SELECTIVE SACRAL NERVE BLOCKS IN THE MANAGEMENT OF "UNINHIBITED NEUROGENIC BLADDER"

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IMPROVED UNDERSTANDING of the nervous control of the urinary bladder has made available a rational therapeutic approach to the management of some selected cases of uninhibited neurogenic urinary bladder, provided that the dominant parasympathetic outflow tracts to the bladder can be identified.

An uninhibited neurogenic bladder results from excessive parasympathetic tone exerted to the detrusor muscle due to neurological lesions affecting the cortico-regulatory tract above the spinal centers of micturition (S 2-3-4).¹ This produces uninhibited voiding and symptoms of severe frequency, urgency, and often urinary incontinence. Common causes are multiple sclerosis, traumatic injury to the spinal cord and cerebral vascular accidents. The cases selected are those in which the symptoms fail to respond to anticholinergic agents.

The preganglionic parasympathetic outflow from the S 2-3-4 cord segments bilaterally form the nervi erigentes.² However, of these six nerve roots, only one, two, or three are dominant. The role of selective sacral block is paramount in identifying the dominant nerves in each particular patient, following which a selective neurectomy can be carried out with successful results while causing minimal interference with the function of other pelvic organs.^{3,4,5}

The following case report demonstrates the value of selective sacral nerve block in the management of this type of problem.

CASE HISTORY

Mrs. M.B. is a 45-year-old housewife who gave a history of urgency, frequency, nocturia, and urinary incontinence several times a day and at night. Her urinary incontinence was very incapacitating. She had been given large doses of probanthine with little relief and because of the side effects this treatment had to be discontinued. Because of the patient's sex, an effective urinary appliance is not available and she had to wear large numbers of pads for many years. A pelvic floor repair was done ten years prior to admission and this failed to correct her incontinence. She had previously been investigated and had numerous urine cultures, intravenous pyelograms and cystoscopies which revealed no abnormality. Neurological examination and myelogram had also been negative.

In November of 1972 she was admitted to Kingston General Hospital for investi-

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FIGURE 1. Cystometrograms prior to treatment and after block and pelvic neurectomy. Rate of bladder filling: approximately 5 cc/min in the top curve and 15 cc/min in the others.

gation when a cystometrogram revealed a strong detrusor contraction at a volume of 75 ml (Figure 1). The diagnosis of an uninhibited neurogenic bladder was made. A cystometrogram was done again in January 1973 under epidural anaesthesia and this showed a flat curve up to 400 ml (Figure 1). In April 1973 the cystometrograms were repeated under caudal epidural anaesthesia, and then after selective nerve blocks to the 2nd, 3rd and 4th sacral nerves individually on both right and left sides. The bladder tone showed the best responses to block of S2 and S4 on the left, with restoration of the bladder capacity to a normal level during the block (Figure 1).

The patient was treated surgically in May 1973 when section of the nervi erigentes on the left was carried out.³ Postoperatively, her symptoms and cystometrogram were much improved and her urinary incontinence was cured. She has been followed for almost a year and remains continent with good bladder capacity.

BLADDER PHYSIOLOGY

The controversies surrounding this field defy a brief description. It is agreed, however, that detrusor contraction is produced through the parasympathetic nerves (S 2-3-4) and this results in bladder emptying. The mechanism by which the urinary bladder accommodates a certain volume of urine is not clear. This has been attributed to an intrinsic property of smooth muscle to adapt to stretch; to the sympathetic innervation (T 10 to L 2) which reaches the bladder through the superior hypogastric plexus (right and left inferior hypogastric plexi), or to the regulation by higher centers.^{6,7}

The role of higher centers in the control of micturition is well recognized, but their exact location and the pathways remain a controversial issue. The brain stem micturition centers located in the pons send fascilitatory and inhibitory impulses to the spinal cord centers. These are supposedly responsible for regulating the threshold volume and the complete emptying of the bladder. One higher center in the cerebral cortex has been described and this is thought to be responsible for inhibiting the lower centers until a suitable time and place to relieve bladder fullness is found.^{2,8}

CASE DISCUSSION

Although a neurological lesion could not be identified in the patient described, there was no doubt about the diagnosis of an uninhibited neurogenic bladder. The lesion was presumed to be congenital in origin and in simple terms could be described as an inadequate development of the normal "inhibitory bladder control." This was confirmed by the cystometrogram (Figure 1). It should be emphasized that there was no evidence of any bladder abnormality or any urinary infection and attempts at controlling detrusor contractions with parasympatholytic agents were unsuccessful despite doses that produced significant side-effects.

SELECTIVE SACRAL BLOCK

This procedure is indicated prior to any surgical intervention in order to determine which nerve root or roots are responsible for the hypertonic bladder in the uninhibited state. This is an invaluable adjunct to the treatment of this condition. It helps to determine the potential outcome of the surgery and identifies the dominant roots, thus making the surgery selective with minimal or no interference with the function of other pelvic organs.

A cystometrogram is done before any blocks are done, then repeated after each of the six nerves are blocked individually. Usually one or two roots are responsible for most of the hypertonicity. The blocks should be repeated to be certain of the results.

Technically the blocks are quite difficult. The patient lies prone with the buttocks elevated so that the sacrum forms an angle of 45 degrees with the table. As described by D.C. Moore, the surface anatomy of the posterior superior iliac spines, and the sacral cornua is carefully mapped out.⁹ Once the foramina are located,

a needle is passed through each one, which may have to be located by the "touch and pick" method, and passed about one half inch into it. One then feels for the anterior sacral foramen and passes the needle into it as it enters the pelvis. If a parasthesia is felt, 2 c.c. of Lidocaine 1 per cent are deposited.

To confirm initial results, number 18 plastic "Angiocath" catheters were placed into each of the six foramina in the present case. Sequential blocks were carried out on each nerve root at four hourly intervals, and cystometrograms obtained. (Figure 1).

SUMMARY

A case of uninhibited neurogenic bladder is presented and discussed from the viewpoints of diagnosis, physiology of micturition and its derangement in this condition. The role of differential sacral nerve block in treatment is described.

RÉSUMÉ

Une meilleure compréhension de la physiologie et en particulier de l'innervation vésicale a rendu possible le traitement de certains cas de "vessie neurogène" consécutif à une hypertonie para-sympathique.

Une méthode d'identification de la racine ou des racines sacrées prédominantes dans l'innervation parasymphatique vésicale d'un sujet donné est décrite. Cette méthode est basée sur des blocages sélectifs des nerfs sacrés S-2, S-3 et S-4. Une technique de blocage des racines S-2, S-3 et S-4 est également décrite.

Les auteurs présentent un cas clinique où des blocages sélectifs des nerfs sacrés ont permis d'établir la prédominance des racines sacrées gauches de S-2 et de S-4. Une section des nerfs érecteurs gauches fut pratiquée par la suite avec amélioration significative du cystogramme et cure de l'incontinence urinaire du malade.

REFERENCES

1. LAPIDES, J. Symposium on neurogenic bladder. The Urologic Clinics of North America, Volume 1: 84 (1974).
2. GUYTON Textbook of medical physiology, 4th edition. Philadelphia. Saunders, 526 (1971).
3. SUSSET, J., PINHEIRO, J., OTTON, P., BRINDLE, F., & BERTRANT, G. Phenolization et neurotomie selective dans le treatment de la dysfonction vesicale neurogene par lesion centrale incomplete; Extrait des proces verbaux, memories et discussions de la 64^e Session de l'Association Francaise d'Urologie (Paris 1969).
4. GARGOUR, G. Selective sacral root section for experimental detrusor inhibition. J. Neurosurg. 38: 494 (1973).
5. ROCKSWOLD, *et al.* Effect of sacral nerve block on the function of the urinary bladder in humans. J. Neurosurg. 40: 83 (1974).
6. RUCH, T.C. Central Control Of The Bladder in Handbook of Physiology And Neurophysiology, volume 2, pages 1207-1223. American Physiological Society, Washington, D.C. (1960).
7. EL-BADAWI & SCHENK Dual innervation of the mammalian urinary bladder; American J. Anat. 119: 405 (1966).
8. BEST & TAYLOR Physiological basis of medical practice, 8th edition, page 1717 (1966).
9. MOORE, DANIEL C. Regional block, 3rd edition, chapter 50, page 473. Charles C. Thomas, Springfield, Illinois (1961).