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Case Series

C-arm fluoroscopic guided subarachnoid block: a single centre experience

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ABSTRACT

Subarachnoid block is routinely accessed blindly by the use of anatomical landmarks in the localization of the subarachnoid. Performing the procedure using the landmark technique in patients with spinal deformities or morbidly obese can inflict discomfort to the patient from multiple needle pricks or prolonged positioning during the procedure. This article aims to demonstrate the use of C-arm fluoroscopy for easy and smooth access into the subarachnoid space. This was a retrospective review of all patients who had subarachnoid block with the aid of C-arm fluoroscopy for surgeries involving the pelvis and perineum at Colworths Medical Centre, Port Harcourt from September 2020 to June 2022. Data were collected from the patients records over the period of study, there were seven cases recorded. Of the 7 cases, 5 were males and 2 females. Fluoroscopy allows visualization of the needle path and additionally identifies pathological conditions before needle insertion.

Keywords: Fluoroscopy, Subarachnoid block, Spinal anaesthesia, Colworths Medical Centre

INTRODUCTION

The subarachnoid block is routinely performed blindly by the use of anatomical landmarks in identifying the lumbar interspace using an imaginary line drawn across the highest point of both iliac crests known as Tuffier's line.[1] Ultrasound imaging is deployed in the localization of the subarachnoid space for spinal anaesthesia. The use of ultrasound has been shown to reduce the number of attempts required in performing a subarachnoid block.[2] Ultrasound is valuable in accessing the subarachnoid space in predicted difficult cases, real-time ultrasound guidance for spinal anaesthesia in challenging patients provided lower needle insertion attempts and patient satisfaction when compared with using the landmark technique.[3,4] This notwithstanding, the use of ultrasound in localization of the subarachnoid space has some setbacks similar to the conventional palpation method, it was observed that accuracy was largely dependent on the observer's proficiency, even in the hands of the experienced anaesthetist in the use of ultrasound, misinterpretation of the intervertebral levels of the spine has been noted, this is seen in patients with severe spinal deformities and the supra obese.[5]

Fluoroscopy is a well-established imaging tool in operating theatres and pain clinics. Performing the procedure using the landmark technique in patients with spinal deformities or morbidly obese can inflict discomfort to the patient from multiple needle pricks or prolonged positioning during the procedure.[5] The use of fluoroscopy in accessing the subarachnoid space has the advantage of showing real-time images and provides accurate visualization of the intervertebral space and needle paths.[6] This article reports the demonstration of the use of c-arm

fluoroscopy for easy and smooth access into the subarachnoid space.

CASE SERIES

This study was carried out at Colworths Medical Centre (CMC), Port Harcourt, Rivers State, Nigeria. CMC is one of the private health facilities in Port Harcourt the capital of Rivers.

The study involved patients who had Subarachnoid block with the aid of C-arm fluoroscopy for elective surgeries involving the pelvis and perineum at September 2020 to June 2022 (twenty-one months duration).

Procedure

C-arm guidance was chosen for the patients following previous failure at achieving spinal block despite multiple attempts, morbidly obesity, and spinal deformities following pre-anaesthetic review, informed consent was obtained from the patients.

In the theatre, baseline vital signs were obtained and recorded. Intravenous access with appropriate size intravenous cannulae was achieved. The patients were placed in sitting position, a lateral view of the lumbar spine obtained, after the lumbar region of the back was aseptically prepared. L3/L4 interspace identified. To help in identifying the interspace, a 23G hypodermic needle was inserted at the supposed L4/L5 interspace following palpation. This needle serves as a guide on the skin in identifying the appropriate intervertebral space. After L3/L4 interspace was identified, a skin wheal with 1% lidocaine was raised and a 25G Quincke spinal needle was introduced using the paramedian approach, with the sudden loss of resistance the stylet was removed. Correct placement was confirmed by the free flow of cerebrospinal fluid. Hyperbaric bupivacaine (0.5%) was deposited (Figure 1). In some cases, 20 µg fentanyl was added to prolong the SAB. The mean procedure time was 9.5 minutes. Patients were very satisfied with the procedure especially those with previous failed attempts.

Single-shot imaging method was employed to reduce radiation exposure. All theatre staff present wore lead jackets (Figure 1).

The Medical Director of the centre gave approval for the data collection and conduct of the study.

Over the period of the study, there were seven participants that had subarachnoid block with the aid of C-arm fluoroscopy for elective surgeries involving the pelvis and perineum at the CMC. Five were males while 2 were females. Table 1 shows the sociodemographic and clinical characteristics of the participants.

Table 2 shows the types of surgery and the Indications for the use of fluoroscopy are shown in Table 3.

Figure 1: Administration of local anaesthetic agent using fluoroscopy guidance in sitting position.

Figure 2: C-arm fluoroscopic machine in an operating room at Colworths Medical Centre.

Table 1: Sociodemographic and clinical characteristics of the participants

Variable	Mean (SD)*
Age (years)	55±13.4
Weight (kg)	64.4±16.0
Height (cm)	156.6±8.1
Body mass index BMI (kg/m^2)	26.4±5.6
Duration of surgeries under SAB (minutes)**	60±19.3
Duration of SAB procedure (minutes)	9.5±2.4

* Standard deviation; **subarachnoid block

Table 2: Types of surgery.

Type of surgery	Frequency
Transurethral resection of prostate	3
Laser lithotripsy	1
Vaginal hysterectomy	1
Haemorrhoidectomy	1
Abdominal myomectomy	1
Total	7

Table 3: Indications for the use of fluoroscopy.

Indications	Frequency
Previous spinal decompression surgery with implant	2
Patient refusal for GA with difficult spinal anaesthesia	2
Spinal deformities with multiple failed lumbar punctures	2
Morbidly obese patient with previous difficult SAB	1
Total	**7**

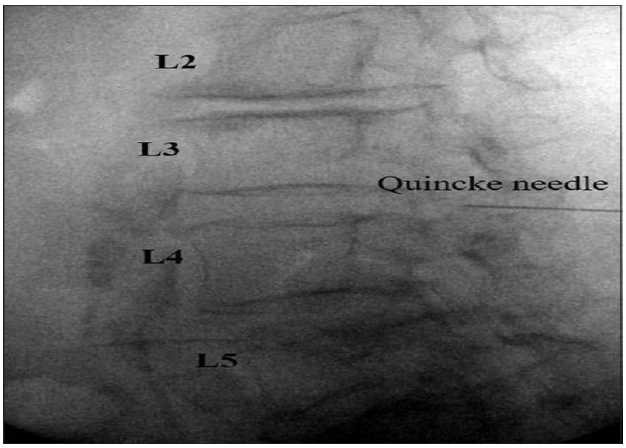

Figure 3: Radiograph of the lumbar region with spinal needle transecting structures at the back.

DISCUSSION

Fluoroscopy-guided subarachnoid block was used in seven patients with various pelvis and perineal surgeries of intermediate duration. The patients had predictably difficult spinal anaesthesia using the landmark-guided SAB as a result of anatomical deformities of the spine. Both the midline and paramedian approaches can be used in accessing the subarachnoid space. In our study, we use the paramedian approach. Adam and colleagues reported that the high success rate in accessing the subarachnoid space using fluoroscopy is largely due to the paramedian approach.[7] The paramedian approach avoids the ossified midline ligaments and a reduced risk of damaging exiting spinal nerve root with a lower incidence of paraesthesia and post-dural puncture headache.[8]

There is paucity of literature that measured the total procedure time, defined as the sum of the time for identifying landmarks and performing the subarachnoid block. Park and co-workers in a study to compare ultrasound-assisted versus landmark-guided spinal anaesthesia in patients with abnormal spinal anatomy showed that ultrasound required longer time to identify the subarachnoid space (95 seconds) as against using the landmark technique (34 seconds).[9] However, this difference was offset by the shorter time required administering the spinal anaesthesia in the ultrasound group (38seconds) than in the landmark group (118 seconds). As a result, total procedure time did not differ significantly between the two groups (133: 152) seconds. In this study, the mean total procedure time was 9.5 minutes, this was largely due operating the fluoroscopy machine. The mean duration of the surgical procedure was (60±19.3) minutes. Subarachnoid technique using 0.5% hyperbaric bupivacaine was used for the procedures as most of the surgeries are of intermediate duration. Infraumbilical surgeries with long-acting local anaesthetic agents such bupivacaine has analgesic effect of 1–3 hours duration and can be increased when adjuvant is added, fentanyl an opioid has shown to prolong the duration spinal anaesthesia.[10]

Fluoroscopy is also useful in patients with marked degenerative changes resulting in very narrow intra-laminar spaces. Although fluoroscopy is highly accurate in the localization of the intervertebral space it is deemed inappropriate to be used routinely.

Radiation exposure and the associated biological side-effect to the patient and the staff remain a major concern with the fluoroscopic guided subarachnoid block. This can be minimized by the judicious patient selection, reducing exposure time, proper shielding, and the use of low doses and pulse modes.[11,12]

CONCLUSION

The knowledge of fluoroscopic technique provides the anaesthesiologist with options and opportunities to provide regional anaesthesia in patients with challenging anatomy.

In patients with a seemingly impossible neuraxial block by the landmark technique, fluoroscopic guidance can be helpful in the visualization of the needle paths in real-time into the intervertebral space as well as the identification of pathological conditions prior to needle insertion. As such, fluoroscopy enables patients with spinal deformities or the morbidly obese have subarachnoid block for infraumbilical surgeries.

Recommendations

Provision of fluoroscopy machines in more health facilities and the training of the personnel to operate them.

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