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A FURTHER LOOK AT THE RATIONALE OF 'EXTERNAL SPHINCTEROTOMY'

By N. O. K. GIBBON, M.B., Ch.M(L'pool), F.R.C.S.Edin., F.R.C.S.
Head, Liverpool Regional Urological Centre

ENDOSCOPIC 'external sphincterotomy' ('division of the external sphincter') is well established as a safe and effective way of relieving obstruction at membranous urethral level in the adult male with a neuropathic bladder. More than 200 of these operations have been done in Liverpool and there have been no deaths in the past 18 years. The risk of haemorrhage and extravasation is minimal if the urethral wall is progressively incised using a pointed electrode and the lowest effective coagulating current. With experience, very few second operations are required, and we are now turning our attention to the rationale of the procedure.

In supra-sacral lesions the retention has always been attributed to spasticity of the striated external sphincter which is now known to develop soon after injury. In cases with severe damage to the conus or cauda equina the external sphincter will be completely flaccid and the urethral resistance subnormal, as measured in the usual supine position. However, a marked increase in resistance may occur in the upright position (Gibbon, 1973) and this has hitherto been explained on a mechanical basis (Vincent, 1966; Dollfus 1972). Recent discoveries in the complex field of vesico-urethral physiology make this an appropriate time to subject these ideas to a critical review.

Henle's century-old description of the circular striated external sphincter with its inverted fan of fibres extending up anteriorly still stands (Haines, 1969). This muscle is now thought, however, to play little part in the resting urethral resistance which is largely due to plain muscle under sympathetic control (Donker *et al.*, 1972). The urethral pressure profile is said by these authors to be unaffected by bladder filling or posture in the normal subject, while alpha-blocking agents effectively flatten the curve. In view of these revelations it is not surprising that doubts about the classical innervation of the external sphincter by the internal pudendal nerves (Gil Vernet, 1964) have been revived. Elbadawe and Schenk (1974) have shown histo-chemically sympathetic and parasympathetic as well as somatic motor nerve endings but the source of the latter awaits confirmation. Gil Vernet and others believe that the somatic fibres travel in the nervi erigentes. The unreliability of pudendal neurectomy in the management of external sphincter spasticity (Gibbon, 1966) is readily understandable on this basis.

The main function of the compressor urethrae seems to be sudden voluntary interruption of the urinary flow and continence is normally maintained during increases of abdominal pressure by the intra-abdominal situation of the proximal urethra which is subject to the same forces which are bearing on the bladder (Enhorning, 1961). When the bladder is grossly overdistended, however, the

external sphincter may come in with the other pelvic floor muscles as a second-line defence against leakage. No function can yet be assigned with confidence to the anterior oblique part of the sphincter. Sant (1972) has suggested that it maintains the circular smooth muscle coat of the urethra in a state of tension and so raises the resistance to flow.

Applying these observations to operations on the external sphincter several interesting features emerge. The usual empirically-derived 6 mm. deep incisions extending on each side from the verumontanum distally for about 2 cms. have been shown by post-mortem studies to divide all the striated muscle in that region (Linker & Tanagho, 1975). Inevitably the smooth muscle coats of the urethra are also incised in the same areas, which would largely account for the flattening of the urethral pressure profile observed postoperatively in both sacral and supra-sacral lesions. In supra-sacral cases reflex bladder emptying may be opposed by simultaneous sphincter contractions or clonic spasm as well as a raised basic tone (Diokno, *et al.*, 1974) and presumably these forces are also diminished by sphincterotomy, though to what extent remains to be shown by postoperative electromyography. The importance of reflex overactivity of the smooth muscle of the urethra in relation to the levels of neurological damage is another important field for research.

Sant (1972) has suggested tht the incisions should be anterolateral to include the oblique parts of the sphincter but Currie *et al.* (1970) found no further decrease in the retrograde urethral resistance when an anterior incision was added. In our experience bilateral cuts produce a high incidence of first-time success in eliminating the peak of the urethral pressure profile, while the clinical failures are related more to deficiency of detrusor action than to the degree of residual resistance in the membranous urethra (Abel *et al.*, 1975).

As far as sacral lesions are concerned we have shown that the marked increase in the elevation of the urethral pressure profile which occurs on moving to the upright position is abolished by an alpha-blocking agent, which should re-awaken interest in drugs and sympathectomy as alternatives to local surgery (Abel *et al.*, 1974).

The relationship of 'external sphincterotomy' to stress incontinence is now clearer. In supra-sacral lesions a normal proximal urethra would ensure continence under abdominal stress provided that reflex detrusor contractions were not provoked. Clearly bladder-neck resection should be avoided in these cases unless specifically indicated. In sacral cases with voiding by straining the bladder neck may funnel into the paralysed pelvic floor from the start or following bladder-neck resection. If division of the external sphincter region is also required it seems wise to preserve initially the segment of urethra between the verumontanum and the urogenital diaphragm in the hope that this will close under the influence of abdominal pressure and so prevent undue stress leakage.

Unfortunately, the endoscopic operation (which should, perhaps, be redesignated 'internal membranous urethrotomy') is difficult or impossible in children and infants even with the latest equipment. Koontz *et al.* (1972) reported good results with a high complication-rate, while Johnston and Kathel (1971) have preferred dilatation or incision through a perineal urethrotomy. Thomas *et al.* (1973) described division of the external sphincter by a perineal approach, without opening the urethra. The effects of the operation were inconsistent and this has led the authors to include the posterior wall of the membranous urethra in the

incision. The results of this modified technique will be watched with interest and may shed some further light on the role of the plain muscle of the urethra in neuropathic disorders of micturition.

SUMMARY

A sound anatomical and physiological basis has now been provided for the endoscopic operations which are carried out for the relief of urethral obstruction due to spasticity of the external sphincter. However, the operation 'external sphincterotomy' was originally applied empirically to cases with sacral areflexia in which the mechanism of the obstruction was obscure. It now seems that plain muscle contraction under sympathetic control and influenced by posture is probably responsible and there are prospects of relief from the use of alpha-adrenergic blocking agents. When endoscopic incision is required, the operation might be better designated 'internal membranous urethrotomy'.

RÉSUMÉ

Il existe actuellement une bonne base anatomique et physiologique pour les opérations endoscopiques réalisées en vue d'éliminer l'obstruction urétrale provoquée par la spasticité du sphincter externe. Cependant, l'opération dite 'sphinctérectomie externe' était initialement appliquée de manière empirique aux cas d'aréflexie sacrale chez lesquels le mécanisme d'obstruction était obscure. Il semble maintenant qu'une simple contraction musculaire commandée par le sympathique et influencée par la position du corps en est probablement responsable et qu'il existe des perspectives d'amélioration si l'on utilise des agents de blocage alpha-adrénergiques. Lorsqu'il est nécessaire de pratiquer une incision endoscopique, il semble préférable d'appeler cette opération "urétrotomie membraneuse interne".

ZUSAMMENFASSUNG

Für endoskopische Operationen, die zur Beseitigung von urethralen Obstruktionen, die durch Spastizität des externen Sphinkters verursacht werden, durchgeführt werden, besteht jetzt eine anatomische und physiologische Basis. Externe Sphinkterotomie wurde bisher erfahrungsgemäss bei Patienten mit Sakralareflexie, bei denen der Obstruktions-Mechanismus nicht klar war, empirisch vorgenommen. Es scheint jedoch, dass durch sympathische Kontrolle verursachte Muskelkontraktion, die auch durch die Körperhaltung beeinflusst wird, verantwortlich ist, und man könnte durch Verabreichung von Alpha-adrenergischen Mitteln eine Besserung erzielen. Falls eine endoskopische Inzision notwendig erscheint, sollte man solche Eingriffe als "interne membranöse Urethrotomie" bezeichnen.

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