

# Vigilant Approach to Intramyometrial Vasopressin in Obstetrics-A Case Report

Trishagni Talukdar\* and Ahmad Zahid

Department of Anaesthesia and Critical Care, Silchar Medical College and Hospital, Assam, India

## Abstract

Uterine leiomyomas, commonly called fibroids are benign tumours of uterine myometrium composed of smooth muscle with variable amount of connective tissue. It is the commonest tumour of the female pelvic organ. As it is vascular tumour, many a times Myomectomy leads severe intraoperative blood loss. It is estimated that the average volume of blood loss during abdominal myomectomy ranges between 200 ml-400 ml, with blood loss greater than 1000 ml considered as major blood loss. Vasopressin is a synthetic analogue of the anti-diuretic hormone, has a V1 receptor agonistic action thereby causes vasoconstriction. Intramyometrial injection of vasopressin helps to reduce significant intraoperative blood loss. However, it is not devoid of side effects and sometimes might cause very serious complications like arrhythmias, bradycardia, pulmonary oedema, and cardiac arrest. Here we are presenting a case report of sudden severe bradycardia caused by intramyoma diluted vasopressin injection and discussion on management of such patients.

**Keywords:** Intramyometrial injection • Vasopressin • Pulmonary oedema

## Introduction

Vasopressin is a naturally occurring hormone produced by magnocellular neurons of the hypothalamus and secreted by the posterior lobe of the pituitary gland [1-2]. Vasopressin has a multitude of effects on different organ systems; however, its primary effect of vasoconstriction is what has attracted gynaecologic surgeons. Uterine leiomyomas, commonly called fibroids are benign tumours of uterine myometrium composed of smooth muscle with variable amount of connective tissue [3-5].

A 29 year female presented to gynaecology department in our hospital, Silchar medical college and hospital, Assam, India with c/o heavy menstrual bleeding for 2 years and primary infertility. She was diagnosed to have Myoma (size approx. 6.5 cm × 5.7 cm × 6 cm) and was planned for myomectomy under regional anaesthesia. The patient weighing 62 kg underwent pre anaesthetic check-up and cleared under American society of anaesthesiologist grade II.

Patient was transfused 2 units of PRBC 1 day prior to surgery in view of anaemia (Hb 6.6 gm %) and post transfusion Hb was 8 gm %. All the preoperative investigations and airway assessment was done and found to be within normal range. In night before OT, Patient was given 0.5 mg alprazolam to relieve anxiety. In the operation theatre, standard routine monitoring was initiated which showed non-invasive BP 116 mmhg/72 mmhg, pulse rate 80/min, SpO<sub>2</sub> 98% on room air.

(Pre op vitals) An intravenous line was secured with 18 g canula on right hand and coloadng was performed with Ringer's lactate solution. Combined spinal epidural block was given in the L3-L4 interspace using a spinal needle and 3 ml of 0.5% bupivacaine with 25 µg fentanyl was administered in the subarachnoid space. Within 6 min-8 min, T6 sensory block level was achieved. Through a face mask oxygen was administered to the patient. The patient remained hemodynamically stable following Sub Arachnoid Block (SAB).

**\*Address for Correspondence:** Talukdar T, Department of Anaesthesia and Critical Care, Silchar Medical College and Hospital, Assam, India, E-mail: Mback106@gmail.com, Department of Anesthesia, Hospital de Clinicas Municipal José Alencar, SP- Brazil, E-mail: dr.l Luiz.imbelloni@gmail.com

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Approximately 45 mins of surgery, surgeons injected 100 ml of (0.2U/ml of vasopressin, i.e., 20 units vasopressin diluted in 100 ml of 0.9% NS) into the myometrium after confirming negative aspiration of blood. Within 2 min, the patient developed bradycardia with HR less than 38/min, Blood Pressure (BP) fell to 78 mmhg/39 mmhg, while ECG complexes were normal. The radial and brachial arteries were feeble to palpate. Patient was seen to be restlessness and complaining of Nausea. Immediately Atropine 0.6 mg was administered. IV fluids (1000 ml of NS) were given in bolus dose through wide bore IV canula in both hands. Patient was put on Bag and mask ventilation with 100% oxygen. Defibrillator and all resuscitative drugs and equipment's were kept in standby. Patients Conjunctiva and tongue appeared pale. The patient did not have any symptoms of headache, chest pain, palpitation, difficulty in breathing during this period. Level of sensory blockade was rechecked, found to be below T6. After 5 min, vitals improved with heart rate 134 mmhg/86 mmhg and Pulse Rate of 100/min. within 15 min; colour of conjunctiva appeared normal. It was decided to continue with surgery. The surgery did not have any untoward events after that & whole procedure completed in approximately 90 min. Patient monitored in recovery room for 24 hrs.

## Discussion

Vasopressin is a naturally occurring hormone produced by magnocellular neurons of the hypothalamus and secreted by the posterior lobe of the pituitary gland. Vasopressin has a multitude of effects on different organ systems; however, its primary effect of vasoconstriction is what has attracted gynaecologic surgeons.

Vasopressin use in gynaecology surgery as haemostatic agent is found in reports as early as 1959. After that, many studies have been done worldwide in this regard and its role to reduce intraoperative blood loss has been established [6].

Vasopressin has got 3 distinct receptors through which it exerts its actions. The V1 receptor is located throughout the vascular tree, especially the capillaries, small arterioles, and venules, and less on the larger veins, and on smooth muscle throughout the body, particularly the gastrointestinal tract.

The uterus mainly has this V1 receptors activation of which causes vasoconstriction and smooth Muscle contraction [7-8].

The V2 receptor is located in the epithelial principal cells of the collecting duct of the kidney through which vasopressin helps to regulate extracellular fluid osmolality.

As myomas are very vascular tumour, so to reduce significant blood loss and lessen morbidity local vasopressin injection is especially useful. Vasopressin causes increased myometrial contractility [9]. The vasoconstrictive effects of intramyometrial vasopressin manifest within seconds with a half-life of 10 min-20 min and a duration of action of 2 hrs-8 hrs [10]. The injection of diluted vasopressin into the plane between the myoma and myometrium leads to vasoconstriction of the feeding vessels (capillaries, small arterioles and venules) for 45 min-60 min which is usually sufficient for the myometrial suturing to be completed and therefore reducing the blood flow to the myoma and decreasing the blood loss during the excision of the myoma.

Thiek found that vasopressin significantly decreased the blood loss and blood transfusion requirement during myomectomy in 35 patients in a case control studies [11]. Although its vasoconstrictive effects are strongest locally in the area of administration, systemic effects happen sometimes. Many potential complications (mainly cardiovascular) of Vasopressin use in gynaecologic procedures have been reported to occur. For these untoward effects, several European countries have put ban on its use.

Hobo reported a case of sudden cardiac arrest after intramyometrial vasopressin (11.2 units, 0.2 units/ml) and also Nerurkar reported a similar complication [12]. Hung reported two cases of bradycardia followed by cardiac arrest and pulmonary oedema with intramyometrial vasopressin (12 units-20 units, 2 units/ml) and similar complications were described by other studies [13-14]. Severe hypotension was reported by Nezhat, Chilkoti and Deschamps in a patient found severe bradycardia and atrioventricular block with bigeminy after injecting 3U intramyometrial vasopressin [15-17].

Kitamura in a case report, described severe hypotension, bradycardia in addition to ST-segment depression and premature ventricular contractions in the ECG when a patient received vasopressin injection (7.9 units, 0.2 unit/ml) during laparoscopic myomectomy and the similar reports were described by Lurie and Lee described a case of severe bradycardia (26 bpm) followed by cardiac arrest after intramyometrial injection of vasopressin (20 units, 0.5 unit/ml) and with immediate atropine administration heart rate came to normal [18-19]. Kabade described a case of bradycardia, severe hypotension, cardiac arrest after intramyometrial vasopressin (8 units, 0.2 units/ml) [20]. After resuscitation, the patient recovered, but the haemodynamic was severely unstable even with inotropic support, and the patient succumbed postoperatively.

The possible causes of these complications may be linked to the severe vasopressin induced hypertension, severe bradycardia, and cardiac arrest because of large dose or accidental intravascular administration. The vasoconstrictive effect of vasopressin causes coronary artery vasospasm that causes cardiac ischaemia, infarction, and arrest. In the literature across many last years on intramyometrial vasopressin, it does not reveal any definite dose or dilution which can be considered safe from serious cardiovascular complications. Even (lower doses (3 units-11 units) and concentration (0.1 unit/ml) have resulted bad outcomes sometimes [21-23]. Butala recommended 0.05 U/ml-0.3 U/ml concentration of dilute vasopressin to avoid its serious complications [24].

Dose and dilution of vasopressin, both are important in predicting as well as alleviating the risks of lethal complications. Dilution helps to make sure there is less risk to patients in case of inadvertent intravascular injection, also helps in diffusion through a larger area.

In the present case, described here the patient received 20 U of vasopressin in dilution of 0.2 U/ml after which patient experienced cardiac side effects. Most trials typically used concentrations of 0.2 U/ml. With regards to dose, multiples studies & reports published have concluded to use lowest possible dose to stop bleeding. However, that is a vague term, as even lower doses also sometimes harm the cardiovascular system. So best advice would be to remain overly cautious, anticipation of immediate bad outcomes, and being ready handedness to manage any untoward events after vasopressin injection. It would be prudent not to use or careful use of vasopressin in patients with pre-existing coronary artery disease,

ventricular dysfunction or arrhythmias, hypomagnesemia, or peripheral vascular disease.

## Conclusion

Though the use of intramyometrial vasopressin decreases blood loss and blood transfusion, it is especially important to appropriately select the patients and use of minimal dose and adequate dilution just to help the purpose. It is on the part of both gynaecologists and anaesthesiologists for taking necessary precautions, be alerted to manage potential life threatening complications of intramyometrial vasopressin.

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