Circumcision Supplemented by Dorsal Penile Nerve Block With 0.75% Ropivacaine: A Complication

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Background and Objectives: Dorsal penile nerve block is a common procedure and can provide effective analgesia after penile surgery. Ischemic complications are rare and generally result from trauma or inadvertent administration of vasoconstrictive solutions.

Case Report: We describe a period of temporary ischemia of the glans penis occurring 40 minutes after dorsal penile nerve block with 0.75% ropivacaine. This was successfully treated with an intravenous infusion of iloprost (a PGI_2 analogue), and at 43 hours appearances were normal.

Conclusion: Theoretical concerns over the vasoconstrictive properties of ropivacaine may be sufficient to avoid its use where the potential for ischemia to end organs is present. *Reg Anesth Pain Med 2000;25:424-427.*

Key Words: Ropivacaine, Dorsal penile nerve block.

Postoperative analgesia for penile surgery is commonly provided by regional nerve block, and this can be performed by a variety of methods. When choosing penile nerve block, the avoidance of local anesthetic solutions containing vasoconstrictors is mandatory. We describe a patient in whom pallor of the tip of the penis occurred following a dorsal penile nerve block using 0.75% ropivacaine. Although ropivacaine is known to cause vasoconstriction, the effect is predominant at lower concentrations and, until now, considered of little clinical significance. This case report questions the advisability of using ropivacaine for regional anesthesia to end organs.

Case History

An 18-year-old man underwent elective circumcision as an outpatient, having been admitted on 2 previous occasions for division of preputial adhesions. These operations had been performed uneventfully in the same year at the age of 11, once under general anesthesia and on the second occasion under general anesthesia combined with a penile nerve block. He had mild asthma but no other significant past medical history and was on no routine medications.

Anesthesia was induced with propofol (200 mg), fentanyl (50 µg), and a laryngeal mask was inserted, after which anesthesia was maintained with sevoflurane. A dorsal penile nerve block was then performed. Using a 21-gauge needle, Buck's fascia was penetrated through a single midline insertion. A total of 8 mL of 0.75% ropivacaine was injected with angulation to the left and right of midline to reduce the risk of damage to the dorsal artery. A further 2 mL was then injected subcutaneously around the frenulum, because this has been reported to improve the quality of analgesia due to the contribution of perineal innervation.[1]

At no time was blood aspirated and the operation proceeded uneventfully with clinical evidence of sensory block. The prepuce was split dorsally and then removed to both sides. Hemostasis was secured with bipolar diathermy and ligation was achieved using 3/0 Vicryl, after which the skin and mucosa were approximated with 3/0 catgut and dressings applied. The operation took 25 minutes. At no stage during the operation or after the initial performance of the block was pallor noted.

Shortly after the patient arrived in the recovery ward, it was noted that the glans penis was pale.

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Following surgical review, the dressings were removed with only marginal improvement; after a period of observation it was decided to admit the patient. Eight hours after the procedure the penis was insensate and the clinical picture unchanged, with pallor of the tip of the glans. There was no edema. Inspection of the injection site showed no evidence of hematoma, swelling, or pallor.

An opinion was sought from the vascular physicians and, on their advice, subcutaneous Fragmin (dalteparin sodium) (Pharmacia and Upjohn, Milton Keynes, UK) was administered in a dose of 15,000 IU. An iloprost infusion was commenced (0.5 to 2 µg/h) and continued with gradual improvement. It was stopped at 43 hours, when appearances were normal. There were no residual sequelae and the patient was discharged.

Discussion

Dorsal penile nerve block (Fig 1) is a useful technique in providing analgesia after circumcision, with a reported failure rate of 4% to 7% and a low incidence of complications.[2] These complications tend to be minor and include small ecchymoses at the injection site, hematoma formation, and mild local edema. However, Sara and Lowry[3] have reported 2 children presenting with gangrene of the skin of the glans after penile nerve block with plain solutions of 0.5% bupivacaine. In both cases, presen-

Image available in print only.

Fig 1. Dorsal penile nerve block: Single-injection technique. (Reprinted with permission from: Cousins MJ, Bridenbough PO, *Neural Blockade in Clinical Anesthesia and Management of Pain*, Lippincott-Raven, 1998.[11])

tation was delayed (first and third postoperative days), and it was suggested that compression by bleeding at the site of injection may have been the underlying mechanism. In the first case, the patient was discharged without treatment; at review 2 weeks later, the patient had a small loss of dorsal coronal skin. In the second example, an intravenous infusion of heparin was administered for 4 days. The patient was discharged on the ninth postoperative day with no residual defect.

A further case report describes the inadvertent performance of a penile block with epinephrine 1:1,000 in a 2-day-old infant.[4] This resulted in pallor of the suprapubic area and the penile shaft, and systemic manifestations of epinephrine toxicity. A caudal catheter was inserted and a single injection of 0.5 mL/kg of 1% lidocaine administered to establish a sympathetic block. The perfusion improved and was considered to be normal at 18 hours. This case illustrates the importance of avoiding injection of epinephrine-containing solutions when performing penile nerve blocks, because the vessels at the site of injection are end arteries.

The arterial supply to the penis is through terminations of the internal pudendal artery, the first branches of which supply the bulbourethral arteries. These traverse the corpora spongiosa to ultimately provide some of the arterial supply to the glans. The glans is also supplied by the dorsal arteries, which give off circumflex branches that perforate the tunica albuginea, particularly near the distal end of the corpora.

The etiology of a period of presumed temporary ischemia to the glans in our case can only be postulated and may be multifactorial. Unintentional vascular injury cannot be excluded, but is unlikely in view of the technique and lack of any apparent swelling or perineal bruising. Perivascular pressure due to the formation of a mini-compartment syndrome secondary to an anatomical abnormality is also unlikely due to the prior performance of an uneventful penile nerve block using the same volume of local anesthetic (bupivacaine) by the same technique, although this cannot be excluded. There was no swelling or engorgement of the glans, suggestive of venous damage. There were also no factors to suggest a failure of surgical technique, which can result in a spectrum of complications after circumcision.

It has been shown in several studies that ropivacaine possesses intrinsic vasoconstrictive action, although the clinical significance of this is unclear. As with other amide local anesthetics, it exerts a biphasic effect on the vasculature. Although in vitro studies on isolated human arteries show no significant difference in vasoactivity between lidocaine and ropivacaine, comparison of the direct vascular effects of local anesthetics on the femoral artery and vein of the dog reveal ropivacaine to be a potent vasoconstrictor.[5,6] Further evidence for vasoconstriction with ropivacaine is suggested by a median decrease in epidural blood flow of 37% (17% to 85%) when measured using the xenon clearance technique, in comparison to an increase in blood flow seen with administration of epidural bupivacaine.[7] The effects of ropivacaine are dose dependent, with vasoconstriction more pronounced at lower concentrations. However, intradermal administration of ropivacaine in a concentration of 0.75% has been shown to produce a net decrease in skin blood flow compared to saline when measured with laser Doppler flowmetry.[8] The potential for ropivacaine to have contributed to the clinical picture is therefore theoretically possible. What is more apparent, however, is that there appears to be no clear advantage to be gained by the use of ropivacaine in this situation, where concerns over systemic toxicity are minimal.

Therapy with an intravenous infusion of iloprost (a PGI_2 analogue) was instituted, and during the course of the infusion the color of the glans returned to normal. Prostacyclin (PGI_2), the major prostanoid produced by blood vessels, inhibits platelet aggregation and relaxes vascular smooth muscle. It has been administered by intra-arterial or intravenous infusion to patients with severe vascular disease and has also been used in the treatment of impotence.[9,10] The improvement in perfusion was slow, as in the report by Sara and Lowry,[3] and it is uncertain as to the contribution made by iloprost in the recovery profile.

Having not previously used ropivacaine for this procedure and with considerable experience of the technique, we suggest that it may be advisable to avoid the use of ropivacaine for any regional anesthetic technique where there is an end artery or the potential for ischemic injury is increased.

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