Successful completion of transurethral lithotripsy in a patient with factor XIII deficiency: A case report

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ARTICLE INFO

Keywords:
Congenital coagulation factor XIII deficiency
Bleeding disorders
Calculus
Transurethral lithotripsy

ABSTRACT

Factor XIII (FXIII) deficiency is a rare inherited coagulopathy. Standard perioperative management in those with FXIII deficiency requiring surgical procedures has not been elucidated. Herein, we report the case of a patient with FXIII deficiency who successfully underwent transurethral lithotripsy. Recombinant FXIII was used effectively in perioperative management and safely without any bleeding complications. This is the first report of a patient with FXIII deficiency in the field of urology.

Introduction

Congenital factor XIII (FXIII) deficiency is a rare and serious autosomal recessive coagulation disorder with a high risk of life-threatening bleeding complications. Patients with congenital FXIII deficiency often experience major spontaneous bleeding episodes more frequently than those with other congenital bleeding disorders. These patients are also at a high risk of intraoperative bleeding. Some studies have reported associations of FXIII activity with perioperative bleeding in cardiac, gastrointestinal, gynecological, and neurological surgeries. However, little is known about the role of perioperative FXIII activity in urological surgeries. To our knowledge, this is the first report of a patient with FXIII deficiency who underwent transurethral lithotripsy (TUL) successfully, after receiving preoperative FXIII replacement therapy.

Case presentation

A 64-year-old Japanese woman with FXIII deficiency presented with right-sided calculus pyelonephritis, complicated by severe flank pain and high fever. Computed tomography (CT) revealed a stone 5 mm in diameter in the right upper ureter accompanied by hydronephrosis (Fig. 1). The pyelonephritis was managed with antibiotics after which it improved. However, the stone continued to be located at the same level in the ureter for 2 months and the degree of hydronephrosis did not change. Therefore, TUL was planned for stone removal. Her medical history was significant for FXIII deficiency, which had been diagnosed at the age of 18 years when the patient underwent surgical tooth extraction. The procedure had been complicated by postoperative hemorrhage requiring blood transfusion. Since then, the patient has been on prophylactic recombinant FXIII therapy, administered at a dose of 10 international units per kilogram (IU/kg), once every 30 days. There was no positive family history of blood disorders.

The patient underwent TUL under general anesthesia 1 hour after her regular prophylactic recombinant FXIII infusion, with an aim to achieve more than 20% intraoperative FXIII activity. Her postoperative FXIII activity levels were 21%, 23%, and 24% at 1, 2, and 24 h after the single infusion, respectively (Fig. 2A). The levels remained at more than 5% for 4 weeks (Fig. 2B).

The total operation time was 1 hour with stenting, and no intra- or postoperative bleeding occurred. The intraoperative endoscopic findings are shown in Fig. 3. There was no remarkable decrease in the hemoglobin levels from those before the procedure (12.9 g/dL) and that after (12.1 g/dL). In addition, no periu rinary tract hematoma was observed on the postoperative CT scan. The patient was discharged uneventfully 6 days after the operation; on postoperative day 30, the ureteral stent was removed. The patient resumed receiving regular prophylactic FXIII therapy on the same day.

Discussion

FXIII is the terminal enzyme in the blood coagulation cascade and is essential for the cross-linking of fibrin molecules to form an effective and...
stable clot. This was confirmed in 1948 by K. Laki and L. Lorand.\(^2\) The clot becomes resistant to fibrinolysis with higher concentrations of active FXIII. It also plays an important role in wound healing. Inherited FXIII deficiency has an autosomal recessive pattern of inheritance affecting males and females equally, with an estimated incidence rate of 1 per 3 to 5 million. Patients with congenital FXIII deficiency experience major spontaneous bleeding episodes (umbilical cord bleeding, mucosal bleeding, primary intracranial hemorrhage, or spontaneous miscarriage) more frequently than those with other congenital bleeding disorders.\(^1,2\)

Prophylactic recombinant FXIII at a dose of 10–20 IU/kg every 3–4 weeks, to maintain a trough activity level of 5–20%, is vital to prevent spontaneous bleeding in daily life.\(^3,4\) However, little is known about perioperative management in those with congenital FXIII deficiency. Some previous reports have suggested that target FXIII activity levels as low as 5% may be sufficient for surgery. Others have claimed that FXIII should be administered immediately before major surgery to achieve FXIII activity levels of at least 50%. Additionally, in patients undergoing prolonged or complicated surgeries, target levels of 100% should be considered.\(^1,2,5\)

In the present case, it was confirmed that FXIII activity levels reached 20% or more immediately after intravenous administration of prophylactic recombinant FXIII. Therefore, we set the target FXIII activity level as 20% and presumed that the level would be enough to maintain hemostasis during surgery. Thus, a dose of 10 IU/kg recombinant FXIII was administered 1 hour before surgery. Postoperative FXIII activity remained at levels more than 20% immediately after the operation without requirement of further transfusions, and at levels more than 5% for 4 weeks (Fig. 2A and B).

Clear visual information is essential for successful endoscopic urological surgeries because even slight bleeding often hinders proceedings. In the present case, the intraoperative endoscopic findings were similar to those in patients without any coagulation disorders (Fig. 3). Neither periurinary tract hemorrhage nor any residual stone was observed on postoperative CT scans, showing that recombinant FXIII could be used safely without the occurrence of bleeding complications and effectively in perioperative management.

Conclusions

The present case adds to the very limited body of evidence currently available on surgery in FXIII-deficient patients. For urological endoscopic surgery in patients with FXIII deficiency, recombinant FXIII administration 1 hour before surgery could be effective in achieving levels of FXIII activity required for hemostasis, perioperatively.

Author contributions

Drafting of the manuscript: N.T. Revision of the manuscript: S.N, K.S, and A.Y. Supervision: T.O. and S.U. All authors have read and approved the final manuscript.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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**Fig. 1.** Right ureteral stone on CT. CT revealed a stone 5 mm in diameter, in the upper ureter (arrow) accompanied by hydronephrosis. CT, computed tomography.
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Fig. 2. Postoperative FXIII activity levels after recombinant FXIII administration. FXIII activity was at a level of 21%, 23%, and 24% at 1, 2, and 24 h after the administration, respectively (A). The activity levels remained at >5% for 4 weeks (B).

Fig. 3. Intraoperative ureteroscopic findings. The findings were similar to those of patients without any coagulation disorders.

Declaration of competing interest

None.