Intracameral phenylephrine. How much is too much?

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PURPOSE

Phenylephrine is used for mydriasis in cataract surgery; at higher doses topically, it can cause life-threatening adverse events (AE's).[1] An alternative is an irrigation of intracameral phenylephrine (ICP), commercially available as Mydrane® (0.31% phenylephrine, 0.1% tropicamide , 1% lidocaine). Some surgeons use diluted eye-drops 'off-label' as ICP. A sympathomimetic, phenylephrine also treats systemic hypotension. AE's include arrhythmias and cardiac arrest. A recent survey found some UK surgeons using 10% phenylephrine as ICP,[2] a high dose. Because of safety concerns, we reviewed the literature.

METHODOLOGY

We calculated the potential 'total dose' of phenylephrine using 2.5% or 10% eye-drops, Mydrane, and 'off-label' ICP. We looked for case reports of AE's from Medline® and Medicines and Healthcare products Regulatory Agency (MHRA). Prospective randomised controlled trials (PRCT's) and case series on ICP and systemic findings and/or AE's were reviewed.

Table 1: *Calculated total dose of phenylephrine, when given to one eye via various routes*

Formulation	Route of administration	Total dose of phenylephrine (via each eye)
Phenylephrine eye-drops **2.5%**	**Topical** (assume **3 drops** given)	2.78mg per eye
Phenylephrine eye-drops **10%**	**Topical** (assume **3 drops** given)	**11.1mg per eye**
Mydriasert® (5.4mg phenylephrine insert with tropicamide)	Conjunctival **insert**	5.4mg per eye
Mydrane®(phenylephrine **0.31%** with tropicamide 0.1% lidocaine 1%)	**Intracameral** (assume 0.25ml)	0.775mg per eye
Phenylephrine eye-drops, diluted to **1.25%**	**Intracameral** (assume 0.25ml)	3.125mg per eye
Phenylephrine eye-drops **2.5%**	**Intracameral** (assume 0.25ml)	6.25mg per eye
Phenylephrine eye-drops **10%**	**Intracameral** (assume 0.25ml)	**25mg per eye**
BNF recommended maximum dose of Phenylephrine **to treat hypotension**	**Intramuscular** **Intravenous**	**15mg** **0.5mg**

Table 2: *A summary of AE's from the literature*

Phenylephrine source	Adverse Events
Case reports-Topical phenylephrine 10% use [1]	Arrhythmias, hypertension, acute coronary syndrome and subarachnoid haemorrhage
Case reports- ICP use [3,4] (dose not stated)	1 Arrhythmia and 1 "fatality"
pRCT's with ICP- cardiac disease patients excluded [5-11] (0.62mg -3mg administered)	None in 446 patients (but all pRCT's excluded patients with cardiovascular disease)
Case series with ICP (includes patients with cardiovascular risk factors) (6.25mg) [12] (7.5mg)[13]	None in 471 patients

RESULTS

Undiluted 10% intracameral phenylephrine is equivalent to more than the maximum recommended dose for treatment of systemic hypotension (Table 1). Only two reports of serious SAE's with ICP (table 2) were found, though we suspect under-reporting of SAE's. Effective mydriasis was reported for all strengths of ICP, including Mydrane.

CONCLUSION

ICP as Mydrane® contains significantly less phenylephrine than eye-drops, or eye-drops diluted as ICP. There is potential for a serious 'overdose' with 10% phenylephrine drops, or with drops diluted for ICP. Mydrane ® may be a safer alternative to phenylephrine drops, particularly for hypertensive cataract patients.

No commercial relationships to declare.

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