LETTERS TO THE EDITOR

Sir,

We read with interest the report by Tanner and Caswell on the comparative effects of 2.5% and 10% phenylephrine on pupil mydriasis for cataract surgery, in which it was concluded that there was no statistically significant difference between the two concentrations in the initiation and maintenance of mydriasis during either phacoemulsification or extracapsular cataract extraction.[1] While this may be true, their report does document a 4-fold greater incidence of inadequate initial mydriasis with the 2.5% as compared with the phenylephrine 10% concentration. In addition, as the authors acknowledge, Duffin and co-workers found, in their study of 44 patients undergoing extracapsular cataract extraction, that phenylephrine 10% was significantly better for maintaining mydriasis intraoperatively.[2] While maximal dilatation may now be less necessary with the advent of continuous capsulorhexis and endocapsular phacoemulsification, the issue of relative efficacy is important, given the concern about potential systemic side-effects from phenylephrine, and the question as to whether the weaker concentration is less likely to produce these effects.

To study the potential systemic side-effects of phenylephrine, Brown and co-workers performed a prospective, randomised, double-masked study of 100 subjects receiving phenylephrine 10% compared with 50 subjects receiving tropicamide 1% and found that there was no statistically significant difference between the two groups with respect to drug effect on either blood pressure (BP) or pulse rate (PR), and that neither group recorded a mean increase in either systolic or diastolic BP, mean BP and PR showing a *decrease* from baseline measurement.[3] This finding was also notable given the use of *aqueous* phenylephrine, which is regarded as possibly being more likely to produce systemic side-effects than the viscous preparation, which retards systemic absorption of phenylephrine. The patients studied do not, however, appear to have been in a pre-operative situation, so that the potential effect of increased anxiety due to imminent surgery may need to be considered.

In a study of 126 patients having routine cataract surgery, we looked for evidence of alteration in systolic and diastolic BP after instillation of phenylephrine 10% (Minim) and cyclopentolate 1%, and also compared these patients with an additional small number of consecutive patients ($n = 14$) who received cyclopentolate 1% alone. The mean age of the combination group was 73.1 years (range 37–90 years) with 40% males; the mean age in the cyclopentolate-only group was 73.3 years (range 60–88 years) with 46% males. The drops were administered at 15-minute intervals to a total of three instillations prior to surgery. An initial BP measurement was taken prior to the instillation of any drops, and BP was then recorded prior to each subsequent installation, and again just after the patient entered the operating theatre. No change was seen in the mean systolic or diastolic BP of either group during the period of the measurements (Table I). However, analysis of fluctuations in systolic BP of >30 mmHg across each group showed that, while in the phenylephrine-treated group 19 of 126 (15%) recorded elevations >30 mmHg, 20 of 126 (16%) showed a depression of >30 mmHg; in the cyclopentolate-only group, 1 of 14 (7%) patients recorded a depression, with no patients showing an elevation. The cyclopentolate-only group is small, but a paired two-tailed Student's *t*-test showed a statistically significant difference ($p<0.05$) between the two groups. The fluctuations in systolic BP did not correlate with whether a previous diagnosis of systemic hypertension had been made. These results demonstrate some volatility in the BP within the phenylephrine-treated group, such that mean BP measurement may be an inappropriate way to record group results in studies such as these. The depression of systolic BP observed may represent a decrease in anxiety, as suggested by Brown and coworkers,[3] or

Table I. Mean systolic and diastolic blood pressure measurements (mmHg; ±1 SD) are recorded for 126 patients immediately prior to receiving a combination of one drop each of phenylephrine 10% and cyclopentolate 1% at 15 minute intervals to a total of three doses prior to cataract extraction. The mean blood pressure for the group does not vary significantly

	Blood pressure (mmHg)	
Time interval	Systolic	Diastolic
Initial (prior to drop 1)	153 ± 25.1	86.1 ± 14.9
15 minutes (prior to drop 2)	150 ± 24.9	84.7 ± 15.1
30 minutes (prior to drop 3)	151 ± 26.4	84.7 ± 14.8
45 minutes (pre-operative)	150 ± 24.4	83.3 ± 14.5

may represent a relative reflex bradycardia and decrease in cardiac output consequent upon an initial vasopressor response.

The question as to whether phenylephrine 2.5% is safer than phenylephrine 10% has been addressed by Duffin and co-workers, who found no statistically significant difference in the BP response to phenylephrine 2.5% as compared with phenylephrine 10% in 44 patients being prepared for cataract surgery.[2] Kumar and co-workers,[4] in a study of 24 patients undergoing vitreoretinal surgery, also reported no statistically significant difference in mean systolic and diastolic BP response in patients treated with phenylephrine 2.5% as compared with phenylephrine 10% for pre-operative mydriasis. Fraunfelder and Scafidi[5] collected 33 reports of systemic side-effects thought to be related to phenylephrine 10%, and stated that a pressor response to phenylephrine 2.5% is not seen in the neonate population as compared with that seen with phenylephrine 10%; however, no evidence was provided with regard to comparative safety of the two concentrations in an elderly population.

The sum of these studies would seem to suggest, therefore, that phenylephrine 10% may be better than phenylephrine 2.5% for maintaining intraoperative mydriasis, but while it may not alter mean BP measurements, it may be responsible for some volatility in BP. However, phenylephrine 2.5% seems not yet to have been proven to have any lesser systemic effect in an elderly population than phenylephrine 10%, so that if there remains concern about potential systemic complications, the rational decision must be as to whether – in the age of endocapsular phacoemulsification and topical non-steroidal anti-inflammatory agents to maintain mydriasis – any intraoperative technical advantages are sufficient to justify the use of phenylephrine at all.

R. C. Andrew Symons, MB, BS
Mark J. Walland, MB, BS, FRACO, FRACS
David V. Kaufman, MB, BS, FRACO, FRACS

Department of Ophthalmology
Royal Melbourne Hospital
Grattan Street
Parkville 3050
Victoria
Australia

Correspondence to:
Dr Mark J. Walland
55 Victoria Parade
Fitzroy 3065
Australia
Fax +61 3 9416-1435

References

1. Tanner V, Casswell AG. A comparative study of the efficacy of 2.5% phenylephrine and 10% phenylephrine in pre-operative mydriasis for routine cataract surgery. Eye 1996;10:95–8.
2. Duffin MR, Pettit TH, Straatsma BR. 2.5% v 10% phenylephrine in maintaining mydriasis during cataract surgery. Arch Ophthalmol 1983;101:1903–6.
3. Brown MM, Brown GC, Spaeth GL. Lack of side effects from topically administered 10% phenylephrine eyedrops. Arch Ophthalmol 1980;98:487–9.
4. Kumar V, Schoenwald RD, Chien DS, Packer AJ, Choi WW. Systemic absorption and cardiovascular side effects of phenylephrine eyedrops. Am J Ophthalmol 1985;99:180–4.
5. Fraunfelder FT, Scafidi AF. Possible adverse effects from topical ocular 10% phenylephrine. Am J Ophthalmol 1978;85:447–53.

Sir,

We read with interest the comments by Symons *et al.* on our recent paper entitled 'A comparative study of the efficacy of 2.5% phenylephrine and 10% phenylephrine in pre-operative mydriasis for routine cataract surgery'. They raise several points to which we would like to reply in turn.

Firstly, a comment is made as regards the fact that a greater number of patients in the 2.5% phenylephrine group in our study failed to achieve an initial pupil size of 6 mm on dilation. This may be an underlying trend which would become significant with a greater number of patients studied; however, in our study the difference in numbers was not statistically significant, highlighting the similar efficacy of the two concentrations of phenylephrine in this particular patient group.

The authors also make reference to a study by Duffin *et al.* commenting that phenylephrine 10% was found to be significantly better for maintaining mydriasis intra-operatively. Close examination of Duffin *et al.*'s papers revealed that they compared viscous 10% phenylephrine with aqueous 2.5% phenylephrine. The viscous preparation of 10% phenylephrine is thought to increase drug contact time with the eye and possibly result in less systemic absorption. However, viscous phenylephrine is not commonly used in the UK and in our study both concentrations of phenylephrine were in the aqueous form. Furthermore, Duffin *et al.* themselves comment that the greater maintenance of intra-operative mydriasis was significant only for dark irides and not for light or moderately pigmented irides. Duffin *et al.* also studied blood pressure following administration of 2.5% and 10% phenylephrine and found no statistically significant difference between the two groups. However, further analysis with respect to patient age found that older patients did in fact have a statistically significant elevation of blood pressure in both the 2.5% and 10% phenylephrine groups. Their