

calculated³ that the cohort of boys included in Scorer's study had an orchidopexy rate twice the true cryptorchidism rate (1.90% v 0.96%). A possible explanation for this discrepancy is that surgeons (both now and in the past) may be operating on a proportion of boys who have retractile rather than truly undescended testes. Alternatively, Atwell has suggested that cryptorchidism may be acquired after birth by the resorption of an occult inguinal hernia⁹; and we have reported that 18 (40%) out of 45 boys whose testes descended after birth but before 3 months of age had an undescended testis when followed up at one year.¹⁰

We thank the staff of the maternity and paediatric surgery departments of the John Radcliffe Hospital, the general practitioners, and especially all the mothers who allowed us to examine their babies. We also thank Mr G H Farrington for a most helpful discussion when we were setting up this study. The manuscript was prepared by Sarah Jones. The Institute of Cancer Research receives support from the Cancer Research Campaign and the Medical Research Council.

References

- 1 Chilvers C, Dudley NE, Gough MH, Jackson MB, Pike MC. Undescended testis: the effect of treatment on subsequent risk of subfertility and malignancy. *J Pediatr Surg* 1986;21:691-6.
- 2 Scorer CG. The descent of the testis. *Arch Dis Child* 1964;39:605-9.
- 3 Chilvers C, Pike MC, Forman D, Fogelman K, Wadsworth MEJ. Apparent doubling of frequency of undescended testis in England and Wales in 1962-81. *Lancet* 1984;i:330-2.
- 4 Breslow NE, Day NE. The analysis of case-control studies. In: *Statistical methods in cancer research*. Vol 1. Lyon: International Agency for Research on Cancer (IARC) Scientific Publications, 1980:32.
- 5 Macfarlane A, Mugford M. *Birth counts: statistics of pregnancy and childbirth*. London: HMSO, 1984.
- 6 Scorer CG, Farrington GH. *Congenital deformities of the testis and epididymis*. London: Butterworth, 1971.
- 7 Depue RH. Maternal and gestational factors affecting the risk of cryptorchidism and inguinal hernia. *Int J Epidemiol* 1984;13:311-8.
- 8 Swerdlow AJ, Wood KH, Smith PG. A case-control study of the aetiology of cryptorchidism. *J Epidemiol Community Health* 1983;37:328-44.
- 9 Atwell JD. Ascent of the testis: fact or fiction. *Br J Urol* 1985;57:474-7.
- 10 John Radcliffe Hospital Cryptorchidism Study Group. Boys with late descending testes: the source of cases of "retractile" testes undergoing orchidopexy? *Br Med J* 1986;293:789-90.

(Accepted 9 October 1986)

Endoscopic correction of primary vesicoureteric reflux: results in 94 ureters

BARRY O'DONNELL, PREM PURI

Abstract

Sixty one patients with primary vesicoureteric reflux were treated by endoscopic injection of Mentor Polytef paste. Seventy six of the 94 treated ureters showed complete disappearance of vesicoureteric reflux after one injection. Eight refluxing ureters required a second injection, one required a third, and one a fourth. Six ureters showed improvement in the grade of reflux after the first injection. Two ureters did not show any change in the grade of reflux after endoscopic injection. The amount of paste injected to correct reflux in the 94 ureters varied from 0.1 to 1.0 ml (mean 0.33 ml).

Patients were followed up for three to 25 months (mean 13.4 months). Follow up micturating cystograms in the 94 ureters showed absence of reflux in 83. Eleven ureters showed recurrence of reflux. Recurrence of reflux was attributed to early technical difficulties and to insufficient amounts of polytef paste used in some cases. Follow up urograms did not show evidence of ureteric obstruction in the treated ureters.

Endoscopic injection of polytef paste is a safe, simple, and effective procedure for primary vesicoureteric reflux and averts the need for open operation.

Introduction

Vesicoureteric reflux is common in children and has been reported in one third to a half of children with urinary tract infection.¹ It is now recognised as an important cause of end stage chronic renal failure in adult life.^{2,3} Management continues to be a subject of

controversy. It is generally agreed that vesicoureteric reflux in an undilated system is likely to disappear over years and therefore that it should be managed by continuous low dose chemoprophylaxis until disappearance is documented. Moderate reflux is controversial, but most cases are now treated conservatively if controlled by chemoprophylaxis. Severe vesicoureteric reflux, recurrent urinary tract infections during antimicrobial treatment, and non-compliance by the patient with medical procedures are generally taken as indications for surgery. Several open antireflux operations have been used, most of which are successful.

Recently vesicoureteric reflux induced in piglets was corrected by intravesical subureteric injection of Mentor Polytef paste.⁴ Examination of the vesicoureteric region showed a well circumscribed subureteric polytef mass of firm consistency retaining its shape and position at the site of injection. Histologically, the polytef implant showed encapsulation by a thin layer of fibrous tissue. This provides a firm anchorage to the submucosal ureter and prevents it from sliding outwards and upwards during micturition and thus prevents reflux. Subsequently this technique was used successfully to treat primary⁵ and secondary⁶ vesicoureteric reflux in children by endoscopic injection of polytef paste. We report our experience in 61 children with primary vesicoureteric reflux treated by endoscopic injection of polytef paste.

Patients and methods

We began endoscopic correction of vesicoureteric reflux in March 1984 and by March 1985 had treated 61 children with primary vesicoureteric reflux. There were 52 girls and nine boys and their age range was 3 months to 13 years (mean 5.2 years). Twenty eight patients had unilateral vesicoureteric reflux and 33 bilateral reflux and so the series represented 94 refluxing ureters. Patients with refluxing duplex systems were not included. Vesicoureteric reflux was graded according to the international classification of reflux: I, ureter only; II, ureter, pelvis, and calices, no dilatation, normal caliceal fornices; III, mild or moderate dilatation or tortuosity of ureter and mild or moderate dilatation of renal pelvis but with no or slight blunting of fornices; IV, moderate dilatation or tortuosity of ureter and moderate dilatation of renal pelvis and calices, complete obliteration of sharp angle of fornices, but maintenance of papillary impressions in most calices; V, gross

Children's Research Centre, Our Lady's Hospital for Sick Children, Crumlin, Dublin 12, Ireland

BARRY O'DONNELL, MCH, FRCS, professor of paediatric surgery
PREM PURI, MS, associate paediatric surgeon

Correspondence to: Mr Puri.

dilatation and tortuosity of ureter, gross dilatation of renal pelvis and calices, and papillary impressions no longer visible in most calices.⁷ Table I shows the grades of vesicoureteric reflux in our patients.

The decision to treat grade I or II ureters was made when either the contralateral side in bilateral cases showed higher grades of reflux or the patient suffered recurrent urinary tract infections despite receiving chemoprophylaxis.

TABLE I—Grade of reflux (international classification)

	Reflux grade					Total
	I	II	III	IV	V	
No of ureters	2	8	47	33	4	94

Patients were discharged from hospital within 24 hours. Many were treated as day cases when this was convenient. Co-trimoxazole was prescribed for two weeks after the procedure. A micturating cystourethrogram was carried out six weeks after discharge. A follow up micturating cystourethrogram and intravenous urogram were obtained in earlier cases at three months and in later cases at six to 12 months after injection.

Results

Table II summarises the results. Micturating cystograms showed disappearance of vesicoureteric reflux after one injection of polytef paste in 76 of the 94 treated ureters (figs 1 and 2).

Table III gives the results of follow up micturating cystography at three to 25 months (mean 13.4 months) after endoscopic correction of vesicoureteric

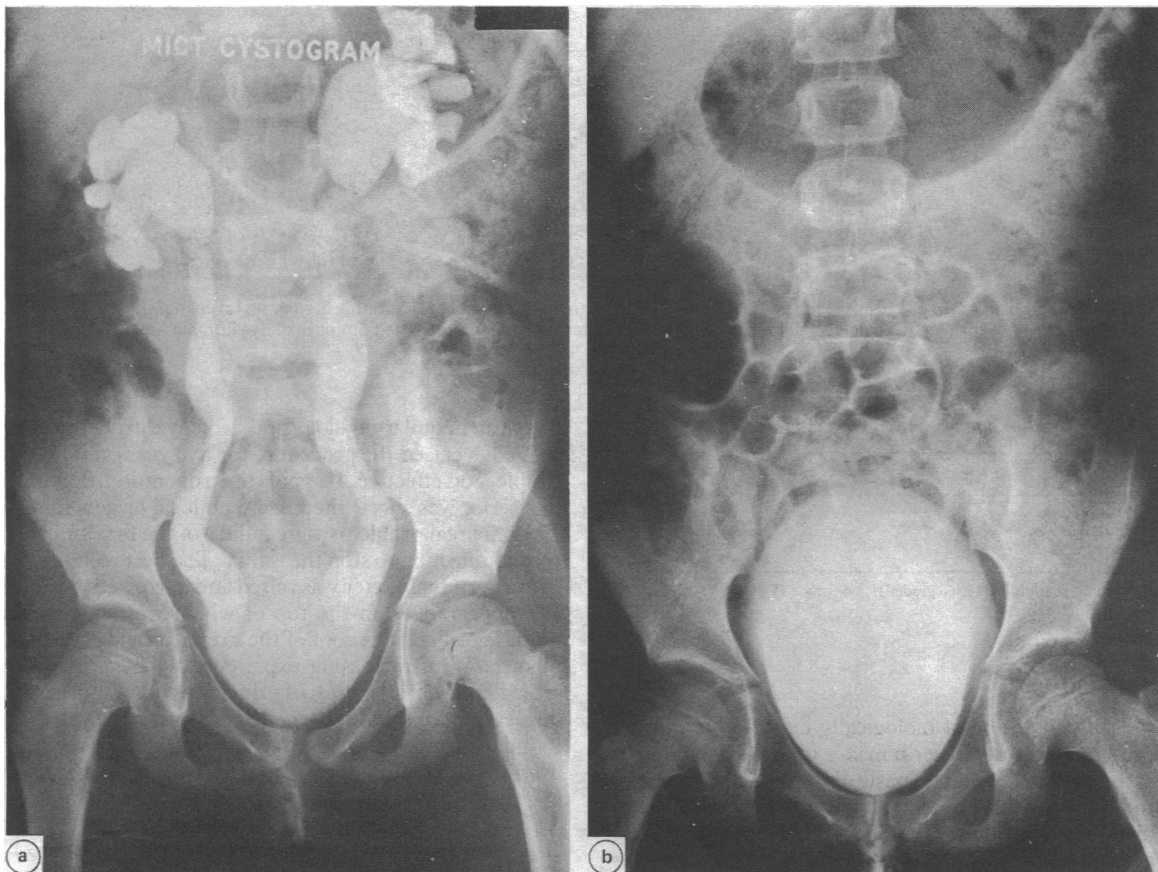


FIG 1—(a) Micturating cystogram in 10 year old girl with severe hypertension showing grade IV bilateral vesicoureteric reflux. (b) Micturating cystogram nine months after subureteric injection of polytef paste showing absence of reflux. Follow up renogram showed no evidence of ureteric obstruction.)

TECHNIQUE

The injection of polytef paste was carried out with a 5 F nylon catheter (Storz), on to which was swaged a 21 gauge needle with 1 cm of needle protruding. The catheter was introduced through a 14 F cystoscope. The needle was introduced under the mucosa 3-4 mm below the affected ureteric orifice. The needle was advanced 5 mm into the lamina propria behind the submucosal ureter and 0.1 to 1.0 ml (mean 0.33 ml) Mentor Polytef paste injected using a 1 ml syringe with a metal sheath and piston (Storz). (Recently we have used a specially designed instrument made by Wolf—"The Stinger" (11.5 F)—through which a rigid needle can be used for the injection.) A correctly placed injection creates the appearance of a nipple on top of which is a slit-like or inverted crescentic orifice. The uninjected roof retains its compliance while preventing reflux. It provides a firm hump against which the ureteric roof may easily be compressed with rising intravesical pressure. It angles the orifice making it less easy to fall open.

reflux. There was absence of vesicoureteric reflux in 83 ureters. Eleven ureters showed recurrence of reflux.

Follow up intravenous urography did not show any evidence of ureterovesical obstruction in the treated ureters. There were no untoward side effects from the use of the paste.

TABLE II—Results of endoscopic treatment of vesicoureteric reflux in 94 ureters

	No of ureters
Disappearance of reflux after single injection of polytef	76
No requiring second injection for correction of reflux	8
No requiring third injection for correction of reflux	1
No requiring fourth injection for correction of reflux	1
Grading of reflux improved after first injection	6
No change in grade of reflux after polytef injection	2

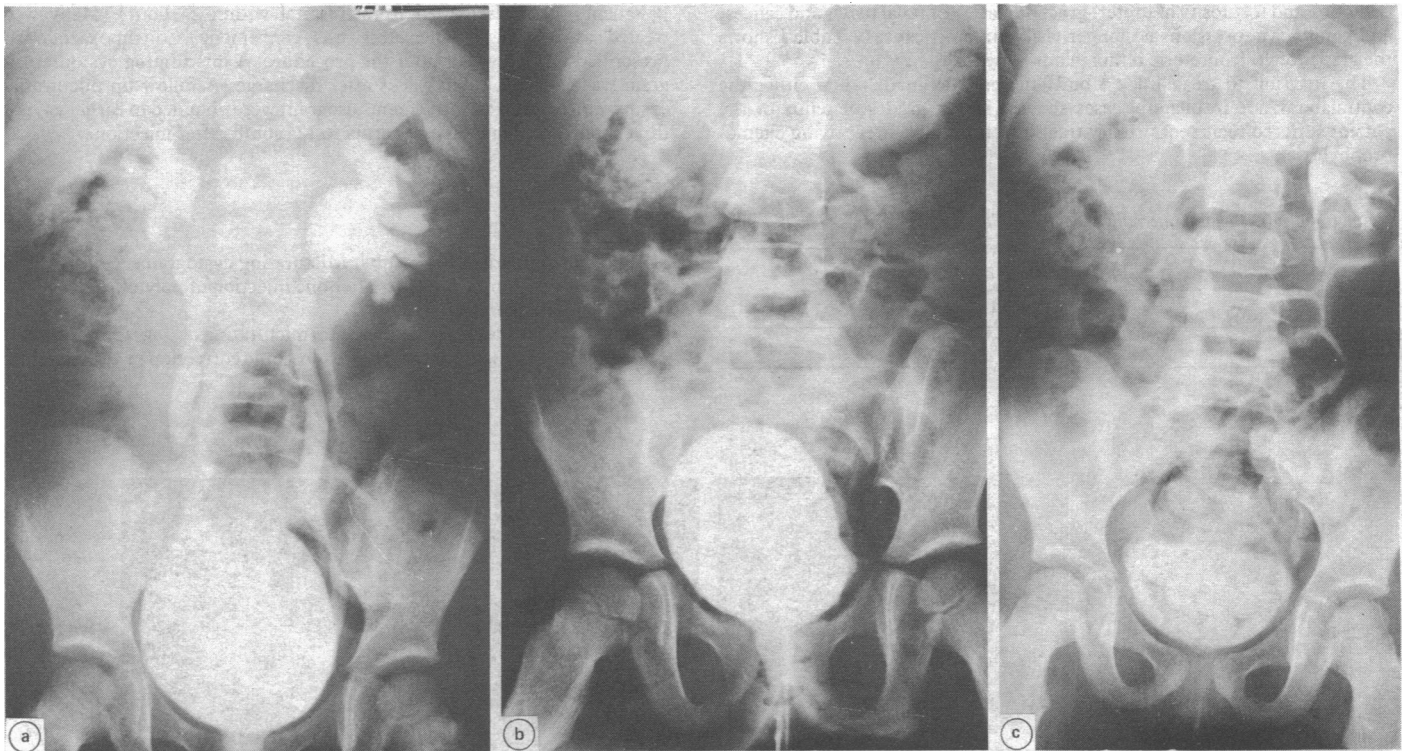


FIG 2—(a) Micturating cystogram in 4 year old girl showing grade III bilateral vesicoureteric reflux. (b) Micturating cystogram seven months after subureteric injection of polytef paste showing absence of reflux. (c) Intravenous pyelogram seven months later showing unobstructed drainage of dye into bladder.

TABLE III—Results of follow up micturating cystography in 94 ureters

	No of ureters
Absence of vesicoureteric reflux	83
Recurrence of vesicoureteric reflux	11*
Contralateral vesicoureteric reflux	5

* Four ureters grade I reflux, four grade II, two grade III, one grade IV.

Discussion

Polytef paste is a suspension of biologically inert polytetrafluoroethylene particles in glycerin. Glycerin makes up half of the weight of the paste. After injection of polytef paste glycerin is absorbed into the tissues and the polytef implant achieves firm consistency, retaining its shape and position at the injection site encapsulated by thin fibrous tissue.⁵ Injection of polytef paste has been used for many years to enlarge displaced or deformed vocal cords in patients with dysphonia⁸⁻¹⁰ and to treat urinary incontinence.¹¹⁻¹³ No untoward side effects from these uses of the paste in man have been reported.

Malizia *et al* have reported that periurethral injection of polytef paste in continent animals was associated with distant migration of polytef particles from the injection site.¹⁴ They also cited a reported instance¹⁵ (the first recorded) of polytef granulomas being found in the lungs of a patient who had received two periurethral injections of polytef paste (10-15 ml each injection) two years and one year before his death by suicide. On examination of that report it appeared that the polytef particles reached the pulmonary circulation through the prostatic venous plexuses and initiated the formation of Teflon granulomas. Politano, who pioneered the use of polytetrafluoroethylene for urinary incontinence, did not find a single instance of significant embolisation documented clinically after injection of 10-20 ml polytef paste periurethraly in over 300 cases since 1964.¹⁶

In our patients the amount of polytef paste needed to be injected was so small that appreciable migration seemed unlikely. If, on the other hand, migration of polytef particles to regional lymph nodes does occur then evidently it is harmless given the trouble free use of

the paste in otolaryngology and urology during the past 20 years.

We have used the procedure for two years and find that it is safe, simple, and effective. It avoids open operation. Though follow up in this series was short, there were no local or general complications. The only real problems were failure of the first and occasionally the second injection to stop the reflux. The best results were in patients whose terminal ureter was raised and narrowed to produce a nipple-like appearance, on the top of which was an inverted crescentic ureteric orifice. The roof of the ureter provides the necessary compliance. With increasing experience we have used the procedure satisfactorily in all grades of primary reflux. Our results in refluxing duplex systems have been disappointing. Duplex systems were found to be more difficult to correct and also the recurrence of reflux was much higher in duplex systems than in primary reflux.

References

- Hodson CJ, Cotran RS. Reflux nephropathy. *Hosp Pract* 1982;17:133-56.
- Bailey RR, Lynn KL. End-stage reflux nephropathy. *Contrib Nephrol* 1984;39:102-10.
- Bailey RR. End-stage nephropathy. *Nephron* 1981;27:302.
- Puri P, O'Donnell B. Correction of experimentally produced vesicoureteric reflux in the piglet by intravesical injection of Teflon. *Br Med J* 1984;289:5-7.
- O'Donnell B, Puri P. Treatment of vesicoureteric reflux by endoscopic injection of Teflon. *Br Med J* 1984;289:7-9.
- Puri P, Guiney EJ. Endoscopic correction of vesicoureteric reflux secondary to neuropathic bladder. *Br J Urol* 1986;58:504-6.
- International Reflux Study Committee. Medical versus surgical treatment of primary vesicoureteral reflux. *Pediatrics* 1981;67:392-400.
- Arnold GE. Alleviation of aphonia or dysphonia through intrachordal injection of Teflon paste. *Ann Otol Rhinol Laryngol* 1963;72:384-95.
- Dedo HH, Urrea RD, Lawson L. Intrachordal injection of Teflon in the treatment of 135 patients with dysphonia. *Ann Otol Rhinol Laryngol* 1973;82:661-7.
- Lewy RB. Experience with vocal cord injection. *Ann Otol Rhinol Laryngol* 1976;85:440-50.
- Politano VA, Small MP, Harper JM, *et al*. Periurethral Teflon injection for urinary incontinence. *J Urol* 1974;111:180-3.
- Schulman CC, Simon J, Wespes E, *et al*. Endoscopic injections of Teflon to treat urinary incontinence in women. *Br Med J* 1984;288:192.
- Politano VA. Periurethral polytetrafluoroethylene injection for urinary incontinence. *J Urol* 1982;127:439-41.
- Malizia AA, Reiman HM, Myers RP, *et al*. Migration and granulomatous reaction after periurethral injection of polytef (Teflon). *JAMA* 1984;251:3277-81.
- Mittleman RE, Marracini JV. Pulmonary Teflon granulomas following periurethral Teflon injection for urinary incontinence. *Arch Pathol Lab Med* 1983;107:611-2.
- Vorstman B, Lockhart J, Kaufman M, *et al*. Polytefuroethylene injection for urinary incontinence in children. *J Urol* 1985;133:248-50.

(Accepted 30 September 1986)