Dextrose-Containing Infusion Running in An Arterial Line System

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ABSTRACT

Processes and procedures in intensive care units and during anaesthetic delivery are centered around ensuring patient safety. This article aims to shed light on a rare possible mechanism for inadvertent iatrogenic hypoglycaemia as can affect critical care specialists or anaesthetists in the line of service delivery and recommendations have been suggested.

Keywords: Anaesthesia, arterial line, critical care, critical events, patient safety.

I. INTRODUCTION

Arterial line cannulation serves an important role in the hands of anaesthetists and critical care specialists for real-time continuous blood pressure monitoring. It also serves as a route for obtaining arterial blood samples for monitoring blood gases, serum electrolytes, and blood glucose levels [1]. Arterial line systems are recommended to be continually kept flushed with 0.9% sodium chloride solution. Where an inadvertent placement of dextrose-containing fluid as a flushing fluid into an arterial line system occurs, the possibility of iatrogenic hypoglycaemia occurring could be the outcome where this is not promptly detected [2].

II. LITERATURE REVIEW

The contamination of arterial blood gas sample taken from an arterial line sample that has dextrose infusion running as a flushing fluid has been limitedly reported in the medical literature. These situations have been described where ‘dead space’ sample have been discarded in an open or closed method of sampling. The resultant spurious hyperglycaemia could find treatment by the non-observing anaesthesiologist or intensivist and predispose patient(s) to iatrogenic hypoglycaemia as a result. This error mechanism could be perpetuated where there is an over-reliance on blood glucose levels from arterial line systems without a corresponding check with capillary blood glucose check [3].

The danger of hypoglycaemia remains the same whether it occurs iatrogenically or as a result of a disease process. Hypoglycaemia causes damages to brain cells by both mechanisms of starvation to these cells and the active loss of energy-dependent mechanisms that ensure membrane integrity in the brain. Remarkable cellular necrosis occur after 30 minutes of electrocerebral silence where untreated hypoglycemia persists. Portions of the brain most affected by necrosis from hypoglycaemia include the dentate gyrus of the hippocampus and the superficial layers of the cerebral cortex [4].

One unique feature about the never-event related to iatrogenic hypoglycaemia in patients with arterial line cannulation with erroneous dextrose infusion running as a flush system is that the patients involved could have impaired capacity as a result of being under anaesthetics or on an intensive care unit. This highlights the possible blunting of the neuroglycopenic symptoms that an awake patient could potentially have felt, which could have been a calling point to suggest further reviews [5]. Hence, the need to remove the margin of error that this event could continue to recur.

Where neuroprotection becomes an essential point of discussion (for example, in stroke, head-injured patients, and post-cardiac arrest patients), ensuring appropriate blood glucose targets to improve patient outcomes becomes even more important. More publicity and the design of mechanisms to prevent this mechanism of iatrogenic hypoglycaemia for patients on intensive care units, in theatres or on acute stroke units [6]. Where possible, the inclusion of this mechanism of iatrogenic injury means could make it on to published lists of never-events [7].

Wrongfully running dextrose infusion in an arterial line system also raises attention to the role checklists can play in preventing never-events. Applying checklists will help to remove human factors related to lack of awareness of such errors (or to any other never-event) when they do happen by ensuring that checks are conducted before arterial line insertion, further intermittent checks in the course of usage of such lines in the course of a patient’s stay on an intensive care or acute stroke unit or time under anaesthesia.

This never-event also raises the unique need to consider
routine protocols for the management of hyperglycaemia in the settings mentioned above. This would ensure that where the arterial lines are being used, health personnel would know to exclude spurious readings promptly before considering treating hyperglycaemia that could be due to an actual disease process that requires corresponding action to treat.

The role of continuing education of staff members responsible for the management of patients using arterial line systems towards preventing the never-event under discussion remains paramount. Reference [8] published the outcome of a simulation of awareness of the critical care staff members to erroneous blood glucose reading resulting from a patient having an arterial line system with dextrose infusion running as a flush fluid. The simulation was done on the background of previous occurrence of iatrogenic hypoglycaemia caused by treating spurious hyperglycaemia resulting from using dextrose solution to maintain arterial line cannulation and the education of their staff members to this danger had prior been done. Of the 20 participants who partook in the simulation, only 2 personnel were able to identify the error involved with running such dextrose infusion.

It is equally important to highlight that fluid bags (in this case 0.9% normal saline) hung up in pressure bags remain readable. Infusion bags should be to ensure that one could easily be told off from another as a visual aid, hence helping to reduce margins of error towards putting up wrong infusions. The entire equipment required for an arterial line system could come pre-prepared in a kit bag (including the saline bag required) to ensure excluding glucose-infusion being infused through arterial line systems.

III. Conclusion

Ensuring the safety of patients on arterial line cannulation for different reasons remains the task of everyone involved in their care, hence, minimizing the chance of inadvertent iatrogenic hypoglycaemia occurring due to erroneous use of dextrose-containing fluid in arterial line systems.

REFERENCES