

end-expiratory pressure measurements taken at near-zero airway flows should theoretically minimize this error, since transients should have maximally settled by end-expiration. The PAD pressure values obtained just before initiation of the next ventilatory cycle would yield the most stable estimation of LAM pressure. The low-pass digital filter yields a mean value for pulmonary arterial pressure that is an exponential weighting of all previous pulmonary pressures.

The algorithm demonstrates that more reproducible determinations of PVR can be obtained in the ICU. Although the PVR so derived is surely biased, it will permit more reliable detection of changes in PVR. Stated in the most practical way, errors in determination of PVR caused by the conventional method of calculation can be larger than changes that would indicate a change in a patient's condition if accepted as real. Our approach is straightforward, easily implemented, and significantly decreases the scatter in results not due to a change in patient status.

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Beta-receptor Blockade Following the Use of Eye Drops

STANLEY I. SAMUELS, M.B., B.Ch.,* AND MERVYN MAZE, M.B., Ch.B.†

Glaucoma is characterized by increased intraocular pressure (IOP), which, if untreated, eventually leads to blindness due to restriction of the retinal arterial blood supply and compression of the optic nerve head. In the treatment of glaucoma, use is made of autonomic drugs, usually by topical application, to decrease IOP. However, profound systemic effects have been found with the use of these drugs.¹⁻³ Increased IOP can also be decreased with the aid of β -adrenergic blocking agents.⁴ These drugs, used topically, have met with great enthusiasm, since they do not disturb vision or cause hyperemia of the conjunctiva. Despite the potential usefulness of β -adrenergic blocking agents in the treatment of glaucoma, there is a danger that they too could exert a systemic effect following

topical application because of high lipid solubility and ease of tissue penetration. This has recently been shown to occur in the case of pindolol, a β -adrenergic blocker, in healthy volunteers.⁵ We now report the occurrence of systemic effects with timolol (Timoptic®), a β -adrenergic blocking agent, when used by topical application in a patient with glaucoma.

REPORT OF A CASE

A previously healthy, 73-year-old, moderately obese, 54-kg white woman, ASA 2, was admitted for vaginal repair of a cystocele and rectocele and hysterectomy. Past medical history revealed that she had glaucoma that had been first diagnosed three years prior to admission. Originally she had been treated with pilocarpine eye drops, but this had been changed, three months earlier, to timolol, 0.25 per cent, eye drops, one drop in each eye twice daily. Previous operations included uncomplicated cholecystectomy and hiatal hernia repair. She had no allergy and took no other medication. Preoperative physical examination showed no abnormality except a slow pulse, 58 beats/min. The electrocardiogram showed sinus bradycardia, but was otherwise normal.

The patient received meperidine, 75 mg, and hydroxyzine, 100 mg, im, for preoperative medication. Blood pressure immediately

* Assistant Professor of Anesthesia.

† Resident in Anesthesia.

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Address reprint requests to Dr. Samuels.

before induction was 130/70 torr, with a pulse rate of 60 beats/min. Anesthesia was induced with thiopental, 500 mg, in divided doses, and intubation of the trachea was facilitated with succinylcholine, 100 mg. Anesthesia was maintained with nitrous oxide: oxygen (3:2 l/min) and enflurane, to 2 per cent. During the operation, the lungs were mechanically ventilated at a tidal volume of 800 ml and a rate of 10/min. There were episodes during the operation in which blood pressure decreased 20–30 torr in response to sudden blood loss or repositioning the patient in the head-up position. However, pulse rate did not alter during these episodes and remained 50–60 beats/min throughout. Apart from this, anesthesia and operation were uneventful. There was a 1,200-ml blood loss, but blood was replaced at the time; the operation lasted five hours. Bradycardia persisted in the immediate postoperative period, and heart rate decreased to as low as 45 beats/min. This proved to be refractory to atropine, 0.4 mg, iv. Use of a beta agonist, such as isoproterenol, to accelerate heart rate was judged unwarranted, since the patient manifested no adverse effect of the bradycardia. The patient inadvertently omitted the timolol eye drops for four days postoperatively, during which period pulse rate increased to 80–100 beats/min. There was no other cause for this relative tachycardia. Reinstitution of the timolol eye drops resulted in reversion to a rate of 60 beats/min.

DISCUSSION

Timolol is a nonselective β -adrenergic blocking agent which lacks local anesthetic and intrinsic stimulant activities.⁶ The onset of maximal reduction in intraocular pressure occurs about four hours following conjunctival administration and persists for 12–24 hours after a single dose.⁷ Its use in the treatment of glaucoma was particularly welcome owing to the lack of systemic effect⁷ when it was administered locally in an ophthalmic solution. However, this study examined only the effects after a single administration and has now been challenged by the sporadic findings of unwanted systemic effects from sustained topical administration.⁸ Furthermore, the manufacturers have

included a warning concerning the use of timolol in patients with underlying bronchospastic disease, since there are several reports of worsening bronchospasm occurring within two days of administration of timolol eye drops.[‡] Having excluded various perioperative causes of sinus bradycardia on clinical grounds, we suspect that timolol maleate caused a β -adrenergic block due to systemic absorption. Thus, both β_1 - and β_2 -adrenergic systemic blockade effects have been seen with the use of local application of timolol.

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Hairline Cracks in Epidural Needles

L. B. READY, M.D., F.R.C.P.(C)*

To perform a lumbar epidural block in obstetrics, a reusable Crawford 18-gauge, thin-wall, stainless-steel needle was selected (Becton Dickinson Cat. #1304). Following the usual skin preparation, draping, and infiltration of the skin and superficial tissues with local anesthetic, the tip of the needle was

inserted from a paramedian approach into the ligamentum flavum. A 10-ml glass control syringe containing saline solution was attached to the needle in order to facilitate identification of the epidural space by a "loss of resistance." When resistance to the injection of saline solution could not be perceived, the needle was withdrawn to the subcutaneous tissue and reinserted into the ligamentum flavum a second time. Again, no resistance to saline injection was felt. The needle was completely withdrawn and examined. It was found to have a series of hairline cracks,

* Assistant Professor.

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Address reprint requests to Dr. Ready.