



## CASE REPORT

# Anaesthetic Management in Glucose-6-Phosphate Dehydrogenase (G6PD) Deficiency Patient Posted for Total Knee Replacement: A Case Report

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## Abstract

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is a most common hereditary genetic, X-linked defect of red blood cells (RBC) enzyme disorder in humans. Clinical manifestations commonly seen are neonatal jaundice, acute hemolytic or chronic non-spherocytic anemia. Acute hemolysis poses a perioperative challenge in management for anesthesiologists and the surgeons. Peripheral nerve block as well as general anaesthesia is a popular and safe anesthesia technique. We report a case of osteoarthritis left knee joint undergoing total knee replacement under general anaesthesia and femoral nerve block was given for post-operative pain.

## Keywords

Glucose-6-phosphate dehydrogenase (G6PD) deficiency, Acute hemolysis, Total knee replacement

surgery, infections, fava beans ingestion or drugs can cause damage to red blood cells in G6PD deficiency [3]. This can result in hemolysis as the affected RBC are not able to scavenge free radicals [4]. Clinical manifestations commonly seen are neonatal jaundice, acute hemolytic or chronic non-spherocytic anemia [5]. The most common serious clinical outcome of G6PD deficiency is caused by exposure to oxidative stress caused by acute hemolysis. This poses a perioperative challenge in management for anesthesiologists and the surgeons. Peripheral nerve block as well as general anaesthesia is a popular and safe anesthesia technique.

Here, we report a case of osteoarthritis left knee joint undergoing total knee replacement under general anaesthesia and femoral nerve block was given for post-operative pain.

## Introduction

Glucose-6-phosphate dehydrogenase (G6PD) deficiency is a most common red blood cells (RBC) enzyme disorder in humans [1]. It is a hereditary genetic, X-linked defect having a prevalence in greater than 400 million people across the world [2]. Antioxidants protect RBC from oxidative stress and G6PD is necessary for antioxidants production [3]. Certain conditions like

## Case Description

A 59-year-old female with osteoarthritis left knee joint posted for left total knee replacement (TKR). She is a known case of G6PD deficiency diagnosed some years ago. She had no other co-morbidities. The surgery was planned under general anaesthesia and for post-operative analgesia femoral nerve block was given. Patient was taken into the OT and monitors attached.



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Preoxygenation with 100% oxygen and she was induced using injection Fentanyl 100 mcg, injection Propofol 120 mg and injection Atracurium 30 mg. An Ambu-LMA of size 3 was inserted in first attempt. Intradermal buprenorphine patch 10 mcg/hour was applied on the upper chest at the time of induction. Surgery lasted for about 2.5 hours and intraoperative period was uneventful. Before extubation patient was given femoral nerve block under ultrasound guidance using injection Bupivacaine 0.5% 20 ml. Patient was reversed using injection Neostigmine and injection Glycopyrrolate after return of spontaneous respiration. After achieving adequate tidal volume, patient was extubated. Surgery remained uneventful and patient was shifted to PACU for further care and management. Patient remained comfortable in the postoperative period.

## Discussion

In the perioperative period G6PD deficiency poses an anaesthetic challenge because there is a limited drugs that can be used, as there is risk of hemolysis with the use of local anesthetic agent like lignocaine. Furthermore in an orthopaedic surgery due to the use of tourniquet, there can be peripheral ischemia of limb and reperfusion is a commonly encountered situation. "The World Health Organization has classified the different G6PD variants according to the magnitude of the enzyme deficiency and the severity of hemolysis [3-5].

Class I variants have severe enzyme deficiency (less than 10% of normal) and have chronic haemolytic anemia. Class II variants also have severe enzyme deficiency, but there is usually only intermittent hemolysis. Class III variants have moderate enzyme deficiency (10 to 60% of normal) with intermittent hemolysis, usually associated with infection or drugs. Class IV variants have no enzyme deficiency or hemolysis. Class V variants have increased enzyme activity. Classes IV and V are of no clinical significance" [1].

According to various reports agents like fentanyl, ketamine, propofol, benzodiazepine, inhalational agents like isoflurane, sevoflurane, paracetamol, codeine are considered to be safe for use in perioperative period [1,3].  $\alpha_2$  receptor agonist like dexmedetomidine have been used for the maintenance of anesthesia successfully [6]. However, there are a very few number of case reports mentioning the use of local anesthetic, bupivacaine for regional anesthesia but hemolysis has been reported in G6PD deficiency with the use of lignocaine [7].

In the present case, epidural analgesia for post-operative pain was a better option but we did not use epidural in this case because of the risk of hemolysis and also there are very few studies available on the safety of the use of local anaesthetic agents in G6PD deficiency patient.

In our case the anesthetic challenges in perioperative period were to prevent and monitor the hemolysis, infections necessitating the use of antibiotics and limited choice available for analgesic medications.

## Conclusion

G6PD deficiency poses various challenges in the perioperative period for the anaesthesiologist as there is a limited choice of drugs that can be used in these patients. Also the anaesthesiologist should be vigilant to prevent and diagnose hemolysis and infections in this patient subgroup.

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## Author's Contribution

Medha Bhardwaj: Patient management and literature review; Saurabh Mittal: Drafted and edited the article; Harsimran Kaur Buttar: Literature review; Gurjeet Khurana: Patient management and revised the manuscript.

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