An Alternative Method of Dealing with Incontinence in Children with Neurogenic Bladders

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This is a preliminary article describing a different method of treating incontinence in children born with spina bifida or meningocele, the commonest causes of neurogenic bladders in this age-group. More children born with these conditions are surviving through adolescence into adult life, and it is thus increasingly important that more attention should be paid to the special urinary and faecal problems of this group. At the recent Congress of Urology in Munich (Lattimer, Bischoff, and Gregoir, 1967) the only method of dealing with urinary incontinence discussed was that of a urinary diversion. At present it is common practice to perform this when the female children reach the age of 4 or 5 years, while the males are fitted with a penile urinal (Eckstein, 1968). This age is chosen in many cases because it is the usual age for the child to start school. A diversion is an irreversible procedure and not without risk (Nixon and Kapila, 1968) which we feel should not be performed without first considering all available alternatives.

Over the past 4 years this Unit has studied 20 patients varying in age from 4 to 12½ years and the following is a brief résumé of the findings; some of these children have subsequently been treated with an electronic implant by the method previously described by this Unit (Caldwell, 1967; Caldwell *et al.*, 1968a, b).

Details of Cases

The average age of the 20 children was 6½ years, and 15 were below that age when first seen. 7 had hydrocephalus and 3 of these required valves. All but 1 needed a surgical procedure to correct the spinal defect. More than half had other skeletal abnormalities such as congenital dislocation of the hips, and talipes. One had had a neuroblastoma removed. Of these 20 children wheel chairs were needed by 7, 3 of whom could get about to some extent with calipers. 3 others could manage with calipers but did not need a chair, the

remainder were mobile. 12 had urinary incontinence, the other 8 had double incontinence.

Investigations

Blood urea levels were estimated and IVP's and micturating cystograms were taken before more complex tests. All the children were subjected to cystoscopy and urethroscopy. Under anaesthetic a fine balloon-type manometer catheter was inserted into the bladder: this can be moved into the urethra for pressure measurements (see below). 2 needle electrodes were placed in the perineum, 1 on either side of the perineal body to a depth of about 3 cm. A low stimulating signal was applied to the electrodes, and pressure changes both in the bladder and in the urethra were recorded. The object of this procedure was to determine whether there was any active muscle in the perineum. If no contraction of the perineal muscle was seen, nor any pressure change in the urethra noted, then EMG recordings were made to confirm the absence of muscle.

After these investigations 5 children were judged unsuitable for implant because it was not possible to show any active muscle which could be stimulated. The remaining 15 children were considered suitable and were implanted by the method previously described by Caldwell *et al.* (1968a, b).

The age and sex of the children are given in the Table, together with a clinical summary.

Of those for whom the treatment was thought inadvisable, 3 had hydrocephalus, 4 were paraplegic and confined to wheel chairs, and 1 was completely mobile and apparently normal but lacking any suitable perineal muscle. This last child is being considered for a gracilis transplant (see Table).

Results

The results of implanting 15 children have been encouraging; 9 are still improved while 4 have shown no change; 2 others failed later. One failure was perhaps due to the fact that true perineal stimulation was not applied since a rectus abdominis sling had been attempted: stimulation of the sling was to no avail. One implant was initially a success but later failed when it was necessary to

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TABLE
Results in Patients Implanted

Case No.	Sex	Age (yr.)	Clinical Summary	Mobility	Type of Incontinence	Follow-up (mth.)	Results and Comments
1	M	5	Meningomyelocele, spina bifida, spinal operation	Complete	Double	9	Faecal continence excellent (reverted to total incontinence when external unit failed; controlled again when new unit applied); constantly wet without box; occasionally damp with unit
2	F	5	Meningomyelocele, spina bifida, spinal operation	"	Urinary	18	Successful; initial failure by parents to co-operate; now back in care of Sphincter Research Unit; responding well; damp occasionally during day
3	F	5	Spina bifida	"	"	6	Implanted twice; worked well until leads broke; re-implanted and working well when supervised; is lazy about training herself
4	F	6	Meningomyelocele, spina bifida, hydrocephalus, spinal operation	"	"	24	Responded well to stimulation immediately; partly dry but reverts to being wet without box
5	F	9	Meningomyelocele, spina bifida, hydrocephalus, spinal operation, paraplegic	Wheel chair, and occasionally with calipers	Double	24	Rectal plug because implant produced no response; plug gave intermittent results but finally abandoned
6	M	5	Meningomyelocele, spina bifida, hydrocephalus, valve for hydrocephalus, spinal operation	Complete	Urinary	5	Implanted 3 times; on first 2 occasions wounds became infected; units removed; has responded well previously but is not doing so at present
7	M	5	Meningomyelocele, spina bifida, spinal operation	"	"	8	Implanted twice; successful for 2 years then implant failed; reimplanted; some infection; works well but is having difficulty at present
8	F	6	Meningomyelocele, spina bifida, spinal operation	"	Double	—	No response during operation; no improvement in continence; unit eventually removed due to infection
9	M	4	Meningomyelocele, spina bifida, spinal operation	Calipers	"	3	First implant successful but hindered by infection; unit removed; reimplanted and working well
10	F	4	Meningomyelocele, spina bifida, hydrocephalus, spinal operation, paraplegic	None	Urinary	36	Implanted twice; improved with first then unit broke; no success after 2nd implant; ? lack of co-operation
11	F	4	Meningomyelocele, spina bifida, spinal operation	Complete	"	24	Good result at operation, but no success post-operatively
12	M	4	Meningomyelocele, spina bifida, hydrocephalus, spinal operation, valve for hydrocephalus, paraplegic	Poorly with calipers, wheel chair	"	8	Good response under supervision; lazy about training at home
13	F	4	Neuroblastoma	Calipers	"	9	Good response; works well; has been wet on 2 occasions when unit failed
14	M	10	Meningomyelocele,	Complete	"	3	Too early to say, but is working well at present
15	M	4	Meningomyelocele, spinal operation	Calipers	"	—	Stimulation of rectus sling; adhesions ++ around urethra; failed

remove it because of sepsis, and a second implant failed to give a satisfactory result. Some of the children treated are still damp, though they become wet only if the unit fails (e.g. battery or external unit failure), or they develop urinary infection.

Two main problems have been encountered. The first is that of deciding whether there is any suitable perineal muscle present which will produce continence when stimulated. The second is that of keeping the wound free from infection if the implant is to be retained in the body; until the external unit can be applied these children are wet and dirty. When infection occurs removal of the implant is necessary to allow the wound to heal, though sometimes the implant operation can be repeated at a later date. It is the present policy to implant by a retropubic approach to avoid any perineal wounds.

A problem of management has been to make the children understand what it is like to be continent. They have no feeling of bladder fullness nor of the passage of urine. It is important that they should be allowed to go to the lavatory every 2 hours, and that their supervisors and parents understand the simple workings of the device.

It is undoubtedly easier to control faecal than urinary incontinence by this method. One can see that the anus becomes puckered and gains tone. All the children who had faecal incontinence are now continent.

Discussion

This paper is a preliminary article, because the interval since operation on these children varies from 3 years to only 3 months, and it is therefore too early to say what the long-term results will be. Cooper (1968) expressed the hope that the methods previously described by Caldwell might eventually be used in these children. The results given above show that some children can be helped in this way. One main query which requires answering is whether any ureteric reflux of urine, when present, is made worse by making the child continent. So far this has not been the experience of this Unit, as shown by repeat cystograms and IVP's at intervals after operation.

A few of the older children have stated that they are gaining some sensation on micturition. Eckstein (1968) has shown that 30% of a highly selected group of these children could gain urinary control, the rest presumably being subjected to a diversionary operation. The procedure proposed here may allow a number of these children to gain some control of their urine, and become aware of bladder full-

ness and the desire to micturate, so that they may be trained in bladder control. Diversion can thus be avoided.

The selection of children for implant should be very strict. A controlling factor for failure or success is the presence of some perineal muscle. The findings of this Unit confirm that Cooper's criteria (1968) for successful stimulation are necessary and probably correct. In the past, 3 children with very little muscle present have been implanted in the hope that these muscles would hypertrophy. This happened in 1 case, a second has only just been operated upon, but a third failed.

Griffiths (1968) has shown that gracilis transplants can be used to correct urinary incontinence and where the muscle action falls off, it may be possible to reactivate it by means of an electronic implant. This is another procedure which offers hope to these children who have no perineal musculature.

The complications and risks of a diversionary operation are well known and have recently been summarized by Retik, Perlmutter, and Gross (1967) and Cook *et al.* (1968). Other methods of treating these children should therefore be explored, and it is hoped that the method described here will be considered.

Failure of the implant, which is very rare, or difficulties which may arise from the growth of the child, can now be easily corrected by replacing the implant by a method recently perfected, leaving the leads and electrodes *in situ*.

Summary

Electrode implantation in the perineal muscle provides an alternative to urinary diversion in the treatment of spina bifida children with incontinence. Over the past 4 years 20 children have been studied, 15 of whom were implanted. 11 of these showed some initial improvement in their continence, and 9 are still showing some improvement. The procedure is in no way harmful or irreversible and these children should be given the opportunity of avoiding irreversible operations.

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