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Review

What to do if it gets 'bigger'

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The problems associated with intra-operative erections are discussed. Present theory is reviewed to allow a better understanding of the available treatment options.

Key words: Intra-operative erections – Anaesthesia – Pathogenesis – Treatment – Priapism

Penile erection is a rare, but important, hazard of anaesthesia in endo-urology. The reported incidence (1% and 2.5%) is age dependent, with preponderance for younger patients.[1,2] Elongation and increased rigidity of the urethra and penis render the procedure difficult or even practically impossible. Displacement of anatomical landmarks can result in trauma to the urethra/sphincter complex and excess bleeding will render the procedure difficult or impossible. Urologists and anaesthetists should be aware of its occurrence and make joint efforts to prevent/reverse it. One anaesthetic may be superior to another. The incidence is equal between epidural and general anaesthesia, but lower with spinal anaesthesia.[2]

Pathogenesis

The pathogenesis of intra-operative erections is not fully understood. Present theory will be discussed to allow a better understanding of the available treatment options. Most erections occur during, or just after, a local penile stimulus such as skin preparation or introduction of the endoscope.[2] Penile erection is an autonomic phenomenon.[3] Maintenance of vascular and corporeal baseline muscle tone, by sympathetic output from the thoraco-lumbar spinal segments T10 to L2, is important in maintaining a flaccid state. The sympathetic drive is mediated predominantly via α-adrenoceptors. The parasympathetic output from sacral spinal segments S2 to S4 initiates and maintains erection. During regional and general anaesthesia, the sympathetic output from low thoracic and high lumbar spinal segments is lost. Erections are reported most commonly with regional blocks higher than T8 and very rarely with blocks lower than T12.[4] A penile/urethral stimulus, in combination with 'light' anaesthesia, can elicit a parasympathetically mediated local reflex. This autonomic imbalance with unopposed parasympathetic predominance results in erections by increasing cavernosal blood inflow and reducing blood outflow. This is a simplified theory. It is believed that other non-adrenergic, non-cholinergic neural mechanisms are involved, as well as a complex network of local transmitters such as nitric oxide, kinins and others.

What can be done?

Many different pharmacological treatments of intra-operative penile erection have been described. The use of intracorporal sympathomimetics is most widely reported.[2,5,6–8] Several studies have demonstrated their efficacy and safety (Table 1). Stearman *et al*.[2] reported their experience in treating 23 patients with a single dose

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Table 1 The use of intracavernosal sympathomimetics for the treatment of intra-operative erections

Year	Author	Cases	Treatment	Success rate
1995	Stearman *et al*.[2]	23	Phenylephrine (0.2 mg)	100%
1987	Walther *et al*.[5]	3	Phenylephrine (0.1 mg)	100%
1992	Serrate *et al*.[6]	23	Ethylephrine (10 mg)	100%
1990	Tsai & Homg[9]	5	Metaraminol (10– 25 μg)	100%
1986	De Meyer & De Sy[8]		Noradrenaline	
1992	Zappala *et al*.[7]	5	Epinephrine (0.01 mg)	100%

(0.2 mg) of phenylephrine. They reported a 100% sustained response within 2–3 min. They also observed an intermittent, statistically significant rise in mean blood pressure and a statistically non-significant tachycardia. All cardiovascular changes were self-limiting within 20–30 min, with no untoward cardiovascular events. Others[5] have reported the use of intracorporal phenylephrine at lower doses (0.1 mg) with equal success, but experience is limited. Phenylephrine is a pure α_1-agonist. It lacks the unwanted effects of β_1-adrenergic stimulation. Other sympathomimetics, such as epinephrine (1–100 μg),[7] ethylephrine (10–15 mg),[6] and metaraminol (10 μg to 3 mg),[9] have been reported to be equally effective. Santha *et al*.[10] and Miyabe *et al*.[11] reported the systemic use of the sympathomimetics, terbutaline and ephedrine, respectively. Sympathomimetics have a short half-life. Erectile recurrence is, therefore, possible during prolonged procedures. In such cases, a second low dose can be given safely.[6] Sympathomimetics carry a risk of cardiovascular instability and cardiovascular monitoring is mandatory.

Valley *et al*.[12] reported the successful use of intravenous glycopyrrolate, an anticholinergic, in one high-risk patient. They administered glycopyrrolate incrementally to a total dose of 0.4 mg. They proposed glycopyrrolate as an alternative to intracorporal sympathomimetic treatment in cardiovascularly high-risk patients.

Dorsal penile block is another effective treatment option.[4,13] Safe doses of lignocaine or the longer-acting pubivacaine can be used. Dorsal penile block has the additional advantage of postoperative analgesia. It is believed to obliterate the locally elicited parasympathetic reflex. It is free of any cardiovascular side-effects when care is taken to avoid intravascular administration and when safe doses of the local anaesthetic are used. Miller *et al*.[14] reported on the use of topical ethyl chloride, sprayed liberally along the shaft of the penis, in 10 cases. Its favourable effect may be due to obliteration of the local reflex, but it also has cooling properties that result in vasoconstriction.

Ketamine is widely reported as a treatment of 'anaesthetic' erection but with limited success.[15,16] It is not very attractive because of its late onset and the hallucinations it causes in awake patients. It has been used in combination with anticholinesterases.[17] Systemic benzodiazepines have been used with some success, but wide experience is lacking.[18] On the other hand, benzodiazepines are reported to enhance the effect of papaverine in the treatment of erectile dysfunction.[19] Other alternative treatments include topical nitroglycerine,[20] intracorporal prostaglandins (PGE_1),[21] and systemic vasodilators such as sodium nitroprusside.[22]

Conclusions

'Anaesthetic erection' during transurethral surgery is dangerous and should be reversed before proceeding. Adequate anaesthesia should be ensured. Compression of the shaft penis and cooling with application of ice-cold swabs or ethyl chloride spray, should be tried in the first instance.[14,23] If these measures fail, we propose intracavernosal injection of sympathomimetics as the first-line pharmacological treatment. Inform your anaesthetist. Use which ever drug you are most familiar with, or otherwise we recommend phenylephrine 0.2 mg. The administration of sympathomimetics can be supplemented with aspiration of 75 ml of cavernosal blood. A second dose of phenylephrine at 0.2 mg may be given with close monitoring for recurrent erection. If sympathomimetics fail, try penile block with plain lignocaine (10–20 ml of 1% solution). 'Anaesthetic erection' may be refractory to all pharmacological means. Intravenous glycopyrrolate deserves consideration in cardiovascularly high-risk patients or when the above treatments fail. Other novel invasive pharmacological treatments lack experience and should be resisted. Unresponsive erection is a very good reason for postponing endoscopic procedures.

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