

Interpleural block: a new technique for regional anaesthesia during percutaneous nephrostomy and nephrolithotomy

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Interpleural block was used in four patients undergoing percutaneous nephrostomy, one of whom also underwent percutaneous nephrolithotomy. Interpleural block was achieved with the standard technique using 30 ml of 0.5 per cent bupivacaine. All patients tolerated the procedure well and remained haemodynamically stable during the operative procedure. Mean pain relief from initiation of interpleural block was ten hours (SD = 4.32). Interpleural block was an effective method of obtaining anaesthesia for percutaneous nephrostomy and nephrolithotomy in these four patients.

Un bloc interpleural a été utilisé chez quatre patients devant subir une néphrostomie percutanée dont un a aussi subi une néphrolithotomie percutanée. Le bloc interpleural a été acquis avec une technique standard utilisant 30 ml de 0,5 pour cent de bupivacaine. Tous les patients ont toléré la procédure et sont restés stables hémodynamiquement durant la procédure opératoire. En moyenne le soulagement de la douleur à partir du début du bloc interpleural était de dix heures (SD = 4.32). Le bloc interpleural était une méthode efficace d'obtenir l'anesthésie pour une néphrostomie percutanée et une néphrolithotomie chez ces quatre patients.

Key words

ANAESTHETIC TECHNIQUES: regional, interpleural;
ANAESTHETICS, LOCAL: bupivacaine;
SURGERY: urological.

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Percutaneous nephrostomy and nephrolithotomy are procedures performed for removal of renal calculi. The procedure may be performed in two stages, the first stage in the radiology suite for percutaneous nephrostomy under fluoroscopy control and the second in the operating room to remove the stone, nephrolithotomy. At our institution, these procedures are usually performed under local anaesthesia which provides unsatisfactory pain relief in many cases. Recently, Reistad *et al.*¹ have reported the use of interpleural block in adults to provide pain relief after mastectomy, cholecystectomy and renal surgery. This technique was successfully used for percutaneous nephrostomy and nephrolithotomy in the following four patients. The study was approved by Hospital Human Research Committee and informed consent was obtained from each patient.

Case 1

A 77-yr-old woman with a history of hypertension, diabetes, atherosclerotic heart disease and chronic bronchitis was diagnosed to have left and right renal calculi. Right percutaneous nephrostomy was performed under local anaesthesia in the radiology suite followed by nephrolithotomy in the operating room under general anaesthesia. Two days later the same procedure was performed on the patient's left side using interpleural block with standard monitoring (ECG, blood pressure, respiratory rate and pulse oximetry). Left interpleural block was performed with the patient in the lateral position. After skin infiltration with one per cent lidocaine, an 18G Tuohy needle was used to enter the eighth intercostal space percutaneously in the mid-axillary line. The interpleural space was identified by negative suction of air from a well lubricated air-filled glass syringe along with respiratory movements of the plunger. Keeping the bevel of the needle pointed medially, posteriorly, and caudally, a 20G epidural catheter was inserted through the needle and fixed well to the skin. The position of the

epidural catheter was confirmed by fluoroscopy. Thirty-five ml of 0.5 per cent bupivacaine were injected through the catheter over a five-minute period and the patient was kept in the supine position. Following the interpleural block, percutaneous nephrostomy was performed in the radiology suite. The blood pressure remained stable between 140–160 mmHg systolic and 60–70 mmHg diastolic and the heart rate remained between 75–85 beats per minute. The patient did not require any supplemental sedation or narcotics during the procedure.

Upon completion of the percutaneous nephrostomy, the patient was transferred to the operating room where 20 ml of 0.5 per cent bupivacaine were injected interpleurally (two and a half hours following the initial injection) through the epidural catheter as a top-up dose over five minutes. Percutaneous nephrolithotomy was performed under haemodynamically stable conditions. The blood pressure remained stable between 130–145 mmHg systolic and 65–75 mmHg diastolic and heart rate measured 80–90 beats per minute throughout the second procedure. The patient received no narcotics or sedation, tolerated the procedure well, and was pain-free for 16 hr from the initiation of interpleural block.

Case 2

A 45-yr-old hispanic man with no significant medical problems was scheduled for left percutaneous nephrostomy for renal calculi. Left interpleural block was performed in the radiology suite with standard monitoring with patient in the lateral position. Thirty ml, 0.5 per cent bupivacaine was injected interpleurally through the epidural catheter. The blood pressure remained stable: 130–150 mmHg systolic and 75–85 mmHg diastolic as did heart rate at 72–82 beats per minute. The patient remained stable during the procedure and did not require supplemental narcotics or sedatives. He tolerated the procedure well and remained pain-free for eight hours from initiation of interpleural block.

Case 3

A 72-yr-old woman with hypertension, atherosclerotic heart disease and diabetes was scheduled for percutaneous nephrostomy for renal calculi. Left interpleural block was performed in the radiology suite with standard monitoring (patient in left lateral position) with the same technique as previously described. Thirty ml, 0.5 per cent bupivacaine was injected interpleurally through the epidural catheter. The blood pressure remained stable between 140–160 mmHg systolic and 85–95 mmHg diastolic and the heart rate was 70–78 beats per minute. The patient remained stable during the procedure and did not require any sedation or narcotics. She tolerated the procedure well

and was pain-free for ten hours from initiation of interpleural block.

Case 4

A 60-yr-old hispanic man with no previous medical history was scheduled for left percutaneous nephrostomy for renal calculus. Left interpleural block was performed as previously described using 30 ml of 0.5 per cent bupivacaine. The blood pressure remained stable between 110–130 mmHg systolic and 65–75 mmHg diastolic and the heart rate remained stable between 65–75 beats per minute throughout the procedure. The patient did not require additional pain medications. Midazolam 2 mg, in divided doses, was given for sedation for the duration of the procedure. The patient tolerated the procedure well and remained painfree six hours from initiation of interpleural block.

Discussion

Percutaneous nephrostomy and nephrolithotomy are technically difficult and painful procedures and are sometimes performed on patients with cardio-respiratory disease, which makes the anaesthetic management more challenging. Reistad *et al.*¹ reported interpleural block as a safe and effective method for controlling pain over several dermatomes of the hemithorax.

Following this report, interpleural block has been demonstrated to be effective in pain control caused by multiple rib fractures,⁵ pancreatic disease⁶ and after thoracotomy.⁷ Interpleural block has also been shown to provide adequate anaesthesia for procedures such as needle localization and biopsy of breast masses,⁸ extracorporeal shock wave lithotripsy⁹ and percutaneous hepatobiliary drainage.¹⁰

While the action of interpleural block with bupivacaine is not fully understood, it has been suggested that diffusion of the local anaesthetic solution through the parietal pleura and innermost intercostal muscles causes blockade of multiple intercostal nerves to provide adequate anaesthesia.⁴ Experimental studies on animal models by Vade Boncouer *et al.*^{11,12} have confirmed this hypothesis.

It has been well established, in various studies, that adequate anaesthesia of longer duration can be achieved by using a larger volume of 0.5 per cent bupivacaine.^{2,13} Seltzer *et al.*² reported that following 30 ml of 0.5 per cent bupivacaine injected interpleurally, plasma levels of 2.07 (SD = 0.58) $\mu\text{g} \cdot \text{ml}^{-1}$ were achieved. Jorfeldt *et al.*³ reported the toxic level of bupivacaine to be above 4.0 $\mu\text{g} \cdot \text{ml}^{-1}$. We therefore used 30 ml of 0.5 per cent bupivacaine in our patients and achieved adequate anaes-

thetia and prolonged postoperative analgesia with excellent haemodynamic stability.

While no patient in our study had evidence of complications, the following potential complications may occur: pneumothorax, haemothorax, empyema, systemic toxicity, intravascular injection and Horner's syndrome. We believe that pleural fibrosis, pleural infection, pneumothorax, pleural effusion, severely compromised cardio-respiratory function and sensitivity to local anaesthetic agents are contraindications to interpleural block. The use of interpleural block has not been previously described to maintain anaesthesia for percutaneous nephrostomy or for a two-stage procedure such as percutaneous nephrolithotomy. These patients had excellent pain relief during the procedure without haemodynamic alterations. Mean duration of pain relief from initiation of interpleural block was ten hours.

Conclusion

Interpleural block was a safe and effective method of obtaining anaesthesia without haemodynamic disturbance in four patients for percutaneous nephrostomy and nephrolithotomy. It is a relatively simple technique and has little risk of complications. Controlled randomized studies will be necessary to determine the advantages of this technique over other forms of anaesthesia.

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