A Primary Hepatic Plasma Cell Tumor in a Dog

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ABSTRACT. An 8-year-old female Shetland sheep dog had hyperproteinemia with a monoclonal gammopathy and a solid mass on the liver, which was histologically diagnosed as a plasma cell tumor. After the treatment of surgery and chemotherapy, serum protein level reduced to the normal range and the gammopathy was disappeared. These findings indicate the plasma cell tumor developed primarily from the liver.

KEY WORDS: canine, gammopathy, hepatic plasma cell tumor.


An 8-year-old female Shetland sheepdog was referred to Osaka Prefecture University Veterinary Teaching Hospital because of depression, tachypnea and polydipsia. The results of a hematological analysis were unremarkable. On serum biochemical analysis, severe hyperproteinemia (10.1 g/dl) and hypercholesterolemia (328 mg/dl) were observed and slight elevation of alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyltransferase and amylase also were detected. Serum protein electrophoresis indicated a monoclonal gammopathy, a sharp peak in the gamma globulin region (Fig. 1). Proteinuria (3+ reaction for protein on dipstick analysis) was found on urinalysis. Abdominal radiography and ultrasonography revealed a solitary mass associated with the liver.

On day 12, a ventral celiotomy was performed to allow resection of the abdominal mass. The dog was sedated with diazepam and sodium thiamiral followed with isoflurane anesthesia. A 10-cm diameter mass arising from the liver was found and removed with an approximately 3 cm margin. Bone marrow aspiration was also performed. Blood was collected just after the operation. Comparing analyses before and after the surgery, serum protein and packed cell volume had declined dramatically from 10.4 to 5.7 mg/dl and 42.3 to 18.3%, respectively. Histological evaluation of the mass revealed a plasma cell tumor of the liver consisting of undifferentiated neoplastic plasma cells (Fig. 2). After the surgery, the patient was medicated with melphalan (Alkeran; GlaxoSmithKline, Tokyo, Japan) at a dose of 0.1 mg/kg and prednisolone (Predonine; Shionogi, Osaka, Japan) at a dose of 0.5 mg/kg, orally for 27 days. At the end of the treatment, radiographs and ultrasonography were performed to confirm that there had been no recurrence. Blood analysis also showed that the serum protein concentration was in the normal range and the percentage of gamma globulin indicated by serum protein electrophoresis remained low (Fig. 1). On day 360, mammary gland tumors were found and removed surgically. Blood examination at that time demonstrated mild hyperproteinemia (9.4 g/dl) with a normal A/G ratio (0.84).

The patient returned to the hospital because of a sudden onset of lameness in the left hind foot and anorexia. Abdominal radiography revealed the recurrence of the
hepatic tumor. Ultrasonographs showed multinodular masses on the surface of the liver. A recurrent monoclonal gammopathy was detected upon serum protein electrophoresis (Fig. 1). At this time, alkaline phosphatase (ALP) (2,614 U/l) and serum Ca (12.2 mg/dl) were elevated in addition to high values of ALT (370 U/l), AST (231 U/l), amylase (1,829 U/l), serum protein (10.9 g/dl) and cholesterol (311 mg/dl), which had been observed initially. Normal blood urea nitrogen (21 mg/dl) and creatinine (0.7 mg/dl) levels indicated that the kidneys were still functioning.

On day 606, the patient died, 20 months after the surgical removal of the hepatic mass. A necropsy revealed that bloody fluid was pooled in abdominal cavity. Multinodular masses were seen on the liver. Histologically, nodular proliferation of neoplastic cells similar to those observed in the hepatic masses was seen in the spleen, kidney, mesenteric lymph nodes and an epidermal mass.

Plasma cell tumors typically form multiple tumors in the bone marrow. These tumors are diagnosed by a monoclonal gammopathy in serum protein electrophoresis and punched out lesions indicating bone lysis on radiography [11]. However, extramedullary plasma cell tumors arising in organs other than bone marrow typically cannot be detected by these criteria. In dogs, extramedullary plasma cell tumors have been reported in the skin [8, 9], oral cavity [7], esophagus [4], gastrointestinal tracts [2, 6] and brain [10]. Globulin secreting extramedullary plasma cell tumors are very rare in dogs, and of all these reports, only one case of a tumor arising originally from the gastrointestinal tract showed gammopathy in serum and urine electrophoresis [5]. In our case, a sharp spike in the gamma globulin region was detected upon serum protein electrophoresis at the initial examination and this made us consider multiple myeloma. However, neither bone lesions detectable by radiography nor neoplastic cells in bone marrow aspiration could be found. Histological findings in a biopsy of the hepatic mass showed a plasma cell tumor in the liver and removal of the mass decreased the serum protein concentration and terminated the gammopathy. Thus, we concluded that the liver was the primary site of this tumor.

Primary extramedullary plasma cytoma of the liver is a rare tumor in human beings [12]. To our knowledge, hepatic plasma cell tumors have not been described previously in dogs. This example is one of the rare cases of a gamma globulin secreting plasma cell tumor in extramedullary tissue. The extramedullary plasma cell tumors without gammopathy reported in dogs appear benign because of the good prognosis after adequate surgical excision of the tumors [1]. However, in human beings, there are a few extramedullary plasma cell tumors that progress to multiple myeloma [3]. In our case, the patient survived for 20 months.
after the surgical removal of the hepatic mass, when the tumor metastasized to the kidney, spleen, mesenterial lymph nodes and skin. We did not examine the bone marrow in the necropsy but a high concentration of serum calcium and elevated ALP level indicated the development of multiple myeloma. Hepatic plasma cell tumors tend to have a worse prognosis than other plasma cell tumors in dogs and the early excision before metastasis is important for the treatment of this tumor.

Figure 3 shows the changes in the levels of liver enzymes and the albumin/globulin (A/G) ratio. Slightly high concentrations of ALT and AST in the initial blood analysis suggested liver damage. At that time, a low ratio of A/G with gammopathy was noted. This gammopathy disappeared and the A/G ratio elevated after the removal of the tumor. However, those abnormalities reappeared when the tumor recurred. The A/G ratio began to decline in advance of the increase in liver enzyme concentrations. Thus, the A/G ratio seems to be a good indicator that reflects the development of the tumor. To detect the tumor recurrence earlier, measurement of total protein and albumin should be performed regularly after surgery and serum protein electrophoresis is essential to confirm the diagnosis. Gamma globulin secreting plasma cell tumors of the liver may have a worse prognosis but may be diagnosed more easily than the extramedullary plasma cell tumors reported commonly in dogs.

REFERENCES