass was found after 1 year following.

## ACKNOWLEDGMENTS

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## NOVELTY STATEMENT

The novelty of this case report is the management of a rare case of osteochondroma through the surgical technique in a dog.

## AUTHOR'S CONTRIBUTION

All the authors contributed to the manuscript. Neeranoot Detcharoenyos and Nakrob Pattanapon prepared and interpreted the results and Soontaree Petchdee drafted, critically revised, and approved a manuscript.

## CONFLICT OF INTEREST

The authors have declared no conflict of interest.

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