



Oncology

Compartment syndrome secondary to intra-operative IV methylene blue extravasation to detect ureteral injury

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ABSTRACT

Compartment syndrome of the extremities is a rare but potentially devastating condition.

We herein report a case of a 53-year old female with an unusual case of hand compartment syndrome and fasciitis secondary to methylene blue (MB) extravasation to detect urinary tract injury intraoperatively. This was recognized immediately and fasciotomy was performed.

Features of this case are discussed together with its implications. Despite MB's long history of use, few adverse events of an accidental extravasation have been reported.

1. Introduction

Urinary tract injury is a well-known complication of pelvic surgery. Methylene blue is widely used to detect utero-vesical injuries. Ureteral injuries occurs in 0.5–2% of all hysterectomies and routine gynecologic pelvic operations and in 10% (ranges from 5 to 30%) of radical hysterectomies.¹ Recognition of injury allow immediate repair and as a consequence minimizes postoperative sequelae including morbidity and cost. Where a ureteral injury is suspected intraoperatively, the use of dyes to reveal the site of damage has been advocated.¹

2. Case presentation

A 53-year old female was diagnosed with cervical cancer FIGO stage IB1. She was scheduled for laparotomy radical hysterectomy and retroperitoneal lymph node dissection under general anesthesia. At postoperative day one she was suspected to have bowel injury, which was confirmed on CT with oral and IV contrast. She was taken for exploratory laparotomy and indeed an injury of the terminal ileum was confirmed, resection with primary anastomosis was done. Intraoperatively, a right ureteral injury was suspected and 1 mg/kg IV methylene blue diluted in 250 ml of NaCl was administered for localization via an 18G IV cannula of the right hand over the dorsal aspect over 30 minutes without any significance resistance. No ureteral leak was visualized and no injury detected. She was transferred to a high

dependency unit for continuous monitoring. Within two hours post-operatively blue discoloration on the right hand was noted with edema on the dorsum restricting movement (Fig. 1A). Ultrasound was suggestive of thrombophlebitis of the right cephalic vein from the cubital fossa reaching the mid-arm not extending to the deep veins and no evidence of deep venous thrombosis. Compartment syndrome was clinically suspected and urgent consultation with a plastic surgeon was requested, who planned immediate fasciotomy (Fig. 1B). Blue coloured fluid was retrieved from the swelling, the hand was dressed and immobilized by a splint. Swelling completely subsided with good range of movement on the following day. Daily dressing was being done and at day 7 the wound was sutured. At 1-month follow up, her pain was alleviated regaining her hand mobility with complete resolution of the swelling and discoloration.

3. Discussion

Different approaches have been described to detect ureteral injuries intraoperatively such as intravenous methylene blue (MB) or indigo carmine.¹ Our patient developed postoperative hand compartment syndrome and fasciitis secondary to MB extravasation use for urinary injury detection. MB extravasation occurs by unintentional leakage of dye into the subcutaneous and perivascular tissues. This was reported in approximately 10–30% of patients.^{2,3}

Numerous underlying mechanisms have been proposed in dye

Abbreviations: MB, Methylene blue.

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Fig. 1. 1A, 1B – Pre and post right hand fasciotomy.

extravasation which includes penetrating the vein wall with the needle or catheter or an inflammatory reaction in the vein which can lead to injury of the vessel endothelium and hence leakage of the infused dye.² MB, is a cationic thiazine which causes toxic effects to the tissue by producing free radicals leading to local inflammation and cellular injury.^{2,4}

Several case reports described findings of cutaneous manifestations similar to our patient. Another retrospective study also reported similar MB dye complications used in 398 patients, such as local skin infection, necrosis and hypersensitivity reaction.⁵ Lee et al. noticed six cases of skin necrosis following immediate nipple or skin-sparing mastectomy with simultaneous SLNB using MB dye. Three cases developed full-thickness skin necrosis at day three postoperatively and presented with low temperature over necrotic skin and skin desquamation due to bullae formation and debridement was done.³

It has been shown that the severity of tissue necrosis is proportional to the solution volume and concentration.² In contrast, low concentration of MB dye showed no significant difference in terms of developing complications.⁵ MB can be administered safely through peripheral IV routes without any site changes reported.^{2,4} Several risk factors play a role in developing MB extravasation, such as old age, vascular fragility, anticoagulation or chronic corticosteroid use and chronic disease such as underlying malignancy.²

Management of MB extravasation has been divided into general and secondary management. General management includes cannula removal, limb elevation to reduce swelling and warm compressor to promote vasodilation, drug reabsorption and dissemination. Secondary management includes saline washout, liposuction, steroids, hyaluronidase, phentolamine use and regional sympathetic block. Saline washout was considered to be the most effective way to eliminate the drug from extravasation site.⁴

4. Conclusion

Extravasation is a prevalent risk of IV methylene blue administration, appropriate precautions can decrease the risk but not eradicate it. It should be promptly recognized and treated appropriately to avoid devastating complications. Further studies on the appropriate dosage, concentration and route of administration are required for safe usage of MB dye.

Declarations of interest

None.

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