



Case Report

Complications of interosseous infusion resulting in a diagnostic dilemma

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ABSTRACT

Successful revival of a patient with cardiac arrest need vigilant effort on behalf of whole team but sometimes missing a small thing can create disaster. Here we present a case of 58 years old obese lady who was revived from a cardiac arrest secondary to septic shock. Obstruction due to proximal ureteric stone was relieved with JJ stent insertion. She required renal replacement therapy and invasive ventilation. Fever and inflammatory blood markers improved and she woke up after 6 days in intensive care unit (ICU). She developed another episode of sepsis but this time it was her shoulder that was hurting. Initially it was thought to be an iatrogenic skeletal injury during aggressive cardiopulmonary resuscitation (CPR) but radiographs came out to be normal. Magnetic resonance imaging (MRI) created more confusion by showing septic arthritis with proximal humeral osteomyelitis and gas formation. MRI suggested that it might be the sequelae of an intraosseous line insertion. All documented records were silent regarding the intraosseous line insertion. Resuscitation team was contacted and inquired. They confirmed the insertion of intraosseous line insertion during initial resuscitation which was removed after securing peripheral vascular access and before transferring the patient to ICU but they forgot to document. Her shoulder joint was washed out and debrided arthroscopically. She made a safe recovery without any other problem.

Introduction

Intraosseous access is used to deliver fluids and drugs directly to vascular system through bone marrow. Proximal and distal tibia, proximal humerus and sternum are the preferred sites. It takes less than 01 min to insert an intraosseous line and flow rates of up to 125 ml/min can be achieved. These lines are removed once a stable vascular access has been secured [1]. There are various commercially available devices for each site of insertion. They have their own advantages and disadvantages [2]. Leidel BA et al. described the intraosseous route as fast and efficacious compared to central venous catheterization in adult patients under resuscitation in the emergency department [3].

Intraosseous route has its complications, like osteomyelitis, compartment syndrome, local infection, fat embolism and growth plate damage in skeletally immature patients [4]. We describe our case to present another very rare complication, the septic arthritis of shoulder joint after intraosseous line insertion for resuscitation of a patient with cardiac arrest.

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Case report

58 years old obese lady was brought in emergency department by rescue team. She was accompanied by her son. She presented in critical condition, was confused, tachypneic and tachycardiac. According to attendant, she was complaining for last 2–3 days of abdominal pain, fever, decreased oral intake and decreased urination. Presently she was taking her antihypertensive medication. Few minutes after arrival to emergency department she collapsed and was coded. She was pulseless with electrical cardiac activity (PEA). Cardiopulmonary resuscitation (CPR) was initiated according to Adult Cardiac Life Support (ACLS) protocol. Peripheral vascular access was difficult with several failed attempts. Patient was revived after 5 min of chest compression, endotracheal tube ventilation and single shot of adrenaline. Initial investigations revealed raised WCC, CRP and very high blood glucose levels. She was previously non-diabetic. Working diagnosis of septic shock was made. She was put on broad spectrum antibiotics which were changed according to sensitivity report of blood and urine cultures. Femoral arterial line was used for monitoring, fluid and drug administration. She was sedated and put on invasive ventilation. She was shifted to intensive care unit for monitoring and management. She remained oliguric despite fluid replacement. Computed tomography (CT) abdomen was performed which revealed impacted proximal right ureteric stone with dilatation of pelvicaecal system and bi-basal lung consolidation. She was reviewed by urology team for urosepsis and JJ stent was placed to relieve the obstruction. Fracture pus and old blood was drained which confirmed the reason of shock to be the urosepsis. Urine output improved but she still needed renal replacement therapy. Fever improved but it didn't touch the baseline. Similarly WCC and CRP were showing a decreasing trend. On 6th post admission day patient regained consciousness, urine output improved and invasive ventilatory support was withdrawn. She was transferred out of intensive care unit. She again developed high grade fever, WCC and CRP was persistently raised. Now that patient was conscious and oriented, she started complaining of left shoulder joint pain associated with weakness of left upper limb. Orthopedics team was asked to review the patient. On initial examination, mild joint effusion was suspected and turbid blood stained fluid was aspirated. Iatrogenic skeletal injury during CPR was suspected and radiograph was obtained which was unremarkable other than degenerative changes. Magnetic resonance imaging (MRI) scan was advised to rule out soft tissue pathology. MRI showed large effusion with surrounding tissue edema, bone marrow edema with gas formation in proximal humerus. Based on these findings MRI suggested the differential diagnoses of septic arthritis with proximal humerus osteomyelitis, gas gangrene and sequelae of proximal humeral intraosseous line. This was something new for the whole team. All notes were reviewed again but there was no mention of intraosseous line insertion. Resuscitation team was contacted and inquired about the intraosseous line and they confirm that intraosseous line was inserted for initial resuscitation and it was removed when femoral arterial line was secured, but they forgot to mention it in their notes. Mystery was solved. Shoulder joint was decompressed and washed arthroscopically. She was also diagnosed to have type II diabetes mellitus by endocrinology team and was managed accordingly. Rest of her recovery was uneventful. She was booked by urologist for removal of stone at a later stage.

Discussion

It was 1922 when Drinker et al. first documented the use of intraosseous route for delivery of drugs and fluid [5]. Since then this route has been used in pediatric and adult population for fluid resuscitation and drug delivery when peripheral vascular access is not obtainable. Complications, although not very common, do occur and include local infection, air or fat embolism, local tissue extravasation, dislodgment, osteomyelitis, compartment syndrome and growth plate injury etc. [2].

A multi-center study looking into the complications of intraosseous line in pediatric population noted that no complications occurred when this line was used in 239 patients in emergency department and 52 inpatients [6].

Chalopin T et al. described a case of extensive tibial osteomyelitis in adult male 3 months after this site was used for intraosseous delivery of drugs and fluids [7]. A 2.5 month old infant lost a limb to ischemia and compartment syndrome due to intraosseous line insertion [4]. 67 years old lady received fluid and medications through humeral intraosseous route because below knee amputation on one side and foot amputation on contralateral side. Intraosseous line was removed after 24 h but she developed deltoid compartment syndrome 2 weeks after arrival to hospital. Fasciotomy and debridement was done to relieve the severe pain [8].

Well maintained record are very important communication tool, especially in the current climate of multiprofessional working [9]. 'If it's not written down; it didn't happen.' is self-explanatory. Amanda Andrews and Bernie St Aubyn quote "a patient claimed that one district nurse did not wash her hands when she visited his house to dress his wound. Although the nurse stated that she always washed her hands with alcohol rub following local policy, there was no recorded evidence of this" [10].

Our case is unique in two ways. Firstly it is a very rare complication of a time tested lifesaving procedure, secondly the patient was put in harm's way by hospital staff by not documenting properly. It would have resulted in catastrophe in the form of loss of limb or even life, if patient was still sedated and had not complained of pain in shoulder.

Conclusion

A lifesaving procedure should not be turned into a life-threatening procedure just by documentation error. Any invasive procedure, no matter how small and quick, should be done according to standard protocols and should be documented. This case caused a diagnostic dilemma on the MRI as it reflected impressions of bone edema and gas after the use of intraosseous infusion in the proximal humerus. Similar findings can be found in infection or osteomyelitis from gas forming organisms.

References

- [1] M.W. Day, Intraosseous devices for intravascular access in adult trauma patients, *Crit. Care Nurse* 31 (2) (2011) 76–90. Apr 1.
- [2] Anson, Jonathan A. Vascular access in resuscitation. *Anesthesiology*. 120(4):1015–31.
- [3] B.A. Leidel, C. Kirchhoff, V. Bogner, J. Stegmaier, W. Mutschler, K.-G. Kanz, et al., Is the intraosseous access route fast and efficacious compared to conventional central venous catheterization in adult patients under resuscitation in the emergency department? A prospective observational pilot study, *Patient Saf Surg* 3 (1) (2009) 24.
- [4] J. Molacek, K. Houdek, V. Opatrný, J. Fremuth, L. Sasek, I. Treskova, et al., Serious complications of Intraosseous access during infant resuscitation, *Eur J Pediatr Surg Rep*. 6 (1) (2018) e59–e62 Jan.
- [5] C.K. Drinker, K.R. Drinker, C.C. Lund, The circulation in the mammalian bone-marrow, *Am J Physiol-Leg Content* 62 (1) (1922 Sep) 1–92.
- [6] M. Hansen, G. Meckler, D. Spiro, C. Newgard, Intraosseous line use, complications, and outcomes among a population-based cohort of children presenting to California hospitals, *Pediatr. Emerg. Care* 27 (10) (2011) 928–932 Oct.
- [7] T. Chalopin, A. Lemaigen, A. Guillon, A. Geffray, G. Derot, O. Bahuaud, et al., Acute Tibial osteomyelitis caused by intraosseous access during initial resuscitation: a case report and literature review, *BMC Infect. Dis.* 18 (1) (2018 Dec) 665.
- [8] K.M. Thadikonda, F.M. Egro, I. Ma, A.M. Spiess, Deltoid compartment syndrome: a rare complication after humeral intraosseous access, *Plast Reconstr Surg Glob Open* 5 (1) (2017 Jan) e1208.
- [9] D. Jefferies, M. Johnson, R. Griffiths, A meta-study of the essentials of quality nursing documentation, *Int. J. Nurs. Pract.* 16 (2) (2010) 112–124. Apr.
- [10] A. Andrews, B.S. Aubyn, If it's Not Written Down; it Didn't Happen..., 29(5) (2015), pp. 20–22.