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Case Report

Administration of Spinal Anesthesia in the Jack-knife Prone Position for Anorectal Surgeries

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Abstract

At the institution, anorectal surgeries are often done in prone-jackknife position, under Monitored Anesthesia Care (MAC) combined with either local infiltration or intrathecal spinal anesthesia.

The traditional technique for spinal anesthesia is done with 0.75% hyperbaric Bupivacaine in a sitting position and the patient remains in this position for 10-15 minutes before turning into a prone jackknife position for the surgery. The other approach for spinal anesthesia is done while patient is already in a jackknife prone position and using 0.25% hypobaric Tetracaine, former technique is easier than the latter however demands a longer knife-to-skin time and patients are potentially prone for more hemodynamic instability.

In this case series, three male adults who underwent anorectal surgery in the jackknife position with jack-knife position for spinal anesthesia and mild MAC has been described.

The operating time was more efficient, the perioperative course and recovery were uneventful. Patient and staff satisfactions were encouraging and promising for the jackknife spinal anesthesia technique. A short acting hyperbaric local anesthetic will further enhance efficiency by shortening recovery and discharge time.

Keywords: Spinal anesthesia; Hemi-spinal; Hypobaric; Anorectal surgery; Jackknife; Sensory; Motor.

Introduction

Minor anorectal diseases are rather common. The prevalence of the anorectal dis-ease is 4-5% in adult population in the United States and 10% of those cases require an operation [1]. Due to its extensive nerve supply, anorectal surgeries are notorious for being extremely stimulating and painful therefore when it is performed under mild to moderate sedation, will often cause unwarranted adverse events like, pain, reflex body

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movements, hemodynamic changes, tachypnea, and or laryngeal spasm [2,3]. Deep sedation or general anesthesia will provide adequate anesthesia; however, the latter requires longer recovery and is less ideal for the short ambulatory services. Additionally, general anesthesia requires repositioning to prone jackknife position which would be less efficient for the operating room time besides the potential risks for staff's physical injury. Therefore, neuraxial/spinal anesthesia has become an attractive alternative solution. Spinal anesthesia is commonly administered to the patients in a sitting position, using hyperbaric anesthetic agent and patients are required to stay in a sitting position until local anesthetic is absorbed by the spinal fibers to achieve the desired block before repositioned in the jackknife.

The advantage of this technique is the patient being awake and can participate in repositioning however it is time inefficient, and repositioning might result in unpredictable high spinal spread and hemodynamic instability [4]. The alternative technique is administering spinal anesthesia in jackknife position. Although the technique was first described in 1963 it is not widely practiced [5]. It can provide an extremely efficient and safe process for anorectal procedures. Using this technique, the patients would already be in an optimized surgical position and provided an ideal hemi-spinal sensory anesthesia with no hemodynamic or respiratory complications.

There are limited published studies and guidelines on this technique. It is hoped that the case series will build more interest in this technique and will establish further studies and research.

Case description

Institutional Review Board approval is not required for case reports involving 10 patients at NYU Langone Medical Center (New York City, NY). Three anorectal procedures were performed over a two-month period with the same anesthesiologist-surgeon team and retrospectively reviewed (Table 1). The patients were positioned directly in prone-jackknife position upon entering the operating room for optimal surgical exposure. A pillow was placed under the abdomen to achieve lumbar spine flexion and widen the interlaminar spaces and extra padding was placed under both knees for comfort. Standard anesthesia monitors including pulse oximeter, 5-lead EKG and non- invasive blood pressure cuff were placed and initial vital signs obtained. Supplemental oxygen was provided via nasal cannula at 4L/min with positive end-tidal carbon dioxide monitoring. The patients were sedated with Propofol infusion at a rate of 25mcg/kg/min. Then, the patients' lower back was disinfected with Chlorhexidine. Spinal needle 24-gauge Whitacre pencil-point was inserted after local infiltration of the skin with lidocaine 1% 3-5 ml. 3 ml syringe was attached to the spinal needle and mild negative pressure was applied during the insertion to aspirate for CFS. A Hypobaric mix containing 1ml of 10mg Tetracaine in 3ml of sterile water was injected in the intrathecal space at the L4/L5 spinal level. No further positioning was required to begin the surgical procedure. During the surgical procedure, the patients remained comfortable, spontaneously breathing with no additional medications administered. The patients were then repositioned to supine and transported to the post-anesthesia care unit via a stretcher in stable condition.

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Case	Diagnosis	Procedure Performed	Time from block placement to incision	Operative Time	Time of rom PACU admission to discharge
1	Rectalmass	EUA and core needle biopsy	11 min	13 min	219 min
2	Fistula- in-ano	EUA with placement of Malecot drain	19 min	37 min	133 min
3	Fistula- in-ano	EUA with fistulotomy	19 min	14 min	149 min

Table 1: Cases distribution and outcomes. EUA: Examination under anesthesia.

Discussion

The majority of anorectal surgeries are carried out on an ambulatory basis and require anesthesia to be deep and easily adjustable [6]. However, there is no ideal anesthetic for these ambulatory and rather stimulating surgeries. General anesthesia will provide adequate anesthesia, however, when standard general anesthetics are used, the duration of anesthesia significantly outlasts the duration of the operation.

Aside from intra-operative complications associated with general anesthesia and prone positioning, the post-operative period can be complicated by events such as residual effects of anesthesia, nausea, vomiting, and pain [7]. These side effects lead to prolonged hospital stays and extra burdens on patients and the institution.

Neuraxial spinal anesthesia is an attractive alternative for anorectal surgeries. Advantages of spinal anesthesia include rapid onset of sensory and motor blocks, predictable efficacy, and prompt progression. Needless to mention that it is relatively simple and inexpensive to administer as well. Additionally, it can avoid the discomforts associated with general anesthesia such as sore throat, airway trauma, and muscle pain.

However, the majority of spinal anesthesia for anorectal procedures are performed with the patients in the sitting position and the choice for the local anesthetic tends to be a hyperbaric solution. Administering a hyperbaric solution requires the patients to remain seated for at least 15- 20 minutes in order for the local anesthetic to diffuse locally into the intrathecal space and into the spinal roots.

This timing is extremely crucial as it prevents cephalic spread of the local anesthetic once the patients are repositioned in the jackknife position. Cephalad spread of the local anesthetics which is facilitated by gravity in the jackknife position can potentially cause fatal hemodynamic instability and respiratory depression (Figure 1).

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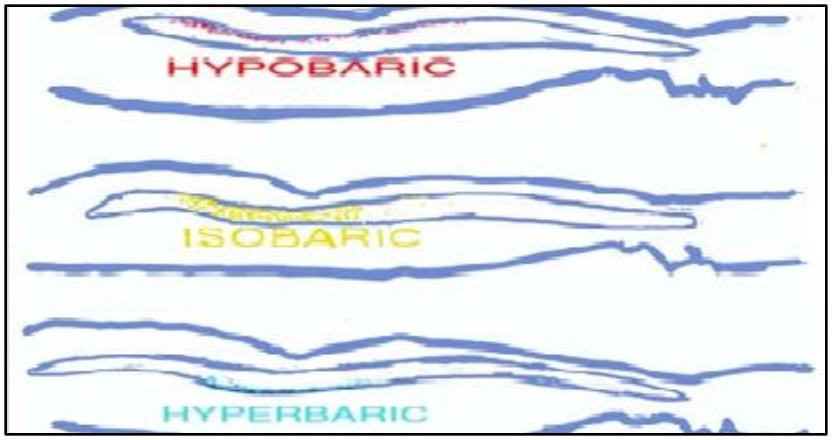

Figure 1: Dispersion of hyper-, iso-, and hypo-baric local anesthetic relative to CSF.

Another drawback of spinal anesthesia in the sitting position is that it causes both motor and sensory blocks. In this position, local anesthetic spreads anteriorly and posteriorly within the intrathecal space and affects both sensory and motor fibers.

This prevents the possibility of providing a hemi-sensory block which can be a major advantage during recovery time and facilitating a quicker discharge. Repositioning the patients to the jack- knife position after the spinal procedure inherits other challenges as well, such as patient participation and physical injury especially in patients with high BMIs. During experience utilizing the jackknife position, one of the patients had complete recovery from spinal anesthesia by the end of the surgical procedure with no urinary retention. This confirmed the belief that spinal anesthesia in a jackknife position could likely provide selective hemianesthesia by selectively blocking the sensory dorsal roots, which is difficult to achieve in a sitting position. Aside from patient position, the baricity of the local anesthetic plays a major role in its spread within the intrathecal space as well (Figure 2).

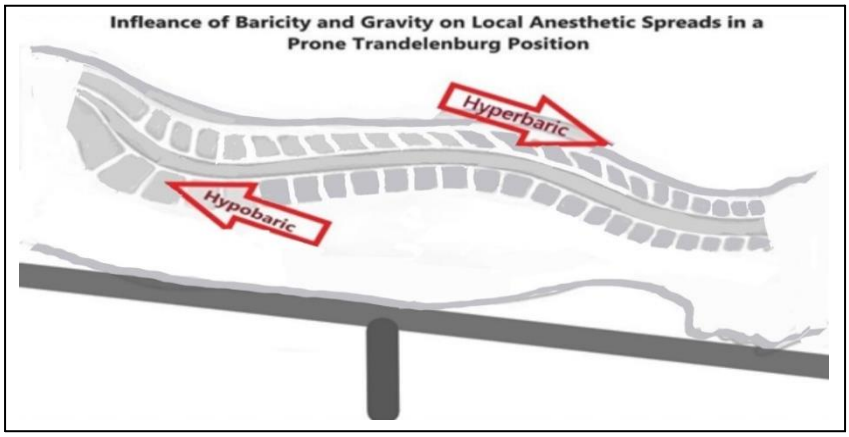

Figure 2: In Prone Trandelenburg Position, hyperbaric Local Anesthesia spreads Cephalad While Hypobaric anesthetics spreads Caudad.

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The isobaric solution is unpredictable and has been shown to result in a block from L5 up to T2 levels [8]. The hyperbaric solution is a little more predictable as it only raises a few segments compared to the isobaric solution. A potential risk with hyperbaric solutions is that the height of the block may rise a few segments when changing positions on the operating table and therefore it is essential to monitor the patient [9].

The hypobaric solution is suitable when the operation is performed in the jackknife position. The advantages of the hypobaric solution are the absence of motor block and stable hemodynamics. Hypobaricity of this solution allows the local an- esthetic to be injected selectively in the posterior intrathecal space which is localized to sensory nerve fibers. Literature shows that hypobaric lidocaine provides sufficient analgesia for short anorectal surgeries [10].

Hypobaric Tetracaine, which is a potent local anesthetic and limited its volume to 4ml to avoid its dispersion into the anterior intrathecal space has been used.

The major advantages of selectively blocking sensory fibers are minimizing side effects such as urinary retention and enhance rapid mobility, recovery from the block, and shorter stay in the postoperative anesthesia care unit (Figure 3).

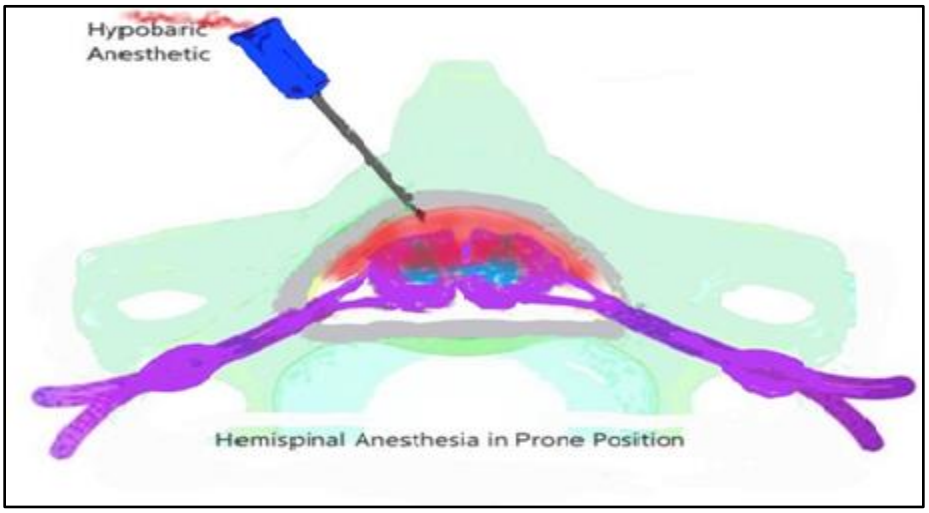

Figure 3: Hemi-spinal anesthesia spread over the dorsal root.

It is important to note that in order to identify the subarachnoid space in the jack- knife position, a slight negative pressure by gently pulling on the plunger of the syringe on the spinal needle has been generated.

This slight negative pressure is crucial to counteract the antigravity position of jackknife position. Aspirating cerebrospinal fluid confirmed proper placement of the spinal needle in the intrathecal space before injecting the medication.

Conclusion

Spinal anesthesia in the jackknife position is an underutilized technique in ambulatory anorectal procedures. The technique provides optimal surgical position without any further repositioning to begin the operation which minimize hemodynamic and respiratory instability and raise the safety for the patients. By using a hypobaric solution, adequate anesthesia and comfort for the patients, minimize unnecessary motor anesthesia, fasten the surgical start time, enhance

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recovery and limit the hospital stay has been provided. To achieve hemi-spinal anesthesia with hypobaric local anesthetic, patients would need to stay prone until the local anesthetic is completely absorbed and cleared from the CSF before turning into a supine position.

In experience, this was successfully done, using 8 mg of the hyperbaric Tetracaine and maintaining patient in prone position for one hour after the spinal block was placed. However, further studies are needed to verify this outcome.

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