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Case report: A pulseless radial artery in a child under anesthesia for radiotherapy

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Abstract
Treatment of cancer in children often requires a combination of chemotherapy, surgery, and/or radiotherapy. Radiotherapy and chemotherapy are not painful processes, but children undergoing these procedures must be made motionless through anesthesia or sedation. There are a few reports of complications during these procedures in relation to the procedures themselves or to the anesthesia given. This report describes an unexpected pulseless radial artery which was preliminarily and unduly attributed to anesthesia. A 2.5 year-old male pediatric patient with an acute lymphoblastic leukaemia was scheduled for radiotherapy. Anesthesia with intramuscular ketamine was induced before starting radiotherapy. About 5 minutes after injection of ketamine we found the right radial pulse undetectable. There was no other manifestation of hypoxia or hypo-perfusion. Carotid pulsation was normal. Examination of the left radial pulse and other peripheral pulses showed normal pulsation. The procedure was continued uneventfully. The next follow-up after radiotherapy, showed a scar and swelling on the right antecubital area, caused by extravasation of chemotherapeutic agent in the prior period of chemotherapy. Doppler ultrasonography of the antecubital vein confirmed the diagnosis. This case study therefore demonstrates that proper intravenous cannula establishment before chemotherapy is of great importance. Furthermore, accurate history and physical examination before induction of anesthesia or sedation may be useful in preventing mismanagement in pediatric cancer procedures.

Keywords: Anesthesia, Radiotherapy, Radial Pulse

1. Introduction

Optimal treatment of cancers in children often requires combined-modality therapy, including: chemotherapy, surgery, and/or radiotherapy. Chemotherapy is not always sufficient to achieve the cure of solid tumors in children; either resection or radiation may be needed for local tumor control as well (1). Children with radiosensitive malignant tumors typically require radiation therapy for a number of sessions over a period of several weeks. Although the procedure is painless, young children need to be sedated or anesthetised in order to provide a motionless state during the procedure. A short period of sedation, analgesia or general anaesthesia is typically required (2). During the actual radiation treatment period, the patient and anaesthesia equipment are observed continuously by closed-circuit television, and monitors are mirrored to the remote observation site outside the treatment room. Different anesthesia methods and anesthetics have been recommended to provide a safe and optimal situation of motionless with a short recovery period in children undergoing general anaesthesia or sedation for external beam irradiation (3-7). This report describes the accidental detection of a missed complication by the anesthetist at the time of radiotherapy, from the previous chemotherapy, which was preliminarily and unduly attributed to anesthesia.

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2. Case presentation

A 2.5 year-old, 13-kg boy, ASA (American Society of Anesthesiologists) class II, with acute lymphoblastic leukaemia (ALL), was scheduled for radiotherapy. He had undergone chemotherapy 6 months prior to the scheduled radiotherapy. Anesthesia was planned by the anesthetist, and the physical examination was normal before radiotherapy. Routine monitoring was established, and for peripheral pulse monitoring, the distal portion of the right upper limb of the child was rested out of the covers. Anesthesia was induced with ketamine (60 mg), which was injected intramuscularly. After about 5 minutes, when the anesthetic effect of ketamine began, we noticed a lack of right radial pulse. Anesthesia-related hemodynamic instability was expected, however no other manifestation of hypoxia or hypo-perfusion was detected. Furthermore, carotid pulsation was normal, and examination of the left radial pulse and other peripheral pulses showed normal pulsation. The procedure was continued uneventfully. Upon the follow-up of the procedure, the patient showed a scar and swelling on the right antecubital area. A more detailed history taken from the child's parents showed his history of chemotherapy during which extravasation of the chemotherapy drug had resulted in severe inflammation and edema at the site of injection. A Colour Doppler Ultrasound of the antecubital area showed deep edema and chronic compression on the antecubital tissue and confirmed the diagnosis. After three days the patient was discharged from the hospital. Permission was obtained from the patient's parents to use the patient's reports, however the patient's information was to remain confidential.

3. Discussion

The incidence range of extravasations of cytostatic drugs in cancer patients has been reported from 0.2 to 1.4% in a five-year study (8). Extravasations in cytostatic treatment may cause a wide range of symptoms, from patients' discomfort to severe complications such as necrosis and amputation. (9) Eccrine squamous syringometaplasia, while rare, has also occurred in patients who have received chemotherapy treatment (10). Yeung et al described a case of metastatic ovarian carcinoma with repeated thrombosis of the femoral arteries following intravenous carboplatin-based combination chemotherapy. Extensive workup showed known causes of arterial thrombosis (11). Persistent withdrawal occlusion (PWO) is frequently caused by fibrin sheath formation around venous access devices. Small doses of thrombolytic drugs (such as urokinase) could manage PWO, but could also serious complicate chemotherapy drug extravasation (12). One such complication is tissue necrosis. Treatments such as Betamethasone ointment have been used for prevention of tissue damage. Keratolytic ointment was applied for old lesions, whereas in new lesions, multiple subcutaneous injections of hydrocortisone solution were used before the application of betamethasone ointment. Application of conservative agents in radiotherapy-induced extravasation areas may avoid tissue necrosis and consequently, reconstructive surgery (13).

Management of cytotoxic drug extravasation in humans is based on the experimental evidences and available case reports because of lack of randomized trials. For instance, topical dimethylsulfoxide (DMSO) and cooling for extravasation of anthracyclines or mitomycin, local injection of hyaluronidase for extravasation of vinca alkaloids, and local injection of sodium thiosulfate (sodium hyposulfite) for extravasation of chlormethine (mechlorethamine; mustine) should be empirically recommended. In the case of failed conservative treatment, plastic surgery could prevent ulceration. Late local reactions are probable in patients receiving chemotherapy (14).

4. Conclusions

The probability of chemotherapeutic agent extravasation should be considered in all patients receiving chemotherapy. Proper intravenous cannula establishment before chemotherapy is of great importance. Accurate history and physical examination before injection of anesthetic agents could be useful in preventing patient mismanagement. A weak pulse in a child can be a significant problem for the anesthesiologist and in this case, it was shown to be a critically misleading factor. Increased emphasis is on clinical evaluation and pulse checking is necessary, especially in children with a history of chemotherapy. Providing thorough pulse evaluation when we work on children and avoiding immediate aggressive intervention before being certain about the cause of weak pulse are additional issues of importance shown by this case report.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:
All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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