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Case Report

The Unique Management of Accidental Intra-Arterial Injection of Propofol in a Patient with Acute Subdural Hemorrhage: A Case Report

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ABSTRACT

Propofol is a commonly used medication for sedation during surgery; however, it must be used with precaution in neurologic patients because of the subsequent adverse effects of cardiovascular and neurologic.

An 83-year-old male patient with acute subdural hemorrhage was referred with a two-year history of falling and a recent occurrence of imbalance; the patient underwent urgent surgery under general anesthesia, using 100 µg fentanyl for premedication, 50 mg Propofol for induction, and Isoflurane gas and fentanyl drip for maintenance. During transmission of the patient for postsurgical computed tomography, two ccs Propofol 1% were mistakenly injected into the patient's radial artery and managed appropriately by the master. Following this management, the patient represented no alteration in his vital signs and was discharged in a favorable condition. Here, we report how this case could be managed successfully.

Robust data regarding the complications of accidental administration of Propofol through an artery are lacking, and the presented results remain controversial. The authors have herby drawn attention to the unique management of an accidental intra-arterial injection of Propofol. Further studies are warranted to establish definite conclusions.

Introduction

Propofol (2,6-diisopropyl phenol) is an intravenous anesthetic used for induction and/or maintenance of anesthesia during and sedation after surgical procedures, mainly in the intensive care unit (ICU) and also in outpatient care [1]. It is widely used in the clinic and preferred because of its rapid onset and short duration of action [2]. The injectable emulsion 1% of Propofol, as the most commonly used form administered by bolus and/or infusion, generally has minimal adverse effects [3]; however, few adverse effects have been reported, including cardiovascular (bradycardia, arrhythmia,

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tachycardia, hypo- or hypertension), movement disorder (e.g., myoclonus) by affecting the central nervous system, respiratory disorders, e.g., apnea, and injection site reactions, e.g., burning, stinging, rash, and pain [4]. There are also rare reports of other adverse effects, including refractory status epilepticus [5] and unmasking mitochondrial disorder [6]. Propofol infusion syndrome represents another rare but lethal negative effect, mainly reported by the prolonged use of Propofol, which is characterized by metabolic acidosis, rhabdomyolysis, arrhythmia, renal failure, and myocardial failure [7-8].

On the other hand, some investigators have reported that sedation with a bolus dose of lipid emulsion of Propofol had additional advantages, including a lower rate of ventricular arrhythmia induced by caffeine, attributed to the baroreflex activity, direct peripheral vasodilatation, myocardial contractility, and outflow of the central sympathetic nervous system [9]. Due to the controversial effects of Propofol, some suggest that non-anesthesiologists use of Propofol should be prevented [10], while others favor this option, considering its advantages in the clinic [11].

Another notable issue in the administration of sedatives remains related to the mistakes amid the administration, among which are concerns regarding the intra-arterial associated manifestation of Propofol injection. Lipophilic drugs can damage endothelial cells when accidentally administered in the patient's artery, some of which are associated with severe morbidities, requiring limb amputation [12]; however, few case reports have unveiled the subsequent complications of the accidental intra-arterial injection of Propofol. Some have reported complications, such as pain, hyperemia, and distal blanching [13], while others have reported no difficulties [14]. Furthermore, no standard gold treatment has been proposed for this incident to guide healthcare providers when encountering such conditions [13]. The author, therefore, sought to share the experience of the unique management of a male elderly, for whom Propofol was inadvertently injected in the radial artery for postoperative sedation. Neither adverse changes in his vital signs nor local or further complications were observed.

Case Report

The author draws attention to the unique management of accidental intra-arterial injection of Propofol in an 83-year-old male with a history of repeated vasovagal syncope, who presented with falling two years ago without any underlying diseases. The last episode was three days before his referral to the hospital, during which the patient had an imbalance in addition to falling, and the family members had taken him to the hospital. His level of consciousness decreased during admission, as he only responded to painful stimuli by limb flexion. The serum laboratory tests were regular, including hemostasis parameters, such as prothrombin time (PT=12.2 sec, compared to the control of 12.2 sec), international normalized ratio (INR=1), partial thromboplastin time (PTT=25 sec), and arterial blood gases. Computed tomography (CT) results demonstrated acute subdural hemorrhage, exacerbated by a previously undiagnosed chronic subdural hemorrhage. The patient was urgently transferred to the operating room (OR). For the general anesthesia, premedication was performed with 100 µg fentanyl, induction with 50 mg Propofol, and maintenance using isoflurane gas and fentanyl drip. The procedure was perfect. After surgery, the serum laboratory tests were standard, including white blood cell (WBC=8.2 ×1000/mm3), red blood cell (RBC=5.41 million/mm3), hemoglobin (Hb=15.8 g/dl), and platelet count (8.2 ×1000/mm3).

After surgery, the patient was awake and aware. Therefore, a fentanyl drip (50-150 µg/h) was prescribed for the patient for sedation, and the patient was transferred to the ICU. Routinely, another CT is taken from the patients about 0.5-1 hour after surgery (under sedation). During the transmission of the patient to the hospital's radiology department, after about half an hour, the neurology resident detected that the patient was waking up and moving his hands. Hence, the resident injected two ccs of Propofol 1% (Diprivan® Fresenius Kabi Co, made in Austria) into his radial artery to sedate the patient.

Fortunately, the master was presented shortly after this injection and washed the patient's artery with 40-50 cc of normal saline (using a syringe) and heparinized serum to heparinize the artery. Furthermore, 4-5 cc of lidocaine was injected. The master controlled the patient's pulse by hand, and the patient's vital signs did not change. In the first 12 hours of ICU admission, the patient's urinary output was 1,700 cc with a 1,600 cc intake.

The patient was aware and oriented the day after and was extubated without any problem. On postoperative day two, he was transferred to the neurology ward and discharged in a favorable condition after three days. Also, the patient had no problem with his hand.

Discussion

Propofol is a widely used anesthetic, but its advantages and disadvantages remain controversial. Some have reported severe adverse effects from Propofol, some of which have been related to the narrow therapeutic window of Propofol. In contrast, others have reported significant advantages for its use as postoperative sedation [15]. Reporting the experience of physicians with this medication can be helpful in the context of future development of knowledge regarding Propofol. We, therefore, present a patient for whom Propofol was injected in the radial artery for postoperative sedation while taking the patient to the radiology department. An early head CT scan is a practical examination in patients undergoing intracranial procedures and is routinely

performed for these patients [16]. Nevertheless, one of the major concerns is the risk of patients' agitation following brain surgery [17], making CT scans impracticable, thereby elucidating why patients are being routinely sedated for the examination above. Propofol represents one of the sedatives used for this purpose [17].

Our patient was also transferred to the radiology department with the company of a neurology resident, who had Propofol with himself whenever the patient required and injected it into the patient as he was waking up. Nevertheless, the injection was mistakenly performed on the patient's radial artery. There are few cases of accidental intra-arterial injection of Propofol available in the literature, which have reported several adverse effects of this accidental injection, such as hyperemia and distal blanching [13]. Shenoi et al. reported a 10-year-old girl, a victim of a motor vehicle collision, for whom 50 mg intravenous Propofol was administered to reduce agitation before surgery, accidentally injected through the arterial line, which resulted in a white blocking of the arterial line, detected by the nurse who had injected the drug [14]. The drug remaining in the line was discharged; she had no pain or hand discoloration after the incident until six months of follow-up (14). This is similar to the case presented here, although we have administered lidocaine to our patient and cannot discuss the patient's pain.

Contrary to the results of the current study, other studies have reported pain and cutaneous sequelae after accidental intra-arterial injection of Propofol. Kjaergaard and Rovsing reported 15-minute pain, hyperemia, and swelling of the hand of a 37-year-old woman because of an accidental intra-arterial injection of Propofol due to incorrect cannulation [18]. Therefore, the authors have suggested more attention during cannulation to prevent the administration of the drugs through the artery instead of a vein, as well as spontaneous termination of the administration when the patient complains of pain and evaluation of the venous line [18]. The higher dose of Propofol administered and no treatment after this accident can explain the causality of the complications reported by Kjaergaard and Rovsing. At the same time, in the current study, we could manage this condition appropriately without any sequelae and subsequent complications. Mitani et al. also reported an increased heart rate from 110 to 120 beats/min, terminated spontaneously, by administration of 2.5 ml Propofol in the suitable radial catheter in a 62-year-old woman (19). He represented an unpleasant sensation in the fitting metacarpophalangeal joints for one hour, with no pain discoloration. However, the patient was transferred to the OR, received general anesthesia shortly after this incident, and could not feel or report acute pain [19]. In the case reported by Mitani et al., Propofol was administered to the catheter and left without management, similar to the case reported by Kjaergaard and Rovsing, which shows the necessity of management after this incident. Interestingly, Sinomato and colleagues reported a successful mechanical thrombectomy and patient stillness by intentional intra-arterial injection of Propofol in a 16-year-old patient with severe heart failure because of ventricle dysplasia and cardiomyopathy, who was ineligible for deep sedation or general anesthesia and reported that the procedure was well tolerated, without cardiorespiratory impairment [20]. Accordingly, they suggested establishing the abovementioned procedure in extreme conditions [20].

There is insufficient evidence regarding the complications of accidental administration of Propofol through an artery, and the presented results remain controversial, as discussed above. In addition, the mechanism of the changes induced by intra-arterial injection of Propofol is poorly understood. The administration route, and closely associated with the administered dose, can significantly influence the risk of complications [13]. Moreover, when the physician detects such a condition, it is mandatory to implement strategies to minimize local and distal complications. In the case presented here, we promptly washed the artery with Normal Saline to mitigate its local effects and heparinized it to minimize the risk of distal complications. We also injected lidocaine to reduce the patient's pain. As the patient had no local or distal difficulties, we conclude that the implemented strategies were successful. However, as this was only one case without control, further studies are required to establish definite conclusions.

The author provided the experience of the unique management of accidental intra-arterial injection of Propofol. The artery was washed with Normal Saline to mitigate the local adverse effects, and heparinized the artery to minimize the risk of distal complications. The senior author also injected Lidocaine to subside the patient's pain, which was not accompanied by the subsequent complications. Further studies are warranted to establish definite conclusions.

Conclusion

Robust data regarding the complications of accidental administration of Propofol through an artery remains poorly understood. The authors have drawn attention to the unique management of an accidental intra-arterial injection of Propofol in a patient with acute subdural hemorrhage. Further investigations are warranted to establish definite conclusions.

List of abbreviations

Intensive care unit (ICU)
Prothrombin time (PT)
International normalized ratio (INR)

Partial thromboplastin time (PTT)
Computed tomography (CT)
Operating room (OR)
White blood cell (WBC)
Red blood cell (RBC)
Hemoglobin (Hb)
Minutes (min)

References

[1] Ellett ML. Review of propofol and auxiliary medications used for sedation. Gastroenterology Nursing. 2010; 33(4):284-95.

[2] Schraag S, Pradelli L, Alsaleh AJO, Bellone M, Ghetti G, Chung TL, et al. Propofol vs. inhalational agents to maintain general anaesthesia in ambulatory and in-patient surgery: a systematic review and meta-analysis. BMC anesthesiology. 2018; 18(1):1-9.

[3] Feng AY, Kaye AD, Kaye RJ, Belani K, Urman RD. Novel propofol derivatives and implications for anesthesia practice. Journal of anaesthesiology, clinical pharmacology. 2017; 33(1):9.

[4] Sahinovic MM, Struys MM, Absalom AR. Clinical pharmacokinetics and pharmacodynamics of propofol. Clinical pharmacokinetics. 2018; 57(12):1539-58.

[5] Lu L, Xiong W, Zhang Y, Xiao Y, Zhou D. Propofol-induced refractory status epilepticus at remission age in benign epilepsy with centrotemporal spikes: A case report and literature review. Medicine. 2019; 98(27).

[6] Finsterer J, Frank M. Propofol is mitochondrion-toxic and may unmask a mitochondrial disorder. Journal of child neurology. 2016; 31(13):1489-94.

[7] Guntani A, Yoshiga R, Mii S. A case of suspected propofol infusion syndrome after abdominal aortic aneurysm surgery. Surgical Case Reports. 2020; 6(1):1-4.

[8] Krajčová A, Waldauf P, Anděl M, Duška F. Propofol infusion syndrome: a structured review of experimental studies and 153 published case reports. Critical Care. 2015; 19(1):1-9.

[9] Terashima S, Muroya T, Ikegawa H, Kajino K, Sakuramoto K, Yui R, et al. Propofol suppresses ventricular arrhythmias: a case report of acute caffeine intoxication. Acute Medicine & Surgery. 2020; 7(1):e514.

[10] Perel A. Non-anaesthesiologists should not be allowed to administer propofol for procedural sedation: a Consensus Statement of 21 European National Societies of Anaesthesia. European Journal of Anaesthesiology| EJA. 2011; 28(8):580-4.

[11] Burtea DE, Dimitriu A, Maloş AE, Săftoiu A. Current role of non-anesthesiologist administered propofol sedation in advanced interventional endoscopy. World journal of gastrointestinal endoscopy. 2015; 7(10):981.

[12] Lokoff A, Maynes JT. The incidence, significance, and management of accidental intra-arterial injection: a narrative review. Can J Anaesth. 2019; 66(5):576-592.

[13] Lake C, Beecroft CL. Extravasation injuries and accidental intra-arterial injection. Continuing Education in Anaesthesia, Critical Care & Pain. 2010; 10(4):109-13.

[14] Shenoi AN, Fortenberry JD, Kamat P. Accidental intra-arterial injection of propofol. Pediatr Emerg Care. 2014; 30(2):136.

[15] Dinis-Oliveira RJ. Metabolic profiles of propofol and fospropofol: clinical and forensic interpretative aspects. Biomed Res Int. 2018; 2018.

[16] Fontes RB, Smith AP, Muñoz LF, Byrne RW, Traynelis VC. Relevance of early head CT scans following neurosurgical procedures: an analysis of 892 intracranial procedures at Rush University Medical Center. J Neurosurg. 2014; 121(2):307-12.

[17] Yan L-M, Chen H, Yu R-G, Wang Z-H, Zhou G-H, Wang Y-J, et al. Emergence agitation during recovery from intracranial surgery under general anaesthesia: a protocol and statistical analysis plan for a prospective multicentre cohort study. BMJ open. 2015; 5(4).

[18] Kjaergaard M, Rovsing ML. Accidental intra-arterial propofol injection. Ugeskrift for laeger. 2010;172(18):1383-4.

[19] Mitani S, Ishiyama T, Matsukawa T. Inadvertent intraarterial injection of propofol in a patient under general anesthesia. J Anesth. 2009; 23(2):307.

[20] Simonato D, Ganau M, Feltracco P, Causin F, Munari M, Bortolato A. Mechanical thrombectomy in a pediatric patient with sedation aided by contralateral intra-arterial propofol injection: feasibility in an extreme condition. Childs Nerv Syst. 2021; 37(5):1785-1789.