OLGU SUNUMU

ANESTHESIA FOR A PATIENT WITH GLYCOGEN STORAGE DISEASE TYPE IA

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SUMMARY

Glycogen storage diseases (GSD) are a group of inherited metabolic disorders concerning the functional enzymes of the synthesis and degradation of glycogen. Glycogen storage disease type Ia (GSD-Ia, OMIM 232200) is an inherited disorder with an absent gene expression of glucose-6 phosphatase enzyme complex. The aim of this case report is to present a complicated surgery with an uncomplicated regional anesthesia and an anesthetic follow up in a patient with GSD type Ia in an elective day case surgery. In this case, there was a serious bleeding problem due to the coagulation disorders related to the disease. Clinicians should be prepared for bleeding disorders in patients with glycogen storage disease type Ia, especially if regional anesthesia will be used.

KEYWORDS: *Glycogen Storage Diseases (GSD); Hypoglycemia; Bleeding; Anesthesia, Caudal.*

ÖZET

GLİKOJEN DEPO TİP Ia HASTALIĞI OLAN BİR HASTADA ANESTEZİ UYGULAMASI

Glikojen depo hastalıkları (GDH) glikojen sentez ve yıkımında rol oynayan fonksiyonel enzimlerin metabolik bozukluğu ile karakterize kalıtımsal hastalıklardır. Glikojen depo hastalığı tip Ia (GDH-Ia, OMIM 232200) glukoz-6 fosfataz enzim kompleksinde gen kaybı ile karakterize kalıtımsal bir bozukluktur. Bu vaka sunumunun amacı elektif günübirlik cerrahide GDH tip Ia tanısı olan bir hastada komplike ve uzun süren bir cerrahi prosedür ve komplikasyonsuz rejyonal anestezi uygulamasını anlatmaktır. Bu olguda bu hastalığa bağlı ciddi koagülasyon bozukluğu nedeni ile kanama komplikasyonu gözlendi. Klinisyenler bu tip hastalığı olan hastalarda, özellikle rejyonal anestezi planlanıyor ise kanama konusunda hazırlıklı olmalıdırlar.

ANAHTAR KELİMELER: *Glikojen Depo Hastalıkları (GDH); Hipoglisemi; Kanama; Anestezi, Kaudal.*

INTRODUCTION

Glycogen storage diseases (GSD) are a group of inherited metabolic disorders concerning the functional enzymes of the synthesis and degradation of glycogen. Glycogen storage disease type Ia (GSD-Ia, OMIM 232200) is an inherited disorder with an absent gene expression of glucose-6 phosphatase enzyme complex. As this enzyme complex catalyzes the last steps of glucose production, its absence is characterized with fasting hypoglycemia due to lack of glucose production and organomegaly due to accumulation of glycogen in liver and kidneys (1-3).

Glycogen storage disease type Ia is a multisystem disorder with significant morbidity and mortality. The clinical features of the disease include hypoglycemia, lactic acidosis, hyperuricemia, hyperlipidemia, hyperproteinemia, hepatomegaly, truncal obesity, rounded "doll-like" face, growth retardation, muscle wasting and bleeding tendency (1-3).

From the anesthetist's point of view; hypoglycemia and hepatic dysfunction are the major problems to deal with in GSD-Ia patients at the perioperative period (2,4). Moreover, difficulties in intubation and ventilation and aspiration risks are the other encountered problems in GSD patients during surgery (2,3,5).

The aim of this report is to present a complicated and long lasting surgical procedure with an uncomplicated anesthetic follow up in a patient with GSD-Ia in an elective day case surgery.

CASE REPORT

Circumcision was planned in a 9-yr old boy with GSD-Ia. He was diagnosed in the infancy period after a liver biopsy and an enzyme assay. His physical examination was unremarkable except prominent hepatosplenomegaly. He was under enalapril (Enapril, Sandoz) treatment for hypertension. His preoperative evaluation re-

vealed thrombocytosis (platelet count: 706 x 103 [150-450x103]) with slightly elevated liver enzymes (AST: 62 IU L^{-1} [1-42 IU L^{-1}], ALT: 51 IU L^{-1} [1-41 IU L^{-1}]). His prothrombin time (PT) and activated partial thromboplastin time (aPTT) levels were within normal limits (PT: 13.4 sec [12-18 sec], aPTT: 25.90 sec [25-40 sec], INR: 0.88% [0.80-1.22]). The patient was consulted to pediatrics and close follow up for hypoglycemia during and after surgery was advised.

The patient was fasted for 4 hr preoperatively and premedicated with midazolam (Dormicum, Roche) 0.5 mg kg^{-1} (po). His preoperative blood sample was drawn for the assessment of blood glucose level after the insertion of an intravenous cannula and was within normal limits. The infusion of 5% dextrose with 0.3% NaCl was started thereafter. Anesthesia was induced with 3 mg kg^{-1} propofol (Propofol, Abbott) and sevoflurane (Sevorane, Abbott) %5. N_2O/O_2 combination and sevoflurane 3% was used for maintenance. A nasogastric tube (10F) and a laryngeal mask airway (LMA® Laryngeal Mask Company Limited, Seychelles) (size 3) were inserted gently at the first attempt. Caudal analgesia was performed with 1 mL kg^{-1} of 2.5% levobupivacaine (Chirocaine, Abbott) using 22 G (Epican®, Braun, Melsungen, Germany). As the duration of a surgical circumcision is about 15 to 20 min, the control of blood glucose level was planned at the 10^{th} min of surgery and it was within normal limits. The patient was circumcised by a consultant pediatric surgeon with sleeve technique using bipolar cautery. At the end of the surgery, volatile agents were discontinued and laryngeal mask was removed while the patient was breathing spontaneously. During recovery, as bleeding from incision site was prominent; he was anesthetized again with 3 mg kg^{-1} propofol for hemostasis. As there was no apparent bleeding after suturing the bleeding sites, the patient was taken to the recovery room. At that time, blood glucose and lactate levels were measured again and both were found within normal limits. After a short while the patient was taken to the operating table for the third time because of bleeding. As no bleeding site was observed after taking off the dressing of the wound, the patient was awakened and sent to his room. At the postoperative period his venous blood sample was taken and his blood glucose, AST and ALT levels were found 89 gr dL^{-1}, 108 IU L^{-1}, and 69 IU L^{-1}, respectively. The patient was infused with 5% dextrose and 0.3% NaCl for 4 hours and fed at the 2nd postoperative hour. He was consulted to pediatric hematology and differential diagnosis for aggregation disorder was recommended. As the parents refused further investigation, he was discharged at the 8th postoperative hour without any other problems.

DISCUSSION

Glycogen storage disease type-Ia (GSD-Ia) is an autosomal recessive disorder with an estimated prevalence of 1 in 20.000 births. The basic defect is the lack of glucose-6-phosphatase enzyme complex, which is responsible to supply glucose to blood in case of hypoglycemia. As this enzyme complex plays an essential role in both glycogenolysis and gluconeogenesis and catalyzes hydrolyzing of glucose-6-phosphate to glucose, its absence is characterized with fasting hypoglycemia. As both glucose producing pathways are blocked due to this inborn error, glycogen accumulation in liver, kidney and intestine is unavoidable. Hypoglycemia and glycogen storage are the main reasons of the clinical findings and other biochemical abnormalities of the disease (1-3).

The hypoglycemia is the major problem in the GSD-Ia patients (2,3). This problem is caused by fasting before surgery. As fasting hypoglycemia is the most important problem of the disease, a short duration of preoperative fasting is recommended for such patients. We offered four hours fasting to our patient and did not experience any preoperative problems related to hypoglycemia. But if a longer preoperative fasting is needed, we believe that hospitalization and preoperative glucose infusions should be more appropriate in order not to have the risk of hypoglycemia. Surgery is a major stress to the body and results in glucose accumulation in the blood due to the release of counter regulatory hormones in patients undergoing surgery. In regard to GSD-Ia patients, the surgical stress results in glucose-6-phosphate accumulation in the blood. The accumulation of this intermediate metabolite causes hypoglycemia and lactic acidosis in acute terms. The perioperative hypoglycemia, not responsive to exogenous glucagon administration, can only be prevented by glucose infusion. We started infusion of dextrose solutions before induction of anesthesia and did not experience any difficulties in maintaining normoglycemia in the patient. Despite our expectations of a short-term surgery, the overall stay time of the patient in the operating theatre was about 2 hours. We also did not experience lactic acidosis during this period. At postoperative period, as fasting lasted, we continued glucose infusions for four hours. The patient was fed at the postoperative 2nd hour. We discontinued the glucose infusions as soon as he tolerated his oral diet.

Hepatic dysfunction due to GSD is another major problem during anesthesia (4). In the pediatric age group, the potential for hepatic injury with sevoflurane is expected to be negligible (6). We used this volatile agent and did not encounter any problems due to the anesthetic agent. The hepatic transaminase levels were found to be slightly elevated in the postoperative period.

Moreover, difficulties in intubation due to short and thick neck and difficulties of mask ventilation due to macroglossy can be encountered in the GSD patients (5). Because of their structural properties, a laryngeal mask can be a good choice for short-term surgical procedures. As the intraabdominal pressure is elevated in these patients due to their organomegaly and truncal obesity, they are more prone to gastroesophageal reflux and aspiration. A nasogastric tube insertion just before placing a laryngeal airway mask seems to be appropriate for these possible complications. Moreover, the usage of ProSeal® (Laryngeal Mask Company Limited, Seychelles) laryngeal mask airway can be a better choice in these patients.

European Study Group of GSD presented complications related to bleeding tendency in 25% of GSD-Ia patients. But only 3% of bleeding problems were reported to be seen after surgery (1). Bleeding tendency in GSD-Ia is reported to be related to prolonged bleeding time caused by either qualitative thrombocyte defects or elevated but abnormal hemostatic protein synthesis (7,8). Moreover in a recent study, Muhlhausen et al. (9) demonstrated the presence of reduced plasma concentrations of von Willebrand factor antigen and normal plasma concentrations of von Willebrand multimers in GSD-Ia patients. Marti et al. (10) presented the usage of 1-deamino-8-D-arginine vasopressin (DDAVP) in five GSD-Ia patients and found that the drug corrected the prolonged bleeding times in four of these patients. Both of the studies suggested the presence of an acquired von Willebrand syndrome type I in GSD-Ia patients. The bleeding time was not evaluated in our patient in the preoperative period and we experienced a prolonged bleeding during surgery. There were no problems caused by the caudal block. We would like to emphasize that routine preoperative evaluation including platelet count, PT and aPTT within normal limits do not eliminate complications related to bleeding and routine preoperative evaluation of bleeding time is needed in patients with GSD-Ia. The usage of DDAVP or continuous enteral/parenteral glucose administration is recommended in these patients in order to correct the prolonged bleeding time prior to elective surgery (1,3,10).

Glycogen storage disease type-Ia is a rare disorder and there is limited data in the literature about the anesthesia applications for the patients having this disease. Hypoglycemia and lactic acidosis are the major problems for these patients and should be evaluated closely in the perioperative period. The airway manipulations are easier with laryngeal airway masks secured with nasogastric tubes in day case surgeries. Although bleeding complication is rare, since its results are detrimental for surgery, preoperative evaluation should be performed throughly. If a bleeding pathology is detected, preoperative correction with either DDAVP or continuous enteral/parenteral glucose administration should be carried out.

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KAYNAKLAR

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