

# Inadvertent intra arterial injection of Rocuronium: A case report

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## Abstract

Accidental intra-arterial injection of drugs is a potentially dangerous complication of intravenous therapy. All the personnel using intravenous therapy must be aware of this possibility and signs symptoms and management of it.

We report a case of accidental intra-arterial injection of Rocuronium and Fentanyl. Patient developed severe hyperemia and sluggish capillary refill distal to site of injection. The patient was given injection lignocaine 2% 60 mg and 30 ml of heparinised saline was infused intra-arterial. The hyperemia resolved slowly and capillary refill improved back to normal over next hour. There were no long term sequelae.

## INTRODUCTION

Accidental intra-arterial injections of drugs are potentially serious complication of intravenous use of drugs. One of the difficulties faced in paediatric anaesthesia is the problem of intra-venous (iv) access especially, in a chubby and uncooperative child. Struggles in iv cannulation at the antecubital fossa may also result in cannulation of brachial, radial or ulnar artery which may be missed altogether.

## CASE REPORT

We report a case of accidental arterial cannulation of brachial artery followed by inadvertent intra arterial injection of fentanyl and Rocuronium.

A 8 year old girl, 115 cm tall and weighing 45 kg, was posted for open reduction and internal fixation of fracture left clavicle that was sustained while playing few hours earlier, along with fracture of scapula on same side.

The patient was quite plump, apprehensive and uncooperative. It was decided to go for an inhalational induction, followed by intravenous access under sedation, and tracheal intubation following muscle relaxation. As such patient was induced with Oxygen, nitrous and Sevoflurane.

Under inhalational induction a search for venous access could reveal only a thin vein in antecubital fossa on right arm. However, insertion of venous cannulae (Vasofix, Branula, B Braun, Melsungen AG) in the skin evoked a movement of hand by the patient and alignment with the

vein was lost. On Manipulation in the same skin insertion site the Branula entered a vessel and secured. The color of blood coming out from cannulae was slightly bright with a normal flow, which at the time was presumed to be due to ongoing inhalation of oxygen enriched mixture.

Subsequently, injection Fentanyl (Janssen-Cilag BV) 50mcg and injection Rocuronium (Organaon) 30 mg were injected through branula to facilitate endotracheal intubation. However, after the airway secured it was noted that the patient had a dense hyperemia in right hand distal to insertion of branula. An infusion of Ringer's lactate was connected to branula. However, it revealed a pulsatile flow up the iv set towards the bottle. Suspecting an intra arterial position of branula, it was left in situ and thirty ml of heparinised saline followed by 60 mg of 2% lignocaine (Astra Zeneca) were injected slowly. Another, small vein on the volar aspect of right forearm just above wrist was cannulated with a 22 G branula.

A look at the capillary refill on right hand fingers revealed a prolonged capillary refill time (~2 sec) compared to other arm. The surgery was commenced, keeping a constant watch on the hyperemia and repeated examination for capillary refill. The hyperemia soon started resolving and by the end of surgery which lasted for about 80 minutes, the color of both hands was alike with no evidence of hyperemia. The capillary refill was also equal to that of left hand (<1sec).

The arterial branula was then withdrawn. The patient was

kept under follow up for the vascular supply of right hand for next 48 hours, which was uneventful. The patient was discharged with an advice to comeback to hospital in the event of any color change the right hand and forearm and / or appearance of any numbness, pain or other abnormal sensation. There were no such complaints a week later at follow up.

### **DISCUSSION**

Accidental intra-arterial cannulations with subsequent intra-arterial injections of drugs are potentially serious complication of intravenous use of drugs. As such providers of intravenous therapy should be aware of signs, symptoms and management of intra- arterial injection of drugs. <sup>1</sup> Reported incidence of intra-arterial injection of drugs has varied from 1/56000 to 1/ 3440<sup>2,3</sup> Further the patient profile in past years has changed from primarily hospitalized patients to iv drug abusers.<sup>4</sup>

Anesthesiologists are often confronted with the difficult in securing intravenous access which may sometimes be impossible in uncooperative plump child. Although there is a case report describing use of intra-arterial route as an alternative for iv access,<sup>5</sup> there are multiple case reports describing the serious complications associated with inadvertent intra-arterial injection of anesthetic agents.

Intra-arterial injections can have wide ranging side effects and complications ranging from gangrene, limb ischaemia and skin necrosis leading to amputations and permanent disabilities, to long term functional deficits like temperature hypersensitivity to paresthesias. It also has economic consequences in terms of lost productivity, long rehabilitation, follow up care and unemployment.<sup>4</sup>

Drugs which are poorly water soluble or insoluble in water as well as those with alkaline pH are the ones most likely to have an adverse reaction with intra-arterial injection and should be avoided at all cost.<sup>6</sup>

Majority of reports on the intra-arterial injection of drugs have focused on two general anaesthetics Thiopentone and Propofol however, Promethazine, Promazine, Amobarbital sodium, Meperidine, Diazepam, Methohexital, Penicillin, Fentanyl, Depomedrol have also been reported. Each of these reports described symptoms of pain and ischaemia after injection of medication, which was attributed to arterial spasm, chemical arteritis, releases of thromboxanes leading to thrombosis and direct tissue destruction leading to gangrene.<sup>4</sup>

Till date no human studies have been performed to establish a definitive treatment for the consequences of intra-arterial injection of drugs. The recommendations for treatment are largely empirical, based on case reports. Management of these patients focuses on providing symptomatic relief, reversing arterial spasm, maintaining or re-establishing blood flow distal to the site of intra arterial injection, treating any sequelae and rehabilitation of patients.<sup>4</sup>

All the reports however stress on leaving the catheter in situ for administration of emergency medication to promote vasodilatation and/ or relieve vasospasm. This was also done in our patient.

The case reports on the subject have recommended infiltration of local anaesthetics to promote vasodilatation, anticoagulation and symaptholytic therapy employing nerve blocks. Two of which namely, use of Lignocaine to promote local vasodilatation and relief of vasospasm and injection of heparinised saline to prevent local thrombosis were used by us in our patient. Of late high dose steroids, combination of low molecular weight heparin and dextran and direct arterial vasodilators like Tolazoline, Nicardapine have been tested in small animal studies. Hyperbaric oxygen therapy has also been recommended by some. <sup>4</sup>

Three important steps have been suggested to avoid arterial cannulation and its complications namely, identifying the patients at risk (obese, uncooperative , dark pigmented skin, vascular anomalies etc), verification of intravenous placement of cannula ( avoid anatomic locations where an artery is expected, initial color of blood in the cannula, pulsatile movement of blood flow, ischemia distal to cannulation site, pain on injection ) and a continuous flow system connected to cannulae so as to dilute the medication administered, dissipate the force of injection of medication and help rule out the extravasations of drug.<sup>7</sup>

However, none of these strategies have proved to be successful always either alone or in combination <sup>8,9</sup>, only transducing the pressure (in a normo-tensive patient) and blood gas analysis (patient not in hypoxia, no arterio-venous fistula/ malformation) together can rule out arterial cannulation with some conviction. Hence, a high index of suspicion is needed to prevent intra-arterial injection drugs. Further, if the suspicion for arterial cannulation is high, then it is probably wise to repeat venous cannulation or use alternative site.<sup>8</sup>

Pain radiating down the distribution of vessel, is the most

consistent sign of intra-arterial injection of drug, however many times it is not reported as the anaesthesia is induced. Further, some of the drugs like propofol are associated with pain even on IV injection. The clinical presentation is variable and may include skin pallor, hyperaemia and cyanosis in the affected area. In conscious patients hyperaesthesia, muscle weakness, paralysis and anaesthesia may also be reported. In severe cases it may be associated with profound edema and gangrene. The affected region is usually distal to the cannulation site but occasionally may extend proximally as well. <sup>8</sup>

Intra-arterial injection of Fentanyl has previously been reported to be free of any side effects.<sup>5,8</sup> That leaves Rocuronium which can be responsible for the intense hyperaemia seen in our patient.

Rocuronium is an amino steroid, non depolarizing muscle relaxant, used as an adjuvant to general anesthetics for facilitating rapid sequence or routine endotracheal intubations and maintenance of muscle relaxation during surgery. Rocuronium is recommended to be used only by intravenous route. It is supplied in an acidic medium. It may cause histamine release on injection with a reported incidence of about 0.8%. At present only intravenous route of administration is recommended. Extravasations of Rocuronium have been associated with local irritation,<sup>10</sup> and it has also been reported to result in a burning sensation at the site of injection, when given prior to loss of consciousness.<sup>11</sup>

Attracurium, another amino steroid muscle relaxant has been reported to cause marked ischaemic appearance secondary to intra arterial injection which resolved with sympatholytic caudal block and led to complete recovery <sup>12</sup>

Despite an exhaustive search of published literature we could find only one case report of inadvertent intrarterial injection of Rocuronium.<sup>13</sup> A large number of drugs including Ketamine, Rocuronium, Dopamine, Sodium bicarbonate and blood etc were given intra-arterial. The patient developed severe ischemia and required emergency embolectomy and extensive fasciotomy to salvage the limb. However, in this report other drugs used are known to result in tissue damage and hence, the causative association of intra-arterial Rocuronium to resultant tissue injury can not be commented with certainty.

The potential of Rocuronium to cause histamine release and local irritation may explain the intense hyperaemia and sluggish capillary refill seen after intra arterial injection of

Rocuronium in our patient. The recovery may be secondary to use of lignocaine and / or heparinised saline through the intra-arterial cannulae.

### CONCLUSION

This is second report of intra arterial injection of Rocuronium. Which lead to intense hyperaemia distal to site of injection. The hyperaemia resolved after injection of iv lignocaine and heparinised saline with no sequelae. Intra arterial injection remains a dreaded possibility and side effect of intravenous therapy and all the persons involved in intravenous therapy should be aware of the risk and treatment options currently available.

### CORRESPONDENCE TO

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