Open Access Library Journal
2024, Volume 11, e11595
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Anaesthetic Challenges of the Open Repair of Trauma Induced Femoral Pseudoaneurysm in CKD Patients Using the Combined Spinal Epidural Technique

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How to cite this paper: Job, O.G. and Emeka, A.C. (2024) Anaesthetic Challenges of the Open Repair of Trauma Induced Femoral Pseudoaneurysm in CKD Patients Using the Combined Spinal Epidural Technique. *Open Access Library Journal*, **11**: e11595.
https://doi.org/10.4236/oalib.1111595

Received: April 20, 2024
Accepted: May 27, 2024
Published: May 30, 2024

Abstract

Background: Multiple needling of femoral vessels for maintenance haemodialysis in patients with chronic kidney diseases without the use of ultrasounds poses a bigger risk for the development of pseudo-aneurysms of femoral vessels. For those who incidentally develop vascular injury resulting in pseudoaneurysms of the femoral artery, which presents as groin swelling, a pulsatile and tender mass, often at risk of clot formation and distal limb vascular compromises etc. Open surgical repairs are commonly offered in Portharcourt Nigeria. The aim of this paper is to describe the challenges of providing perioperative care using the combined spinal epidural anaesthetic technique in these subsets of patients with chronic kidney diseases requiring open surgical repair. **Methods:** Prospective descriptive study involving all elective cases with vascular injury from haemodialysis presenting with pseudo-aneurysms for open vascular repair at the University of Portharcourt teaching hospital and some private hospitals in Portharcourt Nigeria. The study covered the period between January 2018 and January 2024. Ethical exemptions were obtained from the research and ethics committees of the various hospitals with the exclusion of patients with contraindications to neuraxial block and those less than 18 years. **Results:** Twenty-seven patients were offered the combined spinal epidural technique for open pseudo-aneurysmal repairs with an average duration of surgery of six to eight hours and post perioperative conditions and the outcome were satisfactory. **Conclusion:** The use of the combined spinal and epidural anaesthetic tech-

nique for femoral pseudo-aneurysmal repairs offered effective anaesthesia and satisfactory postoperative care with minimal complications.

Subject Areas

Surgery & Surgical Specialties

Keywords

Femoral, Pseudo-Aneurysm, Repair, Combined Spinal Epidural

1. Introduction

The prevalence of renal diseases is on the increase [1] and some patients will require renal replacement therapy especially haemodialysis which in most instances is instituted using temporary vascular access in low-resource settings [2] [3]. Although more definitive vascular access routes such as arteriovenous fistula, tunneled central venous catheters or arteriovenous grafts are available for use and are performed by nephrologists [1] and vascular surgeons, cost drives the frequent use of femoral catheters as temporary vascular access in resource limited settings [1] [2]. This practice requires the use of anatomical landmark techniques to access the vessels and it comes with a prize, which is, inadvertent trauma to femoral vessels from frequent needling for haemodialysis [4]. The decision to initiate haemodialysis and its frequency are based on regional or country preferences [5] and it is a required protocol to use ultrasound-guided vascular canulation which provides rapid and non-invasive and easy access to the vessels and limits any associated complications [6] [7], occasioned by the frequency of canulation [8] and in difficult to access situations. Guidelines also promote the use of definitive and permanent vascular access [9].

Pseudoaneurysms of the femoral artery as a complication following repeated trauma to the vessel are not common but it does occur and often presents late [10]. About a quarter of post haemodialysis admissions are reported to be associated with vascular injuries [10] [11] [12]. Anaesthesia for the open repair of femoral artery pseudoaneurysm poses unique challenges as a result of the suboptimal clinical states of the patients. It requires comprehensive pre-anaesthetic reviews with particular attention to cardiovascular risk assessment, cautious use of preloading fluids, judicious use of anaesthetic agents especially renally excreted drugs, a proper understanding of heparinization during haemodialysis and its interaction with anaesthesia [13] [14]. Regional anaesthesia is preferred if the procedure is amenable to it, as it avoids the interactions of anaesthetic molecules with grossly depleted renal function. The use of neuraxial block, epidural or continuous spinal anaesthesia was advocated for patients with renal derangement in the late 60s [15] [16] [17].

In Nigeria, reports on the use of the combined spinal epidural technique for

the open surgical repair of femoral pseudo-aneurysm are rare and this attempt was a demonstration of the ease of utilizing the technique for these subsets of patients with satisfactory outcomes.

2. Methods

This was a prospective descriptive study conducted by the authors between January 2018 and January 2024. Ethical exemption was obtained from the University of Portharcourt Teaching Hospital, Sterling Specialists Hospital, Princess Medical Centre, Hilton Hospital, Rehoboth Hospital, and Save a Life Specialist Hospital Portharcourt. Included were all elective cases of pseudo-aneurysm booked for open surgical repair and with confirmed CKD. Patients aged over 18 years are required to provide signed informed consent for the combined spinal epidural technique. All cases with absolute contraindications to neuraxial blockade were excluded. All patients were reviewed in person by the anaesthetist with ancillary laboratory workup. All patients had regular haemodialysis with a pre-procedure dialysis period of twenty-four hours with full blood workup.

Intraoperative monitoring consisted of non-invasive blood pressure monitoring (NIBP), ECG, ETC02 sampling line attached to the nasal nares, Pulse oximetry, urethral catheterization and temperature checks. Central venous catheters were mandatory and preloading fluids were limited with ease of vasopressor use if needed. Spinal anaesthesia was instituted with 25 G Whitacre needles and the administration of 15 mg of heavy bupivacaine. Epidural top ups were administered based on the NRS pain score of ≥3 cm and at the end of the procedure, 3 mg of morphine sulphate was administered through the epidural catheter in addition to intravenous paracetamol and diclofenac suppository for postoperative pain. The timing of epidural catheter insertion and removal was based on the guidelines surrounding anticoagulation use. Intravenous ondansetron was offered for persistent nausea, vomiting and pruritus.

Data obtained included demographics, duration of surgical procedure, anaesthetic block characteristics, and side effects and analysed using Epi info 7.1 statistical software.

3. Results

A total of twenty-seven (27) patients were scheduled for open surgical repair of pseudoaneurysm involving the femoral arteries. The mean age was 54.6 ± 8.6 years. Range 30 - 79 years. Females 15 (55.6%), Males 12 (44.4%). In terms of location of aneurysm: Right superficial femoral artery (63%), Left superficial femoral artery (29.6%), and both right and left common femoral arteries (7.4%). Epidural top-up with 50mg of 0.5% plain bupivacaine was done at 179 ± 20.1 minutes at an NRS of ≥3 cm. The maximum sensory block was at T4 (Range T4-T6). (See **Tables 1-3**, **Figure 1**)

Associated photos were obtained with the consents of the patients. (See **Figures 2-5**)

Table 1. Social demographic characteristics.

Variable	Frequency n = 27 (%)
Sex	
Male	12 (44.4)
Female	15 (55.6)
Age group	
30 - 39	1 (3.7)
40 - 49	6 (22.2)
50 - 59	14 (51.9)
60 - 69	5 (18.5)
70 - 79	1 (3.7)
Mean ± SD (years)	54.6 ± 8.6

Table 2. Block characteristics & duration of anaesthesia and surgery.

Variable	Maximum sensory block	M. Bromage Score	Anaesthesia to S2 (minutes)	Surgery (minutes)	t (P-value)
			Mean ± SD	Mean ± SD	
Time to top up epidural/ NRS ≥ 3 cm	T4-T6	3	365.9 ± 69.2	321.7 ± 14.3	1.665 (0.108)
	179 ± 20.1 minutes				

Table 3. Showing the associated perioperative complications.

Variable	Frequency n = 27 (%)
Self-limiting	
Pruritus	12 (100.0)
Nausea	7
Vomiting	8
Outcome	
Alive	27 (100.0)

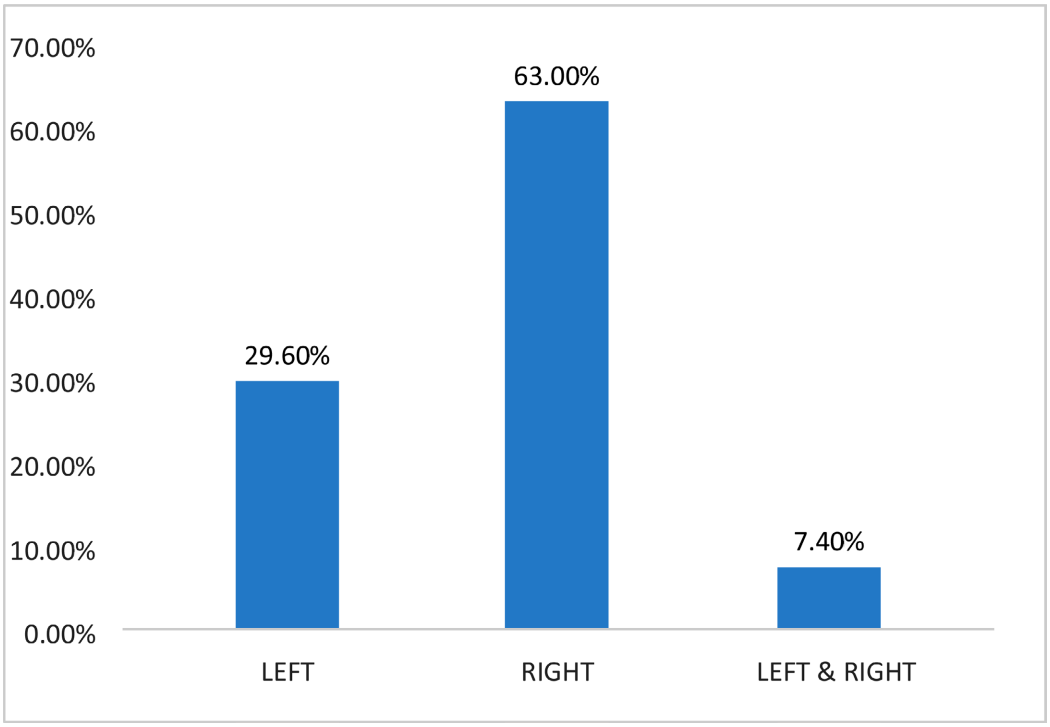

Figure 1. Showing location of femoral artery pseudoaneurysm in the lower limbs.

Figure 2. Groin hematoma from superficial femoral artery pseudoaneurysm.

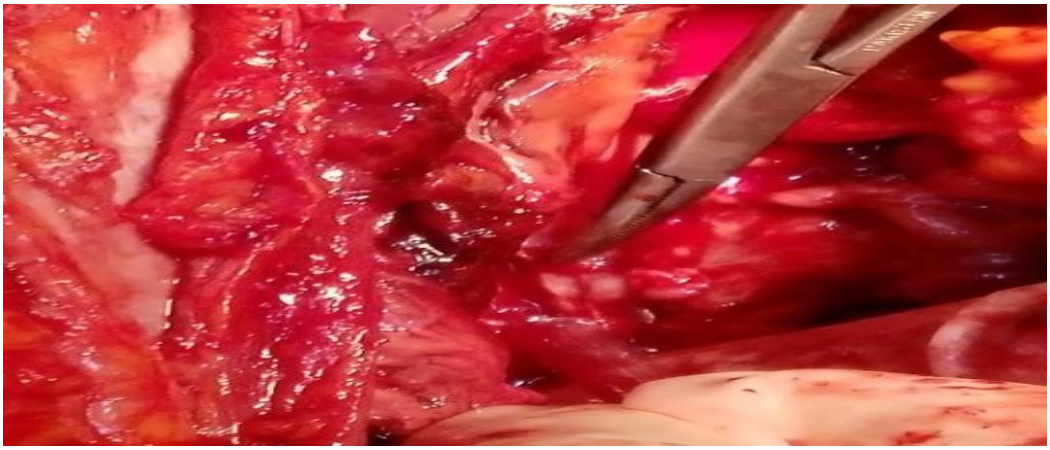

Figure 3. Puncture site on common femoral artery exposed at surgery (shown by tip of forceps).

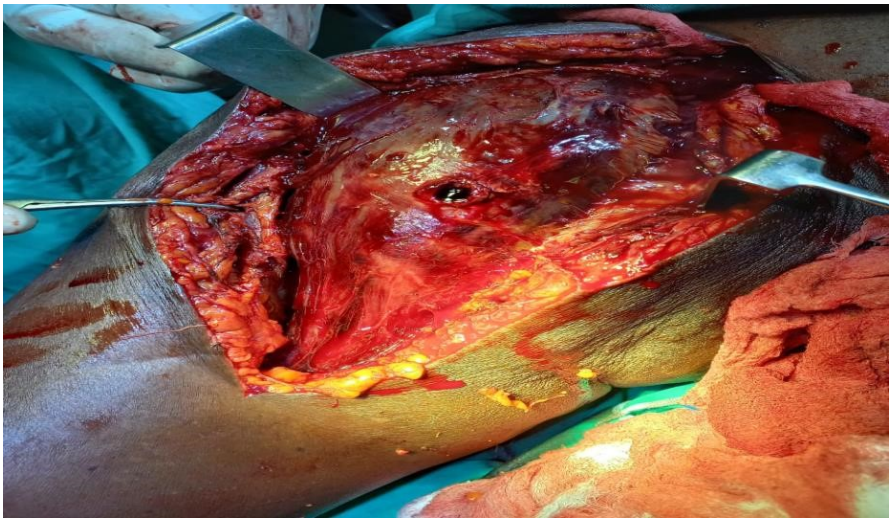

Figure 4. Perianeurysmal haematoma exposed.

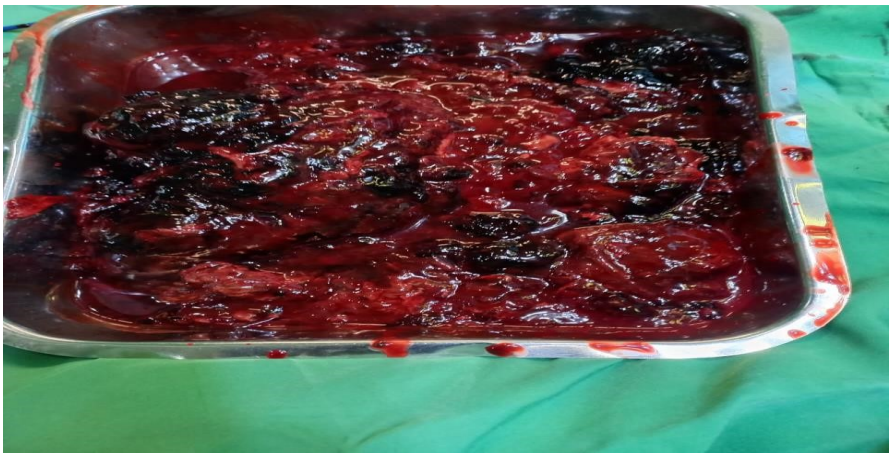

Figure 5. Evacuated haematoma from aneurysmal sac.

4. Discussion

The femoral artery has an apparently fixed position which makes it more vulnerable to injury [12]. The literature is replete with reports of associated injury to the femoral artery causing pseudo-aneurysm from repeated needling and (in)advertent arterial canulation for haemodialysis [2] [18] [19].

The mean age of the patients is comparable with reports by Amadi *et al.* [20], although our study had more females than males as reported by Hemanchandar [21] [22]. In a related report of femoral artery pseudoaneurysm from cardiac catheterization, a female preponderance was observed [23]. Pain and haematoma formation presenting as groin swelling are common indications for referral to the vascular surgeon in addition to complications such as diminished pulsation, limb ischaemia and enlarging haematomas and occasionally bleeding [19]. In our study series, pain, local pressure, thrombosis, and haematoma were very common indications for referral as shown in the figures above and often with late referrals from the time of the incidents hence the large volume of haematomas

in our experience. Huseyin *et al.* [23] in their observation suggested that pseudoaneurysms of the femoral artery, though common from trauma but are often overlooked because they appear innocuous [17] [18] [19]. It is also common knowledge that pseudoaneurysm of sizes less than 2 cm are managed conservatively [20]. In our series, the aneurysms were larger than 2 cm and open surgical repair which we offered was consistent with standard practice [24]. The combined spinal epidural technique (CSE) was offered to all the patients in our series as this anaesthetic option was seen as the best in patients with CKD and multiple comorbidities [13]. General anaesthesia (GA), local anaesthesia or local anaesthesia with sedations are other options which had been reported [23]. The expected decline in renal function in CKD patients [25] makes it imperative to consider the use of the CSE technique which involves medications that would promote an enhanced recovery strategy [26]. Postoperative analgesic plan for our patients consisted of 3 mg epidural morphine, intravenous paracetamol and diclofenac suppository for limited periods and the outcome was very satisfactory. This supported the observation of Otokwala *et al* about the injudicious use of opioids with background renal impairment resulting in opioid toxicity [27]. Self-limiting symptoms of nausea, occasional vomiting and pruritus were common side effects of morphine.

5. Conclusion

Femoral artery pseudoaneurysm can complicate inadvertent or deliberate repeated needling of the femoral artery during haemodialysis in CKD patients, and open surgical repair for aneurysms greater than 2 cm was successfully done using the combined spinal epidural technique with minimal complications.

Conflicts of Interest

The authors declare no conflicts of interest.

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