# Anesthetic Management of a Patient with Crow-Fukase Syndrome

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Crow-Fukase syndrome is a very rare condition associated with plasma cell dyscrasia and multiple clinical symptoms[1]. To our knowledge, no reports have been published on the management of anesthesia for patients with this syndrome. Our report describes the anesthetic management of a patient with Crow-Fukase syndrome who underwent three operations: repair of a femur fracture, hemorrhoidectomy and laparotomy for biopsy.

## Report of a Case

A 29-year-old man was admitted to our hospital because of gait disturbance, edema and pigmentation of the lower extremities. Physical examination revealed muscle weakness, muscle atrophy, hepatosplenomegaly, ascites, polyneuropathy including paresthesia of both feet, lymphadenopathy and papilledema of the optic discs. Laboratory results revealed liver and renal dysfunction with decreased cholinesterase, a decreased phenolsulfonphthalein (PSP) excretion and increased blood urea nitrogen. Bone marrow aspiration indicated a slight increase in plasmacytes and his chest roentgenogram showed a hydrothorax. Lymph node biopsy obtained at laparotomy under modified neuroleptanesthesia (NLA) with pentazocine and diazepam resulted in a diagnosis of Crow-Fukase syndrome. Steroid therapy, 80 mg a day of prednisolone, was begun. In response to this treatment, his clinical symptoms had gradually improved.

When he was 33, he had a second operation, hemorrhoidectomy, under caudal anesthesia with mepivacaine. At that time, the preoperative problems were steroid administration for a long period with its induced secondary diabetes mellitus and hypertension. Anesthesia was uneventful. During the long course of the illness, the clinical features had been changed by steroid therapy. Most of the specific symptoms had gradually become inconspicuous, whereas the side effects of steroid therapy came to the fore.

When the patient was 42, he fell and easily incurred a left femur fracture because of steroid-induced osteoporosis. At that time, laboratory tests revealed a restrictive form of pulmonary dysfunction with decreased vital capacity (VC) and %VC (2 liters, 56%, respectively). Respiratory muscle strength had also decreased. A large amount of therapeutic prednisolone had been administered during the course of the illness (totaling 70000 mg), therefore secondary diabetes mellitus and hypertension continued as side effects. Nifedipine had been given as treatment for hypertension and insulin (16 units in the morning and 4 units in the evening) for diabetes mellitus. A chest roentgenogram showed multiple calcification throughout the lungs. Laboratory data revealed liver and renal dysfunction with decreased total protein and albumin (5.5 g/dl, 3.3 g/dl, respectively) and a low value in the PSP test.

For the fracture repair, general anesthesia was selected. Premedication was with atropine

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0.5 mg intramuscularly. After oxygenation by mask, anesthesia was induced with pentobarbital 200 mg intravenously and maintained with enflurane, 50% nitrous oxide and oxygen. No neuromuscular blockade was given to the patient and ventilation was manually assisted by mask. For steroid coverage, cortisol 100 mg was infused preoperatively; during anesthesia it was not administered. For diabetes mellitus, 8 units of insulin, half the patient's usual amount, was injected intramuscularly preoperatively; but during anesthesia it was not given. Vital signs remained stable throughout the two hour operation. After surgery, the patient awakened rapidly and vital signs were stable. The patient was transferred to his room in good condition. The postoperative course was uneventful.

## Discussion

This syndrome was reported by Crow[2] in 1956 and by Fukase[3] in 1968. In this paper, it is designated as the Crow-Fukase syndrome, corresponding to the names of the first reporters inside and outside Japan, although it has been called the POEMS (polyneuropathy, organomegaly, endocrinopathy, M-protein and skin changes) syndrome[4]; the PEP (pigmentation, edema and plasma cell dyscrasia) syndrome[5]; and Takatsuki syndrome[6] by others.

It shows multiple clinical symptoms including polyneuropathy, diabetes mellitus, increased intracranial pressure (ICP), respiratory and cardiac dysfunction. These symptoms vary among individuals, and the clinical course is very chronic[1]. Patients show a spontaneous waxing and waning of the symptoms. The generally accepted criteria of dianosis are those formulated by Takatsuki[1]: [1] polyneoropathy; [2] elevated cerebrospinal fluid protein and papilledema; [3] skin pigmentation and hypertrichosis; [4] gynecomastia and impotence; [5] edema of the extremities, ascites and pleural effusion; [6] impaired glucose tolerance; [7] hepatomegaly, splenomegaly and lymphadenopathy; [8] polycythemia and leukocytosis; [9] low grade fever; [10] clubbed fingers; [11] angiomatous verrucae; [12] a small amount of M-protein with a strong preponderance of lambda type light chain; [13] increased plasma cells in the bone marrow; [14] osteosclerotic bone lesions and hypercalcemia. Characteristic radiographic features include single or multiple osteosclerotic lesions and a peculiar variety of bony proliferation[7]. In this case, the patient presented with ten of the clinical symptoms.

Histologic studies of the lymph node by Kojima et al.[8] revealed changes resembling those of Castleman's disease. They were characterized by three features: [1] the size of the lymph nodes varies up to that of a thumb tip; [2] angiosclerosis in the germinal centers of the swollen lymph nodes occuring early in the disease, one of the pathognomonic features in this syndrome and common to all cases examined; [3] monoclonal proliferation of plasma cells (plasmacytoma) occurring not only in the bone marrow, but also in the lymph nodes. Plasma cell dyscrasia was first proposed by Osserman[9] and requires the following conditions: [1] plasma cell proliferation with no evidence of stimulation by a specific antigen; [2] monoclonal elevation of gammaglobulin or its subunits in the blood; and [3] impaired synthesis of normal immunoglobulins. It is commonly used as an analogy to monoclonal gammopathy.

Takatsuki et al.[1] speculated that many of the symptoms in this syndrome were remote effects caused by plasma cell dyscrasia and that some biologically active factor other than M-protein was produced by plasma cells, however, detailed etiology of this syndrome is still unknown.

Indications for surgery in a patient with this syndrome are [1] removal of calculi, such as renal and ureteral, caused by the metabolic disorders of this syndrome; [2] excision of plasmacytoma when it exists; [3] surgery for a disease unrelated to the pathophysiology of the syndrome, such as hemorrhoids; [4] therapy for trauma by accident; [5] for biopsy. Our patient had surgery three times for the third, fourth and fifth reasons mentioned above.

The preoperative problems at the time of the first anesthesia were liver and renal dysfunction and hydrothorax. At the second anesthesia in 1976, preoperative problems were liver dysfunction and increased ICP, 300 $mmH_2O$. At the third anesthesia in 1985, the most considerable problem was pulmonary dysfunction indicated by respiratory muscle weakness and decreased VC. During anesthesia serum glucose levels were

kept within normal ranges.

In many cases hyperprolactinemia[10] and increased serum estrogen[10-13] have been reported, but prolactin and estrogen values in this case were within normal ranges before, during and after anesthesia.

As Kamitsuchibashi reported[14], our patient also had decreased serum cholinesterase, therefore, succinylcholine should be given with utmost care.

The first choice of therapy for Crow-Fukase syndrome is administration of large amounts of steroids for a long period[1]. This treatment varies the symptoms and stages of the disease.

In summary, Crow-Fukase syndrome includes multiple symptoms which present differently among individuals. It runs a long term course through various stages with different laboratory data at each stage. Therefore, we anesthesiologists must accurately know the state of the patient at the time of anesthetic management.

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## References

1. Takatsuki K, Sanada I: Plasma cell dyscrasia with polyneuropathy and endocrine disorder: clinical and laboratory features of 109 reported cases. Jpn J Clin Oncol 13:543–556, 1983
2. Crow RS: Peripheral neuritis in myelomatosis. Br Med J 2:802–804, 1956
3. Fukase M, Simpo S, Nishitani H, Tsunematsu T, Kawaguchi Y, Ito K, Hoshino T, Yahata M, Imura H, Matsuyama H, Nakano H, Iwai K, Mori T, Ogawa R, Fukumasu H, Asakuma M, Itani S, Yamauchi Y, Osako F: Solitary plasmacytoma with polyneuritis and endocrine disturbance. Nippon Rinsho 26:2444–2456, 1968
4. Bardwick PA, Zvaifler NJ, Gill GN, Newman D, Greenway GD, Resnick DL: Plasma cell dyscrasia with polyneuropathy, organomegaly, endocrinopathy, M protein and skin changes: the POEMS syndrome –report on two cases and a review of the literature–. Medicine (Baltimore) 59:311–322, 1980
5. Saikawa S: On the etiology of "PEP syndrome (a peculiar progressive polyneuritis associated with pigmentation, edema, plasma cell dyscrasia)". Med J Kagoshima Univ 32:219–243, 1980
6. Driedger H, Pruzanski W: Plasma cell neoplasia with peripheral neuropathy: a study of five cases and review of the literature. Medicine (Baltimore) 59:301–310, 1980
7. Resnick D, Greenway GD, Bardwick PA, Zvaifler NJ, Gill GN, Newman DR: Plasma cell dyscrasia with polyneuropathy, organomegaly, endocrinopathy, M protein and skin changes: the POEMS syndrome. Radiology 140:17–22, 1981
8. Kojima M, Sakuma H, Mori N: Histopathological features of plasma cell dyscrasia with polyneuropathy and endocrine disturbances, with special reference to germinal center lesions. Jpn J Clin Oncol 13:557–576, 1983
9. Osserman EF: Plasma cell dyscrasia, Cecil-Loeb Textbook of medicine. Edited by Beeson PB, McDermott W, Wyngaarden JB. Philadelphia, WB Saunders, 1975, pp 1952–1967
10. Takatsuki K: Plasma cell dyscrasia with polyneuropathy and endocrine disorders. Nippon Rinsho 40:600–601, 1982
11. Solomons EBR: Plasma cell dyscrasia with polyneuropathy, organomegaly, endocrinopathy, monoclonal gammopathy and skin changes: the POEMS syndrome. J R Soc Med 75:553–555, 1982
12. Takatsuki K, Yodoi J, Uchiyama T, Sagawa K: Plasma cell dyscrasia with polyneuropathy and endocrine disorders –review of 36 cases–. Shinkei Naika 7:483–493, 1977
13. Imawari M, Akatsuka N, Ishibashi M, Beppu H, Suzuki H, Yoshitoshi Y: Syndrome of plasma cell dyscrasia, polyneuropathy and endocrine disturbances –report of a case–. Ann Intern Med 81:490–493, 1974
14. Kamitsuchibashi H, Igata A: Reduced serum cholinesterase in polyneuropathy associated with pigmentation, edema and plasma cell dyscrasia (PEP syndrome). Shinkei Naika 19:623, 1983