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Balloon dilatation of the external urethral sphincter in the treatment of detrusor-sphincter dyssynergia

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Balloon dilatation of the external urethral sphincter was introduced in our unit in 1990 as an alternative to sphincterotomy in the surgical management of detrusor-sphincter dyssynergia in spinally injured patients. The initial results with the technique looked promising. We performed 14 balloon dilatations in the period 1990–1993, and these patients have been followed up for 8–68 months (mean 55.5). The procedure was effective in relieving symptoms and had a low morbidity. Sphincter activity assessed at cystoscopy was initially abolished in all patients. Vesicoureteric reflux present in one patient pre-operatively resolved after the procedure. However the long-term results are disappointing, with an 85% failure rate (62% within 1 year). Balloon dilatation in our series has a lower success rate than both sphincterotomy and sphincter stenting and cannot be recommended for the treatment of detrusor-sphincter dyssynergia.

Keywords: spinal cord injury; detrusor-sphincter dyssynergia; balloon dilatation; sphincterotomy

Introduction

Spinally injured patients with the combination of hyperreflexia and detrusor-sphincter dyssynergia suffer the highest incidence of urological complications.[1–3] This is believed to be caused by the combination of prolonged elevations of intravesical pressure and incomplete bladder emptying seen in this group. For over 30 years, sphincterotomy has been the standard operation to lower outflow tract resistance and thus reduce intravesical pressures. However, the procedure sometimes produces poor results and some patients require multiple repeat operations. A variety of techniques have been introduced in the last decade to try and improve this. Balloon dilatation was first introduced as an alternative to transurethral prostatectomy in the treatment of benign prostatic hypertrophy. Balloon dilatation of the external sphincter was first used in our unit in 1990 as an alternative to sphincterotomy. Initial results with the technique suggested it was effective,[4,5] but no long-term results have been published.

Methods

Fourteen balloon dilatations were performed on 13 patients in the period 1990–1993. All patients had detrusor-sphincter dyssynergia (DSD) and sustained high intravesical pressures on pre-operative urodynamic assessment. In addition, one patient had vesicoureteric reflux, three had recurrent urinary tract infections and six suffered from autonomic dysreflexia. The procedure was performed under general anaesthesia with the Optilume prostate dilatation system (American Medical Systems, Minnesota, USA) and endoscopic guidance. The balloon was placed across the external urethral sphincter and inflated to a pressure of three atmospheres for a period of 10 min. The balloon was then deflated and the sphincter assessed via the cystoscope.

Patients were followed up for between 8 and 68 months (mean 55.5, median 61) with regular videourodynamic and ultrasonic assessment. Twelve patients had urodynamics immediately before the operation and within 6 months after the procedure. The urodynamic data from these patients were analyzed for statistical significance using a paired *t*-test.

Results

Loss of sphincter activity and splitting of the mucosa overlying the sphincter was seen through the cystoscope immediately after all 14 procedures. One patient developed septicaemia post-operatively but made a full recovery. Haemorrhage following the procedure was common but always settled without the need for transfusion. Six patients suffered from autonomic dysreflexia pre-operatively and all noticed improvement in their symptoms following balloon dilatation after the procedure. Vesicoureteric reflux noted in one patient prior to operation also resolved. No adverse effects on sexual function were found. Full pre- and post-operative urodynamic data was available in 12

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patients (Table 1). There were no statistically significant changes in any urodynamic parameters, although there was a decrease in maximum detrusor pressure which approached significance.

A successful long-term outcome was regarded as resolution of symptoms, satisfactory urodynamic parameters, absence of DSD on videourodynamics and avoidance of upper tract complications. Failure was defined as recurrence of DSD or symptoms, sustained high pressure detrusor contractions, high residual urine measurements or upper tract complications. Eleven of the 13 patients failed during the follow-up period (Table 2), eight of them within 12 months. One late failure after 32 months had a repeat balloon dilatation and has subsequently had a successful outcome up to 70 months follow-up. One patient has recurrent DSD demonstrated on videourodynamics, but has satisfactory urodynamic parameters and thus has avoided any further intervention. A further patient developed recurrent autonomic dysreflexia after 8 months but was subsequently lost to follow-up. The remaining eight patients have all required further surgical intervention. Two patients had a successful outcome and remain on condom drainage having avoided further intervention.

Table 1 Pre- and post-operative urodynamic data (mean ± 1 standard deviation)

Urodynamic parameter	*Pre-operative*	*Post-operative*	P-*value*
Maximum detrusor pressure (cmH_2O)	95 ± 41	74 ± 35	0.06
Average duration of contraction (s)	160 ± 122	154 ± 108	0.40
Residual urine volume (ml)	213 ± 202	220 ± 219	0.26
Cystometric capacity (ml)	358 ± 180	430 ± 249	0.16

Discussion

Sphincterotomy is the principal procedure used to lower outflow tract resistance and facilitate low pressure voiding into a condom drainage system, but has several problems. The operation is destructive (often a major consideration for spinally injured patients), frequently causes profuse haemorrhage and may cause erectile dysfunction. Recent studies of the long-term efficacy of sphincterotomy have also shown a high incidence of complications and reoperation.[6,7] For these reasons there has been an interest in other techniques to inactivate the sphincter, such as balloon dilatation, stenting and botulinum toxin injection.

Balloon dilatation has largely proved to be an ineffective treatment for benign prostatic hyperplasia as any beneficial effects seem to be of short duration. One randomised double blind study showed no difference between balloon dilatation of the prostate and cystoscopy at 3 months.[8] However, the external urethral sphincter is both smaller and less elastic than the prostate and thus might be expected to be damaged more by stretching. Chancellor *et al* reported a successful outcome in 14 out of 17 (82%) patients with DSD treated with balloon dilatation under fluoroscopic control followed for between 3 and 20 months, as assessed by videourodynamic and cystoscopic investigation. In comparison, our results show a 62% failure rate at 1 year, with an 85% long-term failure rate. The high failure rate was principally caused by a return of sphincteric function, producing either symptoms such as autonomic dysreflexia and recurrent infections, or a deterioration in urodynamic parameters which warranted further surgical intervention. The re-operation rate in this series was 69.2%, with most of the procedures needed within a year of the initial balloon dilatation. This compares to a re-operation rate of 15–50% for sphincterotomy patients.[6,9,10] Recently, laser sphincterotomy has been introduced, and seems to cause less bleeding and have a lower re-operation rate than conventional sphincter-

Table 2 Patient outcome following balloon dilatation

Follow-up duration (months)	*Time to failure* (months)	*Reason for failure*	*Subsequent management*
64	4	DSD, high intravesical pressures	Sphincterotomy
61	4	DSD, high intravesical pressure	Sphincterotomy
56	5	High residual urine, DSD	Sphincterotomy
8	8	Autonomic dysreflexia	Lost to follow-up
62	8	High residual urine, autonomic dysreflexia	Sphincterotomy, sphincter stent
68	10	High intravesical pressure, residual urine	Suprapubic catheter
57	11	DSD, high intravesical pressure	Sphincterotomy, sphincter stent
47	12	High residual urine, DSD	Sphincterotomy
68	32	DSD, hydronephrosis	Sphincter stent
62	32	DSD, vesicoureteric reflux	Repeat balloon dilatation
54	38	DSD	No treatment required
50	–	Successful outcome	–
65	–	Successful outcome	–

otomy whilst having similar efficacy.[11,12] Several reports of the short-term results of sphincter stenting have confirmed that the procedure is straightforward, with a low incidence of immediate complications.[13–16] Stenting appears to be as effective as sphincterotomy in relieving symptoms and improving urodynamic parameters.

Two of our thirteen patients developed upper tract complications (15.4%), which is less than the figure quoted for long-term follow-up of sphincterotomy (30%),[7] but the majority of our patients have undergone further procedures to lower their intravesical pressure. We believe the low rate of upper tract changes is due to our policy of aggressive surgical management of high intravesical pressure rather than the choice of outflow tract operation.

Although balloon dilatation of the external urethral sphincter is a less complex procedure than sphincterotomy, it is an ineffective long-term treatment for detrusor-sphincter dyssynergia in the majority of patients. Sphincterotomy and external urethral sphincter stenting should be the surgical treatments of choice for this condition.

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