Anesthetic experience of a patient with hereditary factor XI deficiency (Hemophilia C) — A case report —

Department of Anesthesiology and Pain Medicine, College of Medicine, The Catholic University of Korea, Seoul, Korea

Yee Suk Kim, Eun Yong Chung, Jun Rho Yoon, In Soo Han,
Ah Reum Park, Tae Kwan Kim, and Chul Woo Lee

Factor XI deficiency (also called Hemophilia C) rarely occurs among ethnicities other than Ashkenazi Jews. A boy was scheduled for frontoethmoidectomy due to bilateral chronic rhinosinusitis. He was incidentally found to have factor XI deficiency due to prolonged aPTT on preoperative laboratory finding. His medical history reveals frequent epistaxis 2 or 3 times per day and his factor XI and XII activity were 17% (normal; 60–140%) and 34% (normal; 60–140%), respectively on furthermore laboratory evaluation. He was diagnosed as hereditary factor XI deficiency. He underwent the operation with administration of the fresh frozen plasma without complication. (*Korean J Anesthesiol* 2009; 56: 706~8)

Key Words: aPTT, Factor XI deficiency, Frontoethmoidectomy.

Coagulation factor XI (plasma thromboplastin antecedent, PTA) deficiency (also called hemophilia C) is an autosomal recessively inheritant coagulopathy [1], known to be most common in Ashkenazi Jews [2], and causes unpredictable bleeding, particularly after trauma or surgery, due to decreased plasma concentration of factor XI [3]. Among other ethnics except Ashkenazi Jews, factor XI deficiency is rarely occurring disease. In Korea, only one case of operative experience for patient with factor XI deficiency was reported [4]. We report a case that patient with hereditary factor XI deficiency underwent bilateral frontoethmoidectomy due to bilateral chronic rhinosinusitis with nasal septal deviation without complication.

CASE REPORT

A 14-year-old male patient (weight 65 kg, height 170 cm)

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Corresponding author: Tae Kwan Kim, M.D., Department of Anesthesiology and Pain Medicine, Holy Family Hospital, The Catholic University of Korea, Sosa 2-dong, Wonmi-gu, Bucheon 414-717, Korea. Tel: 82-32-340-2158, Fax: 82-32-340-2255, E-mail: 3tkkim@catholic.ac.kr

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was scheduled for elective frontoethmoidectomy due to bilateral chronic rhinosinusitis with nasal septal deviation. His laboratory finding showed prolonged aPTT (48.2 sec, normal; 21–38 sec). BT (2 min, normal; 1–4 min), PT (13.2 sec, normal; 10–14 sec) and INR (1.12, normal; 0.7–1.24) were normal. Hb, Hct, and platelet count were 14.9 gm/dL, 43.3%, and 226,000/mm³. Other laboratory findings were normal. Past medical history revealed frequent epistaxis (2–3 times/day) since 8 years old. His family history did not reveal any bleeding disorder. Factor VIII and factor IX activity were 50% (normal; 60–150%) and 69% (normal; 60–150%), respectively. For further evaluation, he was transferred to the Korea Hemophilia Foundation. Factor VIII was 91.1% (normal; 70–120%) and vWF activity was 128% (normal; 70–120%), and factor XI and factor XII activity were 17% (normal; 60–140%) and 34% (normal; 60–140%), respectively. He was diagnosed as hereditary factor XI deficiency. We decided to undergo surgery with replacement of fresh frozen plasma during surgery.

A Prior to surgery the patient was premedicated with glycopyrrolate 0.2 mg intravenous injection and then the patient was monitored with an electrocardiogram, automated blood pressure, pulse oximetry, end-tidal carbon dioxide, and respiratory rate were measured. Anesthesia was induced by propofol 120 mg followed by endotracheal intubation facilitated by rocuronium (esmeron[®]) 50 mg. After induction, 4 units of fresh frozen

plasma were administered to replace the coagulation factor. 3 NIHU of hemocoagulase were administered with mixed to lactated Ringer's solution. Anesthesia was maintained with enflurane-N₂O-O₂. Surgery was performed without any event for 125 min. Because total blood loss was below 100 ml, transfusion of blood was not considered. Total duration of anesthesia was 145 min. He recovered from anesthesia uneventfully and transferred to recovery room. Because he did not show bleeding tendency, he was transferred to general ward. Factor XI and XII activity performed at one day after surgery were 24% and 35%, and PT, INR and aPTT were 13.5 sec, 1.13 and 38.5 sec. He discharged at 3 days after operation.

DISCUSSION

Factor XI is a plasma glycoprotein that participate in the early phase of the blood coagulation cascade and known to play a critical role in the initiation of coagulation through contact activation and the intrinsic pathway [5]. The role of factor XI in coagulation is thought to supplement the factor IXa formed by factor VIIa/tissue factor, which is limited by the presence of TFPA (tissue factor pathway inhibitor) [6]. Thus in certain conditions or at certain sites where the initial quantity of factor IXa produced by factor VIIa/tissue factor is insufficient or the processes opposing coagulation (for example fibrinolysis) are particularly active, factor XI is essential for effective hemostasis [7].

Factor XI deficiency was first described in 1953 [8], and has been reported mainly in Ashkenazi Jews [2]. But sporadic cases have also been reported among Italians, Germans, Japanese, Chinese, Koreans, Indians, American blacks and Arabs [9]. Inheritance is by autosomal recessive [1].

Factor XI gene is located on the distal end of the long arm of human chromosome 4 [10]. Three independent point mutation in the factor XI gene were found in Ashkenazi Jews with factor XI deficiency. The type I mutation is a G to A change at the splice junction boundary of the last intron of the factor XI gene. The type II mutation involves the introduction of a stop codon in exon 5 with a change from GAA to TAA. And the type III mutation is located in exon 9 and consists of a change of TTC, coding for Phe²⁸³, to CTC, coding for Leu. While type I mutation is rare, type II and type III mutation are most common [11].

Bleeding manifestation in factor XI deficiency is variable and largely affected by the genotype of the patient and the

site of surgery. Patients with genotype III/III homozygote had significantly fewer injury-related bleeding events than patients with genotype II/II homozygote or II/III heterozygote. While operation involving tissues with high fibrinolytic activity such as urinary tract, nose, oral cavity or tonsils were frequently associated with excessive bleeding in all patients with severe factor XI deficiency independent of their genotype, other surgical procedures such as appendectomy, orthopedic surgery, cholecystectomy and hysterectomy were significantly less likely to bleed excessively [12].

Diagnosis of factor XI deficiency is usually made by injury-related bleeding or an incidental finding of a prolonged aPTT. Type II homozygotes have the longest mean aPTT values, type III homozygotes the relatively shortest, and type II/III compound heterozygotes have intermediate mean values [13].

Perioperative meticulous care is required for operation of patients with factor XI deficiency. Ingestion of aspirin or other platelet anti-aggregating agents should be avoided for at least one week before surgery. The platelet count and prothrombin time should be normal and the presence of an inhibitor of factor XI must be excluded. Traditionally, fresh frozen plasma has been used for replacement therapy in patients with factor XI deficiency. Disadvantages of replacement by fresh frozen plasma are volume overload, potential transmission of infectious agents and allergic reactions [12]. Recently, a factor XI concentrate was produced and found to be effective, easy to administer and safe [14].

In Korea, the incidence of hemophilia C is not accurately revealed, but according to Hong et al, the incidence of hemophilia C among Korean hemophilia patients was reported to be 5.5%, similarly to other nations [15]. Moreover, in Korea, only one case of operative experience for patient with factor XI deficiency was reported [5].

In this case, patient's family may have no bleeding disorder because factor XI deficiency has autosomal recessive inheritance. The genotype of this patient could not be confirmed, but according to his conditions such as 17% of factor XI activity, history of frequent nosebleeds, and in relation to operation site, we might expect bleeding perioperatively. So, we decided to undergo operation with replacement of fresh frozen plasma. In Korea, factor XI concentrate is not available. Fortunately, throughout the perioperative period bleeding was trivial and blood transfusion was not required. Postoperatively, factor XI level was increased to 24% probably due to administration of fresh frozen plasma.

In conclusion, we report a case that a patient with hereditary factor XI deficiency underwent frontoethmoidectomy with administration of fresh frozen plasma without complication.

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